Yale SCHOOL OF PUBLIC HEALTH

BIOSTATISTICS

FORGING NEW FRONTIERS IN
DATA SCIENCE AND PUBLIC HEALTH

2023

From the Chair

Many times, students have asked me, “Is it a good idea to study biostatistics?”

More than 20 years ago, when I switched majors in college and decided to pursue biostatistics, I had the same question. And I must confess, back then, I was not so sure. Looking back, choosing a career in biostatistics was the best decision I ever made. Now I confidently tell students, “Studying biostatistics is a great idea and now is the best time to do it.”

Biostatistics operates at the intersection of data science, public health, biomedicine, computer science, and several other disciplines. Over the past two decades, we have witnessed a revolution in data collection technology and an incredibly fast accumulation of data from clinical trials, epidemiological studies, high-throughput genetic experiments, pathological and radiological imaging studies, and other research. At the same time, new tools have emerged to help us understand and analyze these data — from powerful statistical modeling methods and machine learning to deep learning and supercomputing power. We are fully ready to tackle the critical challenges that lie before us. Biostatistics is now being used to model paths of infectious diseases, prioritize molecular targets for cancer, quantify the long-term risk of exposure to toxic PFAS chemicals, and make automated diagnoses based on pathological images.

The Yale School of Public Health’s biostatistics program has always strived to develop leading-edge statistical techniques and address the most pressing public health and biomedical challenges. Our research covers the entire spectrum of biostatistics, such as statistical genetics, big data, machine learning, deep learning, clinical trials, and causal inference. We have long and extensive collaborations with all departments at the Yale School of Public Health and Yale School of Medicine as well as with government agencies, such as the Connecticut Department of Public Health, and leading pharmaceutical companies.

It is worth mentioning that during the pandemic our faculty and students have had a deep and direct impact on policymaking in Connecticut and nationwide. Our work supported both COVID-19 biomarker discovery and drug discovery. In 2021 alone, the Department of Biostatistics was represented in more than 230 publications in peer-reviewed journals. Our faculty continue to serve as international leaders in the field, speaking at prominent conferences and being recognized for their pioneering work. At the same time, our students continue to distinguish themselves with awards for their outstanding research and scholarship.

While we will always seek to forge new frontiers in public health, we are most proud of our growing success in training the next generation of biomedical data science leaders. Our approximately 200 students work closely with the 85 members of our experienced and highly talented faculty and they are often co-supervised by world-renowned public health and biomedical researchers. With courses on statistical methodology, data science, and implementation science, they now get more comprehensive training than ever before.

In the Department of Biostatistics, we pride ourselves on our ability to maintain a competitive and dynamic environment for students, while ensuring each receives the personal attention they need. With rigorous and comprehensive training, and a strong history of publication, presentation, and intern experience, our graduates have become leaders in the pharmaceutical industry, research institutions, government agencies, and tech and financial companies.

The future is brighter than ever. It starts here, and it starts now. We welcome you to join us.

SHUANGGE STEVEN MA

Interim Chair, Department of Biostatistics
Professor of Biostatistics

Breaking Down Barriers

The Yale Center for Methods in Implementation and Prevention Science (CMIPS) works to break through the barriers that keep evidence-based interventions from going mainstream while also expediting the transition from research to practice. Led by Dr. Donna Spiegleman, the center is pioneering new methods to optimize the impact of targeted interventions.

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Mathematical Modeling: Pioneering New Directions in Public Health

Data scientists in the Yale School of Public Health's Department of Biostatistics are using advanced mathematical modeling to help public health professionals identify effective interventions and strategies to address today's complex public health issues. By applying creative computer simulation and analysis, our scientists are pioneering new ways of investigating public health data in situations where more traditional forms of research are difficult to do due to logistical, temporal, or other barriers.

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Leading the Way in Collaborative Science

The Yale Center for Analytical Sciences is leading the way in collaborative science. In partnership with the Yale Center for Clinical Investigation and the Yale School of Public Health, the center combines existing academic strengths in biostatistics, epidemiology, health economics, health policy, health services, and big data research at Yale. Its primary mission is to collaborate with investigators on studies to improve health and advance the development of innovative analytical methods while educating and training the next generation of researchers and methodologists.

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> *We are pioneering a new direction for public health investigation, one that complements the more traditional approaches of observational data analysis and experimentation.*

FORREST CRAWFORD,
Associate Professor of Biostatistics

One Student's Story

First-year master's degree student Zichun Xu chose the Yale School of Public Health to pursue his studies in biostatistics because of its world-class faculty and engaging academic environment. He particularly enjoys the school's academic freedom to take classes in related disciplines across Yale. But student life is not all lectures and studying. In his downtime, Xu can often be found playing basketball at the Payne Whitney Gym or biting into a slice of New Haven's world-famous pizza.

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> Interim Chair Department of Biostatistics

Finding Community, Building a Career

Having never visited the U.S., Yaqing Xu was initially hesitant about entering the master's degree program in the Yale School of Public Health's Department of Biostatistics. But positive support from her professors and fellow students, along with exciting course material and research opportunities, confirmed she made the right choice. Xu stayed on at Yale to take advantage of the department's stellar PhD program, adding to the department's many stories of outstanding student success.

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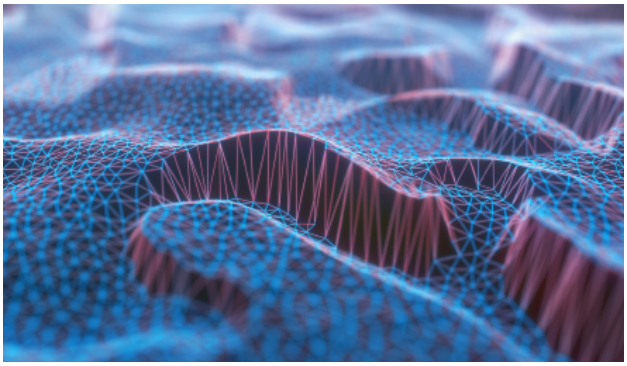

Understanding the Brain

In the Yale School of Public Health's Department of Biostatistics, Associate Professor Yize Zhao is developing innovative statistical and machine learning methods to advance our knowledge of how the intricate processes within our brains impact our mental and physical well-being, and how these processes contribute to debilitating diseases like Alzheimer's and depression.

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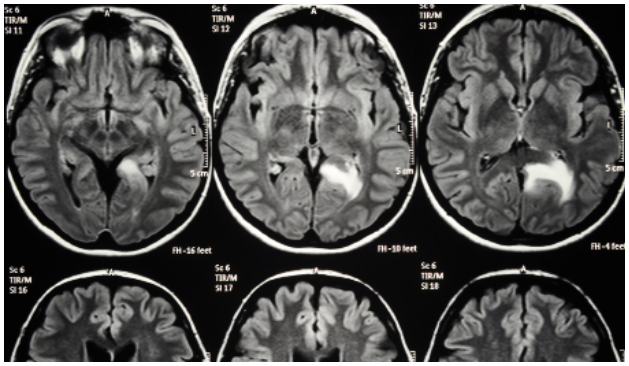

Pursuing New Discoveries in Cancer Genomics

A team of scientists led by Dr. Elizabeth B. Claus, PhD ’88, MD ‘94, professor of biostatistics at the Yale School of Public Health (YSPH) and an attending neurosurgeon in the Department of Neurosurgery at Brigham and Women’s Hospital, recently received a $13 million grant to help answer these questions by investigating the molecular evolution of lower-grade gliomas.

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Addressing Disparities One App at a Time

As the director of the Consumer Health Informatics Lab (CHIL) at Yale, Assistant Professor Terika McCall, PhD, MPH, MBA, is using the latest in digital and mobile technologies to reduce disparities and improve physical and mental well-being among traditionally underserved groups. As part of that effort, McCall is creating new smartphone applications intended to improve mental health resources for Black women and support formerly incarcerated individuals returning to the community. And she’s just getting started.

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Making an Impact

AWARDS AND HONORS

Faculty and students in the Yale School of Public Health’s Department of Biostatistics are being recognized around the world for their outstanding scholarship and research.

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At a Glance (2023)

INTERIM CHAIR

Dr. Shuangge Steven Ma
Professor of Biostatistics

FACULTY

Teaching: 23
Research: 18
Secondary: 27
Adjunct: 7
Lecturer: 10

STUDENTS

Total: 223
PhD: 31
MS: 133
MPH: 59

Aproximately **230** *journal publications from teaching faculty in 2021.*

AREAS OF FOCUS

- Statistical Genetics/Genomics, Spatial Statistics, and Modeling
- Causal Inference, Observational Studies, and Implementation Science Methodology
- Health Informatics, Data Science, and Reproducibility
- Clinical Trials and Outcomes
- Machine Learning and High Dimensional Data

BIOSTATISTICS ASSOCIATED CENTERS AND UNITS

- Center for Interdisciplinary Research on AIDS (CIRA)
- Center for Perinatal, Pediatric and Environmental Epidemiology (CPPEE)
- Collaborative Center for Statistics in Science (C2S2)
- Family Accommodation Obsessive-Compulsive Disorder
- Public Health Modeling Unit
- Yale Institute for Global Health (YIGH)
- Center for Methods in Implementation and Prevention Science (CMIPS)
- Center for Statistical Genomics and Proteomics
- Yale Center for Analytical Sciences (YCAS)

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