Master of Science in Biostatistics

Information Session
Emilia Bagiella, PhD & Emma K. T. Benn, DrPH
Program Co-Directors

Web: www.icahn.mssm.edu/MSbiostat
Email: MSbiostat@mssm.edu
Overview

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WELCOME TO THE ICAHN SCHOOL OF MEDICINE AT MOUNT SINAI!
About ISMMS

1. Chartered in 1963

2. Mission is to rigorously train the next generation of scientists and health professionals.

3. Almost 1200 graduate and medical students enrolled in the 2014/2015 year

4. Leader in medical and scientific training, biomedical research and patient care.

5. Committed to intellectual exchange, multidisciplinary teamwork and innovation that can lead to discoveries and advances to improve the human condition.
Research at ISMMS

- **New Blood Signature Analysis May Help Diagnose Parkinson’s Disease Earlier**
  April 6, 2015

- **Blood Test Predicts Severity of Peanut and Seafood Allergies**
  April 1, 2015

- **Mount Sinai Scientists Establish Link Between Neurodegenerative Disease and the Body’s Response to Viral Infection**
  March 30, 2015
  A key protein previously implicated in Lou Gehrig’s disease and other neurological diseases plays an important role in the response to viral infection.

- **Mount Sinai Researchers Discover Genetic Origins of Myelodysplastic Syndrome Using Stem Cells**
  March 27, 2015
  Findings Shed Light on the Development of Blood Cancers
The Center for Biostatistics at ISMMS

- Established in 2011
- 16 faculty members
- 10 MS statisticians

- Promote successful clinical and translational research at Mount Sinai
- Educate medical students, graduate students, postdoctoral fellows, and other research staff
The Center for Biostatistics at ISMMS

1. Educational Programs
   • MPH Biostatistics track
   • **MS in Biostatistics**
   • Biostatistics Summer Program for Clinical Research
   • The Applied Statistics in Biological Systems (ASIBS) Short Course
   • Support to the Clinical Research Program
Examples of research our MS Biostatisticians have contributed to:


What is Biostatistics?

http://www.worldofstatistics.org/2013/02/11/biostatistics-unveiled/
What is Biostatistics?

Biostatistics is a branch of statistics that allows for the analysis and interpretation of scientific data generated in the clinical, public health, biomedical and translational sciences.

"By a small sample, we may judge of the whole piece." - Miguel de Cervantes (from Don Quixote)
What is Biostatistics?

Areas where STATISTICS are used

Business
Economics, Engineering, Marketing, Computer Science

Physical Sciences
Astronomy, Chemistry, Physics

Health & Medicine
Genetics, Clinical Trials, Epidemiology, Pharmacology

Government
Census, DOH, NCHS, CDC, FDA, NIH

Environment
Agriculture, Ecology, Forestry, Animal Populations

Adapted Figure from the American Statistical Association
1. Sponsored by Center for Biostatistics & Department of Population Health Science and Policy at ISMMS

2. Designed to prepare individuals for:
   - Career as data analysts and applied statisticians in the biomedical sciences
   - PhD/DrPH in Biostatistics or Epidemiology or Bioinformatics

3. Distinctive, accelerated design
   - One year, full-time program
   - Comprehensive didactic training for conducting high-quality clinical and translational research
   - Curriculum emphasizes strong quantitative training to address complex challenges

4. Student-centered
   - Small cohort size (5 – 10 students)
   - Excellent mentorship and individualized attention

5. Uniquely positioned
The Graduate School of Biomedical Sciences
Science That Changes Medicine

The Graduate School is uniquely positioned within a world-class medical school and health system. We have broken down the barriers to collaboration, allowing students to connect science, biostatistics, medicine, education and health care delivery.

Programs Across the Translational Health Continuum

- PhD Program (Basic Sciences)
- MD/PhD Program
- MS in Biostatistics
- MS in Biomedical Sciences
- PhD in Clinical Research
- MS Clinical Research
- MS in Genetic Counseling
- MS in Health Care Delivery Leadership
- Masters in Public Health
- MSW/MPH
- Summer Undergraduate Research Program
- Post Baccalaureate Research Education Program
- Clinical Research Education Program
- Advanced Certificate in Public Health
- Physician Scholars PhD Program

Basic Sciences PhD Multidisciplinary Training Areas

- Cancer Biology
- Developmental and Stem Cell Biology
- Design, Technology and Entrepreneurship
- Genetics and Genomic Sciences
- Immunology
- Microbiology
- Neuroscience
- Systems Biology of Disease and Therapeutics
- Structural/Chemical Biology and Molecular Design

Quick Facts

- Ranked 4th among U.S. medical schools for sponsored funding per investigator
- Over 225 Research Laboratories
1. To be eligible for the MS in Biostatistics Program, students must have:
   • At least two semesters of college-level calculus w/ grade of B or higher
   • At least 1 college-level linear algebra course w/ grade of B or higher
   • TOEFL for applicants from non-English speaking countries
   • GRE (optional)

2. Prior exposure to statistics/biostatistics not required

3. Knowledge of mathematical/statistical programming language not required, but certainly helpful
# Master of Science in Biostatistics – Curriculum

1. One year curriculum = 31 core credits + ≥ 3 elective credits

<table>
<thead>
<tr>
<th>FALL TERM</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Introduction to Advanced Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>Fundamentals of Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Probability</td>
<td>3</td>
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<tr>
<td>Responsible Conduct of Research</td>
<td>1</td>
</tr>
<tr>
<td>Capstone</td>
<td>1</td>
</tr>
<tr>
<td>Clinical Trials Management (Elective)</td>
<td>3</td>
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</tbody>
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<table>
<thead>
<tr>
<th>SPRING I TERM</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Linear Models I</td>
<td>3</td>
</tr>
<tr>
<td>Analysis of Categorical Data</td>
<td>3</td>
</tr>
<tr>
<td>Statistical Inference</td>
<td>3</td>
</tr>
<tr>
<td>Applied Biostatistics in Clinical Trials</td>
<td>3</td>
</tr>
<tr>
<td>Capstone</td>
<td>1</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>SPRING II TERM</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Analysis of Longitudinal Data</td>
<td>3</td>
</tr>
<tr>
<td>Survival Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Capstone</td>
<td>1</td>
</tr>
<tr>
<td>Computational Tools for Clinical Research (Elective)</td>
<td>3</td>
</tr>
<tr>
<td>The Drug Development Process (Elective)</td>
<td>3</td>
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</tbody>
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| Required Credits | 31 |
| Minimum Elective Credits | 3 |
| Total Credits     | 34 |
Master of Science in Biostatistics – Curriculum

1. Capstone Objectives

• **Engage students** in important discourse surrounding *data management and research ethics* – *Fall Term*

• **Challenge students to operationalize conceptual research questions** into testable hypotheses and to **determine the appropriate analytic methods** to test their hypotheses – *Spring I Term*

• **Provide students with the opportunity to shadow Biostatistics faculty** in the Center for Biostatistics consultation service – *Spring II Term*
  
  • Learn how to **successfully collaborate with non-statisticians** (primarily clinical faculty) at ISMMS
  
  • **Contribute appropriate study design-related and methodologic solutions** to cutting edge research questions
  
  • Conduct **mentor-guided preliminary analyses**
  
  • **Disseminate findings** to an institution-wide audience at the annual MS in Biostatistics Capstone Symposium
Master of Science in Biostatistics – Admissions


2. Application components

   • Online application
     • Background and demographics
     • Personal statement (≤700 words) – motivation for applying and post-graduation career objectives
     • Current CV or resume
     • Non-refundable application fee ($80)
   • Official Transcripts – undergraduate and graduate (if applicable)
     • Mail to:
       ISMMS Office of Admissions
       One Gustave L. Levy Place
       Box 1002
       New York, NY, 10029
   • Two Letters of Recommendation
     • Recommenders email LORs directly to admissions@mssm.edu
   • GRE (optional) and TOEFL (if international and non-English speaking) to School Code 2464
Master of Science in Biostatistics – Tuition & Financial Aid

1. Tuition is $41K for the program in its entirety

2. Student and Activity Fees are $150

3. Health Insurance Required

4. Financial Aid Available
Master of Science in Biostatistics – Tuition & Financial Aid

1. Eligible students submit the FAFSA. (US Citizen/eligible non-citizen)

2. Types of aid available
   - Stafford Loans
   - Federal Direct Graduate PLUS
   - Private Loans

3. We recommend applying for financial aid by August 1st

4. School code is G07026

5. FAFSA Website https://fafsa.ed.gov/
Master of Science in Biostatistics – Tuition & Financial Aid

Stafford Loans Unsubsidized

• $26,000/year
• Repayment begins 6 months after graduation

Direct Plus Loans

• Credit based and covers full out-of-pocket cost including living expenses
• Repayment begins immediately, but can be deferred while enrolled
Master of Science in Biostatistics

Resources

• **ISMMS**: [www.icahn.mssm.edu](http://www.icahn.mssm.edu)

• **Center for Biostatistics**: [www.icahn.mssm.edu/centerforbiostatistics](http://www.icahn.mssm.edu/centerforbiostatistics)

• **MS in Biostatistics Program Website**: [www.icahn.mssm.edu/MSbiostat](http://www.icahn.mssm.edu/MSbiostat)

• **MS in Biostatistics Program Email**: Msbiostat@mssm.edu

• **MS in Biostatistics Program Co-Directors**:
  • Emilia Bagiella, PhD – emilia.bagiella@mountsinai.org
  • Emma K. T. Benn, DrPH – emma.benn@mountsinai.org

• **Admissions Email**: admissions@mssm.edu

• **Housing Resources**:
  • International House of New York: [http://www.ihouse-nyc.org](http://www.ihouse-nyc.org)
  • Hotel Alexander: [http://www.hotelalexandernyc.com/student_housing.html](http://www.hotelalexandernyc.com/student_housing.html)
Careers and Opportunities in Biostatistics

“Biostatisticians with advanced degrees can look forward to excellent career opportunities in government, industry, and academia.” – American Statistical Association

Career opportunities:

- Academic Medical Centers
- Pharmaceutical Industry
- Contract Research Organizations (CROs)
- US Food and Drug Administration
- Centers for Disease Control & Prevention
- State Departments of Health
- US Census Bureau
- National Institutes of Health
- Foundations
Careers and Opportunities in Biostatistics

1. Clinical Trials Design and Conduct
2. Public Health applications
3. Quality Control
4. Genetics and Genomics
5. Basic Sciences
6. Personalized Medicine
7. Big Data
8. Teaching
Careers and Opportunities in Biostatistics

1. Job placement within 3-4 months from graduation
2. Median salary at first hire: $55K-70K
3. Opportunities for growth
I USED TO THINK CORRELATION IMPLYED CAUSATION.

THEN I TOOK A STATISTICS CLASS. NOW I DON'T.

SOUNDS LIKE THE CLASS HELPED. WELL, MAYBE.
Master of Science in Biostatistics

Our Program
The Master of Science in Biostatistics is offered by the Center for Biostatistics and Department of Population Health Science and Policy at the world-renowned Icahn School of Medicine at Mount Sinai in New York City. The MS in Biostatistics is designed to prepare individuals for a career as data analysts and applied statisticians in the biomedical sciences. The program is directed at students whose goal is to work as a biostatistician in a clinical, research, or industry setting; or as a stepping stone to pursue a doctoral degree in Biostatistics or Epidemiology.

The distinctive design of this 1-year, full-time, MS Program allows for:

- Rigorous and comprehensive training in fundamental skills required for conducting high-quality clinical and translational research
- A curriculum emphasizing strong quantitative training, critical thinking skills, and practical strategies for addressing complex challenges of novel, clinical research
- A stimulating environment in which students apply statistical tools to real data and collaborate with clinical and translational scientists.

Learning Experience
The MS in Biostatistics curriculum consists of at least 34 credits, to be completed in 1 year, of which 31 are core credits and at least 3 are elective credits. See an example curriculum below.

### FALL TERM
- Introduction to Advanced Biostatistics
- Fundamentals of Epidemiology
- Introduction to Probability
- Responsible Conduct of Research

### SPRING I TERM
- Applied Linear Models I
- Analysis of Categorical Data
- Statistical Inference
- Applied Biostatistics in Clinical Trials

### SPRING II TERM
- Analysis of Longitudinal Data
- Survival Analysis
- Drug Development Process (Elective)
- Computational Tools for Clinical Research (Elective)

In addition to coursework, students will complete a capstone project in each term. The capstone-related lectures and projects will:

- Engage students in important discourse surrounding data management and research ethics
- Challenge students to operationalize conceptual research questions into testable hypotheses and apply the appropriate analytic methods to test their hypotheses
- Provide students with the opportunity to shadow Biostatistics faculty mentors in the Center for Biostatistics consultation service in order to gain valuable skills related to research collaboration

www.icahn.mssm.edu/msbiostat
How to Apply:
All prospective students interested in applying to the MS in Biostatistics program at the Icahn School of Medicine at Mount Sinai should visit the program website at www.icahn.mssm.edu/msbiostat

Application Deadline:
July 15, 2015

Contact Information:
Email: MSBiostat@mssm.edu

Program Eligibility
Prospective applicants must have:
• At least two semesters of college-level calculus with grade of B or higher
• At least 1 college-level linear algebra course with grade of B or higher
• GRE (optional)
• TOEFL for applicants from non-English speaking countries

Applying to the Program
A comprehensive evaluation for admission is based upon a range of factors including academic record, post-undergraduate professional experiences (if applicable), and motivation for successful completion of the program. Women and underrepresented minorities are encouraged to apply.

Application Requirements
• Completed online application
  – Background and demographics
  – Personal statement (700 words or less) clearly explaining the applicant’s motivation for applying to the MS in Biostatistics program and post-graduation career objectives
  – Current curriculum vitae or resume
  – Non-refundable application fee of $80
• Submit official transcripts for all undergraduate and graduate programs for which a degree was earned to:
  Icahn School of Medicine at Mount Sinai
  Office of Admissions
  One Gustave L. Levy Place
  Box 1002
  New York, NY 10029
• Two letters of recommendation to be emailed directly to admissions@mssm.edu.
• GRE (optional) and TOEFL (if applicable) scores should be submitted using School Code 2464.

Application Deadline:
July 15, 2015

Career Prospects for Graduates
According to the American Statistical Association, “Job prospects for new graduates with Master’s and PhD degrees in biostatistics are excellent.” Graduates with an MS in Biostatistics have a vast array of career opportunities available to them and provide their statistical expertise to tackle challenging questions in many sectors. These sectors include, but are not limited to:
• Academic Medical Centers
• Public Health
• Pharmaceutical Industry
• US Food and Drug Administration
• Centers for Disease Control and Prevention
• State Departments of Health
• US Census Bureau
• National Institutes of Health

Upon graduating, students will be better equipped to provide novel methodologic solutions to cutting-edge, real-world clinical and translational research questions.