



“My ultimate goal is to combine my interest in mathematics with my desire to improve health in high-risk communities.”

BETHANY HEDT
Master's student, Department of Biostatistics

Bethany Hedt says she is drawn to biostatistics because it is “mathematics with a conscience.” This sensibility is undoubtedly what led her to join the Peace Corps after graduating in mathematics from the University of North Carolina in 1999.

The Peace Corps sent Bethany to Namibia. For two-and-a-half years, Bethany taught science and math to high school students, some almost as old as she, who had been denied access to education during the years the country had been governed by South African apartheid policies. Before beginning graduate school, Bethany went back to Namibia for an additional year as a member of the Crisis Corps, which returns experienced Peace Corps volunteers to areas in the midst of humanitarian emergencies. This time she ran HIV-AIDS prevention and support programs for students and teachers.

Now in her first year of her master’s program at HSPH, Bethany says, “I have never worked so hard in my life, but there is something so satisfying about being pushed and pushing yourself.” She loves the diversity of her fellow students and is looking forward to exploring a range of subjects beyond biostatistics, especially HIV-AIDS.

As for the future, Bethany says she may continue on for a doctoral degree or perhaps teach. “My ultimate goal is to combine my interest in mathematics with my desire to improve health in high-risk communities,” she comments. “I am excited to see where this degree will take me.”

DEPARTMENT OF BIOSTATISTICS

BIOSTATISTICS INVOLVES THE THEORY and application of statistical science to analyze public health problems and to further biomedical research.

The faculty includes leaders in the development of statistical methods for clinical trials and observational studies, studies on the environment, and genomics/genetics. The department’s research in statistical methods and interdisciplinary collaborations provide many opportunities for student participation.

Current departmental research on statistical and computing methods for observational studies and clinical trials includes survival analysis, missing-data problems, and causal inference. Other areas of investigation are environmental research (methods for longitudinal studies, analyses with incomplete data, and meta-analysis); statistical aspects of the study of AIDS and cancer; quantitative problems in health-risk analysis, technology assessment, and clinical decision making; statistical methodology in psychiatric research and in genetic studies; Bayesian statistics; statistical computing; statistical genetics and computational biology; and collaborative research activities with biomedical scientists in other Harvard-affiliated institutions.

Degree Programs in Biostatistics

As described below, the department offers both 80-credit and 40-credit master of science (SM) programs and a doctor of philosophy (PhD) program with a concentration in biostatistics, as well as both 80-credit and 40-credit SM programs with a concentration in health decision sciences. The PhD is offered under the aegis of the Harvard University Graduate School of Arts and Sciences.

Detailed information about requirements and elective options can be found in a handbook distributed by the department. A master of public health program in quantitative methods is described in the interdisciplinary section of this catalog.

The programs offered by the Department of Biostatistics provide rigorous training in the development of methodology, collaboration, teaching, and consultation on a broad spectrum of health-related problems. The department prepares students for academic and private-sector research careers in the fields of biostatistics and health decision sciences. Recent graduates have assumed faculty posts at universities, as well as positions in research laboratories, federal government centers, pharmaceutical companies, and research institutes.

Applicants to the department should have successfully completed calculus through multi-variable integration and at least one semester of linear algebra and have knowledge of a programming language such as C or FORTRAN. In addition, applicants are strongly encouraged to have completed courses in probability, statistics, advanced calculus, and numerical analysis. Practical knowledge of a statistical computing package such as SAS, S, Stata, or SPSS is also desirable.

Master of Science in Biostatistics (80-credit and 40-credit programs)

All master’s degree programs offered by the department are aimed at students seeking a terminal master’s degree. Students ultimately interested in a doctoral degree are encouraged to apply directly to the PhD program. For information about schoolwide requirements for master’s degrees, see page 58.

Biostatistics The biostatistics concentration offers training in statistical theory and a variety of methods commonly used in the field of biostatistics. For the 80-credit program 25 credits must be earned in core courses on probability theory and applications, statistical inference, methods, and regression and analysis of variance. An additional 15 credits must be chosen from biostatistics courses, of which 10 credits must be selected from a specific list of biostatistics, health policy and management, and interdisciplinary offerings. In addition to formal course work, students acquire experience in the planning of experiments and the analysis of data by participating in a consulting seminar. Students also choose from a variety of elective courses.

The 40-credit program is designed for students who have a master’s degree in one of the mathematical sciences or a doctorate in a quantitative field. Applicants must have a mathematical and statistical background sufficient to achieve a level of proficiency after one year of study comparable to that attained in the 80-credit program. As courses must be taken out of sequence to complete the program in one year, considerable background in probability and statistical inference is needed. The requirements for this degree are essentially the same as for the 80-credit program. The 25-credit core must be completed, although students who have taken equivalent course work elsewhere may petition to substitute more advanced courses. More flexibility is allowed in other requirements since only 40 total credits are required. Other courses are selected in consultation with a faculty adviser.

Health decision sciences The concentration in health decision sciences offers integrated educational training in decision sciences within the context of health problems. This program draws on courses offered by the Departments of Biostatistics and Health Policy and Management.

For the 80-credit program, in addition to schoolwide requirements, students must complete core courses in decision analysis for health and medical practices or for clinical research, methods, theory, management science, probability theory and applications, statistical inference, and computing; a research seminar; and a practicum. Ten additional credits must be earned from the health decision sciences core and extended core. The consulting requirement may be met by obtaining practical experience under the tutelage of a faculty member. Students also choose from a variety of elective courses.

For the 40-credit program applicants must have a statistical and decision science background sufficient to achieve a level of proficiency after one year of study comparable to that attained in the 80-credit program.

Doctor of Philosophy in Biostatistics

The PhD program is designed for those who have demonstrated both interest and ability in scholarly research. Qualified applicants may apply to this program without a prior advanced degree. Please note that Graduate School of Arts and Sciences application forms must be used. The deadline for applying to the PhD program is December 15, 2004.

The course work for the PhD program is built on a 30-credit core curriculum similar to that for the master's degree (see above). In addition, 25 credits of biostatistics courses are required; these courses are chosen by the student in consultation with an adviser. Students must also complete a 10-credit cognate requirement (or minor) in a substantive area (such as the biology of cancer or AIDS). Given the increasing reliance of statistical practice on computing technology, one or more courses in statistical computing are also recommended. PhD students are required to participate as a teaching assistant in a course offered by the department and to satisfy a consulting requirement.

Funding is available to qualified students pursuing the PhD degree. Most of the funding is through five biostatistics training grants in AIDS, cancer, the environment, mental health, and public health training for underrepresented minorities. These traineeships require U.S. citizenship or permanent residency. Other limited funding (for example, teaching and research assistantships) is awarded on a competitive basis to qualified applicants.

Related Offerings

Interdisciplinary concentration in genetic and molecular epidemiology, see page 56.
Interdisciplinary concentration in the epidemiology of infectious disease, see page 56.
MPH concentration in quantitative methods, see page 53.
PhD Program in Health Policy, see page 27.

Contact Information

For more information about research and training in biostatistics, please contact David Wypij, director of student admissions and advising, Department of Biostatistics, 655 Huntington Avenue, Boston, MA 02115.
Phone: 617-432-1056
Fax: 617-739-1781
Email: dept@hsph.harvard.edu
Web: <http://www.biostat.harvard.edu>

For more information about research and training in health decision sciences, please contact Milton C. Weinstein, PhD, Department of Health Policy and Management, 718 Huntington Avenue, Boston, MA 02115.
Phone: 617-432-0805
Email: mcw@hsph.harvard.edu

For the PhD program online submissions are encouraged, using the Graduate School of Arts and Sciences (GSAS) application form available at the web address below.
Web: <http://www.gsas.harvard.edu/admissions/apply.html>

For information on postdoctoral fellowships, please contact the chair of the Postdoctoral Committee, Department of Biostatistics, 655 Huntington Avenue, Boston, MA 02115.
Phone: 617-432-1056
Fax: 617-739-1781
Email: dept@hsph.harvard.edu

COURSES OF INSTRUCTION

Please note that the courses listed are subject to change and some are not offered every year. Complete course descriptions are available at <http://www.harvard.edu/registrar/courses>.

Introduction to Programming in SAS

Introduction to Data Management and Programming in SAS

Principles of Biostatistics—Introductory, I, and II

Introduction to Statistical Methods

Statistical Methods for Health and Social Policy

Statistics for Medical Research—Introductory, II, Advanced, and Translational

Analysis of Rates and Proportions

Regression and Analysis of Variance in Experimental Research

Survey Research Methods in Community Health

Applied Regression for Clinical Research

Principles of Clinical Trials

Basics of Statistical Inference

Applied Survival Analysis and Discrete Data Analysis

Survival Methods in Clinical Research

Applied Longitudinal Analysis

Fundamental Concepts in Gene Mapping

Statistical Genetics in Complex Human Disease

Pattern Recognition of Genomic Data

Probability Theory and Applications I and II

Statistical Inference I and II

Methods I and II

Research Synthesis and Meta-Analysis of Public Health and Medicine

Regression and Analysis of Variance

Sample Surveys

Nonparametric Methods

Analysis of Failure Time Data

Analysis of Multivariate and Longitudinal Data

Design of Scientific Investigations

Advanced Statistical Computing

Bayesian Methods in Biostatistics

Statistical Problems in Drug Development

Computational Methods for Categorical Data Analysis

Seminar on Statistical Methods in Human Genetics

Statistical Science Outreach

Statistical Computing Environments

Applied Stochastic Processes and Models in Public Health

Operational Mathematics

Sequential Analysis

Computational Biology

Smoothing in Biostatistical Modeling

Introduction to Computational Molecular Biology I and II

Theory of Parametric, Semiparametric, and Nonparametric Inference

Spatial Statistics for Health Research

Introduction to Genomics

Public Health Surveillance

Semiparametric Methods for Analysis of Missing and Censored Data

Reading the Medical Literature: A Course for Statisticians

Linear and Longitudinal Regression

Introduction to Stochastic Processes

Independent Study, Tutorials

DEPARTMENT FACULTY

Please note that some faculty members may be on leave during academic year 2004–05.

Department chair: Stephen W. Lagakos, MPhil, PhD; Henry Pickering Walcott Professor of Biostatistics. Statistical methods in AIDS research; clinical trials.

Rebecca A. Betensky, PhD; Associate Professor of Biostatistics. Sequential analysis; correlated binary data.

Marco Bonetti, MS, PhD; Assistant Professor of Biostatistics. Clinical trial and growth data; stochastic geometry and applications to disease spatial clustering.

Tianxi Cai, SD; Assistant Professor of Biostatistics. Analysis of clustered survival data; medical diagnostic testing; semiparametric estimation.

Paul J. Catalano, SD; Lecturer on Biostatistics. Repeated measures; multivariate models; dose-response modeling; risk assessment; environmental statistics.

Brent A. Coull, MS, PhD; Assistant Professor of Biostatistics. Categorical data analysis; generalized linear mixed models; generalized additive models.

Victor G. De Gruttola, SM, SM, SD; Professor of Biostatistics. Methods for analysis of repeated measures from longitudinal studies.

Gregory DiRienzo, MS, PhD; Assistant Professor of Biostatistics. Statistical methods arising in AIDS research; clinical trials.

Garrett Fitzmaurice, MSc, MA, SD; Associate Professor of Biostatistics. Likelihood and nonlikelihood approaches to analyzing multivariate binary outcomes.

Robert C. Gentleman, MSc, PhD; Associate Professor of Biostatistics. Statistical computing and the analysis of censored data.

Robert J. Gray, SM, PhD; Professor of Biostatistics. Clinical trials; survival analysis; techniques for exploratory data analysis and model building.

David P. Harrington, AM, PhD; Professor of Biostatistics. Nonparametric methods for censored data; sequential designs for clinical trials.

Chengcheng Hu, MA, MS, PhD; Assistant Professor of Biostatistics. Failure-time data; measurement error; missing data; longitudinal data; clinical trials.

Michael D. Hughes, MSc, PhD; Professor of Biostatistics. Statistical methods in the design, analysis, and reporting of clinical trials and overviews.

Hongyu Jiang, PhD; Assistant Professor of Biostatistics. Methodology for clinical trials and epidemiologic studies; multivariate survival analysis; bioinformatics.

Karen M. Kuntz, SM, SD; Associate Professor of Health Decision Science. Cost-effectiveness analysis of cancer-screening strategies.

Nan M. Laird, PhD; Professor of Biostatistics. Longitudinal studies; nonresponse and missing-data methods; discrete data analysis; Bayesian methods; statistical genetics.

Christoph Lange, MS, PhD; Assistant Professor of Biostatistics. Statistical methods in genetics; generalized linear models; robust statistics; time series analysis.

Cheng Li, PhD; Assistant Professor of Biostatistics. Computational biology; genetic network modeling.

Yi Li, MS, MS, PhD; Assistant Professor of Biostatistics. Survival analysis; longitudinal and spatial data analysis.

Xiaole (Shirley) Liu, PhD; Assistant Professor of Biostatistics. Computational genomics, especially sequence analysis related to transcription and translation regulations.

Donna S. Neuberg, MA, MS, SD; Lecturer on Biostatistics. Cancer clinical trials; genetic epidemiology.

Marcello Pagano, SM, PhD; Professor of Statistical Computing. Statistical computing; clinical trials; epidemic modeling.

James M. Robins, MD; Mitchell L. and Robin LaFoley Dong Professor of Epidemiology. Analytic methods for drawing causal inferences from complex observational and randomized studies.

Andrea G. Rotnitzky, MA, PhD; Senior Lecturer on Biostatistics. Longitudinal data analysis; analysis of repeated categorical data and cluster correlated data.

Louise M. Ryan, PhD; Professor of Biostatistics. Rodent tumorigenicity experiments; teratology experiments; clinical trials; goodness-of-fit tests; survival analysis.

Mei-Chiung Shih, MS, PhD; Assistant Professor of Biostatistics. Statistical genetics and genetic epidemiology; longitudinal studies; group sequential designs.

Donna L. Spiegelman, SM, SD; Professor of Epidemiologic Methods. Binary data models with measurement error and misclassification in model covariates.

Kenneth E. Stanley, MA, PhD; Lecturer on Biostatistics. Estimating mortality attributable to tobacco in the presence of incomplete information.

Marcia A. Testa, MPH, MPhil, PhD; Senior Lecturer on Biostatistics. Evaluation of quality-of-life indexes in therapeutic clinical trials.

Florin Vaida, PhD; Assistant Professor of Biostatistics. Markov chain Monte Carlo; likelihood inference; nonparametric modeling; longitudinal data.

Molin Wang, ME, PhD; Assistant Professor of Biostatistics. Estimation of functions; nuisance parameters; stratified, sparse, and clustered data; measurement of error.

Wei Wang, MS, PhD; Assistant Professor of Biostatistics. Survival analysis; longitudinal and functional data analysis; semiparametric modeling.

James H. Ware, PhD; Frederick Mosteller Professor of Biostatistics and Dean for Academic Affairs. Design and analysis of longitudinal studies.

Lee-Jen Wei, PhD; Professor of Biostatistics. Design and analysis of clinical trials; repeated measurements analysis; survival analysis.

Milton C. Weinstein, AM, MPP, PhD; Henry J. Kaiser Professor of Health Policy and Management. Cost-effectiveness of health practices and technologies.

Paige L. Williams, BSPH, PhD; Lecturer on Biostatistics. Cancer risk assessment and other areas of environmental statistics.

Wing Hung Wong, MS, MS, PhD; Professor of Computational Biology. Bayesian computation; high-dimensional molecular biology and genetics.

Ronghui (Lily) Xu, MA, PhD; Assistant Professor of Biostatistics. Survival analysis, particularly in relation to proportional hazards models; goodness of fit.

Marvin Zelen, AM, PhD; Professor of Statistical Science and Member of the Faculty of Arts and Sciences. Theory and practice of clinical trials.

Secondary Appointments

(primary appointments at Harvard Medical School or Faculty of Arts and Sciences)

Roger B. Davis, MA; Associate Professor in the Department of Biostatistics. Design and analysis of clinical trials; recursive partitioning methods.

Dianne M. Finkelstein, AM, PhD; Associate Professor in the Department of Biostatistics. Carcinogenicity experiments; survival analysis.

Kimberlee Gauvreau, SM, SD; Assistant Professor in the Department of Biostatistics. Biostatistical issues in clinical studies in pediatric cardiology; institutional variability in outcomes after congenital heart disease surgery.

Richard D. Gelber, SM, PhD; Professor in the Department of Biostatistics. Design/analysis of clinical trials.

Rebecca S. Gelman, PhD; Associate Professor in the Department of Biostatistics. Clinical trials; disease screening; survival methods.

Robert J. Glynn, MA, PhD, SM, SD; Associate Professor in the Department of Biostatistics. Analysis of longitudinal data; nonresponse in sample surveys.

Nicholas T. Lange, MS, SD; Associate Professor in the Department of Biostatistics. Statistical methodology for human and animal brain mapping.

Mei-Ling Ting Lee, MS, MA, PhD; Associate Professor in the Department of Biostatistics. Lifetime data analysis; categorical data analysis.

Jun Liu, PhD; Professor in the Department of Biostatistics. Genetics; computational biology; missing data; Bayesian methodology.

Sharon-Lise T. Normand, MSc, PhD; Professor in the Department of Biostatistics. Bayesian inference; graphical models; meta-analysis.

E. John Orav, PhD; Associate Professor in the Department of Biostatistics. Statistical computing and simulation; stochastic modeling; bioassay.

Bernard A. Rosner, MA, PhD; Professor in the Department of Biostatistics. Analysis of clustered binary data; longitudinal data analysis.

David A. Schoenfeld, MA, PhD; Professor in the Department of Biostatistics. Statistics in medical research; gene arrays; survival theory.

David Wypij, ScM, MS, PhD; Associate Professor in the Department of Biostatistics. Longitudinal data analysis; repeated measures and growth curve models.

Grace Wyshak, SM, PhD; Associate Professor in the Departments of Biostatistics and Population and International Health. Biostatistical/demographic methods.

Adjunct Faculty

Scarlett L. Bellamy, SM, SD. University of Pennsylvania School of Medicine.

Els Goetghebeur, MS, PhD. Ghent University, Belgium.

Cyrus R. Mehta, SM, PhD. Cytel Software Corporation.

Michael A. Stoto, PhD. Department of Epidemiology and Biostatistics, George Washington University.