



It doesn't matter where you start, but where you end.

Perspectives on education and career pathways from collaborative biostatisticians.

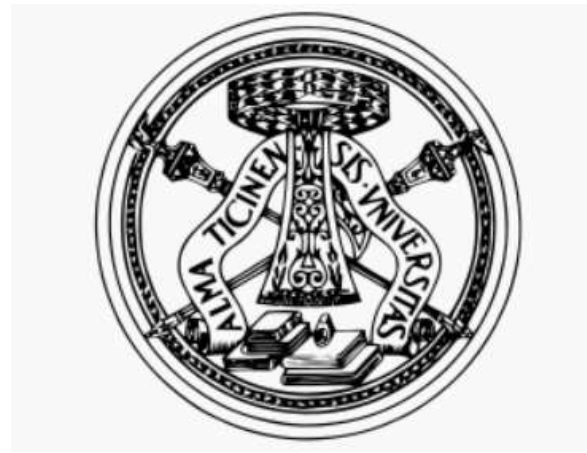
Dr. Todd DeWees

Dr. Isabella Zaniletti

Where did all start?

- High School: Graduated as Technical Expert in Construction, Environment, and Territory
- AFTERMATH:
 - Study more? Yes but what?
 - Options: Engineering & Geology
- 2 years @University' of Pavia → dropout → First job

Back to school



- Laurea @University of Pavia – Department of Political Science
 - Thesis in Econometrics
- Contractor/TA
 - University of Pavia– Centro Interdipartimentale di Ricerca sulla Sicurezza Stradale (CIRSS)
 - MAIDS – Motorcycle Accident in-Depth Study (European Project)
 - University of Sacro Cuore (Milano)



2004 - A year of change

- Applied to The University of Missouri, Columbia - Department of Statistics
 - Test of English as a Foreign Language (TOEFL)
 - Graduate Record Examinations (GRE)
 - Mizzou's Assessment of Classroom Communication Skills (MACCS)
- As a Student → 9 credit hours/week (approx. 3 courses)
- As a Graduate Instructor → 6 credit hours/week



M I Z!



- 2006 - FIRST JOB AS STATISTICIAN with Office of Medical Research, School of Medicine, University of Missouri
 - Study design
 - Power Analysis
 - Descriptive and Inferential statistics
 - Publications
- Adjunct Instructor with Department of Statistics
- 2007 - 2011 PhD in Statistics, Measurement, and Evaluation in Education, School of Educational & Counseling Psychology, University of Missouri

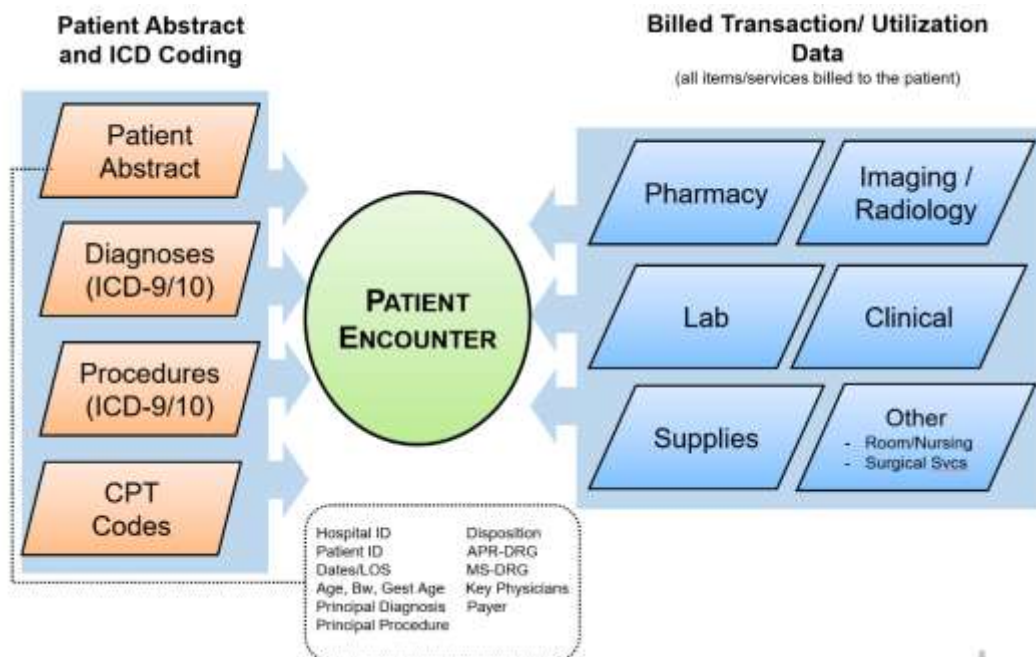


Children's Hospital Association

Roles: Biostatistician 2011-2014

Biostatistician Consultant 2014 – present

- Membership organization of 220 children's hospitals
- Advances pediatric health through innovation in the quality, cost, and delivery of care
- Offices in Washington DC and Lenexa, KS
- Databases:
 - Pediatric Health Information System (PHIS) – pay to play
 - Children's Hospital Neonatal Database (CHND) – currently transitioned to other vendor



PHIS By The Numbers

(Since 2004)

Participating Hospitals: **50**

Inpatient Cases: **7.4 million**

Inpatient Days: **46.0 million**

ED encounters: **32.4 million**

Total Charges: **\$534 billion**

Total ICD-9/10 Codes: **188.4 million**

- Demographics
- Transport and Admission
- Maternal, prenatal and perinatal
- Respiratory Diagnosis and Treatment
- Respiratory and nutritional status at key dates
- ECMO
- PDA
- Neurologic
- Infections
- GI, NEC and HEME
- Vision and hearing
- Surgeries
- Diagnoses
- Mortality details
- Special Diagnosis:
 - Abdominal Wall Defects, Obstruction, and Disorder of Rotation
 - Congenital Diaphragmatic Hernia (CDH)
 - Necrotizing Enterocolitis (NEC)
 - Severe BronchoPulmonary Dysplasia (BPD)/ Chronic Lung Disease (CLD)
 - Hypoxic Ischemic Encephalopathy (HIE) and Therapeutic Cooling
- Feedings for CDH/GI/NEC
- Serial Echocardiograms for CDH and BPD
- Brain Natriuretic Peptide for CDH and BPD

CHND By The Numbers

(Since 2010)

Participating Hospitals: **31**

Total Episodes of Care = **126,894**

Total Patients = **118,952**

NICU Total Patient Days = **2,884,721**

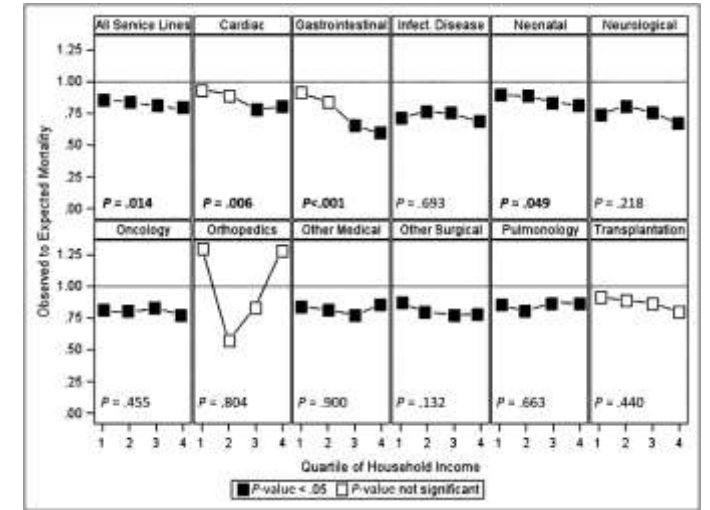
The research – PHIS

Administrative data: costs/utilization

Socioeconomic Status and In-Hospital Pediatric Mortality

Colvin, J. D., I. Zaniletti, E. S. Fieldston, L. M. Gottlieb, J. L. Raphael, M. Hall, J. D. Cowden and S. S. Shah (2013).
Pediatrics 131(1): e182-e190.

- Retrospective cohort study (2009 – 2010) of N = 1,053,101 hospitalizations at 42 centers
- Methods: Flora Z-score, Poisson Regression
- Findings:
 - Within children's hospitals, SES is inversely associated with in-hospital mortality, but is lower than expected for even the lowest SES quartile.
 - The association between SES and mortality varies by service line.
 - Multifaceted interventions initiated in the inpatient setting could potentially ameliorate SES disparities in in-hospital pediatric mortality.



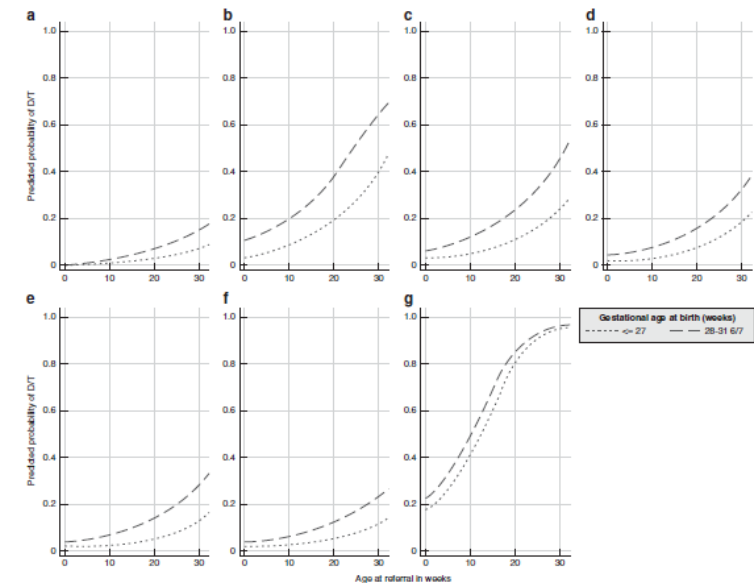
The Research – CHND

Registry data: classification/risk adjustment

Predicting death or tracheostomy placement in infants with severe bronchopulmonary dysplasia

Murthy, K., R. C. Savani, J. M. Lagatta, I. Zaniletti, R. Wadhawan, W. Truog, T. Grover, H. Zhang, J. Asselin and D. Durand (2014). Journal of Perinatology 34(7): 543.

- Retrospective cohort study (2010-2011)
- N=793 infants sBPD and GA < 32 weeks, from 27 sites
- Methods: 80-20 Validation, Logistic Regression
- Findings:
 - Seven clinical variables predicted D/T in this large, contemporary cohort with sBPD.
 - These results can be used to inform clinicians who counsel families of affected infants and to assist in the design of future prospective trials.

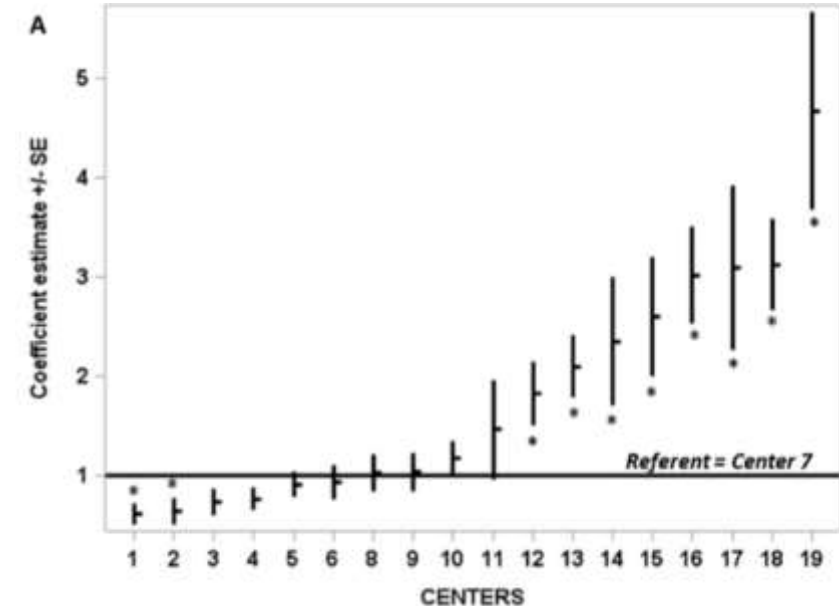


The Research: Linkage PHIS-CHND

Inter-center cost variation for perinatal hypoxic-ischemic encephalopathy in the era of therapeutic hypothermia.

Massaro, A. N., K. Murthy, I. Zaniletti, N. Cook, R. DiGeronimo, M. L. Dizon, S. E. Hamrick, V. J. McKay, G. Natarajan and R. Rao (2016). The Journal of pediatrics 173: 76-83. e71.

- Retrospective cohort study(2010 – 2016)
- N= 822 infants with HIE treated with therapeutic hypothermia at 19 NICUs
- Methods: : PHIS/CHND Linkage



- Findings:
 - There is marked inter-center cost variation associated with treating HIE across regional children's hospitals.

Z O U!



Assistant Professor 2014-2018 (Adjunct 2018-present)

- Teaching
- Advising
 - Undergraduates
 - Masters and PhD's committee
 - Huxley, V.H., Kemp, S.S., Schramm, C., Sieveking, S., Bingaman, S., Yu, Y., **Zaniletti, I.**, Stockard, K. and Wang, J., 2018. Sex differences influencing micro-and macrovascular endothelial phenotype in vitro. The Journal of physiology, 596(17), pp.39293949.
 - Faqeeh, A., Fales, R., Pardalos, J., Amjad, R., **Zaniletti, I.** and Hou, X., 2018. Engineering Evaluation of the Performance of an Automatic Peripheral Oxygen Controller Using a Neonatal Respiratory Model. Journal of Medical Devices, 12(3), p.031005.
 - Faqeeh, A., Hou, X., **Zaniletti, I.**, Pardalos, J., Amjad, R. and Fales, R., 2018, July. Comparison of Automated and Manual Peripheral Oxygen Saturation Control Applied to One Human Subject at a High Target Range. In 2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 3346-3349). IEEE.

Expanding my horizons

- Health Services Advisory Group (HSAG) partners with healthcare providers, federal and state agencies, community stakeholders, patients, families, and caregivers to deliver healthcare quality-improvement support and services through a variety of channels.
- National Contracts
 - Data Science & Advance Analytics
 - Surveys, Research & Analysis
 - **Pharmacy and Quality and Measurement Division**

The HSAG **Pharmacy and Quality Measurement Division** provides clinical and analytical expertise for quality measure development, healthcare policy and evaluation, and medication safety.

- Quality Measure Development
- Medication Safety
- **Healthcare Policy and Evaluation**

- **CMS Quality Measure Development Plan (MDP)**

Project Duration: 2015–2019

Contract With: Centers for Medicare & Medicaid Services (CMS)

- **CMS Quality Measure Index (QMI)**

Project Duration: 2017–2019

Contract With: Centers for Medicare & Medicaid Services (CMS)

- ***Impact Assessment of the Centers for Medicare & Medicaid Services (CMS) Quality and Efficiency Measures***

Project Duration: 2015–2019

Contract With: Centers for Medicare & Medicaid Services (CMS)

Legislative

Congress

Senate
House of Repres.

Executive

President
Vice President
15 cabinets

Judicial

Supreme Court
Other Federal
Courts

Center of Medicare & Medicaid Services (CMS)

Medicare: national insurance program for Americans aged 65 and older, younger with disability, and end stage renal disease (ESRD) and amyotrophic lateral sclerosis (ALS)

Medicaid: federal and state program that helps with medical costs for people with limited income and resources

Agriculture
Commerce
Defense
Education
Energy

Health and Human Service

Homeland Security
Housing and Urban Development
Interior
Labor

State
Transportation
Treasury
Veterans Affairs
Attorney General

TOP SECRET

How did I get here? – High School

- Math was easy and relatively interesting
 - I was going to be a math teacher (elementary preferred) or a professor...
- Recruited to play college football, soccer, and wrestling



How did I get here? - Undergrad

- Majored in ~~Elementary Ed, Secondary Ed~~, Math, Computer Science, and Spanish (Senior Trip to Spain)
- Decided my only path was Mathematics or Computer Science
 - But probably as a teacher...
- Most of my work experience was manual labor, however, I did work for an IT/Telecom company
- Those experiences proved I had only two options, retire or → → → GRADUATE SCHOOL

How did I get here? – Master's

- Started on Nonlinear Systems, then Discrete Math, then Math Bio, then finished with MS in Stats
- Chose Business School advisor because I thought that I would make money in the Financial Industry
- Interned at FDA and realized I made a mistake, but too late.



How did I get here? - PhD

- Left ASU because at the time the program didn't have a PhD in Statistics
- Consulted for a marketing company
- Consulted in our Social Science Statistics Lab and worked with faculty/grads from multiple disciplines.
- Decided Biostats was where I wanted to be.



How did I get here? – 1st JOB!!!

- University of Dundee – Dundee, Scotland
 - 3-year Visa
 - Collaborative work: Diabetes research
 - The program was not ready for stats and spent most of my time on data manipulation, cleaning, curating, etc



How did I get here? – Career Launching Point

- Washington University in St. Louis, MO
 - 2010 - 2018
 - Collaborative work: In the Radiation Oncology Department, collaborating with within biology, medical physics, and clinical trials involving both animals and patients.
 - As the sole statistician, I was responsible for all aspect including; design, data handling and manipulation, analysis, and publication.
 - No methodological work, no travel budget, no external funding = no professional growth

Finally, now that I'm here....

- Mayo Clinic Arizona – Scottsdale, AZ
 - Since March 2018
 - Collaborative work: mainly Radiation Oncology (AZ and MN). However, I collaborate in cancer biology, health disparities, and whatever comes my way...
- Methodological work: Patient-reported QOL, clinical prediction of outcomes, health disparities
- Internal: Research and Hiring Committees, Grant & Protocol Review, etc
- External: Journal and Grant Reviewer, Science Council, etc



Biostatistics Personnel @ Mayo Clinic in AZ

Year	All Employees		Biostatistics	
2007	Staff Physicians & Scientists	391	Faculty	1
			Stat	1
	Allied Health Staff	4,247	SPA	1
2011	Staff Physicians & Scientists	433	Faculty	1
			Stat	3
	Allied Health Staff	4,459	SPA	1
2019	Staff Physicians & Scientists	649	Faculty	3
			Stat	9 (+2)
	Allied Health Staff	6,326	SPA	5 (+2)

May Clinic Estimated Growth

- Arizona -> 2,000 new jobs by 2023, 200 physicians by 2029
- Florida -> 1,000 new jobs by 2023, 130 physicians by 2021
- Minnesota -> 30,000 new jobs over the next 20 years

Biostatistics Personnel Across Mayo Clinic

	Rochester, MN	Scottsdale, AZ	Jacksonville, FL
Faculty	25	3	2
Stat	77	9	4
SPA	115	5	4
Biostat total	217	17	10
Total number of employees	37,569	7,261	6,595

Faculty Statistician Career Ladder

- Parallel professional and academic ranks
- Within professional ranks, we have tenure track and non-tenure track positions



Non-tenure Track (Funding Dependent) Professional Rank	Tenure Track (Not Funding Dependent) Professional Rank	Academic Rank
Research Fellow		Instructor
Research Associate		
Associate Consultant I	Senior Associate Consultant I	Assistant Professor
Associate Consultant II	Senior Associate Consultant II	Associate Professor
	Consultant	Professor

Hiring process

- Online application
 - Resume/CV
 - Cover letter
- Phone screen
- In person all-day interview
 - Panel interview with search committee
 - One-on-one interviews with other statistician faculty and collaborators
 - 45-minute job talk
 - Dinner night before, lunch day of

CV & cover letter should be responsive to the job posting (used as a glimpse into communication skills and work ethic!)

CV: include all relevant experience (if not published/presented, include a brief description of the project & duties)

Research the institution and the people who you will be meeting

Have an “elevator speech” ready

Make eye contact!!!!

Have questions ready!!!!

What do we look for when hiring

- Communication skills!!!!!!!!!!!!
- Ability to describe complicated statistics to someone that doesn't understand statistics
- Critical thinking skills
- Ability to learn
- **Flexibility (we design studies in the real world!)**
- **Applicable experience (coauthored papers, internships)**

Behavioral Interview Assessment

- Communication
 - Active listening & communicating
- Innovation
 - Novel methods or applications to reach goals
- Teamwork
 - How have you worked through differences
- Planning/Prioritizing/Goal Setting
 - How do you manage multiple projects/needs
- Collaborator Focus/Relationships
 - How have you built relationships and results
- Energizing Others
 - How to motivate and lead

Collaborative Faculty Statistician Expectations



Collaborative Research:

- Provide collaboration on research studies
- Design, sample size/power considerations, grant proposals, data management, interim & final analyses, reporting
- Develop national/international reputation in a disease area (evidence: invited lectures)
- Average 5 peer-reviewed co-authored papers per year
- Maintain 80% funding



Methodological Research:

- Develop national/international reputation in a methodological area (evidence: invited lectures)
- Average 1 peer-reviewed first- or senior-author paper per year



Teaching/Mentoring:

- Formal teaching in Mayo Graduate School, Mayo Medical School
- Mentoring committees
- Short courses at conferences



Service/Citizenship:

- Internal and external committees
- Leadership positions
- Grant review panels
- Journal responsibilities

Travel

- Not required, but a definite perk!
- Necessary for:
 - Educational opportunities
 - Networking
 - Developing a national/international reputation
 - Recognition
- When looking for a job, important to ask about funding for travel!

Other advice



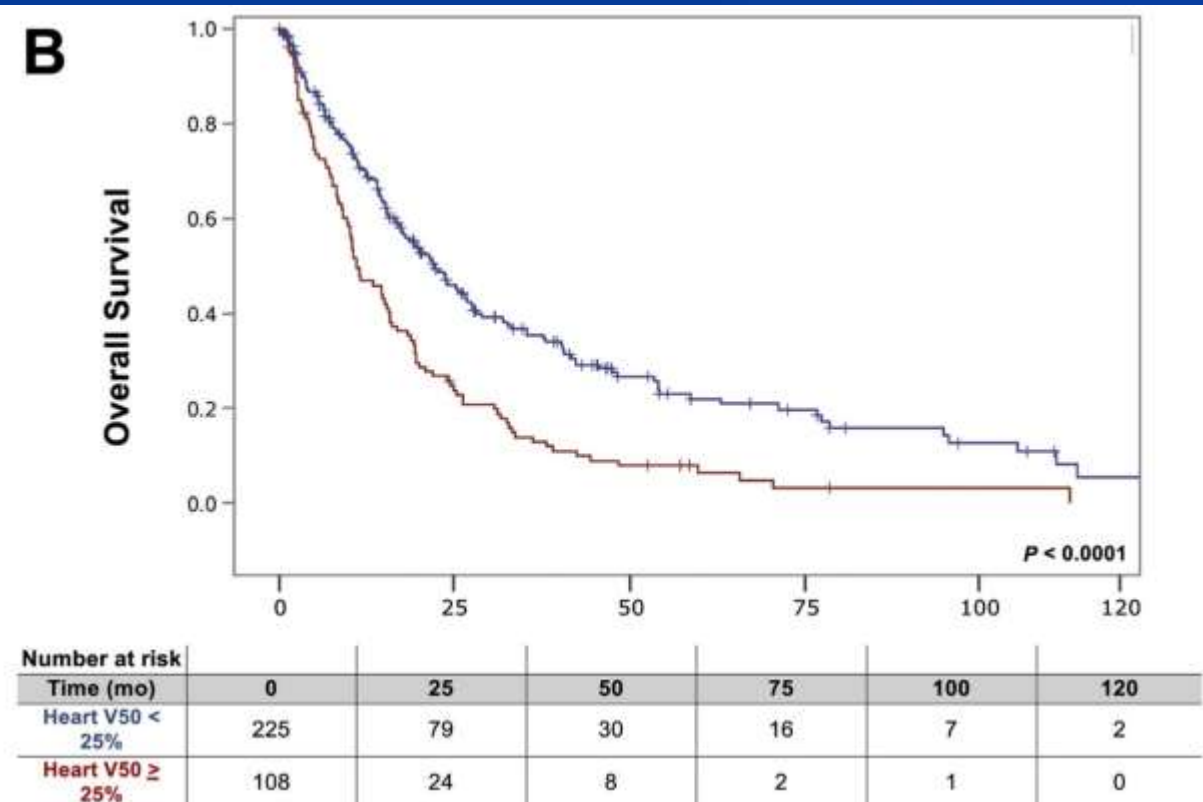
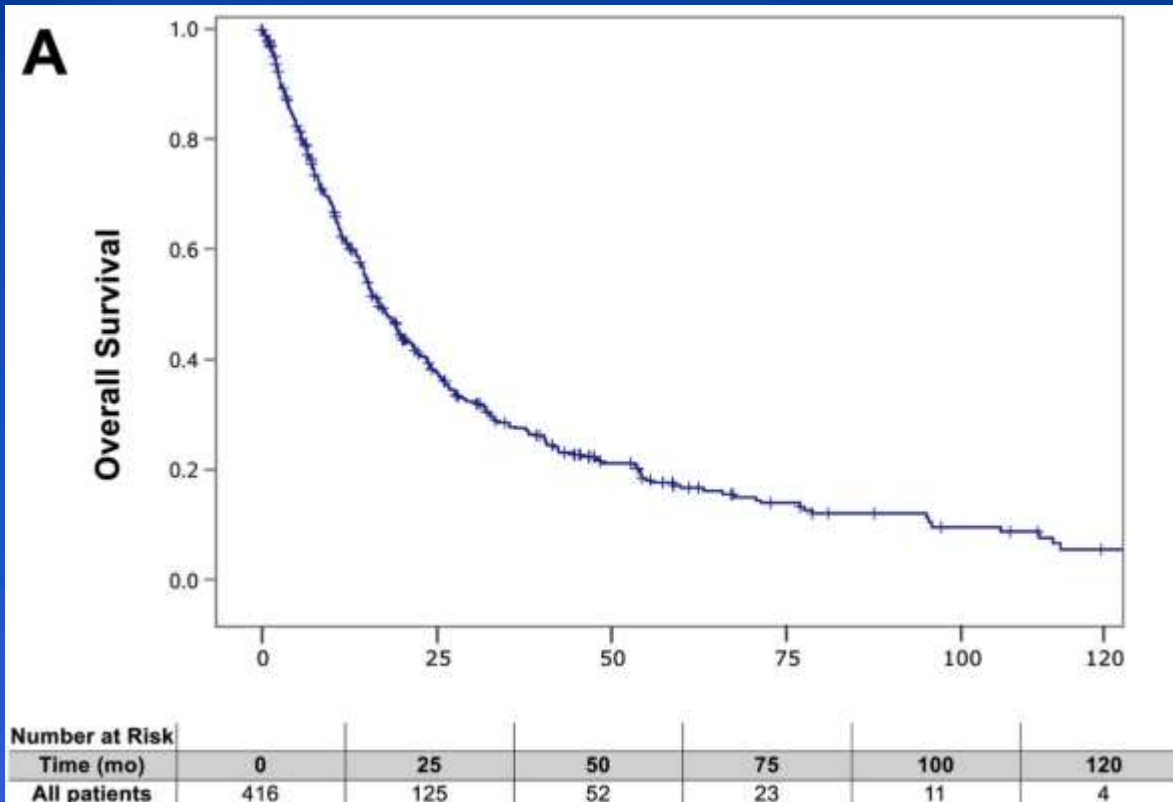
- When getting a biostatistics job
 - Negotiate! -- Protected time for methods research, travel funds, funds for summer intern and/or statistical programmer, expected project assignments, software, data/IT resources, computer equipment, signing bonus, etc.
 - Does the distribution among the work “buckets” fit for you?
- Be aggressive about mentorship
 - Find a **GREAT** mentor (or multiple mentors)
- Be a lifelong learner
- Be responsive (return emails)

The 'art' of the response...

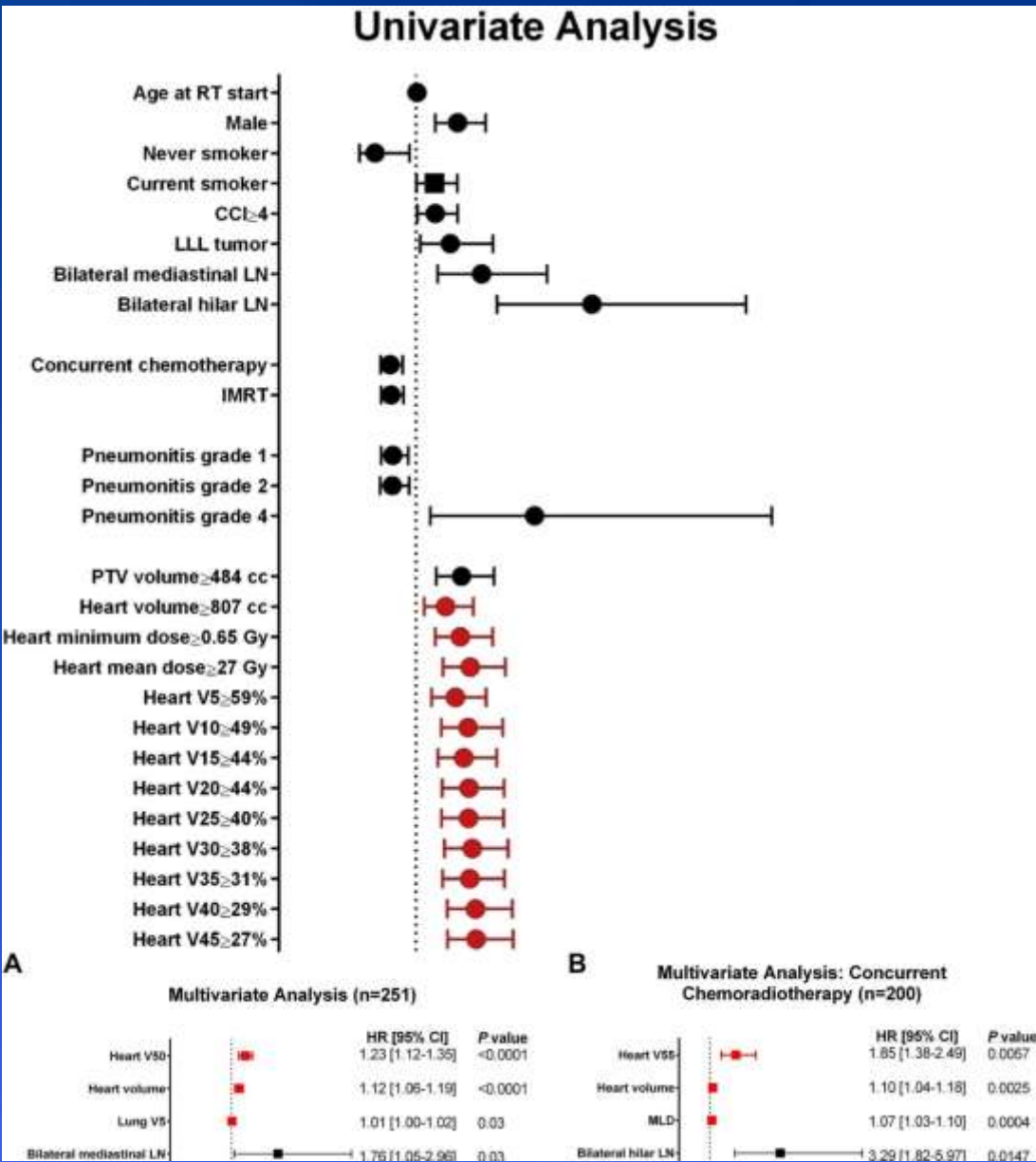
- Say YES
 - Be open to new projects
 - Be confident and don't fall into the "imposter syndrome" trap
- Say NO
 - Everything you say yes to is saying no to something else
 - The art of saying NO
- Address people politely and by name
- Say "Thank You"



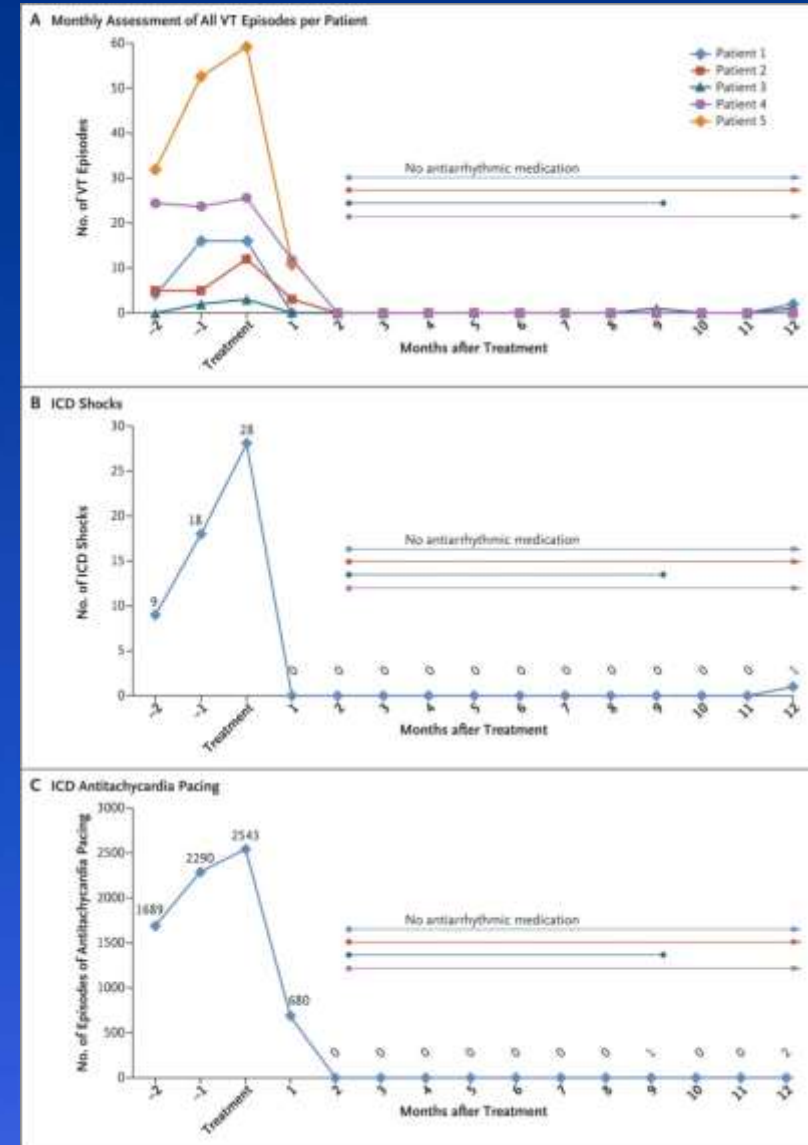
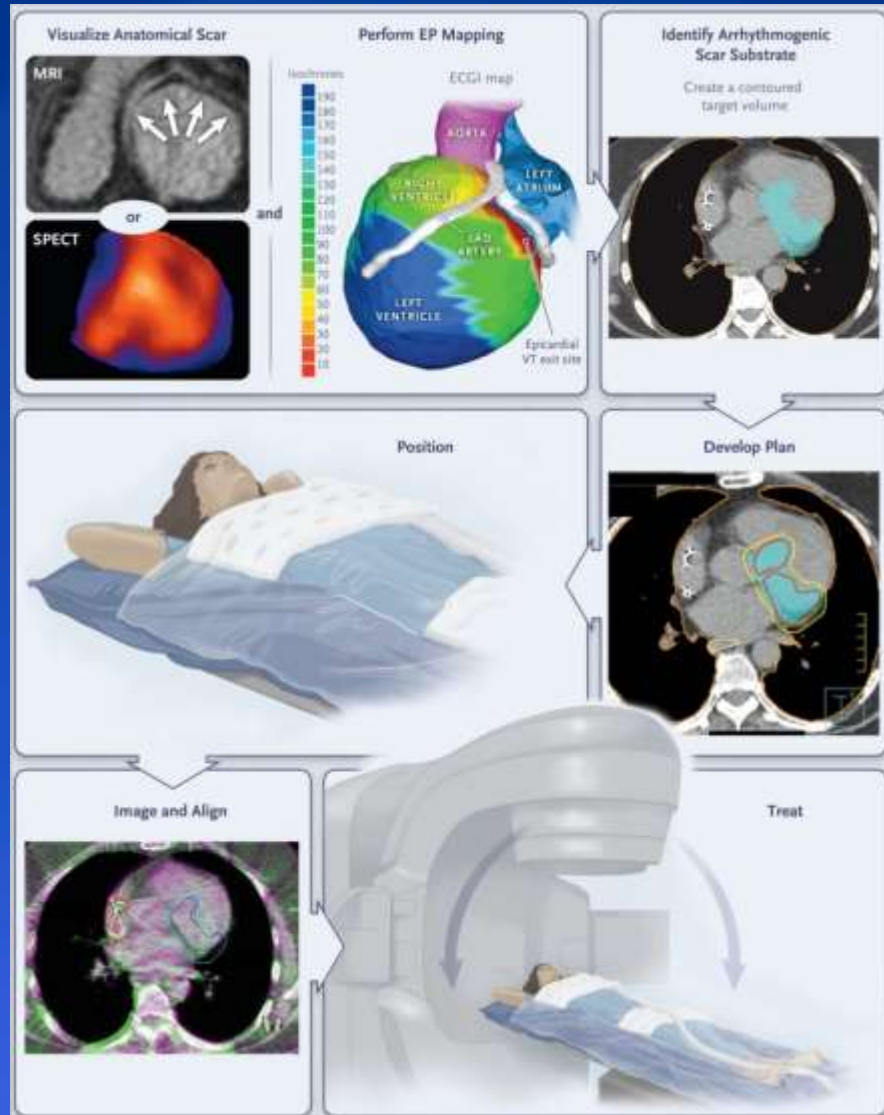
Effects of Heart Dose for Stage III Lung Cancer Patients



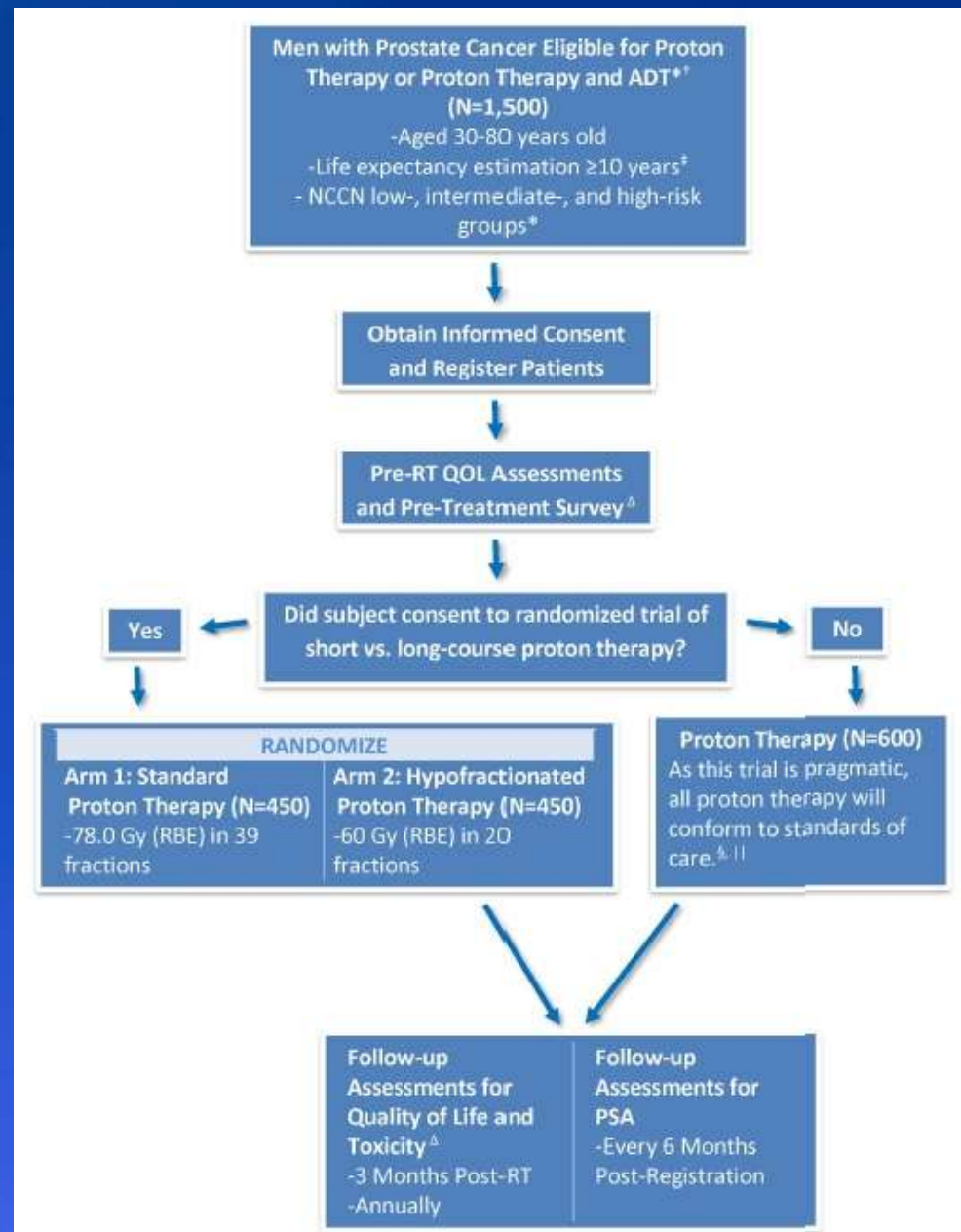
Effects of Heart Dose for Stage III Lung Cancer Patients



Workflow for Electrophysiology-Guided, Noninvasive Cardiac Radioablation.



Multi-site Phase III Prostate Cancer Trial



Artificial Neural Networks for Patient Reported Adverse Events

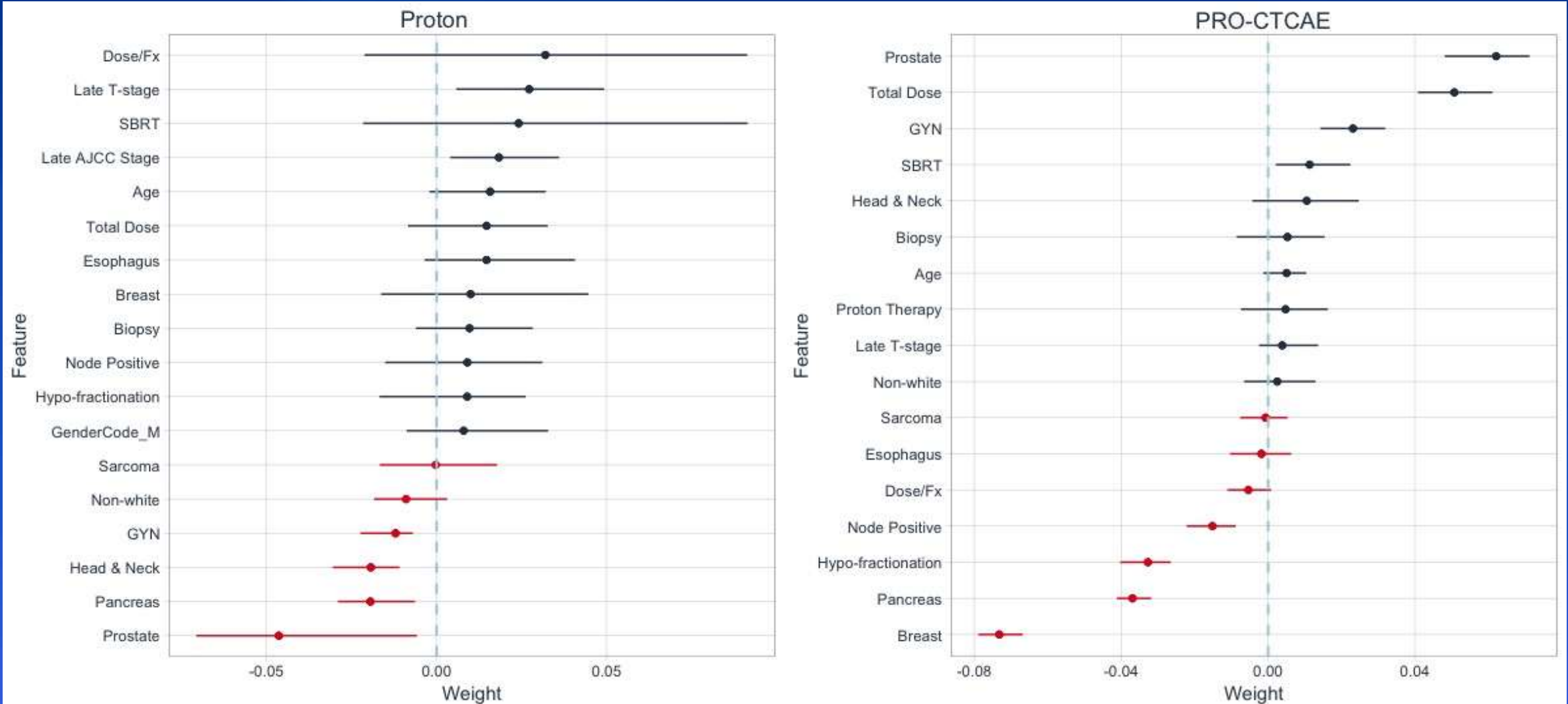


Figure 1: Average cross-validated neural network feature weights with 90% confidence intervals.



THANK YOU!



Questions?

