Biostatistics

The biostatistics education programs offered by the Division of Biostatistics include three master’s degrees and two graduate certificates: the Master of Science in Biostatistics (https://biostatistics.wustl.edu/education/master-of-science-in-biostatistics-msibs-2/) (MSIBS), the Master of Science in Biostatistics and Data Science (https://biostatistics.wustl.edu/education/master-of-science-in-biostatistics-msibs/) (MSBDS), the Master of Science in Genetic Epidemiology (https://biostatistics.wustl.edu/education/master-of-science-in-genetic-epidemiology-gems/) (GEMS; for postdocs only), the Certificate in Genetic Epidemiology (https://biostatistics.wustl.edu/education/certificate-in-genetic-epidemiology/), and the Certificate in Biostatistics and Data Science (https://biostatistics.wustl.edu/education/certificate-in-biostatistics-and-data-science/). Interested students may pursue individual courses offered by the division.

The Washington University School of Medicine is known for being at the forefront of medical research and primary care; the school engages students in research and practical training so that they can contribute to improving health outcomes. Our programs train students as critical thinkers and collaborators in biostatistics, genetics, and data science. We seek those with undergraduate degrees in the quantitative and biomedical sciences, including fields such as mathematics, statistics, computer science, informatics, and biomedical engineering.

Our programs are designed to teach students how to manage, analyze, and interpret health data using statistical and data science approaches. Internationally renowned faculty from multiple disciplines — including biostatistics, genetics, informatics, medicine, and public health — will train a new generation of quantitative scientists. The curriculum offers a unique training experience that combines core data science learning in statistical and computational methodologies with practical training in real-world data analysis of cutting-edge biomedical and genomics research.

NIH-Sponsored Training Program

The PRIDE Summer Institute in Cardiovascular Genetics and Epidemiology (CVD-CGE) focuses on cardiovascular and other heart, lung, blood, and sleep disorders. This all-expenses-paid summer institute is supported by funding from the National Heart, Lung, and Blood Institute. The goal is to mentor junior faculty from underrepresented minorities as well as faculty with disabilities into independent research careers in the biomedical sciences. For more information, visit the PRIDE CVD-CGE website (https://biostatistics.wustl.edu/education/pridecge/) or email the program administrator (schreierl@wustl.edu).

Academic Calendar

The academic programs begin in early July each year. They start with preparatory workshops, which are followed by intensive summer semester courses. For fall and spring courses, the program follows the Washington University academic calendar (http://bulletin.wustl.edu/about/calendar/).

Location

The program is located in the Division of Biostatistics, which can be found on the fifth floor of the Bernard Becker Medical Library (660 S. Euclid Ave., St. Louis, MO 63110) in rooms 500 through 508.

Additional Information

Kim Freels
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Lei Liu, PhD
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Degrees & Offerings

• Master of Science in Biostatistics (http://bulletin.wustl.edu/medicine/degrees-offerings/msibs/)
• Master of Science in Biostatistics and Data Science (http://bulletin.wustl.edu/medicine/degrees-offerings/msbds/)
• Master of Science in Genetic Epidemiology (http://bulletin.wustl.edu/medicine/degrees-offerings/gems/)
• Certificate in Biostatistics and Data Science (http://bulletin.wustl.edu/medicine/degrees-offerings/biostats-data-science-cert/)
• Certificate in Genetic Epidemiology (http://bulletin.wustl.edu/medicine/degrees-offerings/genetic-epidemiology-cert/)
Research

Master's students have multiple opportunities to engage in biomedical research. After completing the first summer semester, students in the MSIBS and MSBDS program are eligible to work as part-time research assistants. These positions are frequently available, both within the Division of Biostatistics as well as in other departments and research labs on the Medical School campus. In addition, depending on the degree program, students will intern and/or work on an independent mentored research project to hone their research skills, including study design, data analysis, and interpretation. GEMS students will work on a mentored research project to explore and characterize the interplay between genes and the environment that affects the biological processes underlying disease.

Faculty

Chengjie Xiong, PhD
Division Interim Director

Visit our website for more information about our faculty (https://biostatistics.wustl.edu/faculty-staff/) and their appointments.

C

Ling Chen, MPH, MS, PHD
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Medicine
MPH University South Carolina 2003
MS Beijing Medical University 1998
BS Beijing Medical University 1996
PHD University of MO Columbia 2009

G

Charles William Goss, MS, PHD
Instructor in Biostatistics (primary appointment)
Instructor in Medicine
BS University of Michigan 2003
MS Florida International 2018
PHD Ohio State University 2014
BA University of Michigan 2018

Chi Gu, PHD, MS
Associate Professor of Biostatistics (primary appointment)
Associate Professor of Genetics
BS Nanjing Medical University 1982
PHD Washington Univ in St. Louis 1992
MS Nanjing Medical University 1985

Aditi Gupta, PHD, MS1
Instructor in Biostatistics (primary appointment)
BS UNIVERSITY OF DELHI 2005
PHD Indaparastha Inst. of Informati 2015
MS1 UNIVERSITY OF DELHI 2008

L

Daphne Lew, MED, PHD, BE, M PH
Instructor in Biostatistics (primary appointment)
MED University of MO St Louis 2014
PHD Saint Louis University 2020
BE University of Pennsylvania 2012
M PH Saint Louis University 2016

Lei Liu, BS1, MS2, MS1, PHD
Professor of Biostatistics (primary appointment)
Professor of Medicine
BS1 ZHEJIANG UNIVERSITY 1994
MS2 Virginia Tech 1998
MS1 ZHEJIANG UNIVERSITY 1997
PHD University of Michigan 2017

M

J. Philip Miller
Professor of Biostatistics (primary appointment)
Professor of Medicine
Tenure Held At-Large in the Medical School
BA Washington Univ in St. Louis 1965

R

Dabeeru C Rao, MS, PHD
Professor of Biostatistics (primary appointment)
Professor of Biostatistics in Genetics
Professor of Biostatistics in Psychiatry
Professor of Mathematics
Tenure Held At-Large in the Medical School
MS Indian Statistical Institute 1968
BS Indian Statistical Institute 1967
PHD Indian Statistical Institute 1971

Treva Kay Rice, MA, PHD
Professor of Biostatistics (primary appointment)
Professor of Psychiatry
MA University of Colorado Boulder 1984
BS University of Texas Arlington 1981
PHD University of Colorado Boulder 1987

S

Kenneth B Schechtman, MA, MS, PHD
Professor of Biostatistics (primary appointment)
Professor of Medicine
Tenure Held At-Large in the Medical School
BS City University of New York 1967
MA Washington Univ in St. Louis 1978
MS Purdue University 1971
PHD Washington Univ in St. Louis 1978

W

Guoqiao Wang, MS, MA, PHD
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Neurology
data management, ownership, security, and sharing, data ethical challenges related to research design, data collection, issues in their work and to develop professional and ethical to recognize complex situational dynamics and ethical of a biostatistician. The primary goals are for biostatisticians across the range of professional roles and responsibilities ethical and professional issues in the practice of biostatistics This course prepares biostatisticians to analyze and address ethica...
will acquire understanding of mathematical algorithms in genome sequence analysis (alignment analysis, gene finding/predicting), of gene expression microarray (genechip) analysis, and of the impact of recent developments in protein microarray technology. Prerequisite: M21 506. Contact the program manager for details, to register, or to obtain permission from the course master (biostat-msibs@email.wustl.edu). Credit 3 units.

M21 MSB 650 Biostatistics I
This course is designed for students who want to develop a working knowledge of basic methods in biostatistics. The course is focused on biostatistical and epidemiological concepts and on practical hints and hands-on approaches to data analysis rather than on details of the theoretical methods. We will cover basic concepts in hypothesis testing, introduce students to several of the most widely used probability distributions, and discuss classical statistical methods that include t-tests, chi-square tests, regression analysis, and analysis of variance. Both in-class examples and homework assignments will involve extensive use of SAS. Prerequisite: M21 503 or sufficient practical experience with SAS. Students are required to participate in the "Computing/Unix" workshops offered free of charge prior to this course. For details, to register, or to obtain the required permission from the course master, contact the program manager (biostat-msibs@email.wustl.edu).
Credit 3 units.

M21 MSB 570 Biostatistics II
This course is designed for students who have taken Biostatistics I or the equivalent and who want to extend their knowledge of biostatistical applications to more modern and more advanced methods. Biostatistical methods to be discussed include logistic and Poisson regression, survival analysis, Cox regression analysis, and several methods for analyzing longitudinal data. Students will be introduced to modern topics that include statistical genetics and bioinformatics. The course will also discuss clinical trial design, the practicalities of sample size and power computation and meta analysis, and will ask students to read journal articles with a view toward encouraging a critical reading of the medical literature. Both in-class examples and homework assignments will involve extensive use of SAS. Prerequisite: M21-560, Biostatistics I or its equivalent as judged by the course directors. For details, to register, and/or to obtain the required permission of the course director, contact the program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384). Credit 3 units.

M21 MSB 600 Mentored Research
Student undertakes supervised research in a mentor’s lab. The goal is to acquire important research skills as well as good writing and presentation skills. The student finds a mentor and they together identify a research topic. A written thesis based on the research, prepared in the format of an actual scientific publication, must be submitted and presented to a select audience. The course masters will organize a few meetings throughout to facilitate the whole process. The course masters will determine the grade (pass/fail) in consultation with the mentors. Permission of the course masters is required. Credit variable, maximum 6 units.

M21 MSB 617 Study Design and Clinical Trials
The course will focus on statistical and epidemiological concepts of study design and clinical trials. Topics include: different phases of clinical trials, various types of medical studies (observational studies, retrospective studies, adaptive designs, and comparative effectiveness research), and power analysis. Study management and ethical issues are also addressed. Students will be expected to do homework and practice power analysis during lab sessions. Prerequisites: M21-560 Biostatistics I and M21-570 Biostatistics II. Permission of the course director required. For details, to register, and to receive the required permission of the course director, contact the program manager (biostat-msibs@email.wustl.edu). Credit 3 units.

M21 MSB 618 Survival Analysis
This course will cover the basic applied and theoretical aspects of models to analyze time-to-event data. Basic concepts will be introduced including the hazard function, survival function, right censoring, and the Cox-proportional hazards (PH) model with fixed and time dependent covariates. Additional topics will include regression diagnostics for survival models, the stratified PH model, additive hazards regression models and multivariate survival models. Permission of the course director required. Prerequisites: M21-560 Biostatistics I and M21-570 Biostatistics II. For details, to register, and to receive permission from the course director, contact the program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384). Credit 3 units.

M21 MSB 621 Computational Statistical Genetics
This course is designed to give the students computational experience with the latest statistical genetics methods and concepts so that they will be able to computationally implement the method(s) and model(s) developed as part of their thesis. By concentrating on the applications of genomics and computing, it deals with creating efficient new bioinformatic tools to interface with some of the latest, most important genetic epidemiological analysis software and addresses how to derive, design, and implement new statistical genetics models. The course also includes didactic instruction on haplotype estimation and the modeling of relationship to phenotype, LD mapping, DNA pooling analysis methods, analysis approaches in pharmacogenomics (with an emphasis on possible genomic role in drug response heterogeneity), and epistasis (GxG) and GxE interactions; data mining methods, including clustering, recursive partitioning, boosting, and random forests; and fundamentals of meta-analysis, importance sampling, permutation tests, and empirical p-values, as well as the design of Monte Carlo simulation experiments. Prerequisite: Biostatistics I and II and permission of instructor. Contact the program manager for the required permission of the course master (biostat-msibs@email.wustl.edu). Credit 3 units.

M21 MSB 630 Internship
The primary goal of the Internship program is for students to acquire critical professional experience so that they will be well prepared to enter the job market upon graduation. This provides an opportunity for students to develop contacts, build marketable skills and perceive likes and dislikes in the chosen field. Students will have an opportunity to work with experienced mentors (PIs) on a range of projects that may include data management, data analysis, study design, and protocol development among
other things. Students may have opportunities to contribute to and participate in the preparation of publishable quality manuscripts. As part of the Internship requirements, each student will submit a one-page Abstract of the work performed as part of the internship and will give a presentation of the Internship experience. The grade (pass/fail) for each student will be determined in consultation with the mentor. Credit variable, maximum 6 units.

M21 MSB 660 Biomedical Data Mining
This course introduces methods and applications of biomedical data mining. Various computational and statistical methods will be presented, such as model selection and regularization, resampling methods, tree-based methods, and artificial intelligence. In addition to the common applications of the covered methods in biomedical sciences, this course will prepare students for future challenges and opportunities in data science. Prerequisites: M21 506, M21 560, M21 570, and M21 550. Matrix algebra is also highly recommended. Credit 3 units.