

# WELCOME

## Department of Biostatistics and Bioinformatics

### Department's mission:

To develop, apply and provide training in quantitative methods that can improve human health by teasing out the information contained within modern data.



**Rob Krafty, PhD**  
Chair & Acting Professor

# Presenters



**Howard Chang, PhD**  
Associate Professor  
Director, MPH/MSPH Programs in Biostatistics



**Limeng Wan**  
2<sup>nd</sup> year MSPH



**Feier Han**  
1<sup>st</sup> year MSPH



**Melissa Sherrer, M.Ed**  
Associate Director of Academic Programs



**Yue Xie**  
2<sup>nd</sup> year MSPH

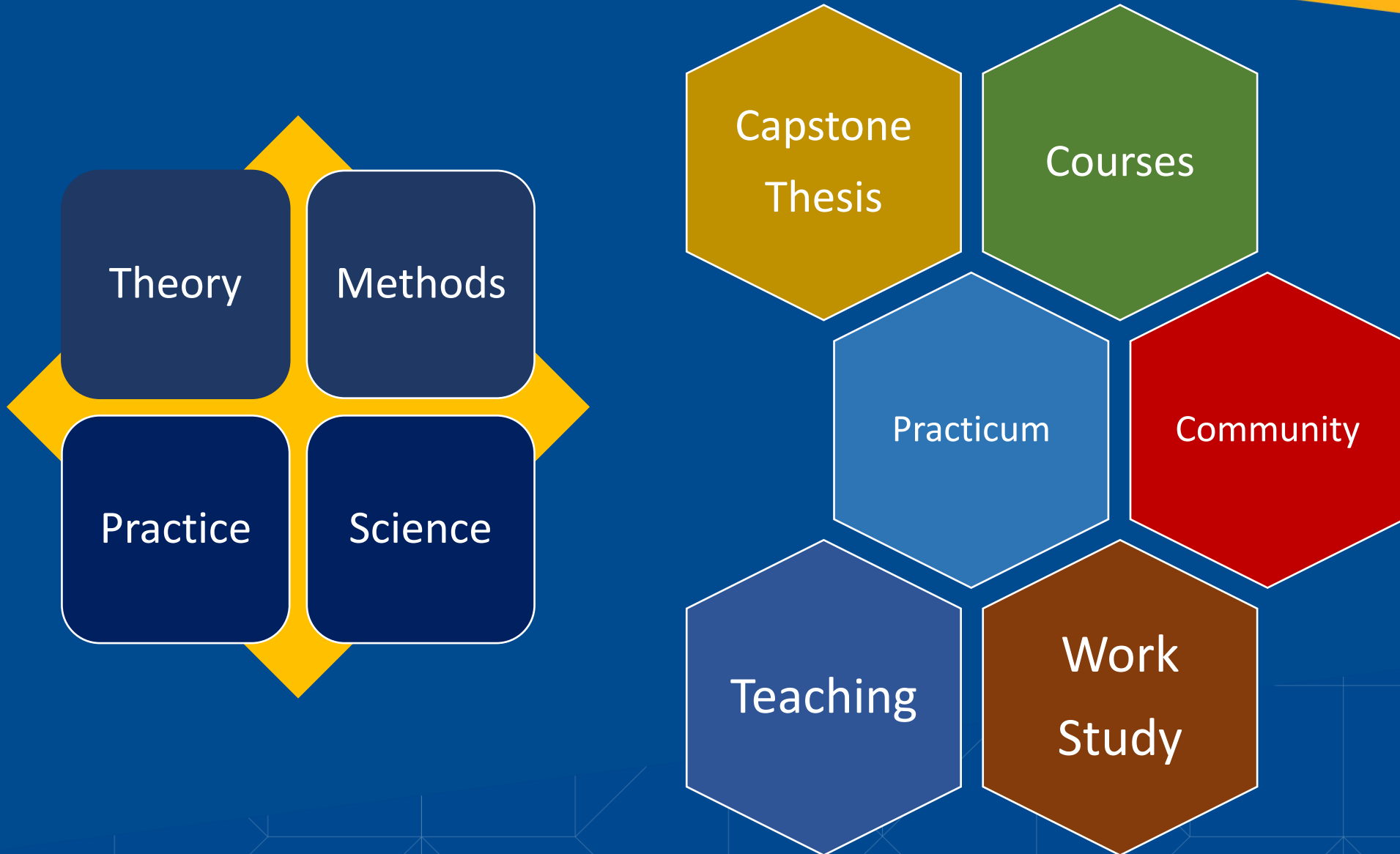


**Zoey Zuo**  
1<sup>st</sup> year MSPH

# Our Education Philosophy

- Provide **comprehensive** training in theory and methods.
- Provide **tailored** instructions for different student backgrounds.
- Provide **flexible** opportunities for different career paths (industry, government, academic research).
- Provide ample experience to develop **soft skills**.

# Integrated Learning



# Year 1 Curriculum

<b>MPH</b>	<b>MSPH</b>
<b>Found. of Biostatistical Methods (4)</b>	<b>Biostatistical Methods (4)</b>
<b>Applied Regression Analysis (4)</b>	<b>Applied Linear Models (4)</b>
<b>Intro. to Probability Theory (4)</b>	<b>Probability Theory I (4)</b>
<b>Intro. to Statistical Inference (4)</b>	<b>Statistical Inference I (4)</b>
<b>SAS Programming (2)</b>	
<b>Epidemiologic Methods I (4)</b>	

# Year 2 Curriculum

<b>MPH</b>	<b>MSPH</b>
<b>Applied Survival Analysis (2)</b>	<b>Survival Analysis Methods (2)</b>
<b>Longitudinal/Multilevel Analysis (2)</b>	<b>Modern Regression Analysis (3)</b>
<b>Statistical Practice I (2)</b>	
<b>Statistical Practice II (2) or Thesis Research</b>	

# Statistical Practice

## Statistical Practice I

- Lectures on consulting, collaboration, ethics, human subjects protection, best practices in programming, and study design.
- Real-life group consulting project.
- Develop study protocol, analysis plan, tables shells.
- Project documentation (research journal, Coding practice)

## Statistical Practice II (Capstone)

- Lectures on project management, reproducibility, literature review, and scientific writing.
- Peer-review writing assignments.
- Effective communications (oral presentation and poster).
- Career panels from industry, government, and academia.

# Elective Courses

2019-2020	2020-2021
<ul style="list-style-type: none"><li>• Geographic information systems</li><li>• Sampling applications</li><li>• Statistical computing</li><li>• Intro to large-scale biomed data analysis</li><li>• Machine learning</li><li>• High-throughput data analysis</li><li>• Analytic methods for infectious disease</li><li>• Observational studies</li><li>• Advanced clinical trials</li><li>• Applied and advanced spatial analysis</li><li>• Advanced survival statistics</li><li>• Advanced neuroimaging statistics</li></ul>	<ul style="list-style-type: none"><li>• Geographic information systems</li><li>• Sampling applications</li><li>• Statistical computing</li><li>• Intro to Bioinformatics</li><li>• Machine learning</li><li>• High-throughput data analysis</li><li>• Analytic methods for infectious disease</li><li>• Data Science Toolkits</li><li>• Causal inference</li><li>• Bayesian modeling</li><li>• Advanced statistical computing</li><li>• Missing and mismeasured data</li><li>• Time series</li></ul>



# Required Student Projects

	Applied Practice Experience (APE)	Thesis / Capstone
Training:	Supervised professional practice	Independent research with BIOS faculty member
Length:	Minimum 200 hours	1-2.5 semester
Location:	Companies, Institutions, Emory, China	Within BIOS
Time:	Summer after Yr 1 – March Yr 2	Summer after Yr 1 – April Yr 2
Requirements:	Written goals and deliverables	Research journal, codes, report, poster, oral presentation

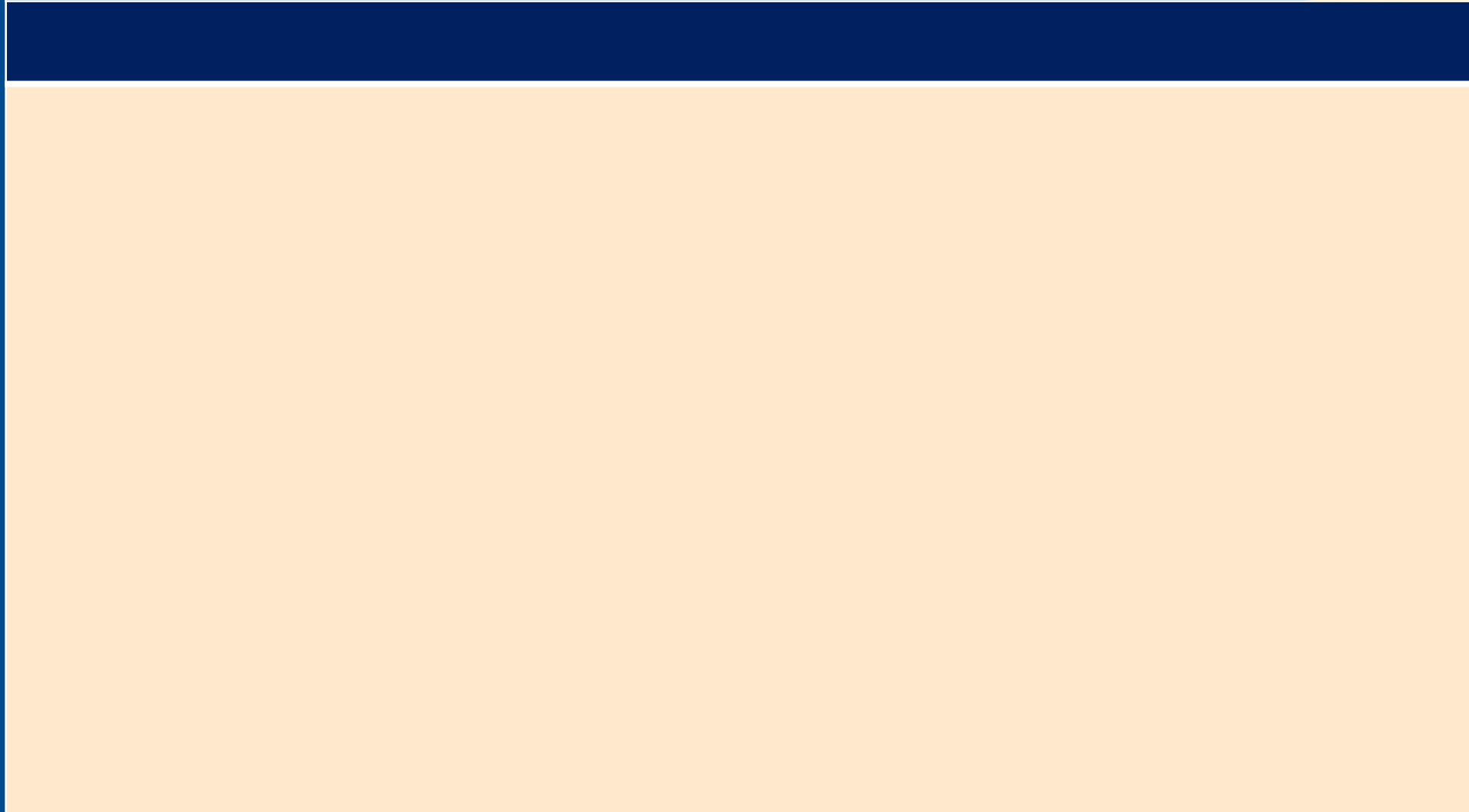
# Typical Student Projects

- 2-3 projects per student
- Capstone/Thesis research projects are mostly on data analyses with collaborators under the guidance of faculty advisor
- APE projects are more diverse (data management, data cleaning, quality control, data analyses etc.)
- Some students take on additional projects of their interest.

# Rollins Earn and Learn (REAL) program

- Get paid for learning through practice
- \$3000 per semester ( \$15 / hour)
- Eligible work: TA, RA, APE projects, Capstone/Thesis projects, other projects
- At Emory or outside partners

# REAL Program Partners

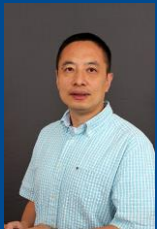


# Career Development

- Panel discussion: Considerations for pursuing a Biostatistics PhD degree (Yr 1)
- Panel discussion: PhD application process (Yr 1)
- Develop professionalism through APE
- Panel Discussion: Biostatistician career, what is important? (BIOS 580)
- Master-level Job search and interviews (BIOS 580)
- Panel Discussion: Technical preparations for job interviews (BIOS 581)
- Salary negotiations (BIOS 581)

# Faculty and Research

## Survival Analysis



Eugene Huang, PhD



Limin Peng, PhD



Steve Qin, PhD



Hao Wu, PhD



Michael Haber, PhD



Max Lau, PhD



David Benkeser, PhD

## Bioinformatics

## Infectious Disease

## Mental Health



Amita Manatunga, PhD



Mary Kelley, PhD



Ying Guo, PhD



Limin Peng, PhD



Rob Krafty, PhD

## Neuroimaging



Ying Guo, PhD



Suprateek Kundu, PhD



Ben Risk, PhD

## Statistical Genetics



Yijuan Hu, PhD



Karen Conneely, PhD



Michael Epstein, PhD

## Epidemiology & Env. Health



Bob Lyles, PhD



Howard Chang, PhD



Lance Waller, PhD

## Example Methodological Research

- Causal inference
- High-dimensional data
- Machine learning
- Risk prediction
- Bayesian methods
- Spatial statistics
- Latent class analysis
- Measurement error
- Fundamental theory

# Faculty and Research

## Clinical Trials



Mike Kutner, PhD



Kirk Easley, MStat



Azhar Nizam, MS

## Cancer

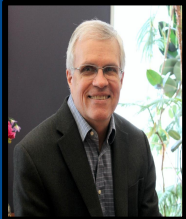


Jeff Switchenko, PhD



Yuan Liu, PhD

## Aging



John Hanfelt, PhD

## Collaboration Core



Renee Moore, PhD



Christina Mehta, PhD

## Cardiovascular

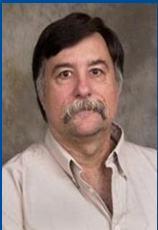


Jose Binongo, PhD



Yi-An Ko, PhD

## Consulting, Analysis, Data Management



George Cotsonis, MS



Lisa Elon, MS



Traci Leong, PhD



Paul Weiss, MS



Rebecca Zhang, MS



Xiangqin Cui, PhD

- RSPH Biostatistics Collaborative Center
- Directors of Biostatistics Cores for:
  - Georgia Clinical & Translational Science Institute
  - Atlanta VA Health Care System
  - Children's Healthcare of Atlanta
  - Emory Center for AIDS Research
  - Emory Winship Cancer Institute
  - Emory Alzheimer's Disease Research Center
  - Emory Exposome Research Center
  - Emory Specialized Center of Research Excellence in Sex Differences



**David Benkeser, PhD**

Assistant Professor

## Identifying correlates of protection for COVID-19 vaccines:

- It takes substantial time and effort to get COVID-19 vaccines approved by the FDA, commonly involving randomized trials that last months and involve upwards of 30,000 people.
- Vaccine approval could be accelerated if we can identify immune responses that predict whether a vaccine is effective.
- Data from randomized trials of COVID-19 vaccines to identify these immune responses.
- Automated pipeline for a harmonized, reproducible analysis of all the US and some international studies of COVID-19 vaccines.





**Yi-An Ko, PhD**

Research Assistant Professor

## Emory Cardiovascular Biobank

- Longitudinal data extracted electronic health records (medication, history) behavior, sleep quality, and many more
- Over 8000 individual patients have been followed annually for adverse CVD events.
- Relationships between genetic basis of oxidative stress, vascular dysfunction, metabolomics, and inflammatory biomarker assays, and cardiovascular outcomes.
- Findings from the biobank include discovery of novel biomarkers for better patient risk stratification and outcome prediction.



**John Hanfelt, PhD**  
Professor

## Latent class analysis of neurodegenerative diseases

- Currently, there are no available therapies to prevent, cure, or slow the progression of Alzheimer's disease and related dementias
- High-dimensional longitudinal information from EHR to classify people at high risk of dementia into precise subtypes that are predictive of the rate of disease progression and underlying disease etiology
- Latent class analysis uses a rigorous probabilistic framework that allows inferences with attractive optimality properties



**Traci Leong, PhD**  
Research Assistant Professor

## Children's Healthcare of Atlanta

- Population health using Electronic medical records (EMR) throughout Emory Healthcare
- Pediatric antibiotic resistance and susceptibility over space and time
- Effects of program evaluation and implementation at the organizational, provider, and patient levels
- Development and commercialization of medical devices



**Yuan Liu, PhD**  
Research Associate Professor

## Winship Cancer Institute

- Predict overall survival and progression free survival for cancer patients with metastatic renal cell carcinoma (mRCC).
- Retrospective analysis of 100 mRCC patients at Winship Cancer Institute from 2015-2018 with inflammation biomarkers, body mass index, and number and sites of metastases were obtained at baseline.
- Statistical Highlights: optimal cutpoints, small sample size, machine learning algorithms, prediction performance evaluation and and calibration.



**Xiangqin Cui, PhD**

Research Associate Professor

## Atlanta VA Medical System

- 1. Predicting kidney function decline in patients with polycystic kidney disease (PKD) using electronic health record (EHR) data**
  - Develop new prediction methods using machine learning and regressions. Validate and modify prediction models in the VA PKD cohort.
- 2. Similarity assessment between patient brain tumor samples and the derived tumor models based on gene expression profiles**
  - Using gene expression data (microarray and next-gen sequencing) to evaluate different similarity/distance metrics.

## RSPH 2020 Incoming Students

637 Total Incoming Students

79% Female

26 Average Age

21% Male

34% Students of Color

5% Non-binary

13% International Students

42 Dual Degree Students

71 Languages Spoken

3.48 Undergraduate GPA Average

## BIOS Students

37 – MPH in Biostatistics

35 – MSPH in Biostatistics

5 – 4+1 Program (BS/MSPH Dual Degree)

40 – PhD Students

“Public Health Capital  
of the World”

## Neighbors of RSPH



Centers for Disease Control and Prevention



American Cancer Society



The Carter Center



Care International



The Task Force for Global Health

# Rollins Earn and Learn (REAL)

- BIOS Departmental Activities



- Student Government Association

- Numerous Student Organizations
- Convos on Tap



# Questions to Current BIOS Students

## *1<sup>st</sup> Year BIOS Students:*

- Why did you chose RSPH?
- What is it like to be a BIOS student?

## *2<sup>nd</sup> Year BIOS Students:*

- Discuss the job positions you've had at RSPH?  
(TA/RA/REAL/APE)
- What are your future goals (next steps after graduation)?

# Examples of Careers of MPH/MSPH Alumni

- **ORISE Fellow**, FDA, CFSAN (Center for Food Safety and Applied Nutrition)
- **Mathematical Statistician**, U.S. Consumer Product Safety Commission
- **Associate Scientist II**, American Cancer Society- Surveillance Department
- **Data Systems Programmer**, The SPHERE Institute, Acumen
- **Biostatistician I**, Brown University, Center for Statistical Sciences - School of Public Health
- **Biostatistician I**, Leidos Biomedical Research (support to NIAID)
- **Biostatistician**, Atlanta VA Medical Center through FAVER; in the Data Analytics Core
- **Senior Statistician-Computation**, Eli Lilly and Company
- **Associate Research Scientist**, Precision for Value: Health Economics and Outcomes Research Department
- **Statistical Analyst**, Department of Biostatistics, St. Jude Children's Research Hospital

Questions  
&  
Thank you!!