

DIVISION OF BIOSTATISTICS

ANNUAL REPORT 2023



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 2023.

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 2023 valued at \$277 million in external funds for MCW; the prominence in the development of novel statistical methods for biomedical data; and the biostatistical consulting service.

In 2023, the division co-authored 150 papers including 31 notable papers in high impact clinical, biomedical, and statistical journals, (Lancet, New England Journal of Medicine, Journal of Clinical Oncology, JAMA Pediatrics, Leukemia, Blood, Annals of Surgery, Nature Genetics, Nature Communications, BMC Genomics, Genetic Epidemiology, Biometrics, Statistics in Medicine, Clinical Trials, Lifetime Data Analysis, Journal of Quality Technology, Statistics in Biopharmaceutical Research, Stat, Communications in Statistics: Simulation and Computation, Statistics and Probability Letters), helped investigators successfully apply for 32 new grants worth \$52 million and collaborated on 252 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 2023 (See Appendix 1).



BIostatistics NEWS

The Division of Biostatistics will be moving from the Institute for Health and Equity (IHE) to the new Data Science Institute, led by its inaugural director Dr. William Hogan. We have enjoyed our long history of being part of the IHE and its preceding forms (Institute for Health and Society, Department of Population Health, Health Policy Institute), and are grateful to the leaders and membership of those groups for their support of the Division of Biostatistics over the years. We look forward now to helping to grow and support data science on campus as part of the new Data Science Institute.

We hired two new faculty members in 2023. Both Zhongyuan Chen and Duo Yu joined the division as assistant professors. In addition, we also hired a new Biostatistician, Farheen Chunara.



Zhongyuan Chen, PhD
Assistant Professor



Duo Yu, PhD
Assistant Professor



Farheen Chunara, MS
Biostatistician I

Dr. Lin was promoted to Associate Professor. Lisa Rein was promoted to Biostatistician III. Bi Qing (Michelle) Teng was promoted to Biostatistician II. Jennifer Ward was promoted to Research Program Coordinator III. Drs. Kim and Martens received outstanding Graduate School Educator awards last year. Drs. Sparapani, Laud, and Logan were winners of the 2023 ISBA Biostats and Pharma Best Paper Award, titled “Nonparametric failure time: Time-to-event machine learning with heteroskedastic Bayesian additive regression trees and low information omnibus Dirichlet process mixtures”, published in *Biometrics*. Ulrich Kemmo Tsafack received a BASS (Biopharmaceutical Applied Statistics Symposium) student travel award and presented a poster on Meta-analytic Gene Clustering algorithm for integrating multi-omic and multi-study data. Peter Zhang presented a poster at the National MD-PhD Student Conference in July. Xi Fang received the 2023 Korean International Statistical Society Outstanding Student Paper Award, as well as a student paper award from the Lifetime Data Science section of the American Statistical Association. We celebrated our first graduates from our Biostatistics and Data Science MA program. Dr. Logan was selected as a new member of the Society for Research Excellence at MCW.

Dr. Sparapani received an AHW grant titled “Automating myocardial infarction diagnosis by ECGs with VERITAS software and hybrid learning.” Dr. Jin received an AHW grant titled “Role of 3D chromatin architecture in breast cancer endocrine resistance.” Dr. Banerjee received a Comprehensive Injury Center grant titled “Stochastic Hierarchical Algorithms for Risk Prediction (SHARP) in impact injury environments.” Drs. Lin and Ahn received a CTSI Pilot-BERD Methodological Innovation Award for their project titled “FastQDesign: A realistic FASTQ-based framework for ScRNA-seq study design issues”. Dr. Sparapani

received a CTSI Pilot-BERD Methodological Innovation Award for his project titled “Novel hybrid artificial intelligence models for cardiovascular risk prognostics based on electrocardiograms.” Several other faculty members continued ongoing methodologic research funded projects, including Dr. Auer (two NIH R01s), Drs. Logan, Laud, and Sparapani (National Marrow Donor Program and Office of Naval Research), Drs. Logan and Martens (R01), Dr. Szabo (R01), and Dr. Jin (R01, U54).

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

- Dr. Martens/Kim/Ahn and Dr. Sparapani/Laud/Logan in Biometrics
- Dr. Szabo in Stat
- Dr. Martens/Logan in Clinical Trials
- Dr. Logan in Lifetime Data Analysis
- Dr. Auer/Wang and Dr. Yu in Statistics in Medicine
- Dr. Chen in Genetic Epidemiology
- Dr. Chen in Statistics and Probability Letters
- Dr. Martens in New England Journal of Medicine
- Dr. Auer in Leukemia
- Dr. Wang, Dr. Brazauskas, Dr. Laud, Dr. Logan, and Dr. Auer in Journal of Clinical Oncology
- Dr. Brazauskas in JAMA Pediatrics
- Dr. Jin, Dr. Auer, Dr. Lin, and Dr. Szabo in Nature Communications
- Dr. Auer in BMC Genomics
- Dr. Auer in Nature Genetics
- Dr. Kim/Ahn in Communications in Statistics: Simulation and Computation
- Dr. Yang in Journal of Quality Technology
- Dr. Tarima in Statistics in Biopharmaceutical Research (x3)
- Dr. Logan in Lancet
- Dr. Logan in Blood
- Dr. Szabo in Annals of Surgery

BIostatistics FACULTY



Kwang Woo Ahn, PhD
Professor of Biostatistics



Paul Auer, PhD
Core Director of Cancer Center & Professor



Anjishnu Banerjee, PhD
Associate Professor of Biostatistics



Ruta Brazaukas, PhD
Associate Professor of Biostatistics



Zhongyuan Chen, PhD
Assistant Professor of Biostatistics



Yan Gao, PhD
Assistant Professor of Biostatistics



Victor Jin, PhD
Professor of Biostatistics, Bioinformatics Core Director



Soyoung Kim, PhD
Associate Professor of Biostatistics



Prakash Laud, PhD
Professor of Biostatistics



Masaki Lin, PhD
Assistant Professor of Biostatistics



Brent Logan, PhD
Director & 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



Duo Yu, PhD
Assistant Professor of Biostatistics



Mei-Jie Zhang, PhD
Professor of Biostatistics

BIostatistics RESEARCH AND STATISTICAL SUPPORT STAFF



Bethany Canales, MPH
Statistician I



Lavanya Choppvarapu, PhD
Research Scientist I



Farheen Chunara, MS
Biostatistics Analyst I



Ryan Conrardy, MS
Biostatistics Analyst I



Kun Fang, MS
Post-Doctoral Associate



Sravya Gethika, MS
Statistical Programmer Analyst I



Manzur Farazi, PhD
Statistical Research Scientist II



Simran Kaur, MS
Statistical Programmer Analyst I



Joy Liu, MS
Biostatistics Analyst II



Tianxiang Liu, MS
Post-Doctoral Associate



Xionlong Ma, MS
Bioinformatics Analyst I



Lisa Rein, MS
Biostatistics Analyst III



Michelle Teng, MS
Biostatistics Analyst II



Yushan Yang, MS
Biostatistics Analyst I



Alexis Visotcky, MS
Biostatistics Analyst III

BIostatistics ADMINISTRATIVE SUPPORT



Kellie Bialzik, MBA
Business Manager, Sr.



Jennifer Ward
Research Program Coordinator II



McKenna Busse
Financial Assistant II



Gabrial Williams
Administrative Assistant

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 2023. (See list below). In addition to publications, the Division of Biostatistics also presented 27 methodological presentations/abstracts (See Appendix 1).

- Auer PL, Wang G, Li G, DeWan AT, Leal SM. Comparison of multiple imputation and other methods for the analysis of imputed genotypes. *BMC Genomics*. 2023 Jun 6;24(1):303. doi: 10.1186/s12864-023-09415-0. PubMed PMID: 37277705; PubMed Central PMCID: PMC10242917.
- Brazauskas R, Eapen M, Wang T. Endpoint selection and evaluation in hematology studies. *Best practice & research. Clinical haematology*, 2023 Sep;36(3):101479, PMID 37611997,
- Brown SA, Chung BY, Doshi K, Hamid A, Pederson E, Maddula R, Hanna A, Choudhuri I, Sparapani R, et al, Cardio-Oncology Artificial Intelligence Informatics and Precision Equity (CAIPE) Research Team Investigators. Patient similarity and other artificial intelligence machine learning algorithms in clinical decision aid for shared decision-making in the Prevention of Cardiovascular Toxicity (PACT): a feasibility trial design. *Cardio-oncology (London, England)*, 2023 Jan 23;9(1):7, PMID 36691060.
- Calderazzo S, Tarima S, Reid C, Flournoy N, Friede T, Geller N, Rosenberger JL, Stallard N, et al. Coping with Information Loss and the Use of Auxiliary Sources of Data: A Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions *Statistics in Biopharmaceutical Research*.
- Chen Z, Liang H, Wei P. Data-adaptive and pathway-based tests for association studies between somatic mutations and germline variations in human cancers. *Genet Epidemiol*. 2023 Dec;47(8):617-636. doi: 10.1002/gepi.22537. Epub 2023 Oct 11. PMID: 37822029.
- Chen, Z. and Xie, J. Estimating heterogeneous treatment effects versus building individualized treatment rules: Connection and disconnection. *Statistics & Probability Letters*, August 2023;199 SCOPUS ID: 2-s2.0-85156220115 08/01/2023.
- Devogel N, Auer PL, Manansala R, Wang T. On asymptotic distributions of several test statistics for familial relatedness in linear mixed models. *Stat Med*. 2023 Jul 30;42(17):2962-2981. doi: 10.1002/sim.9762. Epub 2023 May 9. PubMed PMID: 37345498.
- Flournoy N, Tarima S. Posterior alternatives with informative early stopping *Statistical Papers*, August 2023;64(4):1329-1341.
- Khanal M, Kim S, Ahn KW. Adjusted curves for clustered survival and competing risks data. *Communications in Statistics: Simulation and Computation*, 2023 SCOPUS ID: 2-s2.0-85168081824 01/01/2023.
- Kim S, Fang X, Ahn KW. The analysis of multiple outcomes, multiple variables and variables selection in hematopoietic cell transplantation studies. *Best practice & research. Clinical haematology*, 2023 Sep;36(3):101478, PMID 37611996.
- Li X, Logan BR, Hossain SMF, Moodie EEM. Dynamic Treatment Regimes Using Bayesian Additive Regression Trees for Censored Outcomes. *Lifetime data analysis*, 2024 Jan;30(1):181-212, PMID 37659991.
- Martens MJ, Gao Y, Szabo A. Designing and conducting a clinical trial in blood and marrow transplantation. *Best practice & research. Clinical haematology*, 2023 Jun;36(2):101471, PMID 37353295.
- Martens MJ, Kim S, Ahn KW. Sample size and power determination for multiparameter evaluation in nonlinear regression models with potential stratification. *Biometrics*, 2023 Dec;79(4):3916-3928, PMID 37357412.
- Martens MJ, Logan BR. Statistical rules for safety monitoring in clinical trials. *Clinical trials*, 2023 Oct 25:17407745231203391, PMID 37877375.

- Page KM, Spellman SR, Logan BR. Worldwide sources of data in haematology: Importance of clinician-biostatistician collaboration. *Best practice & research. Clinical haematology*, 2023 Jun;36(2):101450, PMID 37353283.
- Qi X, Szabo A. Semi-parametric generalized linear model for binomial data with varying cluster sizes *Stat*, January/December 2023;12(1).
- Qiu P, Yang K. Spatio-temporal process monitoring using exponentially weighted spatial LASSO *Journal of Quality Technology*, 2023;55(2):163-180.
- Sparapani RA, Logan BR, Maiers MJ, Laud PW, McCulloch RE. Nonparametric failure time: Time-to-event machine learning with heteroskedastic Bayesian additive regression trees and low information omnibus Dirichlet process mixtures. *Biometrics*, 2023 Dec;79(4):3023-3037, PMID 36932826.
- Tarima S, Flournoy N. Group sequential tests: beyond exponential family models. *Statistical Papers*. August 2023;64(4):1361-1372 SCOPUS ID: 2-s2.0-85151406418 08/01/2023.
- Uschner D, Sverdlov O, Carter K, Chipman J, Kuznetsova O, Renteria J, Lane A, Barker C, et al. Using Randomization Tests to Address Disruptions in Clinical Trials: A Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions *Statistics in Biopharmaceutical Research*.
- Van Lancker K, Tarima S, Bartlett J, Bauer M, Bharani-Dharan B, Bretz F, Flournoy N, et al. Rejoinder: 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*, 2023;15(1):119-124.
- Yu D, Wu H. Variable importance evaluation with personalized odds ratio for machine learning model interpretability with applications to electronic health records-based mortality prediction. *Statistics in medicine*, 2023 Jan 05, PMID 36601725.
- Zenkova, ZN., Tarima, SS., Musoni, W., Dmitriev, Y. Statistical Estimation with a Known Quantile and Its Application in a Modified ABC-XYZ Analysis. In: Pilz, J., Melas, V.B., Bathke, A. (eds) *Statistical Modeling and Simulation for Experimental Design and Machine Learning Applications*.

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 127 medical publications in 2023 (Appendix 2). During this past year, they also provided statistical support through major grant effort or integration contracts for the following research programs and units:

- 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
- 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

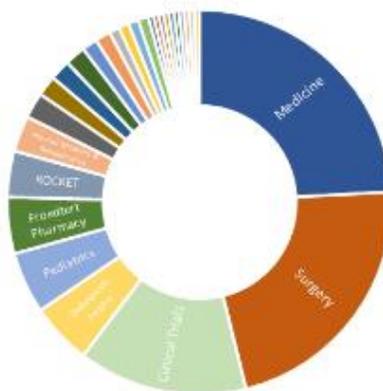
BIostatISTICS CONSULTING SERVICE

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 252 projects in 2023, totaling 5160 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.

Number of Biostatistics Consulting Service by Projects:

	Frequency	Department	Frequency	Department	Frequency	Department	Frequency
Anesthesiology	3	Froedtert Pharmacy	20	Neurosurgery	1	Physical Medicine & Rehabilitation	15
Cancer Center	1	Genetic Counseling	9	Obstetrics & Gynecology	1	Plastic Surgery	2
Cell Biology, Neurobiology, and Anatomy	3	Institute of Health & Equity	3	Ophthalmology & Visual Sciences	1	Psychiatry & Behavioral Medicine	1
Clinical Trials	25	Marquette University	1	Orthopaedic Surgery	29	ROCKET	10
Dermatology	4	Medicine	53	Otolaryngology	1	Radiation Oncology	4
Emergency Medicine	2	Nephrology	1	Pathology	2	Surgery	38
Family Medicine	1	NRC	1	Pediatrics	19	UW-Milwaukee	1



2023 FUNDED GRANTS

Grant Title	PI	Biostatistics Member	TOTAL COSTS
Stochastic Hierarchical Algorithms for Risk Prediction (SHARP) in impact injury environments	^Banerjee, Anjishnu	Banerjee, Anjishnu	\$25,000
Rat Genome Database	*Kwitek, Anne	Ahn, Kwang Woo; Lin, Chien-Wei	\$8,223,056
Deglutitive and airway protective functions of proximal/ striated muscle esophagus in health and disease	^Shaker, Reza	Szabo, Aniko	\$1,902,121
Machine Learning to identify Biomarkers for Risk of Chronic Graft-Versus-Host Disease	^Logan, Brent; Martens, Mike	Logan, Brent; Martens, Mike	\$473,550
Prediction of Shoulder Injury for Disease Prevention in Children and Adults with Spinal Cord Injury Using Advanced Biomechanical Modeling and Diagnostic Imaging	^Tarima, Sergey	Tarima, Sergey	\$99,124
OOR PPG: Center for Aphasia Research and Recovery	*Binder, Jeffrey	Szabo, Aniko	\$250,000
Cardiomyopathy Peripartum Outcomes in a Local Population	^Thordsen, Sarah	Gao, Yan	\$10,000
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	^Wilcox, David	Brazauskas, Ruta	\$7,991,821
OOR PPG: Mechanistic studies of chemokine biology in exocrine pancreas disease	*Dwinell, Michael	Auer, Paul	\$250,000
Omics analysis of three-dimensional transcriptional regulation	^Jin, Victor	Jin, Victor; Fang, Kun; Choppavarapu, Lavanya	\$928,682
Post-acute sequelae of SARS-CoV-2 infection (PASC) in Cancer	*Kothari, Anai	Szabo, Aniko	\$50,000
Biased chemokine receptor signaling in cancer progression	^Dwinell, Michael	Mei-Jie Zhang	\$1,850,849
Statistical Support Project	^Wang, Tao	Tao Wang	\$754,379
Next generation functional genomics of hematology traits	^Auer, Paul	Paul Auer	\$145,162

Effects of Head Impact Exposure During Contact Sport on Middle School and High School Athletes	^Wang, Yang	Banerjee, Anjishnu; Szabo, Aniko	\$374,004
Cerebrovascular reactivity in adults on hemodialysis and association with intradialytic cerebral hypoperfusion	^Wolfgram, Dawn	Gao, Yan	\$234,000
Defining GATA4's Molecular Function in Gastric Cell Biology	^Battle, Michelle	Tarima, Sergey	\$2,289,308
Dual Functionality of Ceramide in Human Microvascular Endothelial Function	^Freed, Julie	Tarima, Sergey	\$3,272,038
A self-organizing embryoid model of peri-implantation human development	^Taniguchi, Kenichiro	Lin, Chien-Wei	\$1,548,658
Reducing innate inflammation in new onset T1D with Lactobacillus plantarum	^Hessner, Martin	Lin, Chien-Wei	\$2,872,358
Control of GVHD by Probiotics with individual Commensal Bacteria	^Yu, Xue-Zhong	Lin, Chien-Wei; Jin, Victor	\$2,515,555
Machine Learning Strategies for Optimizing Donor Selection	^Logan, Brent	Logan, Brent; Sparapani, Rodney, Laud Prakash	\$191,460
Bridging Community-based Continence Promotion and Primary Care	^Neuner, Joan	Laud, Purushottam	\$1,018,565
Mechanistic and therapeutic role of the CD137-CD137L axis in Type 1 Diabetes	^Chen, Yi-Guang	Lin, Chien-Wei	\$3,355,609
17-CSIDE-NMDP	^Logan, Brent	Logan, Brent	\$15,000
Chemotherapy Dosing in Patients With Obesity: Are Oncologists Optimally Balancing Risks and Benefits to Avoid Overtreatment and Undertreatment?	*Neuner, Joan	Sparapani, Rodney	\$1,046,468
Understanding Breast Cancer Risk and Screening in Transgender Persons through a Pilot Breast Cancer Screening Program	*Cortina, Chandler	Brazauskas, Ruta	\$1,052,129
Environmental Sound Recognition Before and After Cochlear Implantation in Adults	^Harris, Michael	Tarima, Sergey	\$446,199
Randomized Study of very low versus low dose busulfan in transplant for severe combined	^Logan, Brent	Logan, Brent	\$121,362
Stem Cell Therapeutic Outcomes Database (SCTOD)	^Rizzo, Douglas J.	Ahn, Kim, Logan, Wang, Zhang	\$29,375,801

No-Show Prevention Practices in Dental Care Settings Serving Underserved Populations	^Szabo, Aniko	Szabo, Aniko; Teng, Bi Qing	\$292,522
Targeting oncogenomic function of N-Myc to inhibit neuroendocrine prostate cancer visceral metastasis	*Jin, Victor	Jin, Victor	\$135,000
Targeting MED31-driven transcription recycling in lethal prostate cancer	*Jin, Victor	Jin, Victor; Fang, Kun	\$452,088
Acute neurobehavioral predictors of risk trajectories following youth violence victimization	^Levas, Michael	Szabo, Aniko	\$877,382
Spinal cord structure-function relationships in degenerative cervical myelopathy	*Vedantam, Aditya	Banerjee, Anjishnu	\$2,667,649
Every Day Counts: A lifestyle program for women metastatic breast cancer	^Melinda Stolley	Banerjee, Anjishnu; Visotcky, Alexis; Bi Qing Teng (Michelle)	\$3,641,133
Early diagnosis of light chain amyloidosis	^D'Souza, Anita	Sparapani, Rodney; Chunara, Farheen	\$1,495,747
The roles of Lyme spirochete adhesins in hematogenous dissemination	^Jenifer Coburn	Gao, Yan	\$3,524,778
A Data Resource for Blood and Marrow Transplants and Adoptive Cellular Therapy Research	^Shaw, Bronwen	Ahn, Auer, Brazauskas, Chen, Kim, Logan, Martens, Zhang	\$33,574,998
Stand Up for Your Health: A Randomized Study	*Kulinski, Jacquelyn	Gao, Yan	\$2,824,501
FY24 C-MACC Funding	*Burke, Michael	Martens, Mike; Szabo, Aniko	\$1,004,203
Therapeutic Targeting of Minimal Residual Disease to Improve Outcomes in Multiple Myeloma	*Mohan, Meera	Szabo, Aniko	\$537,380
Retinal Contributions to Vision Loss in Albinism	^Carroll, Joseph	Tarima, Sergey	\$2,233,406
Ischemic Conditioning and Improved Motor Function Post Stroke	^Durand, Matt	Tarima, Sergey	\$911,137
Clinical and Translational Science Award	^Shaker, Reza	Brazauskas, Ruta; Tarima, Sergey, Szabo, Aniko	\$20,311,044
Leveraging genetic mapping for personalized targeting of breast cancer microenvironment	^Joshi, Amit	Banerjee, Anjishnu	\$1,931,705

Evaluating the Impact of Singing Interventions on Markers of Cardiovascular Health in Older Patients with Cardiovascular Disease	^Kulinski, Jacquelyn	Sparapani, Rodney; Visotcky, Lexi	\$991,980
A longitudinal, nationally representative study of cognition-related effects of breast cancer and its treatment	^Nattinger, Ann	Laud, Purushottam, "Prakash"	\$1,476,873
Neurovascular Uncoupling and Cognitive Impairments of Long COVID in Aging	^Wang, Yang	Banerjee, Anjishnu	\$429,000
Role of RNA activation in Tumor Progression and Metastasis	^Chaluvally-Raghavan, Pradeep	Banerjee, Anjishnu	\$1,704,781
Neuroinflammation and motor neuron loss in SMA	*Ebert, Allison	Lin, Chien-Wei "Masaki"	\$565,054
MCW NCTN Lead Academic Participating Site	^Wong, Stuart	Logan, Brent	\$4,427,701
Deglutitive and airway protective functions of proximal/ striated muscle esophagus in health and disease	^Shaker, Reza	Szabo, Aniko	\$1,872,713
Prostate Cancer Radio-Pathomics for Differentiating Clinically Significant Disease	^LaViolette, Peter	Banerjee, Anjishnu	\$3,312,555
Determining the role of the SDF-1/CXCR4 pathway and its intersection with chronic stress to establish novel precision approaches to head and neck cancer management	*Zenga, Joseph	Banerjee, Anjishnu	\$429,000
Blockade of IL-23 for the Prevention of Graft Versus Host Disease	^William Drobyski	Szabo, Aniko	\$2,193,432
Primary Immune Deficiency Treatment Consortium	^Logan, Brent	Brazaukas Ruta, Liu, Xuerong	\$1,699,124
Machine learning accelerated on-line adaptive replanning	^Eric Paulson	Mei-Jie Zhang	\$2,589,287
Innovative approaches to elucidate the genetic etiology of age-related hearing impairment and tinnitus	^Auer, Paul	Farazi, Manzur Rahman	\$336,428
BAA - Mitigation of Multi-organ Delayed Effects of Acute Radiation Exposure (DEARE) with ACE-inhibitor Lisinopril	^*Himburg, Heather	Szabo, Aniko	\$2,997,981
CardioWatch: an omics-based prediction assay for cardiac late effects of acute radiation exposure	*Himburg, Heather	Szabo, Aniko	\$289,998

Deconstructing sleep disruption as a major risk factor for relapse in opioid use	^Everson, Carol	Szabo, Aniko	\$1,598,776
Puerto Rican Obesity Intervention for Men	^*Sanchez-Johnsen, Lisa	Auer, Paul; Conrardy, Ryan	\$946,314
POINT-mTBI: Prospective Study of Point-of-Care Blood-Based Biomarkers in Acute Military, Civilian, and Sport-Related Mild Traumatic Brain Injury (mTBI)	^*McCrea, Michael	Tarima, Sergey; Rein, Lisa	\$6,403,731
Gastroschisis Outcomes of Delivery (GOOD) Study	^Wagner, Amy	Szabo, Aniko	\$4,216,154
Prognostic implications of mitochondrial inheritance in myelodysplastic syndromes after stem-cell transplantation	^Dong, Jing	Auer, Paul	\$783,000
Endothelial Rap1 in the control of heart function	^Zhang, David X.	Sparapani, Rodney; Yang, Kai	\$511,160
Delineating the mechanisms underlying heart valve endothelial repair	^Lincoln, Joy	Lin, Chien-Wei	\$1,760,706
The Role of Mortalin in Throid Cancer	*Park, Jong In	Lin, Chien-Wei	\$2,161,946
Assessing Breast Cancer Risk Prior to Gender-Affirming Chest Masculinization Surgery	*Cortina, Chandler	Brazauskas, Ruta	\$50,000
The Inflammatory Index as a Biomarker for Pain in Patients with Sickle Cell Disease	*Brandow, Amanda	Lin, Chien-Wei	\$1,265,359
Blood Flow Regulation and Neuromuscular Function Post Stroke	*Durand, Matt	Tarima, Sergey	\$3,178,706
Addressing key social-structural risk factors for racial disparities in maternal morbidity in Southeastern Wisconsin	*Palatnik, Anna	Tarima, Sergey	\$10,231,603
Exploring Age Differences in Patient Reported Cognitive Function Trajectories among Hematopoietic Stem Cell Transplant and Chimeric Antigen Receptor T-cell patients and Linking Two Key Measures	*Cusatis, Rachel	Brazauskas, Ruta	\$429,000
Establishing the dynamics of lymphoid clonal hematopoiesis and its aging-related disease consequences	*Auer, Paul	Auer, Paul	\$663,070

Genetic and Epigenetic Mechanisms of BP Regulation - Project 1	*Geurts, Aron	Auer, Paul	\$136,344
Host-Pathogen Dynamics in Leptospirosis, Project 3: Invasion Dynamics	*Coburn, Jenifer	Gao, Yan	\$1,560,000
Commensurate prior models accommodating historical controls for clinical trials with matched and/or interval-censored data	^Ahn, Kwang woo	Ahn, Kwang woo, Logan, Brent	\$198,408
FastQDesign: A realistic FASTQ-based framework for ScRNA-seq study design issues'	^Lin, Chien-Wei	Lin, Chien-Wei, Ahn, Kwang Woo	\$25,000
Robust Estimators for Missing Covariate Parameters for Right-Censored Data	^Kim, Soyoung	Kim, Soyoung, Ahn, Kwang woo	\$200,000
Polygenic risk scores and health disparities: the role of blood cells immune response and evolutionary adaptation	^Auer, Paul	Auer, Paul; Farazi, Manzur Rahman	\$489,411
NMDP - Access - Donor for all	^Logan, Brent	Logan, Brent	\$25,037
NMDP - 16 NCTD Study	^Brazauskas, Ruta	Brazauskas, Ruta	\$7,890
17-CD33CAR	^Brazauskas, Ruta	Brazauskas, Ruta	\$29,383
Preserve I Project	^Brazauskas, Ruta	Brazauskas, Ruta	\$20,000
Structural Variation and Hematological Traits	*Auer, Paul	Auer, Paul; Farazi, Manzur Rahman	\$243,362
BMT CTN Data and Coordinating Center	^Horowitz, Mary	Logan, Brent; Martens, Mike; Brazauskas, Ruta	\$50,006,292
The histone demethylase JMJD1C in human acute myeloid leukemia	^Sergey Tarima	Sergey Tarima	\$13,784
Moving Forward in Health: promoting healthy eating and exercise among African American and Hispanic community members	^Melinda Stolley	Anjishnu Banerjee	\$600,000
Collaborative Work Groups to Reduce Wisconsin's Breast and Lung Cancer Disparities: Phase One	Young, Staci	Anjishnu Banerjee	
Plasma-induced signatures as a measure disease heterogeneity and immunomodulation in T1D clinical trials	^Hessner, Marten	Lin, Chein-Wei	\$1,770,892
Investigating the role of the microbiome and inflammation in acute and chronic pain in patients with sickle cell disease	^Brandow, Amanda	Lin, Chein-Wei; Szabo, Aniko	\$3,698,191

FastQDesign: A realistic FASTQ-based framework for ScRNA-seq study design issues	*Lin, Chein-Wei	Lin, Chein-Wei	\$25,000
Gigiigooinaan (Our Fish): A New Advisory to Promote Anishinaabe Health and Wellness	^Dellinger, Matthew	Sparapani, Rodney, Vistocky, Alexis	\$1,307,308
(PQ2) Donor socioeconomic status as a predictor of altered immune function and treatment response following hematopoietic cell transplantation for hematologic malignancy	^Knight, Jennifer	Wang, Tao	\$1,451,034
Leveraging a public school district and schoolyard spaces to confront climate health inequities in a low-income, urban community of color	^Beyer, Kirsten	Yang, Kia	\$1,349,999
AHW REDIRECT (Research in Early Child Development to Improve Resiliency and Equity)	Meurer, John	Tarima, Sergey; Rein, Lisa	\$5,000,000
Integration of buprenorphine into a multi-component harm reduction program for people who inject drugs in Kampala, Uganda	^Dickson-Gomez, Julia	Tarima, Sergey	\$565,185
Understanding and Addressing Disparities in Cancer Therapy Induced Inflammation and Associated Endothelial Dysfunction	^Beyer, Kirsten; Stolley, Melinda	Sparapani, Rodney	\$2,924,896
Racism, Residential Racial Segregation, and Breast Cancer Survival Disparities among Black, Hispanic and non-Hispanic White Women	^Beyer, Kirsten	Tarima, Sergey	\$2,404,237
AHW funding provisionally approved. AHW has initiated this grant proposal as part of the process.	Dickson-Gomez, Julia	Tarima, Sergey	\$199,001
Assessing Photoreceptor Structure and Function in Normal and Diseased Retinae	^Carroll, Joseph	Tarima, Sergey	\$2,368,545
Building a sustainable intervention to improve endocrine therapy adherence	^Neuner, Joan	Sparapani, Rodney	\$236,000
Building Community-Based Continence Promotion and Primary Care	^*Neuner, Joan	*Sparapani, Rodney	\$1,503,404

Allostatic Load and Cardio-Oncology Disparities	^Stolley, Melinda	Sparapani, Rodney	\$397,919
Development of a Novel Clinical Decision Support System for Older Adult Patients with Traumatic Brain Injury	Morris, Rachel	Sparapani, Rodney	\$434,128
Novel hybrid artificial intelligence models	*Sparapani, Rodney	*Sparapani, Rodney	\$25,000
RIGERR: Resources for Investigating Genetic and Epigenetic Regulation of Renal Disease	^Liang, Mingyu	Auer, Paul	\$3,807,945
Systems Analysis of Epigenomic Architecture in Cancer Progression - Project 3	^Jin, Victor	Jin, Victor; Choppavarapu, Lavanya	\$40,409
Systems Analysis of Epigenomic Architecture in Cancer Progression - Core	^Jin, Victor	Jin, Victor; Fang, Kun	\$92,500
BMTCTN Protocol 1705 CSL Behring	^Martens, Michael	Martens, Mike	\$45,000
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	^Martens, Michael	Martens, Mike	\$18,686
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	^Martens, Michael	Martens, Mike	\$15,783
BMTCTN Protocol 1506 - Multi-center, Randomized, Double-blind, Placebo-controlled Phase III Trial of the FLT3 Inhibitor Gilteritinib	^Logan, Brent	Logan, Brent	\$104,000
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	^Logan, Brent	Logan, Brent	\$35,855
BMT CTN GVHD Prophylaxis Study / BMT CTN 2203 project	^Logan, Brent	Logan, Brent	\$34,125
Defining the cardiometabolic profile of transgender boys and men on testosterone therapy	Cabrera, Susanne	Ahn, Kwang Woo	\$250,000

Impact of L. plantarum 299v Supplementation on Endothelial Function and Systemic Inflammation	^Widlansky, Michael	Sparapani, Rodney	\$2,788,794
Impact of the COVID-19 Pandemic on Help Seeking of American Indian and Black Women Experiencing Intimate Partner Violence	*Williams, Joni	Yu, Duo	\$283,298
External Funds			\$276,913,043
New Grants			\$51,880,644
2023 Total of All Grants			\$295,344,408

* Denotes New Grants / ^ Denotes External Funding

APPENDIX 1: METHODOLOGIC PRESENTATIONS

Ahn KW, Fang X, Banerjee A, Leifer E, and Logan BR. 2023 ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop, “A commensurate prior model with random effects for interval-censored data to accommodate historical controls”, Washington DC, 09/2023. (in-person invited talk).

Banerjee, A., Sergey T. “Use of possibly incorrect external information in statistical procedures”, Joint Statistical Meetings (JSM 2023), Toronto, CA, 08/09/2023. (in-person invited talk).

Banerjee, A. International Indian Statistical Association (IISA), “Piecewise and distributed learning using federated methods: statistical considerations and operating characteristics.” Colorado School of Mines, Golden, CO. 06/01/ 2023. (presented in-person).

Banerjee, A. “Addressing the validity of information borrowing in transfer learning.” CFE – CMStatistics, Germany, 12/18/2023. (presented virtually).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendations and Cancer Association Studies.” Mellowes Center for Genomic Sciences and Precision Medicine, Medical College of Wisconsin, Milwaukee, 09/22/2023. (in-person talk).

Chen, Zhongyuan. “A Robust Randomized Indicator Method for Accurate Symmetric Eigenvalue Detection.” Minisymposium in 10th International Congress on Industrial and Applied Mathematics, 08/22/2023. (virtual-invited talk).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendations, Cancer Association Studies, and Beyond.” Department of Statistics, Purdue University, West Lafayette, 04/06/2023, (invited in-person).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendations and Cancer Association Studies. “ Seminar, Division of Biostatistics, Medical College of Wisconsin, 02/23/2023, (virtual-invited talk).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendations, Cancer Association Studies, and Beyond”, Division of Biostatistics, School of Public Health, University of Minnesota, Minneapolis, 02/13/2023, (invited in-person).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendations, Cancer Association Studies, and Beyond”, Department of Statistics, Oklahoma State University, Stillwater, 02/03/2023, (invited in-person).

Chen, Zhongyuan. “Data-Guided Statistical Methods for Treatment Recommendation, Dimension Reduction, and Beyond”, Department of Mathematics and Statistical Science, University of Idaho, Moscow, 01/19/2023, (virtual-invited talk).

Yan Gao. “Bayesian joint modeling of survival and longitudinal outcomes in hematology

- oncology.” Statistical. Methods in Oncology Scientific Working Group Meeting, Joint Statistical Meetings, ASA, Toronto, Canada, 08/2023, (presented virtual).
- Yan Gao, “Accelerated fitting of joint models with cumulative variation.” Eastern Asia Chapter of International Society for Bayesian Analysis, Qingdao University, China, 06/2023, (presented virtually).
- Kim, S. University of North Carolina at Chapel Hill, “Improving estimation efficiency for left-truncated competing risks regression under the case-cohort design”, Chapel Hill, NC, 04/27/2023. (In-person invited talk).
- Kim, S. LiDS conference, “Improving estimation efficiency for left-truncated competing risks regression under the case-cohort design”, Raleigh, NC, 06/02/2023. (In-person invited talk).
- Lin, CW. WNAR, “FastQDesign: A realistic FASTQ-based framework for ScRNA-seq study design issues”, Anchorage, AK, 06/21/2023. (In-person invited talk).
- Lin, CW. University of Cincinnati College of Medicine, “FastQDesign: A realistic FASTQ-based framework for ScRNA-seq study design issues”, Cincinnati, OH, 09/22/2023. (Virtual invited talk).
- Martens, M. 2023 Tandem Meetings - Transplantation and Cellular Therapy Meetings of ASTCT and CIBMTR, “Statistical Rules for Safety Monitoring in Clinical Trials.” Orlando, FL, 02/16/2023. (In-person invited talk).
- Martens, M. 65th ASH Annual Meeting & Exposition, “Machine Learning Validates Risk Biomarkers of Chronic Graft-Versus-Host Disease in 936 Patients from BMT CTN 0201 & 1202 Cohorts,” San Diego, CA, 12/10/2023. (In-person invited talk).
- Martens, M. Medical College of Wisconsin Biostatistics Seminar, “A Unified Theory of Sample Size & Power Determination for Nonlinear Regression Models.” Milwaukee, WI, 11/07/2023. (In-person invited talk).
- McCulloch R.; Sparapani, R. “Ensemble Learning with Bayesian Additive Regression Trees” workshop. Milwaukee, WI. 06/07/2023 – 06/08/2023. (In-person invited talk).
- McCulloch, R; Sparapani R, “Ensemble Learning with Bayesian Additive Regression Trees” workshop. Provo, UT. 06/21/2023 – 06/22/2023. (In-person invited talk).
- Sparapani, R. Joint Statistical Meetings. “BART marginal effect estimation: efficiency and extrapolation.” Toronto, Canada. 08/05/2023 – 08/10/2023. (In-person invited talk).
- Sparapani, R. Machine Department of Statistics, “learning regression with marginal effect estimation: extrapolation and efficiency”. University of Wisconsin. Madison, WI. 09/27/2023. (In-person invited talk).
- Tarima, S. ENAR, “Randomization Tests to Address Disruptions in Clinical Trials”, Nashville, TN.

03/19-22, 2023. (In-person invited talk).

Tarima, S. 6th International Conference on Design of Experiments (ICODOE 2023), “Cost of Sequential Adaptation”, Memphis, TN. 05/8-11/2023. (In-person invited talk).

Tarima, S. Model-Oriented Data Analysis and Optimum Design (MODA 13), “Group sequential tests: beyond exponential family models”, Southampton, UK, 07/9-15/2023. (In-person invited talk).

Tarima, S. University of Illinois Chicago, “Cost of Sequential Adaptations and Lower Bound on Mean Squared Error of Post-Adaptation Estimators”, Chicago, IL. 09/13/2023. (in-person invited talk).

Yang, K. INFORMS Annual Meeting, “Design variable-sampling control charts using covariate information.” Phoenix, AZ, 10/16/2023. (in-person invited talk).

APPENDIX 2: COLLABORATIVE PAPERS & PUBLICATIONS

- Abid MB, Rubin M, Szabo A, Longo W, Fenske TS, McCoy C, Lorge A, Abedin S, , et al. Efficacy of Multiple SARS-CoV-2 Vaccine Doses in Patients with B Cell Hematologic Malignancies Receiving Chimeric Antigen Receptor T Cell Therapy: A Contemporary Cohort Analysis. *Transplantation and cellular therapy*, 2023 Dec 23, PMID 38142942.
- Alvarez-Argote S, Paddock SJ, Flinn MA, Moreno CW, Knas MC, Almeida VA, et al. IL-13 promotes functional recovery after myocardial infarction via direct signaling to macrophages. *JCI insight*, 2024 Jan 23;9(2), PMID 38051583.
- Arocho-Quinones EV, Lew SM, Handler MH, Tovar-Spinoza Z, Smyth MD, Bollo RJ, et al, Pediatric Stereotactic Laser Ablation Workgroup. Magnetic resonance imaging-guided stereotactic laser ablation therapy for the treatment of pediatric epilepsy: a retrospective multiinstitutional study. *Journal of neurosurgery. Pediatrics*, 2023 Mar 03:1-14, PMID 36883640.
- Arshad S, Fang X, Ahn KW, Kaur M, Scordo M, Sauter CS, Furqan F, Awan FT, Hamadani M. Impact of thiotepa dose-intensity in primary diffuse large B-cell lymphoma of the central nervous system undergoing autologous hematopoietic cell transplant with thiotepa/carmustine conditioning. *Bone marrow transplantation*, 2023 Nov;58(11):1203-1208, PMID 37563283.
- Baisden JL, Varghese V, Banerjee A, Yoganandan N. Regional variations in C1-C2 bone density on quantitated computed tomography and clinical implications. *North American Spine Society journal*, 2023 Jun;14:100228, PMID 37440985.
- Bashir Q, Nishihori T, Pasquini MC, Martens MJ, Wu J, Alsina M, Anasetti C, et al. A Multicenter Phase II, Double-Blind, Placebo-Controlled Trial of Maintenance Ixazomib After Allogeneic Transplantation for High-Risk Multiple Myeloma: Results of the Blood and Marrow Transplant Clinical Trials Network 1302 Trial. *Transplantation and Cellular Therapy*, 2023 Jun;29(6):358.e1-358.e7, PMID 35840087.
- Beltran Ponce SE, Canales B, McGinley E, Yen T, Tarima S, Zhou Y, Bikomeye JC, Beyer K. Characterizing the Impact of Race and Redlining on Receipt of Guideline-Compliant Locoregional Therapy among Older Women with Breast Cancer. *International journal of radiation oncology, biology, physics*, 2023 Oct 01;117(2S):e7, PMID 37786050.
- Beltran Ponce SE, Jagsi R, Florez N, Thomas CR, Banerjee A, Jasti S, Bailey MM, Lawton CAF, Johnstone C, Clarke CN, Bedi M, Jovanovic M, Saeed H. Can I Leave? Perspectives on Parental Leave and Parenthood in Medical Training Among Program Directors and Trainees in Oncologic Specialties. *Journal of women's health (2002)*, 2023 Nov 21, PMID 38011014.
- Bikomeye JC, Zhou Y, McGinley EL, Canales B, Yen TWF, Tarima S, Ponce SB, Beyer KMM. Historical redlining and breast cancer treatment and survival among older women in the United States. *Journal of the National Cancer Institute*, 2023 Jun 08;115(6):652-661, PMID 36794919.
- Blue BJ, Brazauskas R, Chen K, Patel J, Zeidan AM, Steinberg A, Ballen K, et al. Racial and Socioeconomic Disparities in Long-Term Outcomes in 1 Year Allogeneic Hematopoietic Cell Transplantation Survivors: A CIBMTR Analysis. *Transplantation and cellular therapy*, 2023 Nov;29(11):709.e1-709.e11, PMID 37482244.
- Bodker A, Visotcky A, Gutterman D, Widlansky ME, Kulinski J. The impact of standing desks on cardiometabolic and

vascular health. *Vasc Med.* 2021 Aug;26(4):374-382. doi: 10.1177/1358863X211001934. Epub 2021 Apr 5. Erratum in: *Vasc Med.* 2023 Feb;28(1):NP1. PMID: 33813968; PMCID: PMC9578685.

Bolanos-Meade J, Hamadani M, Wu J, Al Malki MM, Martens MJ, Runaas L, et al. BMT CTN 1703 Investigators. Post-Transplantation Cyclophosphamide-Based Graft-versus-Host Disease Prophylaxis. *The New England journal of medicine*, 2023 Jun 22;388(25):2338-2348, PMID 37342922.

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Canales B, Laud PW, Tarima S, Zhou Y, Bikomeye JC, McGinley EL, Yen TWF, Bemanian A, Beyer KMM. Isolation and survival: The impact of local and MSA isolation on survival among non-Hispanic Black women diagnosed with breast cancer in the United States using a SEER-Medicare cohort. *Health & place*, 2023 Sep;83:103090, PMID 37531804.

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