

D16. Academic and Highly Specialized Public Health Master’s Degrees

Students enrolled in the unit of accreditation’s academic and highly specialized public health master’s degrees (e.g., MS in biostatistics, MS in industrial hygiene, MS in data analytics, etc.) complete a curriculum that is based on defined competencies; produce an appropriately rigorous discovery-based paper or project at or near the end of the program of study; and engage in research at a level appropriate to the degree program’s objectives.

These students also complete coursework and other experiences, outside of the major paper or project, that substantively address scientific and analytic approaches to discovery and/or translation of public health knowledge.

Finally, students complete coursework that provides instruction in the foundational public health knowledge at an appropriate level of complexity. This instruction may be delivered through online, in-person or blended methodologies, but it must meet the following requirements while covering the defined content areas.

The school identifies at least one required assessment activity for each of the foundational public health learning objectives.

The school validates academic public health master’s students’ foundational public health knowledge through appropriate methods.

- 1) *List the curricular requirements for each relevant degree in the unit of accreditation.*

GWSPH offers three academic and highly specialized public health master’s degrees:

- MS in Health Data Science, Biostatistics (36 credits)
- MS in Health Data Science, Bioinformatics (36 credits)
- MS in Public Health Microbiology and Emerging Infectious Diseases (45 credits)

Students without a prior public health degree from a CEPH accredited school or program are required to successfully pass the online PUBH 6080 Pathways to Public Health within one year of matriculation. See [Criterion D16.6](#).

| Requirements for MS in Health Data Science degree, Biostatistics Concentration | | |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------|
| Course number | Course name | Credits |
| <i>Core courses (including consulting/research/thesis)</i> | | |
| PUBH 6850 | Introduction to SAS for Public Health Research | 1 |
| PUBH 6851 | Introduction to R for Public Health Research | 1 |
| PUBH 6852 | Introduction to Python for Public Health Research | 1 |
| PUBH 6860 | Principles of Bioinformatics | 3 |
| PUBH 8870 | Statistical Inference for Public Health Research 1 | 3 |
| PUBH 6869 | Principles of Biostatistical Consulting | 1 |
| PUBH 6898 | Master of Science Thesis | 1 |
| PUBH 6080 | Pathways to Public Health | 0 |
| <i>Concentration courses</i> | | |
| PUBH 6862 | Applied Linear Regression Analysis for Public Health Research | 3 |
| PUBH 6864 | Applied Survival Analysis for Public Health Research | 3 |

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| PUBH 6865 | Applied Categorical Data Analysis for Public Health Research | 3 |
| PUBH 6866 | Principles of Clinical Trials | 3 |
| PUBH 6887 | Applied Longitudinal Data Analysis for Public Health Research | 3 |
| PUBH 8871 | Statistical Inference for Public Health Research 2 | 3 |
| | Electives | 7 |
| | TOTAL CREDITS | 36 |

| Requirements for MS in Health Data Science degree, Bioinformatics Concentration | | |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------|
| Course number | Course name | Credits |
| <i>Core courses (including consulting/research/thesis)</i> | | |
| PUBH 6850 | Introduction to SAS for Public Health Research | 1 |
| PUBH 6851 | Introduction to R for Public Health Research | 1 |
| PUBH 6852 | Introduction to Python for Public Health Research | 1 |
| PUBH 6860 | Principles of Bioinformatics | 3 |
| PUBH 8870 | Statistical Inference for Public Health Research 1 | 3 |
| PUBH 6897 | Research in Biostatistics and Bioinformatics ⁷⁷ | 2 |
| PUBH 6898 | Master of Science Thesis | 1 |
| PUBH 6080 | Pathways to Public Health | 0 |
| <i>Concentration courses</i> | | |
| PUBH 6859 | High Performance and Cloud Computing | 3 |
| PUBH 6861 | Public Health Genomics | 3 |
| PUBH 6884 | Bioinformatics Algorithms and Data Structures | 3 |
| PUBH 6854 | Applied Computing in Health Data Science | 3 |
| PUBH 6886 | Statistical and Machine Learning for Public Health Research | 3 |
| | Electives | 9 |
| | TOTAL CREDITS | 36 |

| Requirements for MS in Public Health Microbiology and Emerging Infectious Diseases degree | | |
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| Course number | Course name | Credits |
| <i>Required courses</i> | | |
| PUBH 6002 | Biostatistical Applications for Public Health | 3 |
| PUBH 6003 | Principles and Practices of Epidemiology | 3 |
| PUBH 6007 | Social and Behavioral Approaches to Public Health | 2 |
| PUBH 6275 | Essential Public Health Laboratory Skills | 2 |
| PUBH 6245 | Infectious Disease Epidemiology | 2 |
| PUBH 6247 | Epidemiologic Methods 1: Design of Health Studies | 3 |

⁷⁷ Independent research course

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| PUBH 6259 | Epidemiology Surveillance in Public Health | 2 |
| PUBH 6262 | Introduction to Geographic Information Systems | 1 |
| PUBH 6276 | Public Health Microbiology | 3 |
| PUBH 6278 | Public Health Virology | 3 |
| PUBH 6853 | Use of SAS for Data Management and Analysis | 3 |
| PUBH 6861 | Public Health Genomics | 3 |
| PUBH 6291/ MICR 8210 | Infection and Immunity | 3 |
| PUBH 6016 | Field/Laboratory Experience | 2 |
| PUBH 6280 | Microbiology and Emerging Infectious Diseases Final Project | 2 |
| PUBH 6080 | Pathways to Public Health | 0 |
| | Electives | 8 |
| | TOTAL CREDITS | 45 |

- 2) *Provide a matrix, in the format of Template D16-1, that indicates the required assessment opportunities for each of the defined foundational public health learning objectives (1-12). Typically, the school will present a separate matrix for each degree school, but matrices may be combined if requirements are identical.*

See [Criterion D16.6](#) for more information on how students are assessed on the foundational public health learning objectives.

Template D16-1

| Content Coverage for Academic Public Health Master's Degree | | |
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| Content | Course | Describe specific assessment opportunity |
| 1. Explain public health history, philosophy, and values. | PUBH 6080 Pathways to Public Health | Week 2 Quiz. See ERF. |
| 2. Identify the core functions of public health and the 10 Essential Services. | PUBH 6080 Pathways to Public Health | Week 3 Quiz. See ERF. |
| 3. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health. | PUBH 6080 Pathways to Public Health | Week 4 Quiz. See ERF. |
| 4. List major causes and trends of morbidity and mortality in the US or other community relevant to the school or program. | PUBH 6080 Pathways to Public Health | Week 6 Quiz. See ERF. |
| 5. Discuss the science of primary, secondary, and tertiary prevention in population health, including health promotion, screening, etc. | PUBH 6080 Pathways to Public Health | Week 7 Quiz. See ERF. |
| 6. Explain the critical importance of evidence in advancing public health knowledge. | PUBH 6080 Pathways to Public Health | Week 5 Quiz. See ERF. |
| 7. Explain effects of environmental factors on a population's health. | PUBH 6080 Pathways to Public Health | Week 9 Quiz. See ERF. |
| 8. Explain biological and genetic factors that affect a population's health. | PUBH 6080 Pathways to Public Health | Week 8 Quiz. See ERF. |
| 9. Explain behavioral and psychological factors that affect a population's health. | PUBH 6080 Pathways to Public Health | Week 13 Quiz. See ERF. |
| 10. Explain the social, political, and economic determinants of health and how they contribute to population health and health inequities. | PUBH 6080 Pathways to Public Health | Week 12 Quiz. See ERF. |
| 11. Explain how globalization affects global burdens of disease. | PUBH 6080 Pathways to Public Health | Week 11 Quiz. See ERF. |
| 12. Explain an ecological perspective on the connections among human health, animal health and ecosystem health (e.g., One Health). | PUBH 6080 Pathways to Public Health | Week 10 Quiz. See ERF. |

- 3) *Provide supporting documentation for each assessment activity listed in Template D16-1. Documentation should include the following, as relevant, for each listed assessment:*
- *assignment instructions or guidelines as provided to students*
 - *writing prompts provided to students*
 - *sample exam question(s)*

See ERF > Criterion D > Criterion D16 > D16.3: Temp D16-1_doc.

- 4) *Provide a matrix, in the format of Template D16-2, that lists competencies for each relevant degree and concentration. The matrix indicates how each competency is covered in the curriculum. Typically, the school will present a separate matrix for each concentration. Note: these competencies are defined by the school and are distinct from the foundational public health learning objectives defined in this criterion.*

Template D16-2

| Competencies for MS, Health Data Science, Biostatistics | | |
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| Competency | Course | Describe specific assessment opportunity |
| Biostatistical Methodology: Summarize and evaluate biostatistical methodology applied in public health and biomedical research. | PUBH 6865 Applied Categorical Data Analysis for Public Health Research | PUBH 6865—In each session, biostatistical methods are explained along with examples of how to conduct analyses using statistical software, check relevant assumptions, and summarize and interpret findings. In the accompanying homework problem sets, students evaluate, summarize and interpret. See ERF. |
| Applied Statistics: Apply the principles of biostatistical methodology to perform analyses of public health and biomedical data. | PUBH 6864 Applied Survival Analysis | PUBH 6864—In Part 2 of the final exam, students apply the methods learned and analyze public health and biomedical data using statistical software. See ERF. |
| Statistical Programming: Use statistical software to perform programming tasks for the purposes of statistical analysis of public health and biomedical data. | PUBH 6862 Applied Linear Regression Analysis for Public Health Research | PUBH 6862—Students are taught statistical programming techniques using R or SAS. In the final exam, students perform programming tasks to obtain the required statistical output to provide appropriate interpretations of results. See ERF. |
| Scientific Writing: Develop components of the statistical analysis section of public health and biomedical research proposals. | PUBH 6866 Principles of Clinical Trials | PUBH 6866—In the Concept Proposal assignment, groups of students develop and write a concept proposal describing the essential elements of a clinical trial. They present a PowerPoint presentation on their proposal, during which all members of the team present. Students are assessed individually during the presentation and Q&A session. See ERF. |

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| <p>Communication: Communicate principles of statistical theory and study design to interprofessional team members.</p> | <p>PUBH 6866 Principles of Clinical Trials</p> <p>PUBH 6869 Principles of Biostatistical Consulting</p> | <p>PUBH 6866—At the start of the course, students are surveyed and placed on multidisciplinary teams based on program and experience. In the Concept Proposal assignment, these groups collaborate and communicate regarding the appropriate statistical theories and study designs. The exchange of concepts and ideas with others on the team and iterative presentations to the class on the trial are part of the course requirement. Through this teamwork, students learn how members of a team interact with one another, the accepted behaviors of a team (such as expressing ideas, voicing opinions and concerns, offering help, and resolving conflict), using various methods of communication. Mastering group communication skills, in all aspects, is essential to collaboration with investigators and other key team members and is a critical part of effective protocol development. See ERF.</p> <p>PUBH 6869—Students learn the principles of biostatistical consulting and communication in sessions 1 through 5. In the Online Quiz, students identify and communicate potential concerns to the lead physician in a described scenario in written format. See ERF.</p> |
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| <p>Competencies for MS, Health Data Science, Bioinformatics</p> | | |
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| <p>Competency</p> | <p>Course</p> | <p>Describe specific assessment opportunity</p> |
| <p>Programming: Develop skills in programming, data structures, algorithms, machine learning, high-performance computing and apply these skills to create approaches that facilitate biological data analysis.</p> | <p>PUBH 6854 Applied Computing in Health Data Science</p> <p>PUBH 6859 High Performance and Cloud Computing</p> | <p>PUBH 6854—In Lab 4—Programming in R (sessions 25–26), students review basic scripting in R including basic arithmetic functions, vectors, summary statistics, matrices, mixed modes and data frames, graphics, scatterplots and simple linear regression. See ERF.</p> <p>PUBH 6859—In Assignment 3—Bioinformatics on AWS, students use AWS cloud computing to make a workflow to run the machine learning clustering algorithm omeClust, including a description of the workflow to retrieve and store data, share data, analyze data, and provide access to other users to run the script and access results. See ERF.</p> |

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| <p>Biology: Develop a basis of knowledge in biology and evaluate biological data generation technologies.</p> | <p>PUBH 6861 Public Health Genomics</p> | <p>PUBH 6861–Problem Set 1 covers the human genome project and the Santa Cruz Genome browser. Students use biological knowledge to navigate human genome databases, review data types and data generation technologies, and download, analyze and compare biological data in a cohort at risk of developing breast cancer. See ERF.</p> |
| <p>Statistics: Apply statistical research methods in the context of molecular biology, genomics, medical, and population genetics research.</p> | <p>PUBH 6861 Public Health Genomics</p> <p>PUBH 6886 Statistical and Machine Learning for Public Health Research</p> | <p>PUBH 6861–Problem Set 4 covers different QC, data manipulation and statistical analyses of genomic data to determine differences in microbial population composition and diversity across humans. In this assignment statistical methodology and the software implementing it are explained, so students can apply both to the analysis of genomic data from a public health study and generate different types of research outcomes. Students must then interpret and discuss those results in the context of the human microbiome. See ERF.</p> <p>PUBH 6886–The Final Project takes the form of a scientific poster and speed presentation that assesses students' abilities to select, apply, and evaluate one or more of the statistical/machine learning methods learned in the course to address a public health or biomedical research question. An important component of the final project will be the presentation and communication of the methods used and the results obtained (pp. 4-5).</p> |

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| <p>Foundational Knowledge: Interpret and synthesize the various foundational concepts of bioinformatics, including genomics, algorithms, and other key tools used in bioinformatics.</p> | <p>PUBH 6859 High Performance and Cloud Computing</p> <p>PUBH 6861 Public Health Genomics</p> | <p>PUBH 6859–In Assignment 6 (session 14), students synthesize a variety of data and tools to develop workflows on Google Cloud where students use Google Cloud computing to make a workflow to run the machine learning clustering algorithm omeClust, including a description of the workflow to retrieve and store data, share data, analyze data, and provide access to other users to run the script and access results and then compare to their AWS approach. See ERF.</p> <p>PUBH 6861–Problem Set 2 covers data types, bioinformatic principles and tools. Students access, retrieve and analyze biomedical and genomic information available at the National Center for Biotechnology Information (NCBI). They synthesize the concepts learned, compare bioinformatic pipelines and search algorithms, and interpret their analytical outcomes in the context of an outbreak of the Influenza A virus. See ERF.</p> |
| <p>Conceptual Integration: Integrate concepts and data across fields of computer science, statistics, data science, biology, and health sciences through bioinformatics.</p> | <p>PUBH 6861 Public Health Genomics</p> | <p>PUBH 6861–In the Research Project, students design, carry out and present a Research Project. They integrate and summarize data, tools and concepts of genomics, statistics, biology, bioinformatics, etc. covered during the course. This semester-long assignment gives students hands-on experience in molecular techniques commonly used in genomic labs and the state-of-the-art computational approaches used to analyze genomic data. Students write a five-page scientific report, which includes all the main sections of a scientific article, summarizing and discussing their results (summative assessment; pp. 3-4).</p> |

| <p>Competencies for MS, Public Health Microbiology and Infectious Diseases</p> | | |
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| <p>Competency</p> | <p>Course</p> | <p>Describe specific assessment opportunity</p> |
| <p>Identify the public health presentation and impacts of infectious agents.</p> | <p>PUBH 6245 Infectious Disease Epidemiology</p> | <p>PUBH 6245–In the Final Exam, students answer multiple choice questions where they identify the presentation and impacts of various infectious agents. See ERF.</p> |

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| Describe the principles of microbial disease surveillance and epidemiology. | <p>PUBH 6245 Infectious Disease Epidemiology</p> <p>PUBH 6259 Epidemiology Surveillance in Public Health</p> | <p>PUBH 6245–In the Final Exam, students answer a series of short answer questions where they describe and apply the principles of microbial diseases surveillance and epidemiology. See ERF.</p> <p>PUBH 6259–In the final paper, students apply the principles of microbial disease surveillance and epidemiology to design and evaluate a hypothetical surveillance system. See ERF.</p> |
| Plan and implement studies to analyze patterns of disease and to evaluate the public health impact. | PUBH 6247 Design of Health Studies | PUBH 6247–In the Research Proposal, students plan and design an observational study to analyze patterns of disease and evaluate the public health impact. See ERF. |
| Interpret and communicate results of outbreak investigations and analytic studies. | <p>PUBH 6245 Infectious Disease Epidemiology</p> <p>PUBH 6291/MICR 8210 Infection and Immunity</p> | <p>PUBH 6245–In the Case Study, Part 3, students interpret the evidence associated with a disease outbreak and develop key messages that need to be communicated in a press release. See ERF.</p> <p>PUBH 6291/MICR 8210–In the Manuscript writing assignment, students receive a figures and methods section from a published journal article. Interpreting the data, students write an abstract, results and discussion section communicating the evidence from the analytic study in academic language (p. 3).</p> |
| Define public health roles and procedures of biomedical and public health laboratories. | PUBH 6275 Essential Public Health Laboratory Skills | PUBH 6275–During the semester, students complete a series of identifications of lab unknowns and compile each in a Lab Notebook. These activities require students to define the role of public health laboratories as well as details of specific procedures used and the role of those procedures. See ERF. |
| Understand currently used laboratory techniques and principles in public health microbiology and genomics that are used to distinguish characteristics of pathogens. | PUBH 6275 Essential Public Health Laboratory Skills | PUBH 6275–Students conduct currently used laboratory techniques and principles as part of their unknown labs. One such test is the <i>Candida albicans</i> Germ Tube Test in Session 4. See ERF. |

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| <p>Understand modes of transmission, pathogenic mechanisms, and immune responses as well as challenges for developing successful vaccines and/or drugs.</p> | <p>PUBH 6276 Public Health Microbiology</p> <p>PUBH 6278 Public Health Virology</p> | <p>PUBH 6276—Students produce a presentation and poster describing the modes of transmission, mechanism, immune response, and therapeutic/prevention challenges for a selected pathogen (p.1; see ERF).</p> <p>PUBH 6278—On the midterm exam, students write a partial manuscript using preliminary results from a study on the pathogenesis of the MP virus which causes encephalitis. A successful manuscript requires knowledge on the modes of transmission, pathogenic mechanisms and immune responses. For the Topic Presentation, students are assigned a scientific article and must present a PowerPoint presentation on it to their fellow classmates. The articles address challenges for developing successful vaccines and/or drugs. See ERF.</p> |
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- 5) *Provide supporting documentation that clearly identifies how the school or program ensures that students complete a curriculum based on defined competencies. Documentation may include detailed course schedules or outlines to selected modules from the learning management system that identify the relevant assigned readings, lecture topics, class activities, etc.*

See ERF > Criterion D > Criterion D16 > D16.5: Competencies_doc.

- 6) *Briefly explain how the school ensures that the instruction and assessment in basic public health knowledge is generally equivalent to the instruction and assessment typically associated with a three-semester-credit course.*

The instruction and assessment in basic public health knowledge is achieved through one of two mechanisms:

- Students must have graduated with a public health degree from a CEPH accredited school or program; or
 - Students must successfully pass degree-required public health-related courses plus PUBH 6080 Pathways to Public Health. The online PUBH 6080 Pathways in Public Health requires students to view asynchronous lecture content, engage with assigned readings and complete short activities and assessments. Students must earn at least 80% on all twelve quizzes to pass the class; quizzes may be repeated later until a passing grade of 80% is obtained. The additional degree-required public health courses vary by degree.
 - Students in the MS in Public Health Microbiology and Infectious Diseases program are required to take PUBH 6002 Biostatistical Applications for Public Health (3 credits), PUBH 6003 Principles and Practices of Epidemiology (3 credits) and PUBH 6007 Social and Behavioral Approaches to Public Health (2 credits), all of which are required foundational courses in the MPH degree. The combination of these three classes plus PUBH 6080 exceeds the three-credit equivalency.
 - Students in the MS in Health Data Science program, both concentrations, complete PUBH 6080 as part of PUBH 6860 Principles of Bioinformatics (3 credits), which teaches more advanced skills such as analyzing and interpreting data and communicating to lay audiences. Students are not able to successfully pass the class without demonstrating that they passed the PUBH 6080 quizzes (or successfully waived the requirement). Between the two courses, students engage in instruction and assessment that exceeds the requirements of a three-semester-credit course.
- 7) *Identify required coursework and other experiences that address the variety of public health research methods employed in the context of a population health framework to foster discovery and/or translation of public health knowledge and a brief narrative that explains how the instruction and assessment is equivalent to that typically associated with a three-semester-credit course.*

Typically, the school or program will present a separate list and explanation for each degree program, but these may be combined if requirements are identical.

All students in the MS in Health Data Science, regardless of concentration, enroll in PUBH 6850 Introduction to SAS for Public Health Research (1 credit), PUBH 6851 Introduction to R for Public Health Research (1 credit), PUBH 6852 Introduction to Python for Public Health Research (1 credit), and PUBH 8870 Statistical Inference for Public Health Research 1 (3 credits), which address public health research methods with a focus on biostatistics and bioinformatics. Additional research courses are taken in each concentration.

In addition to several epidemiology courses, students in the MS in Public Health Microbiology and Infectious Diseases enroll in PUBH 6002 Biostatistical Applications for Public Health (3 credits), PUBH 6275 Essential Public Health Laboratory Skills (2 credits), PUBH 6247 Epidemiologic Methods 1: Design of Health Studies (3 credits), and PUBH 6853 Use of SAS for Data Management and Analysis (3 credits), which introduce public health research applicable to studying infectious diseases. Students also have field exposure through PUBH 6016 Field/Laboratory Experience (2 credits), where they apply public health research methods.

See ERF > Criterion D > Criterion D16 > D16.7: MS_syllabi.

- 8) *Briefly summarize policies and procedures relating to production and assessment of the final research project or paper.*

After successfully completing all core courses and toward the end of their program, students in the MS in Health Data Science, Biostatistics enroll in PUBH 6869 Principles of Biostatistical Consulting (1 credit) and PUBH 6898 Master of Science Thesis (1 credit). During these courses, students conduct a quantitative research project under the guidance of a faculty member. Faculty evaluate students on their work through this final project. All students must conduct master's level research and a written project.

Students in the MS in Health Data Science, Bioinformatics concentration, enroll in PUBH 6897 Research in Biostatistics and Bioinformatics (1-4 credits) and PUBH 6898 Master of Science Thesis (1 credit). Students usually take these two courses (PUBH 6897 and PUBH 6898) toward the end of their program. During these courses, students conduct an independent quantitative research project under the guidance of a faculty member who evaluates their work. This may or may not result in a traditional master's thesis, though all students must conduct master's level research and a written project. For example, one recent graduate published a paper for their final project rather than a traditional thesis.

Students in the MS in Public Health Microbiology and Infectious Diseases enroll in PUBH 6280 Microbiology and Emerging Infectious Diseases Final Project (2 credits) toward the end of their program. During this class, students produce a concept paper, proposal, 18- to 20-page final report and 15-minute oral presentation with PowerPoint slides. The site preceptor and faculty advisor assess each of the deliverables. During the oral presentation, a panel of faculty judges evaluate the student's performance. When taken together, credit is assigned for the course.

- 9) *Provide links to handbooks or webpages that contain the full list of policies and procedures governing production and assessment of the final research project or paper for each degree program.*

See ERF > Criterion D > Criterion D16 > D16.9: MS final rsrch_policies.

- 10) *Include completed, graded samples of deliverables associated with the major paper or project. The school must provide at least 10% of the number produced in the last three years or five examples, whichever is greater.*

See ERF > Criterion D > Criterion > D16.10: MS final rsrch_samples.

There have been four MS in Health Data Science, Bioinformatics graduates in the last three years. There have been no MS in Health Data Science, Biostatistics graduates in the last three years.

11) *If applicable, assess strengths and weaknesses related to this criterion and plans for improvement in this area.*

Strengths

- All MS degrees have an extensive research-focused curriculum that prepares students for post-graduation careers or further graduate studies.
- The MS in Health Data Science degree (both concentrations) changed names in the fall of 2023. Formerly the Health and Biomedical Data Science degree, the name change recognizes the trend in data science programs and should be more prominent in web searches. This program has also experienced tremendous growth in the years since its inception and shows no signs of plateauing.

Challenges

- GWSPH has had to deactivate several MS programs over the last five years due to low enrollment.

Future Plans

- The Department of Environmental and Occupational Health is discussing adding an MS in Environmental Health degree program to the school.
- The Office of PhD and MS Programs plans to ensure clear pathways and appropriate connectivity between MS programs and PhD programs. In particular, the Office intends to look at creating parallel curricula that meet students' needs, as the Health Data Sciences programs did. Currently, the Office of PhD and MS Programs is conducting a landscape analysis for future growth to identify high demand areas with the goal of creating future MS programs in those areas.