Biostatistics @ UMN

Division of Biostatistics
Information Session

SCHOOL OF PUBLIC HEALTH

Epidemiology and Community Health (EpiCH)

Health Policy and Management (HPM)

Environmental Health Sciences (EnHS)

Biostatistics

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UNIVERSITY OF MINNESOTA

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Biostatistics

MPH
MS
PhD

Graduate programs: How can I choose?

Three important questions to ask:

1. Are there high-quality faculty doing work which I find interesting?

2. Will the education and training offered help me maximize my talent?

3. Would I enjoy being in the city/department for two years?

Faculty & Research

UMN Biostatistics in brief

○ Division of Biostatistics within the School of Public Health

○ 25 faculty, ~75 students (50 PhD, 25 Masters)

○ Consistently ranked among top biostat departments in U.S.

○ We're young, and we're growing!

   ○ 4 faculty over 60, 10 under 40

   ○ 7 faculty hires within the last five years!

What do UMN biostatisticians do?

- Collaborate with scientists to help plan, design, and analyze clinical and population studies

- Write and maintain (usually open-source) software

- Act as consultants for government and industry

- Perform research in statistical theory

- Develop novel statistical methods

Some problems UMN Biostat faculty are working on…

Design and Monitoring of Clinical Trials

How do we design and implement a vaccine trial in the midst of an active Ebola epidemic?

Connett   Neaton   Reilly   Rudser   Hodges

Some problems UMN Biostat faculty are working on…

Statistical genetics/bioinformatics

What genetic traits predispose people to HIV drug toxicities?

Pan   Wu   Lock   Basu   Guan

Some problems UMN Biostat faculty are working on…

Causal inference

How do we understand the mechanisms by which lowering nicotine content in cigarettes might affect smoking behavior?

Murray   Wolfson   Koopmeiners   Vock   Chu

Some problems UMN Biostat faculty are working on…

Spatial statistics and biomedical imaging

How can fMRI brain scan data be used to track the progress of neurodegeneration?

Fiecas   Hodges   Zhang   Eberly

Some problems UMN Biostat faculty are working on…

Bayesian Data Integration

How do you combine data from multiple sources or data collection modalities to improve efficiency?

Lock   Safo   Murray   Chu   Koopmeiners

Some problems UMN Biostat faculty are working on…

Survival Analysis and Correlated Data

How do you analyze recurrent infections from umbilical cord blood transplantation?

Luo   Le   Eberly   Rudser

Some problems UMN Biostat faculty are working on…

High-Dimensional Data and Machine Learning

How do you build a model to predict cardiovascular risk using data from millions of electronic health records?

Wolfson   Petersen   Helgeson   Vock

Accomplishments

- 7 faculty with **100+ publications**, 3 with **200+**
- 6 Fellows of the ASA
- Faculty and teaching staff winners of Charles N. Hewitt Creative Teaching Award; Leonard M. Schuman Award for Excellence in Teaching
- #3 research portfolio at the U of M ($40+ million in grants, nearly 50% of the SPH research budget)
- #6 NIH-funded school of public health in the nation
- Top 20 NIH investigator in U.S., consistently (Jim Neaton)

Education & Training

Program Overview

MS and PhD: Year 1

- Take courses:
    - Regression & Advanced Regression
    - Theory of Statistics I & II
- Pass written exam ("Masters exam") covering material from the core courses

PhD only: Year 1

- Work as a Research or Teaching Assistant

Program Overview

MS: Year 2

- Take (a few more) courses:
  - Survival Analysis
  - Clinical Trials
  - + Electives
- *Semester 1: Find a Plan B advisor*
- *Semester 2: Work on Plan B project*
- *Semester 2 or following summer: Final Oral Exam*

Program Overview

PhD: Year 2

- Take (a few more) courses:
    - Linear Models
    - Probability Models
    - Advanced Stat Inference
    - Bayesian Decision Theory
    - + Electives
- Pass PhD Preliminary Written Exam ("written prelim") covering material from these courses
- Work as a Research or Teaching Assistant
- *Start "shopping" for an advisor*

Program Overview

PhD: Year 3

- Wrap up coursework:
    - Survival Analysis
    - Clinical Trials
    - + Electives
- Work as a Research or Teaching Assistant
- *Begin working on the dissertation*
- Form thesis committee
- Pass Preliminary Oral Examination ("oral prelim")

Program Overview

PhD: Years 4-5

- *Keep working on the dissertation*
- Work as a Research or Teaching Assistant (often with advisor), or get supported by various school-wide fellowships
- Pass Final Oral Examination ("thesis defense")
- Start planning for the future: Faculty position/post-doc/etc.

Plan B Project

- Opportunity to work one-on-one with a faculty member

- Some recent Plan B projects by students:

  - "A Study on Group Size Effect in Grouped Variable Selection"

  - "Comparison of Two Regression Models for Dose-Ranging Experiments"

  - "Missing Data Imputation Methods for Predicting Cardiovascular Risk Using Electronic Health Data"

  - "Evaluation of Adaptive Experimental Design in Sequential, Multiple Assignment, Randomized Trials"

  - "An Interactive Web Application for Performing Sample Size Calculations"

The Three-Paper Model

○ PhD dissertations follow the *three-paper model*

○ Thesis is based on three manuscripts, typically:

  ○ One accepted for publication

  ○ One submitted or under revision

  ○ One in preparation or submitted

Year 3   **Year 4**   **Year 5**
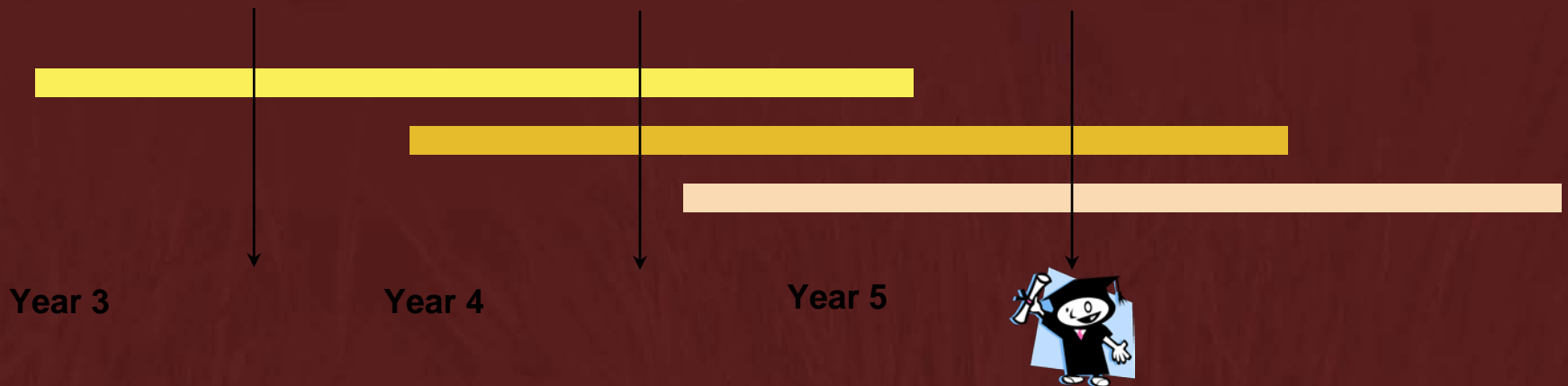
Advantages of the Three-Paper Model

- Concrete milestones = quicker to finish
- At least one publication when you graduate, often more for strong students.
- Material to submit for various student paper competitions.
- Good preparation for what you'll be doing in most post-graduation positions (faculty/post-doc/research scientist)

A Dynamic Research Environment

- Department seminar hosts internationally-known researchers 2-3 times per month

- Students organize a bi-weekly Student Seminar, where they talk about current research and deliver practice talks for upcoming conferences

- Active research working groups in:

  - Biomedical imaging

  - Statistical genetics and genomics

  - Clinical trials

  - Causal inference and machine learning

Positions for Recent PhD Graduates

- Students who graduated in 2017 - 2019
  - Current positions:
    - ~44% academia
    - ~50% industry
   - ~6% government / non-profit

Positions for Recent PhD Graduates

- Academia:
  - Assistant professor at Florida State, University of Colorado, University of Toronto,…
  - Postdoc position at MD Anderson Cancer Center, Mayo Clinic, Johns Hopkins University, University of Washington,…
- Industry:
 - Genentech, UnitedHealthGroup, Novartis, Pfizer, Medtronic,…

Positions for Recent MS Graduates

- Students graduating in 2016-2018:
  - (Bio)statistician or Data Scientist:
    - Minneapolis Medical Research Foundation, Cleveland Clinic, Masonic Cancer Center, NxStage, Boston Scientific, Medtronic, Securian Financial
  - Statistical Consultant
  - Healthcare analyst; Principal health services analyst
  - Epidemiologist
  - PhD student

More Admissions Information
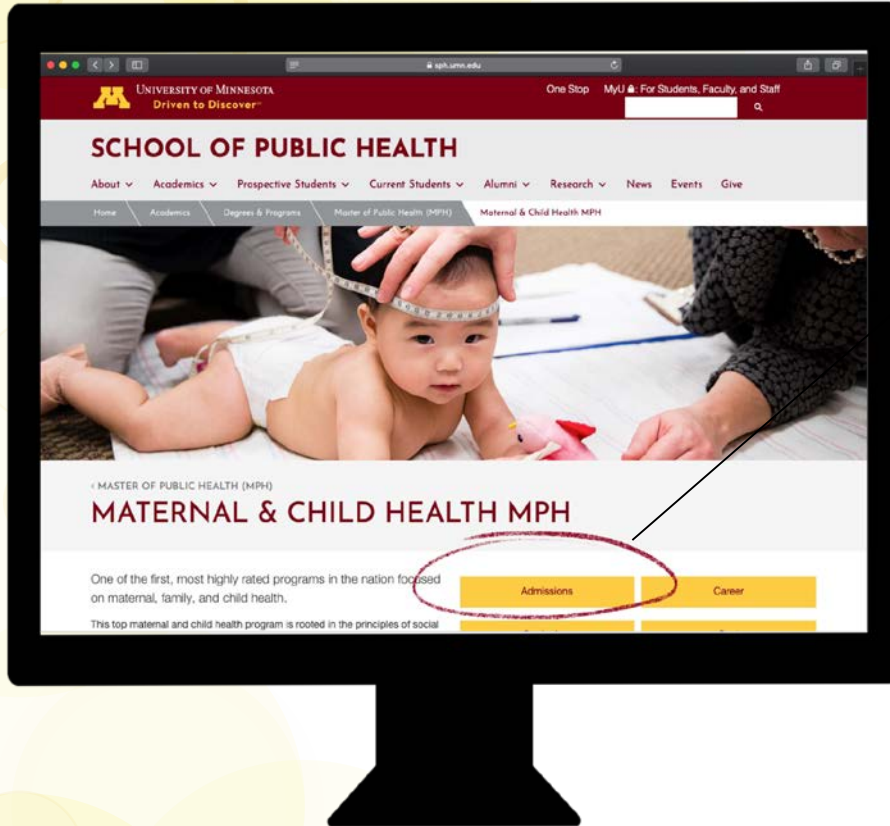
Visit **SPH.UMN.EDU** for more information on **Program-specific requirements** and **Application Deadlines**
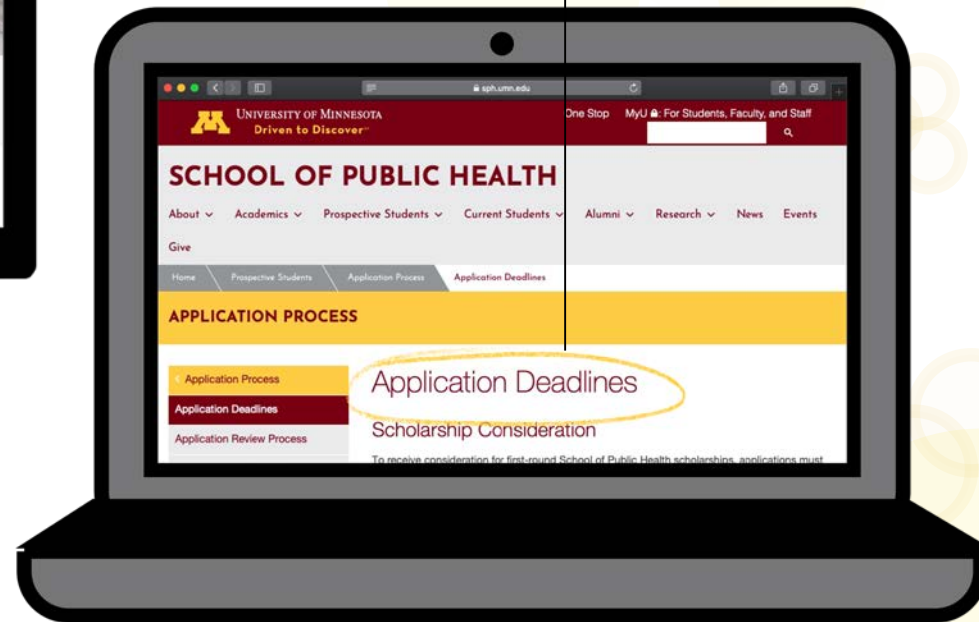
Thank you!

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Learn more: sph.umn.edu

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