HARVARD
T.H. CHAN
SCHOOL OF PUBLIC HEALTH
Department of Biostatistics

GRADUATE STUDENT HANDBOOK

Master of Science in Computational Biology & Quantitative Genetics

2023-2024

Contents

1 INTRODUCTION

This handbook describes the Master's Degree Program in Computational Biology and Quantitative Genetics offered by the Departments of Biostatistics and Epidemiology at Harvard University. The SM program provides students with the rigorous quantitative training and essential skills needed to successfully meet the challenges presented by large-scale public health data – "Big Data" – in biomedical research. The program is designed to prepare students for a career as a bioinformatics analyst or bioinformatics engineer in universities and hospitals, research organizations, and the pharmaceutical and biotechnology industries. It can also provide the foundation for further doctoral studies.

The sections of this handbook include information and regulations concerning entrance requirements, program descriptions, degree requirements, and other program policies. Policies and official requirements of the School of Public Health are set forth in the *Harvard T. H. Chan School of Public Health Student Handbook* (https://www.hsph.harvard.edu/student-handbook/). Each graduate student is responsible for general knowledge of, and adherence to, the policies and requirements of the degree program in which the student is enrolled. Additional program information is available at the website https://www.hsph.harvard.edu/sm-computational-biology/program/. Vitally important for our community is that all members demonstrate respect for each other and our discipline. For all members of the community, respect is demonstrated by attending all scheduled classes or meetings, and arriving on time, fully prepared, and ready to participate.

This handbook was prepared by the Program Directors and approved by the Executive Committee of the Program in Computational Biology and Quantitative Genetics. The Program Directors are responsible for reviewing the student's program of study, and have the authority to consider exceptions to the rules and regulations established by the Executive Committee. Recommendations of the Program Directors are forwarded to the Executive Committee for final approval. Both the Program Directors and the Executive Committee welcome suggestions and comments.

PROGRAM LEADERSHIP AND ADMINISTRATION

Executive Committee

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Master of Science in Computational Biology and Quantitative Genetics
Department of Biostatistics
Department of Epidemiology

2 Master of Science in Computational Biology and Quantitative Genetics

This 80-credit program, offered jointly by the Departments of Biostatistics and Epidemiology, is designed to provide students with:

- The biological background needed to understand and interpret data
- A bioinformatics background providing familiarity with essential tools and data resources
- Computational skills used to analyze and manage "Big Data"
- Statistical skills required to appropriately analyze large quantitative datasets
- Epidemiological skills necessary for the design, conduct, and analysis of experiments

The SM in Computational Biology and Quantitative Genetics is intended as a terminal professional degree which will enable you to launch your career in bioinformatics. It can also provide the foundation for further doctoral studies in biostatistics, epidemiology, computational biology, and other related fields.

Students will receive training in quantitative methods, including linear and logistic regression, survival analysis, longitudinal data analysis, statistical computing, clinical trials, statistical consultation and collaboration, and epidemiology. Students will also gain a strong foundation in modern molecular biology and genetics, computer programming, the use and application of tools for analysis of genomic data, methods for integrative analysis, and meta-analysis of genes and gene function.

2.1 Core Competencies

The curriculum for the Master's in Computational Biology and Quantitative Genetics will provide students with the skills essential to contribute to research projects involving the large, complex genomic datasets that are increasingly common in all areas of biomedical, biological, and public health research. These skills include core competencies in five areas:

1. Biological Background
    - Interpret the results of analyzing diverse types of biological data by applying basic understanding of molecular genetics, the structure and organization of the human genome, gene expression regulation, epigenetic regulation, gene functional descriptions, and modern technologies including genotyping, genome-seq, exome-seq, RNA-seq, ChIP-seq, etc; and their applications, and as well understanding of metagenomics.
2. Bioinformatics Background
    - Use the major genomics data resources, develop basic knowledge of sequence analysis, gain familiarity with gene functional annotation and pathway analysis, the ability to write data management and analysis scripts, working knowledge of data mining and statistical analysis techniques as well as machine learning approaches, and understanding of modern network mod-eling techniques.
3. Computational Skills
    - Understand how to use UNIX commands, a scripting language such as perl or python, an advanced pro-gramming language such as C, C++, or Java, and R/Bioconductor, and familiarity with database programming and modern web technologies to interrogate biological data and to interpret the results of any analysis.
4. Biostatistics Skills
    - Use basic statistical inference and applied regression, survival, longitudinal, and Bayesian statistical analysis in the analysis of biological data to identify statistically significant features that correlate with phenotype.

5. Epidemiology Skills
    - Critically evaluate and apply principles of epidemiologic methods, including exposure and outcome measures, measures of association, bias and confounding, and study design options.

We also have competencies for our two track options:

1. Statistical Genetics
    - Examine the basics of techniques modern population genetics such as genome wide association study methodology.

2. Computational Biology
    - Analyze genomic, transcriptomic, and epigenomic data to explore health and disease.

2.2 Admissions Procedures and Requirements

2.2.1 Harvard T.H. Chan School of Public Health Requirements

Application for admission to the SM program is available online on the Admissions Office website (https://www.hsph.harvard.edu/admissions/admissions/how-to-apply/application-requirements/). For information on general requirements for admission, contact the Admissions Office by phone (617/432-1031) or through their website (https://www.hsph.harvard.edu/admissions/).

2.2.2 Program Requirements

All candidates for admission to the SM in Computational Biology and Quantitative Genetics program should have successfully completed the following:

- An undergraduate degree in mathematical sciences or allied fields (e.g., biology, psychology, economics),
- Calculus through partial differentiation and multivariable integration,
- One semester of linear algebra or matrix methods,
- Either a two-semester sequence in probability and statistics or a two-semester sequence in applied statistics,
- At least one semester of training in biology, with some familiarity with molecular biology and genetics.

In addition, applicants are encouraged to have completed other courses in quantitative areas and in areas of application in the biological sciences. Practical knowledge of computer scripting and programming as well as experience with a statistical computing package such as R is highly desirable. Additional research or work experience is beneficial, but not required. Applicants should show excellence in written and spoken English.

Evidence that these requirements have been fulfilled should form part of the application.

If candidates have questions about whether their coursework is meeting the requirements above, we recommend that they look at the required courses for the program in this handbook and decide. Also, we generally prefer in-person courses for such requirements, but if you choose an online course from platforms like edX or Coursera, such is only acceptable if the material and assessments are comparable to an in-person university course. See this linked list of examples for comparison. If the courses taken do not have the titles mentioned above (like linear algebra or multivariable calculus), then make sure to explain in your statement of purpose in the application which courses you have taken that covered the materials. Please include dates taken, grades received, and institution (whether online or not) in the statement as well.

2.3 Intra/Inter-departmental Biostatistics Degree Program Switch Protocol

The Department of Biostatistics, and several other academic departments at the School (such as Epidemiology), offer master's degree programs. These programs each have their own goals and requirements and make independent decisions about admissions. Students should carefully choose the program to which they apply and we expect students admitted to a program to meet the requirements of that program.

However, we recognize that the interests of some students may change during their time in graduate school. Therefore, the Department has established the following procedure for students applying for a change in program. This applies to students applying for a switch within the Department of Biostatistics, or between the Department of Biostatistics and another department at the School, such as Epidemiology. Please note that transfers between programs are not automatic and may not be approved, and if a student has received a scholarship or other funds from a degree program, that funding will not transfer to the new degree.

1. Students must complete at least one full semester of coursework before applying for a program transfer.

2. Students must enroll in and successfully pass any required coursework for their current program before beginning the transfer process. Please see your current degree program handbook for a list of required coursework. Students may also need to complete coursework in their proposed program so as to not fall behind in requirements to finish their program on time if approved for transfer.

3. Students must complete and submit a formal application and include an updated statement of purpose describing the reason for seeking a program transfer, current CV and one letter of recommendation.

4. The Directors of department master's programs, including the Directors of the student's current program and prospective program, will schedule an interview with the students to assess their application. At the meeting, students will provide a copy of their CV and statement of purpose to each Director, and will briefly explain their decision to apply for a transfer. The Directors will consider the applications and render a decision whether to approve or deny the transfer. These meetings will be scheduled in early January for students applying for transfer to start in the Spring semester, and in late May for students applying to transfer after the Spring semester.

5. The Directors will discuss and notify the student of their decision within three days. All decisions are **final**, and students are **not** allowed to reapply.

6. If approved, completed paperwork must be submitted to the Registrar's Office, and then to the Senior Manager of Academic Services.

Note that all program transfers are at the discretion of the Program Directors and are not guaranteed. If approved, students will be assigned a new academic advisor affiliated with the chosen degree program. It is the responsibility of the students to ensure that they complete all requirements for their degree program.

2.4 Curricular Practical Training (CPT) Approval for Students with F-1 Visas

To be considered CPT, the work must not only be related to the student's major field of study but must also be an integral part of an established curriculum. Before seeking off-campus internship opportunities, students are required to discuss their plans with Elizabeth Capuano (see contact info below) from the Harvard International Office to determine their CPT eligibility. Please note that CPT eligibility may be impacted by the March 2020 guidance issued by the Department of Homeland Security - Student Exchange Visitor Program.

There are two ways in which students are eligible for CPT:

1. Employment that is a required part of a degree program, such as a required internship or practicum. This requirement must be formally documented in school publications, such as a student handbook.

2. Employment that is not required by a degree program, but for which a program will award academic credits. This could include training courses such as a field studies course, or an independent study (see Section 2.5) course that is based on an internship.

International students who wish to pursue this option **MUST** speak with Elizabeth Capuano (elizabeth_capuano@harvard.edu), our representative at the Harvard International Office (HIO), **before beginning interview processes** at prospective internship sites to discuss the requirements for CPT authorization. Students should also speak to one of the directors about whether their employment would qualify for academic credits, as the academic credits are required for CPT authorization. When contacting the program directors, please complete the CBQG CPT Project Proposal form to submit to them for review. If CPT eligibility is established, please note that students **MUST** obtain CPT authorization **PRIOR** to beginning the internship. If doing a summer internship for academic credit, students must sign up for BST 305 CPT-Related Independent Study (Section 2.5) in the following fall semester, or during the summer (see last paragraph in Section 2.5) about tuition costs.

The most up-to-date information about CPT will be found here:
http://www.hio.harvard.edu/curricular-practical-training-cpt.

2.5 Independent Studies

2.5.1 General Independent Study

For independent study not related to a required thesis project or curricular practical training (CPT), the student should discuss with the chosen supervisor the credit hours needed (usually 2.5 credits per term*), and the scope of the work involved before enrolling. If the direct supervisor is not at the School, you'll need to find a department faculty member who will agree to review your progress, even if they are not involved in the project day-to-day. This person can be your academic advisor, one of the program directors, or any other member of the executive committee (Page 2). To register for independent study, the student should sign up for a section of BST 300 with Dr. Brent Coull (who is the Associate Chair), and in the petition to enroll include the name and email address of the direct supervisor, your internal faculty supervisor, and a 1-2 sentence description of the topic to be researched. At the time of registration, the student should also send an email to Jelena (cc'ing the direct supervisor) with the information about the project.

2.5.2 CPT-related Independent Study

For independent study related to curricular practical training (CPT), the student should follow the instructions of Section 2.4, and submit a 1-page proposal of the work to be done during this CPT to their program directors along with the information required by the Harvard International Office (HIO). Program directors will need both before approving the CPT work. At the end of the CPT work, students should submit a 1-page report on the work done, signed by their off-campus supervisor. Both the proposal and the report should tie back to the competencies of the degree program (listed in Section 2.1 of this handbook). To register for the CPT-related independent study, the student should sign up for a section of BST 305 with Dr. Brent Coull (who is the Associate Chair), and in the petition to enroll include the name and email address of the direct supervisor.

*Students may only enroll in 5 credits of independent study in a given semester, and 10 credits maximum for the degree program.

2.6 Change to Part-Time Study

If students find it necessary to change their status, they may do so by submitting a General Petition to the Registrar's Office. Part-time master of science students may take fewer than 15 credits per term. Please read the information found at the Student Knowledge Center about changing your status (https://www.hsph.harvard.edu/r-o-student-knowledge-center/changing-full-time-part-time-status/.

2.7 Advising and Degree Program Approval

2.7.1 Academic Advisor

All entering students are assigned an academic advisor to help plan course loads and explain program requirements. At the earliest possible date, the student and the academic advisor will develop a program of study. Students should bring their Master's Degree Program form (Section 2.7.2) to all meetings with their advisors to keep on track with their requirements. Should a student wish to change their academic advisor, they are encouraged to discuss this with the Program Directors. In addition, SPH provides services for all students with clinically documented learning and/or physical disabilities.

2.7.2 Departmental Approval of Program

The Master's Degree program plan must be submitted to the student's academic advisor and the Program Directors for approval, using the Master's Degree Program form provided at least one semester prior to their expected graduation date (see timeline in Section 3 for details).

2.7.3 Epidemiology Requirement

The School of Public Health requires that Master's students must successfully pass one epidemiology course. The program requires that EPI 201 be taken to satisfy this requirement.

2.7.4 Public Health Practice Requirement

Students may be required to take a public health course by the School of Public Health as part of their accreditation requirements. These requirements will be communicated to all incoming students by the School of Public Health directly.

2.7.5 Research Ethics Requirement

Students must satisfy a research ethics requirement by completing a course in responsible conduct of research or by completing an online training course during the first year in the program (see the timeline in Section 3 for details). Students who feel they have already completed an equivalent training program must submit adequate documentation to, and receive approval from, the Senior Manager of Academic Services in Biostatistics (see contact list on page 1) during the first semester in residence.

2.8 Teaching Fellow Guidelines

The department's current Teaching Fellow Guidelines may be found here (https://content.sph.harvard.edu/biostats/publications/handbook/TF_Guidelines.pdf. If you are assigned a teaching fellow appointment, please reference this document to understand the policies surrounding teaching at the department and the School.

2.9 Satisfactory Progress Requirements

For students in the SM2 program, a total of 80 credits are required with a minimum of 55 ordinal credits from the core courses, tracks, and electives listed in Section 2.10.1. In addition, SPH students must remain in good academic standing, must complete program requirements within the designated time to degree, and must maintain a cumulative average of 2.70 or above. All ordinal grades for courses used to satisfy program

requirements specified in Section 2.10.1 must be at the level of B- or higher. Courses taken on a pass/fail basis cannot be used to satisfy ordinally graded program requirements .

A detailed presentation of SPH's regulations for Master's students is found at https://www.hsph.harvard.edu/student-handbook/. All Master's students and their advisors should make sure that SPH and CBQG program requirements are met according to schedule.

2.10 Degree Requirements

A total of 80 credits are required for the SM2 in Computational Biology and Quantitative Genetics. A minimum of 55 ordinal credits of coursework must be taken from the core courses, tracks, and electives listed below. Students with prior equivalent background to any of the required courses or strong reasons to take a different course can request permission from the Program Directors for a substitution of one or more of the required courses. Students wishing to substitute courses from other departments or institutions for those listed here must obtain prior approval from their academic advisors and one of the program co-directors (see more detailed note after course listings). Although academic advisors and departmental staff will work with students to monitor progress, it is ultimately each student's responsibility to ensure that all requirements are met.

2.10.1 Course Requirements for the SM2 Degree

Fifty-five credits of ordinally graded courses must be taken from the following courses. This includes a 12.5 credit ordinally graded core curriculum consisting of:

BST	210	Applied Regression Analysis (5 credits, Fall)
BST	280	Introductory Genomics & Bioinformatics for Health Research (2.5 credits, Fall 2)
EPI	201	Introduction to Epidemiology Methods I (2.5 credits, Fall 1)
EPI	249	Molecular Biology for Epidemiologists (2.5 credits, Fall 1)

An additional ten credits comprised of courses in either one of the two following tracks:

Statistical Genetics Track

BST	227	Introduction to Statistical Genetics (2.5 credits, Fall 2)
EPI	293	Analysis of Genetic Association Studies (2.5 credits, Wintersession)
EPI	507	Genetic Epidemiology (2.5 credits, Fall 2)
EPI	511	Advanced Population and Medical Genetics (5 credits, Spring)
or		
EPI	535	Epidemiologic Challenges to the Interpretation of Genetic Analyses (2.5 credits, Spring 2)
or		
BST	247	Advanced Statistical Genetics (2.5 credits, Spring 2)

Computational Biology Track

BST	281	Genomic Data Manipulation (5 credits, Spring)
BST	282	Introduction to Computational Biology and Bioinformatics (5 credits, Spring)

A minimum of 22.5 additional credits will come from the field of study tracks above or the following list of elective courses[1]:

BST	212	Survey Research Methods in Community Health (2.5 credits, Spring)
BST	214	Principles of Clinical Trials (2.5 credits, Spring 1)
BST	217	Statistical & Quantitative Methods for Pharmaceutical Regulatory Services (2.5 credits, Spring 2)
BST	221	Applied Data Structures and Algorithms (5 credits) [2]
BST	222	Basics of Statistical Inference (5 credits, Fall)[3]
BST	223	Applied Survival Analysis (5 credits, Spring)
BST	226	Applied Longitudinal Analysis (5 credits, Spring)

BST	228	Applied Bayesian Analysis (5 credits, Fall)
BST	230	Probability Theory and Applications I (5 credits, Fall)
BST	231	Statistical Inference I (5 credits, Spring)
BST	232	Methods (5 credits, Fall)
BST	260	Introduction to Data Science (5 credits, Fall)
or		
CS	109A	Data Science 1: Introduction to Data Science (5 credits, Fall, aka STAT 121A)
BST	261	Data Science II (2.5 credits, Spring 2)
BST	262	Computing for Big Data (2.5 credits, Fall 2)[2]
BST	263	Statistical Learning (5 credits, Spring)
BST	267	Introduction to Social and Biological Networks (2.5 credits, Fall 2)
BST	270	Reproducible Data Science (2.5 credits, Wintersession)[pass grade allowable]
BST	273	Introduction to Programming (2.5 credits, Fall 1)[2]
BST	283	Cancer Genome Data Science (5 credits, Fall)
EPI	202	Elements of Epidemiologic Research: Methods 2 (2.5 credits, Fall 2)
EPI	203	Study Design in Epidemiologic Research (2.5 credits, Spring 2)
EPI	204	Analysis of Case-Control and Cohort Studies (2.5 credits, Spring 2)
EPI	221	Pharmacoepidemiology (2.5 credits, Fall 1)
EPI	271	Propensity Score Analysis (1.25 credits, Wintersession)
EPI	288	Introduction to Machine Learning and Risk Prediction (2.5 credits, Spring)
EPI	289	Epidemiologic Methods III: Models for Causal Inference (2.5 credits, Spring 1)
ID	271	Advanced Regression for Environmental Epidemiology (2.5 credits, Spring 1)
NUT	235	Statistical Methods for Microbiome Data Analysis (2.5 credits, Spring 1)
RDS	280	Decision Analysis for Health and Medical Practices (2.5 credits, Fall 2)
RDS	282	Economic Evaluation of Health Policy & Program Management (2.5 credits, Spring 2)
RDS	285	Decision Analysis Methods in Public Health and Medicine (2.5 credits, Spring 1)
BMI	701	Foundations in Biomedical Informatics I (5 credits, Fall)
BMI	702	Foundations of Biomedical Informatics II (5 credits, Spring)
BMI	703	Precision Medicine I: Genomic Medicine (2.5 credits, Fall 1)
BMI	704	Data Science for Medical Decision Making (2.5 credits, Spring 1)
BMI	705	Precision Medicine II: Integrating Clinical and Genomic Data (2.5 credits, Fall 2)
BMI	706	Data Visualization for Biomedical Applications (2.5 credits, Spring 2)
BMI	713	Computing Skills for Biomedical Sciences (2.5 credits, Fall 1)
BMI	715	Computational Statistics for Biomedical Sciences (2.5 credits, Fall 2)
BMIF	201	Concepts in Genome Analysis (5 credits, Fall)
CS	109B	Data Science 2: Advanced Topics in Data Science (5 credits, Spring, aka STAT 121B)
CS	181	Machine Learning (5 credits, Spring)
or		
MIT	6.7900	Machine Learning (5 credits, Fall) [Formerly 6.867]
MIT	6.7930	Machine Learning for Healthcare (5 credits, Spring, aka HST .956) [Formerly 6.871]
MIT	6.8700	Advanced Computational Biology: Genomes, Networks, Evolution (5 credits, Fall) [Formerly 6.878]

[1]Not all courses in this list will be offered every year.

[2]These courses are strongly recommended.

[3]May be taken concurrently with BST 210 in the fall if in the BIO or CBQG degree programs. This course is a prerequisite for the doctoral-level core Biostatistics theory courses.

Other advanced courses in Biostatistics, including many of the special topics or Wintersession courses, and courses at MIT and the Faculty of Arts and Sciences (FAS) that are offered at an advanced level, may also be acceptable. Students wishing to substitute courses from other departments or institutions for those listed here must obtain prior approval from their academic advisors and one of the program co-directors. Courses not receiving prior approval will not count toward meeting the program requirements.

No more than four courses outside the list above will be approved without special consideration. Courses offered to only undergrads are not allowed to be taken for credit by HSPH. Because MIT does change course numbers often, please check to make sure that the course has not changed to 'undergrad only'.

Note that a maximum of half your total credits per semester can be cross-registered courses without special permission, and a maximum of half of your required 80 credits can be cross-registered courses. This is a School policy.

If you need cross-registration credit conversion, see: https://www.hsph.harvard.edu/r-o-student-knowledge-center/. To request a substitution, first students should email graduate program coordinator, David Cruikshank, to determine if the course has been approved before. If not, then they should email the Program Directors with their reasons for the request (please cc David Cruikshank, so that he may file the information for the final degree audit).

2.10.2 Collaborative Research Thesis

The Collaborative Research Thesis provides students with valuable real-world experience doing research and working with data in Boston's premier biomedical institutions. In the thesis, a student will perform activities related to the design, conduct, and analysis of research studies with the goal of addressing a relevant question requiring the use of methods in computational biology or quantitative genetics. For the thesis, students are generally mentored by a member of the program faculty or other affiliated quantitative scientist with a faculty-level appointment at SPH. Students can also conduct research mentored by members at Harvard University, or a Harvard-affiliated hospital, or other local organizations including nonprofit organizations, biotech startup companies, or pharmaceutical companies, provided they also have a co-mentor among the program faculty (The Program Directors are generally willing to provide such mentorship). Students are responsible for finding and selecting their own advisors and working to develop a suitable research program. A link to a list of possible thesis advisors is provided here, although this list should not prevent you from exploring other potential advisors. Students may also ask their academic advisor or the Program Directors about possibilities for thesis research and advisors; Dr. Erin Lake also has many industry contacts, including those looking for possible SM candidate interns.

Students should notify the Graduate Program Coordinator and cc the Senior Manager of Academic Services in Biostatistics (David and Jelena; see contact list on page 1) by e-mail about their thesis advisor choice by the end of their first academic year. Therefore, students should research and speak to potential advisors and thesis topics throughout their first year. Please cc the thesis advisor in the e-mail so there is a record that they have agreed to serve and please note if there is a co-advisor from the program.

Before the start of the Fall semester of their second year, students should work with their thesis advisors to prepare a short thesis proposal outlining their research question, the data they will use, the methods that will be applied, and the anticipated results; any questions regarding human subjects research should also be addressed. The thesis proposal should have section headings reflecting these four (or five) required elements as well as references cited and should be about two pages in length (although slightly longer is fine) but it should provide sufficient detail to allow the program directors to assess the proposed project. Once the proposal has been approved by the Program Directors, send the approved proposal to David. Examples of previous successful proposals may be obtained from David and/or Jelena to aid in proposal development.

As part of this thesis requirement, students must register for a 10-20 credit ordinally graded CBQG Collaborative Research Thesis (CBQG 325) section, normally undertaken during the third and/or fourth semester, after the required core course work has been completed and should generally correspond to the time during which research is conducted, however students may begin their thesis research during the summer following their second semester (see timeline in Section 3 for details). If students sign up for thesis credits (CBQG 325) prior to their final semester, they may receive an "incomplete" grade until the final semester. If a grade is requested prior to the final semester, the student should submit a 1-2 page progress report, discussed with their thesis advisor, about their thesis work during the grading period of the related semester to the program directors (cc'ing their thesis advisor, and David).

The student will then write a Master's thesis of approximately 15-25 double-spaced pages (excluding tables, figures, and references) that describes, in a standard scientific writing style, the medical or public health problem of interest as well as the analytical methods used and their appropriateness, summarizes the data analyses, and provides a scientific interpretation of the data. The student will also orally present this work in a presentation of approximately 30 minutes in length. The defense must be booked for forty-five minutes to allow for questions and discussion by committee after the presentation.

The Master's thesis and oral presentation will primarily be the work of the student, with only advisory input from the thesis committee members. The Master's thesis and oral presentation will be evaluated by a thesis committee consisting of a minimum of three members. The members will include the student's thesis advisor(s), one of the Program Directors, and other Biostatistics faculty members or surrogates as needed (potentially including the student's academic advisor). The student will submit a Thesis Committee Nomination form before scheduling the thesis defense.

If the thesis work has already been accepted as a journal article, a student may still use this as part of the thesis, but should write introduction and conclusion sections placing the work in context.

The thesis defense should be scheduled by contacting David by late March or early April in their final semester (see timeline in Section 3 for more details). Once a date has been chosen, the Thesis Scheduling form should be completed and submitted to David, and the draft of the Master's thesis must be submitted to the thesis committee at least two weeks prior to the scheduled oral presentation. After the successful defense, and any moderations requested by the Thesis Committee, the final thesis should be submitted to the Program Directors, the Thesis Committee, and David by June 1.

3 ADMINISTRATIVE TIMELINE

Detailed requirements and deadlines for degree completion are given on the Harvard T.H. Chan School of Public Health webpage. All forms linked below are also located on the last page of this Graduate Student Handbook.

- **Summer Before Entering Program**
  - ☐ Take online course in R. One option is https://www.datacamp.com/courses/free-introduction-to-r
- **Year One**
  - First Semester
    - ☐ Complete Research Ethics requirement by taking the free online CITI program or attending HPM 548 (See Section 2.7.5). You will receive a reminder about where to find the online course before beginning the Fall term.
    - ☐ If planning to waive courses, ask for those waivers of fall core courses (BST 210 or BST 280) or the track courses by emailing the Program Directors **and** David in Biostatistics with details about the course(s) taken or experience that you have that may qualify you for a waiver. You may **not** waive out of EPI 249 without a strong background in the material covered. To waive EPI 201 which is a school-wide core requirement, students must submit this Waiver of Core Courses Form through the online form for approval before August 1, and then submit signed approval form through my.harvard to the Registrar's Office.
  - Second Semester
    - ☐ Complete or waive spring track courses.
    - ☐ Attend scheduled meeting about thesis advisors and research projects (March or April).
    - ☐ Search for thesis advisor (see Section 2.10.2) and potential project.
    - ☐ Notify David of your thesis advisor choice by May 15.
  - Summer
    - ☐ May start thesis research over the summer. Signing up for thesis credit (CBQG 325) is not necessary or advisable during the summer.
    - ☐ Work on your thesis proposal with your thesis advisor and submit the proposal by form in email to the Program Directors **by the beginning of Fall term**. Once the proposal has been approved by the Program Directors, send the approved proposal to David (or you may cc David on the original email to the directors). Examples of previous successful proposals may be obtained from David or Jelena prior to submission.
- **Year Two**
  - Third Semester
    - ☐ Continue to complete any necessary coursework.
    - ☐ Start or continue thesis research and sign up for research credit (CBQG 325) at this time, counting the summer work as a part of this enrollment. The grade for CBQG 325 in the fall may be "incomplete" until you finish your thesis and defend it in the spring term unless you follow the instructions in the 4th paragraph in Section 2.10.2 about the required progress report.

– Fourth Semester

- ☐ Continue to complete any necessary coursework.
- ☐ Start or continue thesis research and sign up for research credit (CBQG 325).
- ☐ Turn in your final program form by February 15.
- ☐ Choose your thesis committee members, and complete this form. Submit it to David by the end of Spring 1 term (**no later than March 15**).
- ☐ Work with David to schedule a room for your thesis defense date/time. The Program Directors should have dates/times blocked off in mid to late April or early May for all thesis defenses. Fill out the Thesis Scheduling form after locking down a date.
- ☐ Submit final version of the defended thesis to David by June 1 and let him know if you are willing to share your final version with future students.

4 PROGRAM FORMS

- **CBQG SM2 Degree Program Form**
  https://content.sph.harvard.edu/biostats/publications/cbqg_handbook/SM2_Degree_Form_CBQG.pdf
- **CBQG CPT Proposal Form**
  https://content.sph.harvard.edu/biostats/publications/cbqg_handbook/CBQG_CPT_Project_Proposal.pdf
- **CBQG Thesis Proposal Form**
  https://content.sph.harvard.edu/biostats/publications/cbqg_handbook/CBQG_Thesis_Proposal_Form.pdf
- **Thesis Committee Nomination Form**
  https://content.sph.harvard.edu/biostats/publications/cbqg_handbook/Thesis_Committee_Nomination_Form.pdf
- **CBQG Thesis Defense Scheduling Form**
  https://content.sph.harvard.edu/biostats/publications/cbqg_handbook/Thesis_Defense_Scheduling_Form.pdf