BIOSTATISTICS

OVERVIEW

The program offers a concentration in biostatistics leading to the M.S. degree.

Emphasis is placed on learning how to design studies and perform computerized data analysis as the statistician in a research team. The curriculum takes full advantage of courses taught in the Statistics Program and includes potential experience in a variety of health, biomedical, natural resource and other research projects in the College of Medicine or other departments of UVM. This experience is designed to provide candidates with opportunities to use their academic training and work experience in defining research problems, formulating rational methods of inquiry, and gathering, analyzing, and interpreting data.

Three faculty members are in the College of Medicine's Department of Medical Biostatistics and Bioinformatics, whose research activities cover the full range of studies that take place within an academic medicine environment. These include population-based health surveys of various types and evaluations of health promotion programs and professional education activities, such as community intervention studies to prevent smoking and to promote breast cancer screening. They also include clinical studies of many different interventions, bioengineering experiment design and measurement studies, statistical genetics, as well as data from other preclinical, clinical, and epidemiological studies.

Opportunities are also available for biostatistical research related to problems in agriculture and the life sciences, as well as natural resources and the environment. Opportunities could include multivariate or spatial data analyses for ongoing wildlife and water quality studies, for example. All students gain research and consulting experience through the research requirement: a research project (STAT 381) or a thesis (STAT 391). Other opportunities for experience will arise through involvement in the Statistical Consulting Clinic (STAT 385). (See also Statistics Program and Statistical Consulting Clinic descriptions.)

DEGREES

- Biostatistics AMP
- Biostatistics M.S.

FACULTY

Ashikaga, Takamaru; Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles
Bentil, Daniel E.; Associate Professor, Department of Mathematics and Statistics; DPHIL, University of Oxford
Bunn, Janice Yanushka; Research Associate Professor, Department of Mathematics and Statistics; PHD, Ohio State University
Buzas, Jeff Sandor; Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh
Callas, Peter W.; Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst
Danforth, Christopher M.; Associate Professor, Department of Mathematics and Statistics; PHD, University of Maryland College Park
Dinitz, Jeffrey Howard; Professor, Department of Mathematics and Statistics; PHD, Ohio State University
Dodds, Peter S.; Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology
Foote, Richard Martin; Professor, Department of Mathematics and Statistics; PHD, University of Cambridge
Golden, Kenneth Ivan; Professor, Department of Mathematics and Statistics; PHD, University De Paris
Jefferys, William; Lecturer I, Department of Mathematics and Statistics; PHD, Yale University
Lakoba, Taras Igorevich; Associate Professor, Department of Mathematics and Statistics; PHD, Clarkson University
Mickey, Ruth Mary; Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles
Sands, Jonathan Winslow; Professor, Department of Mathematics and Statistics; PHD, University of California San Diego
Single, Richard M.; Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook
Son, Mun Shig; Professor, Department of Mathematics and Statistics; PHD, Oklahoma State University
Warrington, Gregory S.; Assistant Professor, Department of Mathematics and Statistics; PHD, Harvard University
Wilson, James Michael; Professor, Department of Mathematics and Statistics; PHD, University of California Los Angeles
Yang, Jianke; Professor, Department of Mathematics and Statistics; PHD, Massachusetts Institute of Technology
Yu, Jun; Professor, Department of Mathematics and Statistics; PHD, University of Washington Seattle

Courses

BIOS 200. Med Biostatistics&Epidemiology. 3 Credits.
Introductory design and analysis of medical studies. Epidemiological concepts, case-control and cohort studies. Clinical trials. Students evaluate statistical aspects of published health science studies. Prerequisites: STAT 111, STAT 141 or STAT 143; or STAT 211. Cross-listed with: STAT 200.

BIOS 211. Statistical Methods I. 3 Credits.
Fundamental concepts for data analysis and experimental design. Descriptive and inferential statistics, including classical and nonparametric methods, regression, correlation, and analysis of variance. Statistical software. Prerequisite: Junior standing. Cross-listed with: STAT 211.

BIOS 221. Statistical Methods II. 3 Credits.
Multiple regression and correlation. Basic experimental design. Analysis of variance (fixed random and mixed models). Analysis of covariance. Computer software usage. Cross-listed with: STAT 221.

BIOS 223. Applied Multivariate Analysis. 3 Credits.
Multivariate normal distribution. Inference for mean vectors and covariance matrices. Multivariate analysis of variance (MANOVA), discrimination and classification, principal components, factor analysis. Prerequisite: Any 200 level Statistics course; STAT 221 or STAT 225 recommended; matrix algebra recommended. Cross-listed with: STAT 223.

BIOS 229. Survival Analysis. 3 Credits.
Probabilistic models and inference for time-to-event data. Censored data, life tables, Kaplan-Meier estimation, logrank tests, proportional hazards regression. Specialized applications (e.g. clinical trials, reliability). Prerequisite: Any 200 level Statistics course; one year of calculus. Cross-listed with: STAT 229.

BIOS 231. Experimental Design. 3 Credits.
Randomization, complete and incomplete blocks, cross-overs, Latin squares, covariance analysis, factorial experiments, confounding, fractional factorials, nesting, split plots, repeated measures, mixed models, response surface optimization. Prerequisites: BIOS 211 (BIOS 221 recommended). Cross-listed with: STAT 231.

BIOS 235. Categorical Data Analysis. 3 Credits.
Measures of association and inference for categorical and ordinal data in multiway contingency tables. Log linear and logistic regression models. Prerequisite: BIOS 211. Cross-listed with: STAT 235.

BIOS 241. Statistical Inference. 3 Credits.
Introduction to statistical theory; related probability fundamentals, derivation of statistical principles, and methodology for parameter estimation and hypothesis testing. Pre/co-requisites: BIOS 151, BIOS 153 or BIOS 25; BIOS 141 or equivalent; MATH 121. Cross-listed with: STAT 241.

BIOS 251. Probability Theory. 3 Credits.
Distribution of random variables and functions of random variables. Expectations, stochastic independence, sampling and limiting distributions (central limit theorems). Concepts of random number generation. Pre/co-requisite: MATH 121; STAT 141 or STAT 153 recommended. Cross-listed with: MATH 207, STAT 251.

BIOS 261. Statistical Theory. 3 Credits.
Point and interval estimation, hypothesis testing, and decision theory. Application of general statistical principles to areas such as nonparametric tests, sequential analysis, and linear models. Pre/co-requisites: STAT 251 or either STAT 151 or STAT 153 with Instructor permission. Cross-listed with: STAT 261.

BIOS 308. Applied Biostatistics. 3 Credits.
The rationale and application of biostatistical methods in the biological, health and life sciences with emphasis on interpreting and reporting. Prerequisite: STAT 141 or equivalent. Cross-listed with: MPBP 308, STAT 308.

BIOS 350. Advanced Methods in Biostat. 3 Credits.
Essential topics in modern biostatistics including epidemiology studies, clinical trials, statistical genetics, issues involved in secondary data analysis of complex surveys. Prerequisites: STAT 261 & STAT 200 or Instructor permission. Cross-listed with: STAT 350.

BIOS 391. Master's Thesis Research. 1-12 Credits.
Credit as arranged.

BIOS 395. Advanced Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.