

DIVISION OF BIOSTATISTICS

ANNUAL REPORT 2022



knowledge changing life



BIOSTATISTICS

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EXECUTIVE SUMMARY

This document summarizes the activities of the Division of Biostatistics in the Institute for Health & Equity of the Medical College of Wisconsin for 2022.

The division supports the missions of the Medical College of Wisconsin through the graduate and continuing medical professional training in biostatistics; the support of funded research projects in 2022 valued at \$215 million in external funds for MCW; the prominence in the development of novel statistical methods for biomedical data; and the biostatistical consulting service.

In 2022, the division co-authored 131 papers including 23 notable papers in high impact clinical, biomedical, and statistical journals, (JAMA Oncology, Lancet: Haematology, Blood, Annals of Surgery, Chest, Hypertension, Nature Genetics, Nature Methods, PLoS Computational Biology, BMC Bioinformatics, Genetics, American Journal of Human Genetics, Biometrics, Statistics in Medicine, Lifetime Data Analysis, Journal of Quality Technology, Statistics in Biopharmaceutical Research, Annals of the Institute of Statistical Mathematics), helped investigators successfully apply for 20 new grants worth \$22 million and collaborated on 232 projects through the Biostatistics Consulting Service.

The division faculty have active research programs in various areas of biostatistics. The division is recognized worldwide for its research in survival analysis. Other areas of investigation include statistical genetics and bioinformatics, Bayesian statistics, big data methods, design and analysis of clinical trials, and multiple comparisons. The division faculty had 23 methodological papers appear as an online publication in 2022 (See Appendix 1).



BIostatISTICS NEWS

We hired one new faculty member. Victor Jin joined us from University of Texas Health San Antonio. In addition to conducting research in functional/computational epigenomics and systems biology, he is supporting the Genomic Sciences and Precision Medicine Center as Bioinformatics Core Director.

Several new staff joined us in 2022, including Lavanya Choppvarapu, Ryan Conrardy, Manzur Farazi, Kun Fang, Xiolong Ma, Sravya Gethika, Simran Sethi, and Yushan Yang. We also said goodbye to one faculty member, Raphael Fraser, and two biostatisticians, Dan Eastwood and Huaying Dong.



Victor Jin, PhD
Professor



Lavanya Choppvarapu, PhD
Research Scientist



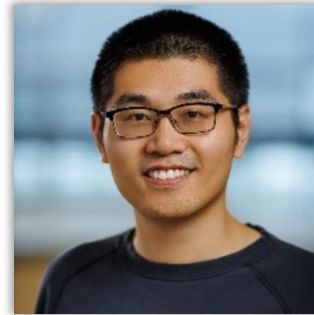
Ryan Conrardy
Biostatistician I



Manzur Farazi, PhD
Statistical Research Scientist



Xiolong Ma
Bioinformatics Analyst I



Kun Fang
Postdoctoral Associate



Sravya Gethika
Statistical Programmer Analyst I



Simran Sethi
Statistical Programmer Analyst I



Yushan Yang
Biostatistician I

Dr. Ahn was promoted to full Professor. Xuerong (Joy) Liu was promoted to Biostatistician II. Two students, Manoj Khanal and Xiao Li, successfully defended their dissertations. Drs. Wang, Martens, and Lin received outstanding Graduate School Educator awards last year.

Dr. Soyoung Kim (with Dr. Ahn) received an AHW-REP grant titled “Robust estimators for missing covariate parameters for right-censored data.” Dr. Kai Yang received a CTSI Pilot-BERD Methodological Innovation Award for his project titled “Online Spatio-Temporal Disease Surveillance Using Exponentially Weighted Spatial LASSO”. Dr. Kwang Woo Ahn (with Dr. Martens and Dr. Kim as co-investigators) received a CTSI Pilot-BERD Methodological Innovation Award for his grant entitled “Penalized regression modeling with knockoff selection to incorporate historical data for clinical trials with survival outcomes”. Several other faculty members continued ongoing methodologic research funded projects, including Dr. Auer (NIH R01, R21), Drs. Logan, Laud, and Sparapani (National Marrow Donor Program and Office of Naval Research), Dr. Logan (FDA), Drs Ahn and Logan (FDA), Drs. Logan and Martens (R01), Dr. Szabo (R01), and Dr. Jin (R01, U54). Finally, several faculty from our Division (Drs. Zhang, Ahn, Kim, Wang, Brazauskas, Logan, Martens, Auer) working with the Center for International Blood and Marrow Transplant Research (CIBMTR) made contributions to two major grants/contracts which were recently re-awarded (HRSA contract, NIH U24).

Several of our division faculty members were involved in notable high impact publication.

- Dr. Tarima in Biometrics
- Dr. Jin in BMC Bioinformatics
- Dr. Auer in Nature Genetics
- Dr. Kim/Ahn in Statistics in Medicine
- Dr. Auer in American Journal of Human Genetics
- Dr. Kim/Ahn and Kim/Zhang/Ahn in Lifetime Data Analysis
- Dr. Auer in Nature Methods
- Dr. Yang in Journal of Quality Technology
- Dr. Tarima in Statistics in Biopharmaceutical Research
- Dr. Lin in Genetics
- Dr. Jin in PLoS Computational Biology
- Dr. Yang in Annals of the Institute of Statistical Mathematics
- Dr. Logan in Lancet: Haematology
- Dr. Kim in JAMA Oncology
- Dr. Wang, Dr. Kim, Dr. Wang, and Dr. Ahn in Blood
- Dr. Szabo in Annals of Surgery
- Dr. Szabo in Chest
- Dr. Wang in Hypertension

BIostatISTICS FACULTY



Brent Logan, PhD
*Director & Professor of
Biostatistics*



Paul Auer, PhD
*Core Director of Cancer
Center & Professor*



Prakash Laud, PhD
Professor of Biostatistics



Mei-Jie Zhang, PhD
Professor of Biostatistics



Kwang Woo Ahn, PhD
Professor of Biostatistics



Anjishnu Banerjee, PhD
*Associate Professor of
Biostatistics*



Ruta Brazaukas, PhD
*Associate Professor of
Biostatistics*



Victor Jin, PhD
*Professor of Biostatistics,
Bioinformatics Core Director*



Yan Gao, PhD
*Assistant Professor of
Biostatistics*



Soyoung Kim, PhD
*Associate Professor of
Biostatistics*



Masaki Lin, PhD
*Assistant Professor of
Biostatistics*



Michael Martens, PhD
*Assistant Professor of
Biostatistics*



Rodney Sparapani, PhD
*Associate Professor of
Biostatistics*



Aniko Szabo, PhD
Professor of Biostatistics



Sergey Tarima, PhD
*Associate Professor of
Biostatistics*



Tao Wang, PhD
*Professor of
Biostatistics*



Kai Yang, PhD
*Assistant Professor of
Biostatistics*

BIostatistics RESEARCH AND STATISTICAL SUPPORT STAFF



Alexis Visotcky, MS
Biostatistics Analyst III



Bethany Canales, MPH
Statistician I



Joy Liu, MS
Biostatistics Analyst II



Kun Fang, MS
Post-Doctoral Associate



Lavanya Choppvarapu, PhD
Research Scientist I



Lisa Rein, MS
Biostatistics Analyst II



Manzur Farazi, PhD
Statistical Research Scientist II



Michelle Teng, MS
Biostatistics Analyst I



Ryan Conrardy, MS
Biostatistics Analyst I



Shravya Jasti, MS
Research Statistical Programmer I



Simran Sethi, MS
Statistical Programmer Analyst I



Sravya Gethika, MS
Statistical Programmer Analyst I



Xionlong Ma, MS
Bioinformatics Analyst I



Yushan Yang, MS
Biostatistics Analyst I

BIostatistics ADMINISTRATIVE SUPPORT



Kellie Bialzik, MBA
Business Manager, Sr.



Jennifer Ward
Research Program Coordinator II



McKenna Busse
Financial Assistant II



Evan Heffelfinger
Administrative Assistant Sr.

METHODOLOGIC RESEARCH

The division faculty have active research programs in various areas of biostatistics. The division is recognized worldwide for its research in survival analysis. Other areas of investigation include statistical genetics, Bayesian statistics, big data methods, design and analysis of clinical trials, and multiple comparisons. The division faculty had 23 methodological papers that appeared in statistical literature with an online publication date in 2022. (See list below). In addition to publications, the Division of Biostatistics also presented 6 methodological presentations/abstracts (See Appendix 1).

Ali O, Farooq A, Yang M, Jin VX, Björnäs M, Wang J. (2022). "abc4pwm: affinity-based clustering for position weight matrices in applications of DNA sequence analysis." *BMC bioinformatics*; 23(1): 83. 03/05/2022.

Auer, P. L. (2022). "Finding causal genes underlying risk for coronary artery disease." *Nature Genetics* 54(12): 1768-1769. 12/07/2022.

Brazauskas R, Jatoi A, Le-Rademacher JG. (2022). "A Cautionary Tale: Grouping Patients on Late Events." *Mayo Clinic proceedings*; 97(3): 449-453. 02/10/2022.

Dai R, Zheng C, Zhang MJ. (2022). "On High-Dimensional Covariate Adjustment for Estimating Causal Effects in Randomized Trials with Survival Outcomes." *Statistics in Biosciences*. 11/2022.

Fang K, Wang J, Liu L, Jin VX. (2022). "Mapping nucleosome and chromatin architectures: A survey of computational methods." *Computational and structural biotechnology journal*; 20: 3955-3962. 08/12/2022.

Flournoy N, Tarima S. (2022). "Discussion on 'Adaptive enrichment designs with a continuous biomarker' by Nigel Stallard." *Biometrics*. 03/16/2022.

He Y, Kim S, Mao L, Ahn KW. (2022). "Marginal semiparametric transformation models for clustered multivariate competing risks data." *Statistics in medicine*; 41(26): 5349-5364. 09/19/2022.

Huang L, Rosen JD, Sun Q, Chen J, Wheeler MM, Zhou Y, et al. (2022). "TOP-LD: A tool to explore linkage disequilibrium with TOPMed whole-genome sequence data." *American journal of human genetics*; 109(6): 1175-1181. 05/04/2022.

Hu ZH, Wang HL, Gale RP, Zhang MJ. (2022). "Correction to: A SAS macro for estimating direct adjusted survival functions for time-to-event data with or without left truncation." *Bone Marrow Transplantation*; 57(4): 693. 04/2022.

Kim S, Kim JK, Ahn KW. (2022). "A calibrated Bayesian method for the stratified proportional hazards model with missing covariates." *Lifetime data analysis*; 28(2): 169-193. 01/17/2022.

- Li Z, Li X, Zhou H, Gaynor SM, Selvaraj MS, Arapoglou T, et al. (2022). "A framework for detecting noncoding rare-variant associations of large-scale whole-genome sequencing studies." *Nature methods*; 19(12): 1599-1611. 10/28/2022.
- Mamenko M, Lysikova DV, Spires DR, Tarima SS, Ilatovskaya DV. (2022). "Practical notes on popular statistical tests in renal physiology." *American journal of physiology. Renal physiology*; 323(4): F389-F400. 07/15/2022.
- Othus M, Zhang MJ, Gale RP. (2022) "Clinical trials: design, endpoints and interpretation of outcomes." *Bone Marrow Transplant*. 01/2022.
- Qiu P, Yang K. (2022). "Spatio-temporal process monitoring using exponentially weighted spatial LASSO." *Journal of Quality Technology*. 01/01/2022.
- Sparapani RA, Teng BQ, Hilbrands J, Pipkorn R, Feuling MB, Goday PS. (2022). "Novel Pediatric Height Outlier Detection Methodology for Electronic Health Records via Machine Learning With Monotonic Bayesian Additive Regression Trees." *Journal of pediatric gastroenterology and nutrition*; 75(2): 210-214. 06/02/2022.
- Tarima S, Flournoy N. (2022). "Distribution Theory Following Blinded and Unblinded Sample Size Re-estimation under Parametric Models." *Communications in statistics: Simulation and computation*; 51(4): 2053-2064. 06/28/2022.
- Tarima S, Flournoy N. (2022). "Most Powerful Test Sequences with Early Stopping Options." *Metrika*; 85(4): 491-513. 05/24/2022.
- Van Lancker K, Tarima S, Bartlett J, Bauer M, Bharani-Dharan B, Bretz F, et al. (2022). "Estimands and their Estimators for Clinical Trials Impacted by the COVID-19 Pandemic: A Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions." *Statistics in Biopharmaceutical Research*. 01/01/2022.
- Vedi M, Nalabolu HS, Lin CW, Hoffman MJ, Smith JR, Brodie K, et al. (2022). "MOET: a web-based gene set enrichment tool at the Rat Genome Database for multiontology and multispecies analyses." *Genetics*; 220(4). 04/06/2022.
- Xie Q, Han C, Jin V, Lin S. (2022). "HiCImpute: A Bayesian hierarchical model for identifying structural zeros and enhancing single cell Hi-C data." *PLoS computational biology*; 18(6): e1010129. 06/14/2022.
- Xu Y, Kim S, Zhang MJ, Couper D, Ahn KW. (2022). "Competing risks regression models with covariates-adjusted censoring weight under the generalized case-cohort design." *Lifetime data analysis*; 28(2): 241-262. 01/17/2022.
- Yang K, Qiu P. (2022). "A three-step local smoothing approach for estimating the mean and covariance functions of spatio-temporal Data." *Annals of the Institute of Statistical Mathematics*; 74(1): 49-68. 02/01/2022.
- Yang K, Qiu P. (2022). "Design variable-sampling control charts using covariate information." *IIE Transactions*; 54(5): 505-519. 01/01/2022.

COLLABORATIVE APPLIED RESEARCH

The Division of Biostatistics provides biostatistical support for collaborative applied research through three mechanisms:

- Co-investigators on grants
- Integration contract set up with Medical College departments, division, centers, institutes, or other research programs to provide upfront integrated biostatistical support to their members
- Hourly effort recharge mechanism of the Biostatistics Consulting Service

Faculty and analysts in the Division of Biostatistics co-authored 232 medical publications in 2022 (Appendix 2). During this past year, they also provided statistical support through major grant effort or integration contracts for the following research programs:

- The Center for International Blood & Marrow Transplant Research (CIBMTR)
 - Resource for Clinical Investigation in Blood and Marrow Transplantation (RCI BMT)
 - Blood and Marrow Transplant Clinical Trials Network (BMT CTN)
 - National Marrow Donor Program / Be the Match
- The Medical College of Wisconsin Cancer Center
- The Clinical and Translational Science Institute
- Department of Radiation Oncology ROCKET clinical trials program
- Neuroscience Research Center
- Department of Orthopedic Surgery
- Department of Physical Medicine and Rehabilitation
- Pediatric Emergency Medicine
- Department of Pediatrics (support for genomics researchers)
- Department of Surgery
- Division of Hematology / Oncology
- Froedtert Hospital Pharmacy

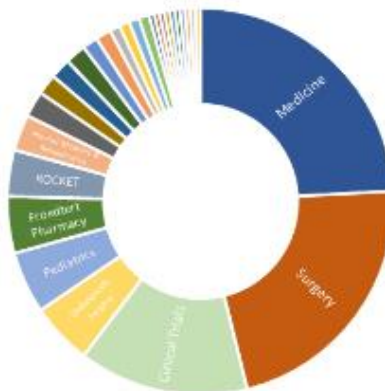
BIostatISTICS CONSULTING SERVICE

The Biostatistics Consulting Service (BCS) provides statistical support to investigators at the Medical College, its affiliates, and the public. The services provided include assistance with study design, data management, statistical analysis, interpretation of study results, and assistance in grant preparation. This pre-arranged assistance is available through the BCS on a recharge basis or through pre-arranged contacts with departments and centers as described previously.

The BCS collaborated on 232 projects in 2022, totaling 4660 hours of Biostatistics Faculty and Analyst collaboration time. Following is a breakdown of projects per MCW department or other affiliation. The BCS also provides drop-in consulting hours, similar to “faculty office hours” where staff biostatisticians designate weekly hours for investigators to receive free statistical consultations. To learn more, view the Biostatistics Consulting Service website.

Department	Frequency	Department	Frequency	Department	Frequency	Department	Frequency
Anesthesiology	2	Froedtert Pharmacy	11	Ophthalmology & Visual Sciences	4	Physiology	1
Biochemistry	1	Institute of Health & Equity	5	Orthopaedic Surgery	12	Plastic Surgery	1
Cancer Center	3	Marquette University	3	Otolaryngology	2	Psychiatry	1
Cinical Trials	33	Medicine	56	Pathology	4	ROCKET	9
Dermatology	2	NRC	1	Pediatrics	12	Radiation Oncology	4
Emergency Medicine	1	Neurology	1	Pharmacology & Toxicology	1	Surgery	51
Family Medicine	1	Obstetrics & Gynecology	1	Physical Medicine & Rehabilitation	7	UW-Milwaukee	2

Number of Biostatistics Consulting Service by Projects:



2022 FUNDED GRANTS

Grant Title	PI	Biostatistics Member	TOTAL COSTS
(PQ2) Donor socioeconomic status as a predictor of altered immune function and treatment response following hematopoietic cell transplantation for hematologic malignancy	^Jennifer Knight	Tao Wang	\$1,458,114
17-CD33CAR-NMDP	^Ruta Brazauskas	Ruta Brazauskas	\$7,120
17-CSIDE- NMDP	^Brent Logan	Brent Logan	\$3,000
A Data Resource for Analyzing Blood and Marrow Transplants	^Bronwen Shaw	Ahn, Auer, Brazauskas, Fraser, Kim, Logan, Martens, Wang, Zhang	\$18,553,283
A longitudinal, nationally representative study of cognition-related effects of breast cancer and its treatment	*^Ann Nattinger	Prakash Laud	\$1,427,400
A Phase I Clinical Trial Testing Feasibility of Hematopoietic Stem Cell Gene Therapy Using Platelet Factor VIII to Safely Improve Hemostasis for Severe Hemophilia A with Inhibitory Antibodies to FVIII	^David Wilcox	Ruta Brazauskas	\$8,112,896
A self-organizing embryoid model of peri-implantation human development	^Kenichiro Taniguchi	Chien-Wei Lin	\$1,554,811
Acute neurobehavioral predictors of risk trajectories following youth violence victimization	^Michael Levas	Aniko Szabo	\$888,613
ALLOSTATIC LOAD AND CARDIO-ONCOLOGY DISPARITIES	*^Melinda Stolley	Rodney Sparapani	\$397,919
Blockade of IL-23 for the Prevention of Graft Versus Host Disease	^William Drobyski	Aniko Szabo	\$2,301,570
BMT CTN - 2002 - A Phase 3, Randomized, Open-Label, Multicenter Study, to Compare T-Guard to Ruxolitinib for the Treatment of Patients with Grade III or IV Steroid-Refractory Acute Graft-Versus-Host D	^Michael Martens	Michael Martens	\$18,686
BMT CTN -1902 Celgene CAR T-Cell Therapy in Patients with High Risk Multiple Myeloma / CAR T-Cell Therapy to Upgrade Disease Response in Patients with Multiple Myeloma	^Brent Logan	Brent Logan	\$35,855

BMT CTN 2101 Prospect Observational Study of the Immunogenicity of Vaccines for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) After Autologous Hematopoietic Stem Cell Transplantation (H	^Michael Martens	Michael Martens	\$15,783
BMT CTN Data and Coordinating Center	^Mary Horowitz	Brent Logan	\$50,274,589
BMT CTN GVHD Prophylaxis Study / BMT CTN 2203 project	*Brent Logan	Brent Logan	34,125.00
BMTCTN Protocol 1506 - Multi-center, Randomized, Double-blind, Placebo-controlled Phase III Trial of the FLT3 Inhibitor Gilteritinib	^Brent Logan	Brent Logan	\$104,000
BMTCTN Protocol 1705 CSL Behring	^Michael Martens	Michael Martens	\$45,500
Bridging Community-based Continence Promotion and Primary Care	*^Joan Neuner	Prakash Laud	\$998,982
Clinical and Translational Science Award	^Reza Shaker	Ahn, Szabo, Tarima, Sparapani	\$21,365,292
Clinical and Translational Science Award (Kwarteng)	*^Reza Shaker	Anjishnu Banerjee	\$297,323
Cohesin Mutations in Acute Myelogenous Leukemia	^Sergey Tarima	Sergey Tarima	\$66,045
Commensurate prior models accommodating historical controls for clinical trials with matched and/or interval-censored data	^Kwang Woo Ahn	Kwang Woo Ahn	\$198,408
Control of GVHD by Probiotics with individual Commensal Bacteria	*^Xue-Zhong, Yu	Chien-Wei Lin	\$2,460,952
Deglutitive and airway protective functions of proximal/ striated muscle esophagus in health and disease	*^Reza Shaker	Aniko Szabo	\$1,840,904
Delineating the mechanisms underlying heart valve endothelial repair	^Joy Lincoln	Chien-Wei Lin	\$1,714,384
Development of a Novel Clinical Decision Support System for Older Adult Patients with Traumatic Brain Injury	*Rachel Morris	Rodney Sparapani	\$434,128
Development of a Surgical Oncology Disparities Research Program	*Callisia Clarke	Paul Auer	\$1,091,200
Development of Team-Based Infrastructure for the Application of Personalized Medicine for Cardiovascular Risk Prediction in Cancer Patients and Survivors using Artificial Intelligence Algorithms	^Sherry-Ann Brown	Rodney Sparapani	\$37,957

Dual Functionality of Ceramide in Human Microvascular Endothelial Function	*^Julia Freed	Sergey Tarima	\$3,163,950
Endothelial Rap1 in the control of heart function	^David X Zhang	Rodney Sparapani	\$477,548
Environmental Sound Recognition Before and After Cochlear Implantation in Adults	^Michael Harris	Sergey Tarima	\$446,213
Estimation of casual treatment effects in hematologic oncology (HO) trials in presence of multiple subsequent therapies	^Brent Logan	Brent Logan	\$100,000
Evaluating the Impact of Singing Interventions on Markers of Cardiovascular Health in Older Patients with Cardiovascular Disease	^Jacquelyn Kulinski	Rodney Sparapani	\$991,980
Every Day Counts: A lifestyle program for women metastatic breast cancer	*^Melinda Stolley	Anjishnu Banerjee	\$3,641,133
Family-based methods to analyze sequence data to elucidate AD etiology	^Paul Auer	Paul Auer	\$299,841
FY23 C-MACC Funding	*Michael Burke	Aniko Szabo	\$1,000,000
Gastroschisis Outcomes of Delivery (GOOD) Study	^Amy Wagner	Aniko Szabo	\$4,200,721
Genetic and Epigenetic Mechanisms of BP Regulation	^Mingyu Liang	Paul Auer	\$11,798,714
Gigiigooinaan (Our Fish): A New Advisory to Promote Anishinaabe Health and Wellness	^Matthew Dellinger	Rodney Sparapani	\$1,307,308
Impact of L. plantarum 299v Supplementation on Endothelial Function and Systemic Inflammation	^Michael Widlansky	Rodney Sparapani	\$2,788,794
Inhibition of Oral Tumorigenesis by Antitumor B	^Stuart Wong	Brent Logan	\$151,948
Innovative approaches to elucidate the genetic etiology of age-related hearing impairment and tinnitus	Paul Auer	Paul Auer	\$337,600
Investigating the role of the microbiome and inflammation in acute and chronic pain in patients with sickle cell disease	^Amanda Brandow	Aniko Szabo	\$3,698,191
Ischemic Conditioning and Improved Motor Function Post Stroke	^Matt Durand	Sergey Tarima	\$773,601
Leveraging a public school district and schoolyard spaces to confront climate health inequities in a low-income, urban community of color	*^Kirsten Beyer	Kai Yang	\$1,349,999

Machine Learning Strategies for Optimizing Donor Selections	^Brent Logan	Brent Logan	\$63,600
Machine Learning to identify Biomarkers for Risk of Chronic Graft-Versus-Host Disease	^Brent Logan	Brent Logan	\$490,190
MCW NCTN Lead Academic Participating Site	^Stuart Wong	Brent Logan	\$4,768,440
Mechanistic and therapeutic role of the CD137-CD137L axis in Type 1 Diabetes	^Yi-Guang Chen	Chien-Wei Lin	\$3,436,755
Men Moving Forward: A Lifestyle Intervention for African American Prostate Cancer Survivors	^Melinda Stolley	Anjishnu Banerjee	\$3,280,010
National Marrow Donor Program 204757	^Tao Wang	Tao Wang	\$142,272
Neurovascular Uncoupling and Cognitive Impairments of Long COVID in Aging	*^Yang Wang	Anjishnu Banerjee	\$429,000
New treatment monitoring biomarkers for brain tumors using multiparametric MRI with machine learning	^Kathleen Schmainda	Brent Logan	\$2,621,712
Next generation functional genomics of hematology traits	^Paul Auer	Paul Auer	\$145,627
NMDP-Access- Donor for all	^Brent Logan	Brent Logan	\$5,020
NMDP-ADS-202 Megenta	^Brent Logan	Brent Logan	\$15,056
No-Show Prevention Practices in Dental Care Settings Serving Underserved Populations	^Aniko Szabo	Aniko Szabo	\$289,033
Omics analysis of three-dimensional transcriptional regulation	*^Victor Jin	Victor Jin	\$962,395
Penalized regression modeling with knockoff selection to incorporate historical data for clinical trials with survival outcomes	Kwang Woo Ahn	Kwang Woo Ahn	\$25,000
Pharmacological Jak2 inhibition to overcome androgen receptor aberrations in prostate cancer	^*Marja Nevalainen	Anjishnu Banerjee	\$2,945,938
Plasma-induced signatures as a measure disease heterogeneity and immunomodulation in T1D clinical trials	Martin Hessner	Chien-Wei Lin	\$1,770,892
Polygenic risk scores and health disparities: the role of blood cells immune response and evolutionary adaptation	^Paul Auer	Paul Auer	\$486,082
Predicting urinary continence status with sacral neuromodulation and botulinum toxin treatments	^James Hokanson	Anjishnu Banerjee	\$369,590

Prediction of Shoulder Injury for Disease Prevention in Children and Adults with Spinal Cord Injury Using Advanced Biomechanical Modeling and Diagnostic Imaging	^Sergey Tarima	Sergey Tarima	\$99,124
Primary Immune Deficiency Treatment Consortium	^Brent Logan	Brent Logan	\$1,521,768
Prostate Cancer Radio-Pathomics for Differentiating Clinically Significant Disease	^Peter LaViolette	Anjishnu Banerjee	\$3,312,555
Randomized Study of very low versus low dose busulfan in transplant for severe combined	^Logan, Brent	Brent Logan	\$121,764
Reducing innate inflammation in new onset T1D with Lactobacillus plantarum	^Martin Hessner	Chien-Wei Lin	\$2,974,047
Robust estimators for missing covariate parameters for right-censored data	*Soyoung Kim	Soyoung Kim	\$200,000
Shaping diabetogenic T cells by IL-27 in type 1 diabetes	^Yi-Guang Chen	Chien-Wei Lin	\$1,486,417
Small molecule NO precursors as a bioactive source of NO in vasodilation and angiogenesis	^Nicole Lohr	Yan Gao	\$2,262,460
Stem Cell Therapeutic Outcomes Database (SCTOD) Renewal 2022	^J. Douglas Rizzo	Kwang Woo Ahn	\$29,230,092
Stochastic Hierarchical Algorithms for Risk Prediction (SHARP) in impact injury environments	*Anjishnu Banerjee	Anjishnu Banerjee	\$25,000
Systems Analysis of Epigenomic Architecture in Cancer Progression - Core	*^Victor Jin	Victor Jin	\$92,500
Systems Analysis of Epigenomic Architecture in Cancer Progression - Project 3	*Victor Jin	Victor Jin	\$40,499
The roles of Lyme spirochete adhesins in hematogenous dissemination	^Jenifer Coburn	Yan Gao	\$3,595,351
Tracking Women's Experiences of Intimate Partner Violence During the Covid-19 Pandemic **	^Joni Williams	Yan Gao	\$291,958
Tumor Subtypes and Therapy Response in Pancreatic Cancer	^Susan Tsai	Anjishnu Banerjee	\$779,808
External Funds			\$215,587,891
New Grants			\$22,833,347
2022 Total of All Grants			\$220,546,335

* Denotes New Grants / ^ Denotes External Funding

APPENDIX 1: METHODOLOGIC PRESENTATIONS

- Banerjee A, Medical College of Wisconsin; Chakraborty S, University of Missouri; Dey T; Harvard University. "Bayesian Nonlinear Model for Data Integration and Distributed Statistical Inference." 2022 JSM Conference, ISBA: Section on Biometrics. 08/11/2022. (Invited talk).
- Banerjee A, Medical College of Wisconsin; Huang Y, University of Missouri; Chakraborty S, University of Missouri; Dey T, Harvard University. "Robust Inference on Unconfirming Silos." 2022 JSM Conference, ISBA: Section on Biometrics. 08/11/2022. (Invited talk).
- Banerjee, A, Hu H. "Greater than the Sum of its Part- Learning from Piecewise Data in Spatial Contexts." 2022 IISA Conference, International Indian Statistical Association (IISA). 12/26/2022-12/30/2022. (Invited, virtual talk)
- Jin, V. "Systems Biology Approaches to Dissect the Multi-layer Epigenetic Architecture in Cancer Progression." 2022 Mellowes Center, Medical College of Wisconsin. 07/13/2022. (Invited, virtual talk).
- Kim, S. "Statistical Methods for Multivariate Survival and Competing Risks Data in Case-Cohort Design." 2022 Division of Biostatistics, Medical College of Wisconsin. 04/05/2022.
- Kim, S. "Improving Estimation Efficiency for Left-Truncated Competing Risks Regression Under the Case-Cohort Design." 2022 Department of Biostatistics, Yale University. 11/2022.
- Sparapani, R. "Nonparametric Machine Learning and Efficient Computation with Bayesian Additive Regression Trees (BART)." 03/16/2022. (Invited, virtual talk).
- Sparapani, R. "Novel Pediatric Height Outlier Detection for Electronic Health Records: Machine Learning with Monotonic Bayesian Additive Regression Trees." 04/01/2022. (Invited, virtual talk).
- Szabo, A. "Operating Characteristic Guided Design of Group-Sequential Trials." 2022 Mayo Clinic QHS Grand Rounds. 09/12/2022. (Invited, virtual talk).
- Tarima, S, Juan W, Zenkova, Z, Homan, M. "Use of Previously Published Results for More Powerful Testing of Factors Related to Adverse Birth Outcomes." 2022 HRSA. 08/08/2022. (Contributed talk).
- Yang K. "Adaptive Process Monitoring Using Covariate Information." 2022 ICSA Applied Statistic Symposium, International Chinese Statistical Association (ICSA). 06/19/2022-06/22/2022. (Invited talk).
- Yang, K. "Adaptive Process Monitoring Using Covariate Information." 2022 Joint Statistical Meeting, American Statistical Association (ASA). 08/06/2022-08/11/2022. (Topic-contributed talk).

Yang, K. "Spatio-temporal Process Monitoring Using Exponentially Weighted Spatial Lasso." 2022 INFORMS Annual Meeting, Institute for Operations Research and the Management Sciences (INFORMS). 10/16/2022-10/19/2022. (Invited talk).

Yang, K. "Effective spatio-temporal disease surveillance by using covariate information." 2022 IISA Conference, International Indian Statistical Association (IISA). 12/26/2022-12/30/2022. (Invited talk).

APPENDIX 2: COLLABORATIVE PAPERS & PUBLICATIONS

- Abid MB, Rubin M, Ledebner N, Szabo A, Longo W, Mohan M, et al. (2022). "Efficacy of a third SARS CoV-2 mRNA vaccine dose among hematopoietic cell transplantation, CAR T cell, and BiTE recipients." *Cancer cell*; 40(4): 340-342. 02/25/2022.
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