

Biostatistics and Epidemiology

Division Details

RESEARCH AND TRAINING DETAILS

Faculty	21
Joint Appointment Faculty	14
Research Fellows and Post Docs	1
Research Graduate Students	11
Total Annual Grant Award Dollars	\$6,669,459



Row 1: J Khoury, S Ehrlich, M Macaluso, N Zhang, H Sucharew

Row 2: K Bowers, L Ding, J Meinzen-Derr, M Hossain, J Woo, P Ryan

Row 3: R Ittenbach, M Altaye, T Folger, B Zhang, N Ollberding, L Fei, R Szczesniak, E King

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Division Highlights

Language Outcomes in Children who are Deaf or Hard of Hearing

[Dr. Jareen Meinzen-Derr, PhD](#), associate professor in the Division of Biostatistics and Epidemiology received funding to conduct a randomized trial using augmentative and alternative communication (AAC) delivered on iPads to help children who are deaf, or hard of hearing, develop and learn language. Despite early identification and intervention for hearing loss, many children who are deaf, or hard of hearing, continue to have significant gaps in language development. These gaps in language can have significant downstream effects on other areas of child development, including social functioning and academics. This trial, funded by the [March of Dimes](#) and [National Institute of Disability, Independent Living, and Rehabilitation Research](#), is the first to introduce AAC technology into therapy for children with hearing loss to close the gap between language and cognitive skills. Early results of this innovative work have shown that children who are deaf, or hard of hearing, benefit from the use of AAC technology as a tool to support development of more complex language skills. Many of the participants have made substantial improvements in their language, comprehension, and social skills as a result of the intervention.

Phenotypes from Electronic Health Research

Clinical data repositories like patient registries present unique challenges and opportunities for biostatisticians and epidemiologists in the quest to positively impact child health. In many chronic pediatric diseases, use of these registries as a means of epidemiologic surveillance are now interrogated to improve medical monitoring, and develop targeted therapies. New approaches to the analysis of registry data are beginning to enable clinicians to track child health outcomes, and employ decision support tools to slow disease progression in these populations. One approach is to phenotype patients' longitudinal trajectories, which allows analysts to classify severity of each patient's clinical course and accurately predict onset of severe events in ways that were previously not possible. *The American Journal of*

Respiratory and Critical Care Medicine recently published a study by Drs. [Rhonda Szczesniak, PhD](#); Cole Brokamp, PhD; and Ms. Su of the Division of Biostatistics, and Epidemiology and members from the Divisions of [Pulmonary Medicine](#) and [Biomedical Informatics](#), has identified phenotypes of rapid lung function decline by applying a novel phenotyping approach to data from the national cystic fibrosis patient registry. Rapid lung function decline is a prolonged drop in lung function that cystic fibrosis patients are susceptible to throughout life. Their study confirmed the severity and timing of this event described in previous epidemiologic studies, which suggests that it occurs most dramatically during adolescence and early adulthood, and it also revealed that children with the highest lung function early in life suffer the greatest loss of lung function by that time. The study also shows associations with infections and comorbidities according to phenotype. These results pave the way to more targeted approaches for early treatment of rapid decline prior to irreversible loss of lung damage, and extended for other chronic diseases and disorders.

Methods and Tools Development

In FY 2017, faculty and staff from the division developed novel methods and tools, and applied innovative statistical approaches, to advance pediatric science and medicine. Examples of new methods and tools included Land Use Random Forest (LURF) models for elemental components of particulate matter (PM) in urban cities (Drs. Cole Brokamp, PhD; and [Patrick Ryan, PhD, MS](#)); CerebroMatic—a versatile toolbox for spline-based MRI template ([Dr. Mekbib Altaye, PhD](#)); nonrespondent subsample multiple imputation for two-phase sampling ([Dr. Nanhua Zhang, PhD](#)); and Nomograms for the extrahepatic bile duct diameter in children (Ms. Resmi Gupta and [Dr. Lin Fei, PhD](#)). Innovative applications of advanced statistical methods included application of inverse-probability of treatment weighting to study racial disparities in child asthma readmission (Drs. [Bin Huang, PhD](#); Patrick Ryan, PhD; and Chen Chen); semiparametric approach to identify sensitive time points during gestation (Ms. Resmi Gupta, Drs. [Jane Khoury, PhD](#); Mekbib Altaye, PhD; and [Rhonda Szczesniak, PhD](#)); functional approach to study longitudinal patterns of glycemic control and blood pressure in pregnant women with Type 1 diabetes mellitus (Drs. Szczesniak, Altaye, Khoury, PhD), and time-varying propensity score matching to examine causal risk factors for cognitive impairment (Dr. Zhang). Dr. Bin Huang, is leading a Patient-Centered Outcomes Research Institute ([PCORI](#)) Methods Award to develop patient centered adaptive treatment strategies.

Professional journals in which our new methods and innovative applications in FY 17 appear include *JAMA Pediatrics*, *Atmospheric Environment*, *Frontiers in Computational Neuroscience*, *Journal of Pediatric Gastroenterology and Nutrition*, *American Journal of Perinatology*, *Journal of Official Statistics*, and *Communications in Statistics*. Both intramural and extramural awards funds this work. Shared interest groups in causal inference, big data, and adaptive clinical trials met regularly within the division to promote research collaborations in these important areas of pediatric research. A newly formed special interest group focusing on statistical process control includes members of Division of Biostatistics and Epidemiology and of the [James H. Anderson Center for Health Systems Excellence](#) who support quality improvement projects at Cincinnati Children's and within the [Learning Networks](#).

Community-based Research

[Dr. Patrick Ryan, PhD](#), associate professor in the Division of Biostatistics and Epidemiology, is leading the Ecological Momentary Assessment and Personal Particle Exposure (EcoMAPPE) Study to elucidate the health effects associated with ultrafine particles (UFP) exposure. A growing body of research suggests that exposure to UFP associates with adverse respiratory outcomes and may trigger inflammation in multiple systems. UFPs are a form of air pollution and are a product of various processes such as diesel combustion and cigarette smoke. The EcoMAPPE Study will enroll adolescent children with, and without asthma. During a one-week study period, participants will wear a personal sensor that simultaneously measures UFPs and tracks location using a GPS. Participants will also complete breathing tests and questionnaires regarding their surroundings, activities, and respiratory symptoms throughout the day via smartphone applications. Integration and analysis of the data from these multiple platforms will help to identify locations and scenarios associated with high UFP exposure. Further, we will evaluate the effect of UFP exposures on respiratory health and inflammatory responses. Increased inflammatory response associates with multiple chronic diseases including heart disease and stroke, as well as many forms of cancer. Thus, the UFP-inflammation link may represent a major modifiable risk factor with a high impact on health and survival through the lifespan.

Post-Doc Spotlight

Dr. Cole Brokamp, PhD, recipient of the 2016 Strauss Fellowship, led innovative research into machine learning methods for estimating the history of an individual's exposure to specific components of air pollution from the home address. Unlike other methods currently available,

Dr. Brokamp's approach allows identifying pollution hotspots in time and space, opening new horizons in epidemiologic research, environmental management, and policy making.

Division Publications

1. Leisner MZ; Madsen NL; Ostergaard JR; Woo JG; Marino BS; Olsen MS. **Congenital Heart Defects and Risk of Epilepsy A Population-Based Cohort Study.** *Circulation.* 2016; 134:1689-1691.
2. Raghuvver G; White DA; Hayman LL; Woo JG; Villafane J; Celermajer D; Ward KD; de Ferranti SD; Zachariah J; American Heart Association Committee on Atherosclerosis, Hypertension, and Obesity in the Young of the Council on Cardiovascular Disease in the Young; Behavior Change for Improving Health Factors Committee of the Council on Lifestyle and Cardiometabolic Health and Council on Epidemiology and Prevention; and Stroke Council. **Cardiovascular Consequences of Childhood Secondhand Tobacco Smoke Exposure: Prevailing Evidence, Burden, and Racial and Socioeconomic Disparities: A Scientific Statement from the American Heart Association.** *Circulation.* 2016; 134:e336-e359.
3. Zhang Z; Biagini Myers JM; Brandt EB; Ryan PH; Lindsey M; Mintz-Cole RA; Reponen T; Vesper SJ; Forde F; Ruff B. **β -Glucan exacerbates allergic asthma independent of fungal sensitization and promotes steroid-resistant TH2/TH17 responses.** *Journal of Allergy and Clinical Immunology.* 2017; 139:54-65.e8.
4. Ryder JR; Edwards NM; Gupta R; Khoury J; Jenkins TM; Bout-Tabaku S; Michalsky MP; Harmon CM; Inge TH; Kelly AS. **Changes in Functional Mobility and Musculoskeletal Pain After Bariatric Surgery in Teens With Severe Obesity Teen-Longitudinal Assessment of Bariatric Surgery (LABS) Study.** *JAMA Pediatrics.* 2016; 170:871-877.
5. Beck AF; Huang B; Auger KA; Ryan PH; Chen C; Kahn RS. **Explaining Racial Disparities in Child Asthma Readmission Using a Causal Inference Approach.** *JAMA Pediatrics.* 2016; 170:695-703.
6. Kahn JA; Widdice LE; Ding L; Huang B; Brown DR; Franco EL; Bernstein DI. **Substantial Decline in Vaccine-Type Human Papillomavirus (HPV) Among Vaccinated Young Women During the First 8 Years After HPV Vaccine Introduction in a Community.** *Clinical Infectious Diseases.* 2016; 63:1281-1287.
7. Harley KG; Engel SM; Vedar MG; Eskenazi B; Whyatt RM; Lanphear BP; Bradman A; Rauh VA; Yolton K; Hornung RW. **Prenatal Exposure to Organophosphorous Pesticides and Fetal Growth: Pooled Results from Four Longitudinal Birth Cohort Studies.** *Environmental health perspectives.* 2016; 124:1084-1092.
8. Myer GD; Schneider DK; Khoury J. **Correct Data and Meta-analytic Approaches Show the Reduced Risk of Concussion for Athletes Playing at Higher Altitudes.** *JAMA Neurology.* 2017; 74:484-485.
9. Mackey J; Khoury JC; Alwell K; Moomaw CJ; Kissela BM; Flaherty ML; Adeoye O; Woo D; Ferioli S; De Los Rios La Rosa F. **Stable incidence but declining case-fatality rates of subarachnoid hemorrhage in a population.** *Neurology.* 2016; 87:2192-2197.
10. Nehus EJ; Khoury JC; Inge TH; Xiao N; Jenkins TM; Moxey-Mims MM; Mitsnefes MM. **Kidney outcomes three years after bariatric surgery in severely obese adolescents.** *Kidney international.* 2017; 91:451-458.
11. Trout AT; Serai S; Mahley AD; Wang H; Zhang Y; Zhang B; Dillman JR. **Liver Stiffness Measurements with MR Elastography: Agreement and Repeatability across Imaging Systems, Field Strengths, and Pulse Sequences.** *Radiology.* 2016; 281:793-804.
12. Athans BS; Depinet HE; Towbin AJ; Zhang Y; Zhang B; Trout AT. **Use of Clinical Data to Predict Appendicitis in Patients with Equivocal US Findings.** *Radiology.* 2016; 280:557-567.
13. Myer GD; Yuan W; Foss KDB; Thomas S; Smith D; Leach J; Kiefer AW; Dicesare C; Adams J; Gubanich PJ. **Analysis of head impact exposure and brain microstructure response in a season-long application of a jugular vein compression collar: a**

- prospective, neuroimaging investigation in American football.** *British journal of sports medicine.* 2016; 50:1276-1285.
14. Dingess KA; Valentine CJ; Ollberding NJ; Davidson BS; Woo JG; Summer S; Peng YM; Guerrero ML; Ruiz-Palacios GM; Ran-Ressler RR. **Branched-chain fatty acid composition of human milk and the impact of maternal diet: the Global Exploration of Human Milk (GEHM) Study.** *American Journal of Clinical Nutrition.* 2017; 105:177-184.
 15. Scheitz JF; Abdul-Rahim AH; Macisaac RL; Cooray C; Sucharew H; Kleindorfer D; Khatri P; Broderick JP; Audebert HJ; Ahmed N. **Clinical Selection Strategies to Identify Ischemic Stroke Patients with Large Anterior Vessel Occlusion: Results from SITS-ISTR (Safe Implementation of Thrombolysis in Stroke International Stroke Thrombolysis Registry).** *Stroke.* 2017; 48:290-297.
 16. Alsaied T; Bokma JP; Engel ME; Kuijpers JM; Hanke SP; Zuhlke L; Zhang B; Veldtman GR. **Factors associated with long-term mortality after Fontan procedures: a systematic review.** *Heart.* 2017; 103:104-110.
 17. Iams JD; Applegate MS; Marcotte MP; Rome M; Krew MA; Bailit JL; Kaplan HC; Poteet J; Nance M; McKenna DS. **A Statewide Progestogen Promotion Program in Ohio.** *Obstetrics and Gynecology.* 2017; 129:337-346.
 18. DeBoer MD; Gurka MJ; Morrison JA; Woo JG. **Inter-relationships between the severity of metabolic syndrome, insulin and adiponectin and their relationship to future type 2 diabetes and cardiovascular disease.** *International Journal of Obesity.* 2016; 40:1353-1359.
 19. Beck AF; Sandel MT; Ryan PH; Kahn RS. **Mapping Neighborhood Health Geomarkers To Clinical Care Decisions To Promote Equity In Child Health.** *Health Affairs.* 2017; 36:999-1005.
 20. Depinet H; von Allmen D; Towbin A; Hornung R; Ho M; Alessandrini E. **Risk Stratification to Decrease Unnecessary Diagnostic Imaging for Acute Appendicitis.** *Pediatrics.* 2016; 138:e20154031.
 21. Hunter LL; Meinzen-Derr J; Wiley S; Horvath CL; Kothari R; Wexelblatt S. **Influence of the WIC Program on Loss to Follow-up for Newborn Hearing Screening.** *Pediatrics.* 2016; 138:e20154301.
 22. O'Connor AM; Wray J; Tomlinson RS; Cassidy A; Jacobs JP; Jenkins KJ; Brown KL; Franklin RCG; Mahony L; Mussatto K. **Impact of Surgical Complexity on Health-Related Quality of Life in Congenital Heart Disease Surgical Survivors.** *Journal of the American Heart Association : Cardiovascular and Cerebrovascular Disease.* 2016; 5.
 23. Madsen NL; Marino BS; Woo JG; Thomsen RW; Videboek J; Laursen HB; Olsen M. **Congenital Heart Disease With and Without Cyanotic Potential and the Long-term Risk of Diabetes Mellitus: A Population-Based Follow-up Study.** *Journal of the American Heart Association : Cardiovascular and Cerebrovascular Disease.* 2016; 5:e003076.
 24. Donauer S; Altaye M; Xu Y; Sucharew H; Succop P; Calafat AM; Khoury JC; Lanphear B; Yolton K. **An Observational Study to Evaluate Associations between Low-Level Gestational Exposure to Organophosphate Pesticides and Cognition during Early Childhood.** *American Journal of Epidemiology.* 2016; 184:410-418.
 25. Smith DF; Hossain MM; Hura A; Huang G; McConnell K; Ishman SL; Amin RS. **Inflammatory Milieu and Cardiovascular Homeostasis in Children With Obstructive Sleep Apnea.** *Sleep.* 2017; 40.

Grants, Contracts, and Industry Agreements

Annual Grant Award Dollars

Investigator	Title	Sponsor	ID	Dates	Amount
Bin Zhang, PhD	Mechanisms of Refractory Hypertension	National Institutes of Health (University of Alabama-Birmingham)	R01 HL113004	04/07/2014 - 03/31/2019	\$27,525
Jessica Woo, PhD Elaine Urbina, MD	Childhood CV Risk and Adult CVD Outcomes: an International Long-	National Institutes of Health	R01 HL121230	12/01/2014 -	\$1,320,957

	term Follow-up				11/30/2019
Jane C Khoury, PhD	Comparison of Hemorrhagic & Ischemic Stroke Among Blacks and Whites	National Institutes of Health (University of Cincinnati)	R01 NS030678	04/01/2015 -	\$161,760 03/31/2020
Patrick H Ryan, PhD	Traffic-related Air Pollutants and Respiratory Tract Microbiome in Children	National Institutes of Health (University of Cincinnati)	R21 ES024807	09/30/2015 -	\$80,223 09/29/2017
Bin Huang, PhD	Patient Centered Adaptive Treatment Strategies (PCATS) using Bayesian Causal Inference	Patient-Centered Outcome Research Inst.	ME-1408- 19894	09/01/2015 -	\$477,602 08/31/2018
Rhonda Szczesniak, PhD	Preventing Rapid Decline in CF: Statistical Research Career Commitment	National Institutes of Health	K25 HL125954	08/01/2015 -	\$169,473 03/31/2020
Shelley Ehrlich	Bisphenol A and Gestational Diabetes	National Institutes of Health (University of Cincinnati)	K12 HD051953	09/01/2014 -	\$108,000 06/30/2016
Nanhua Zhang, PhD	Examining the Impact of Stigma and Stress on HIV Clinical Indicators and Quality of Life for MSM in Ghana West Africa	National Institutes of Health (University of Rochester)	R21 MH109350	06/01/2016 -	\$21,448 04/30/2018
Cynthia L. Baker	Telehealth	Children's Hospital of Philadelphia (Lurie Children's Hospital of Chicago)	R01 NR002093	07/01/2014 -	\$14,368 12/31/2016
Eileen King, PhD Peter S White	Administrative Coordinating Center: Cardiovascular Development and Pediatric Cardiac Genomics Consortia	National Institutes of Health	U01 HL131003	01/01/2016 -	\$3,252,500 12/31/2020
Jareen K Meinzen-Derr, PhD	Improving Outcomes using Aided Augmentative and Alternative Communication for Children who are Deaf or Hard of Hearing	Department of Health and Human Services	90IF0122- 01-00	09/30/2016 -	\$199,859 09/29/2019
Jareen K Meinzen-Derr, PhD	Language and Functional Outcomes in Children who are Deaf or Hard of Hearing	Ctr for Disease Control and Prevention (University of South Carolina)	U01 DD001007	09/30/2016 -	\$99,748 09/29/2017
Maurizio Macaluso, PhD	Cincinnati Center for Clinical and Translational Sciences and Training	Natl. Ctr for Advancing Translational Sc (University of Cincinnati)	KL2 TR001426	08/14/2015 -	\$49,978 03/31/2019
Lin Fei, PhD	Phase II: Vincristine vs Sirolimus for High Risk Kaposiform Hemangioendothelioma	Food and Drug Administration (Children's Hospital Boston)	R01 FD004363	09/01/2016 -	\$7,362 08/31/2017
Eileen King, PhD	Pharmacokinetics Studies of Tacrolimus in Transplant Patients	Food and Drug Administration (University of Cincinnati)	U01 FD004573	09/12/2015 -	\$34,595

				09/14/2016	
Bin Zhang, PhD	Guerbet S.A. Iodinated Contrast Media and Hypothyroidism Study	Food and Drug Administration (Society of Pediatric Radiology)	FDA	06/02/2016	\$2,574
				-	
				06/01/2017	
Jareen K Meizen-Derr, PhD	Technology-assisted Language Intervention in Early LIFE	March of Dimes - Ohio	6-FY17-480	06/01/2017	\$66,398
				-	
				05/31/2020	
Patrick H Ryan, PhD	Assessing Personal Exposure to Ultrafine PM Number and Respiratory Health	National Institutes of Health	R33 ES024713	03/15/2017	\$575,089
				-	
				02/29/2020	
Total Annual Grant Award Dollars					\$6,669,459
