

Department of Biostatistics: Master's Programs

**Harvard T.H. Chan
School of Public Health**

Summer 2016

David Wypij
Director of Master of Science Programs

Department of Biostatistics: Master's Programs

- SM in Biostatistics
 - 2-year (SM2, 80 credits)
 - 1-year (SM1, 42.5 credits)
 - 1.5-year (SM60, 60 credits) including Master's thesis
- SM2 in Computational Biology and Quantitative Genetics (joint with EPI), **started in fall 2014**
- SM60 in Health Data Science, **to start fall 2017**

Department of Biostatistics: Eligibility

- Multivariable calculus (“Calculus III”)
- Linear algebra / matrix methods
- Knowledge of a programming language
- Encouraged to have courses in probability, statistics, advanced calculus, numerical analysis
- Students interested in bioinformatics are encouraged to have courses in biology, computational biology, and genetics
- **(Not just math majors)**

Master's Competencies

- Designing research studies in medicine and public health
- Analyzing and interpreting quantitative data
- Using modern computational methods
- Collaborating and communicating effectively

SM2 (80 credits, 2 years)

- Area of interest in Biostatistics: 50 biostatistics credits with flexibility to develop an individualized program
- Area of interest in Bioinformatics: 55 credits of a more structured program with a focus on computational biology, genetics, and related areas
- Epidemiology / Research ethics
- Other courses in allied public health fields

Biostatistics Course Work

- Basics of probability and inference
- Linear and logistic regression
- Clinical trials and survival analysis
- Longitudinal data analysis
- Statistical computing
- Statistical genetics
- Bioinformatics / computational biology
- Data science and machine learning
- Decision analysis
- ...

Allied Public Health Fields

- Epi of AIDS and infectious diseases
- Cancer prevention, cancer epidemiology
- Psychiatry and psychology
- Environmental health
- International/global health
- Health economics
- Molecular biology
- ...

Courses in Other Depts

- Statistics
- Applied Mathematics
- Computer Science
- Epidemiology
- ...

SM1 (42.5 credits, 1 year)

- Master's core courses (25 credits), at an intermediate to advanced level
- Epidemiology / Research ethics
- Other courses in allied public health fields
- Student must have a relevant prior graduate degree and training sufficient to allow consideration for 1-yr program

SM60 Program in Biostatistics (60 credits, 1.5 years)

- Biostatistics core program (25 credits)
- Epidemiology / Research ethics
- Other biostatistics electives (10 credits)

SM60 Program in Biostatistics

(60 credits, 1.5 years)

- After nine months of courses, students focus on a collaborative research practicum and write up and defend a Master's thesis (10-20 credits)
- Students would be expected to finish in the fall of their second year (most likely)
- Some students take additional courses in the fall of their second year

SM60 Program in Biostatistics (60 credits, 1.5 years)

- Practicum is designed to involve students in an extensive data analysis and statistical computing project, using methods going beyond standard course work
- The practicum could involve Biostatistics faculty projects with affiliated hospitals or external projects with pharmaceutical or biotechnology companies

SM60 Program in Biostatistics (60 credits, 1.5 years)

- The SM60 program is primarily a terminal Master's program aimed at students who want to work in hospitals, industry, or related positions (though some graduates may decide to pursue further graduate studies later)
- Students could request possibly switching between the 80 credit and 60 credit programs

Comparisons of Master's Programs

- The first year of course work for this SM60 program could be very similar to courses taken by first year students in the SM2 program
- Students in the SM2 program would take more advanced courses in biostatistics and allied public health fields in their second year, but do not have a thesis requirement

Goals of SM Program

- Gaining biostatistical skills needed to work in an academic/hospital clinical research setting, the pharmaceutical/ biotechnology industry, or government
- Careers involve the design of studies, data collection/management of research studies, statistical analysis, writing of reports/ publications, and consulting
- May be preparatory to a PhD program

Where do Master's Grads Go?

- Approximately $\frac{1}{2}$ go to work in hospitals, universities, or academic research institutes
- Approximately $\frac{1}{4}$ go to work in private industry, e.g., pharmaceuticals, biotechnology, business
- Approximately $\frac{1}{4}$ go directly to a doctoral program (in biostatistics or statistics, as well as computational biology, environmental health, epidemiology, nutrition, medicine)

SM2 Program in Comp. Biology and Quant. Genetics

- Designed to provide students with skills in biology, bioinformatics, computing, statistics, and epidemiology to manage and analyze large quantitative datasets (“Big Data”) arising in genomics and genetics
- Joint with the Department of Epidemiology

SM2 Program in Comp. Biology and Quant. Genetics

- Intended as a terminal professional degree to launch career in bioinformatics, or possibly preparation for PhD studies in biostatistics, epidemiology, computational biology, or related fields
- Students would benefit by having some background in biology, computational biology, genetics, databases, and a scripting language

SM2 Program in Comp. Biology and Quant. Genetics

- 55 credits of required and elective courses
- Epidemiology / Research ethics
- Collaborative research thesis project with thesis defense

SM60 in Health Data Sciences

- Our newest program, with students arriving in Fall 2017
- Focus on addressing research questions on massive datasets from electronic medical records, remote sensing of environmental exposures, data acquired by mobile devices, internet search engines, etc.

SM60 in Health Data Sciences

- Required and elective courses in statistical inference, machine learning, and computer science with applications in health sciences
- Case-based approach in many courses
- Culminating Health Data Science practicum – project-based course

Later applying to a PhD program

- Some Master's students have gone on to doctoral programs in biostatistics, epidemiology, medicine, or public health
- Master's students with interests in our PhD program typically apply during their second year
- Such students should have a very strong record in their program here, and should target their Master's course work to satisfy doctoral requirements (especially in their second year)

Sources of SM Student Support

- Loans and other resources from our Office of Student Financial Services
- Limited Department of Biostatistics funding
- Outside support or scholarships
- Possible part-time RA jobs (maybe during 1st year, summer after 1st year, 2nd year)
- Some grader or TA positions available (usually summer or in 2nd year)

Sources of SM Information

- Harvard Chan Admissions Office, Registrar's Office, Office for Student Financial Services
- Biostatistics Student Handbook
- Department Chair (Xihong Lin), Director of Master of Science Programs (David Wypij), Manager of Academic Services (Jelena Follweiler)
- <http://www.hsph.harvard.edu/biostatistics/>