

BIOGRAPHICAL SKETCH

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NAME: Cole Brokamp

eRA COMMONS USER NAME (credential, e.g., agency login): brokampr

POSITION TITLE: Associate Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Cincinnati; Cincinnati, OH	B.S.	06/2010	Biomedical Engineering
University of Cincinnati; Cincinnati, OH	Ph.D.	04/2016	Biostatistics and Bioinformatics
Cincinnati Children's Hospital Medical Center; Cincinnati OH	Postdoctoral Research Fellow	10/2017	Biostatistics and Bioinformatics

A. Personal Statement

As a biostatistician, epidemiologist, and data scientist, I have specialized myself in the areas of informatics and machine learning with applications in population-level environmental, community, and health outcome data. I develop new methods and technologies to support environmental and population health research, including tools for geocoding and geomarker assessment, high resolution spatiotemporal exposure assessment models, and causal inference machine learning methods. I lead research on the roles of environmental exposures and community characteristics on pediatric psychiatric health by applying these methods and tools to large databases of electronic health records, observational cohort studies, clinical registries, and vital records.

As the PI of the proposed project and the creator and lead developer for DeGAUSS, I will work to oversee the successful completion of all project deliverables and objectives. I am uniquely positioned to lead this work due to my expertise in developing DeGAUSS software and my experience conducting patient-level biomedical health research that leverages environmental exposures and community characteristics made possible by the DeGAUSS approach. Additionally, my research group's strong connection to open-source and data science communities convened by the National Institutes of Environmental Health Sciences enables us to facilitate the adoption of DeGAUSS, thereby enhancing its impact and fostering increased scientific research on a broader scale.

Ongoing projects that I would like to highlight include:

NIH/NHGRI R01HG011411

Mersha T (PI)

9/1/21 - 6/30/26

Epigenome-wide variations and socio-environmental exposures in African American asthmatic children

AHRQ

Beck A (PI)

11/1/21 - 10/31/26

Achieving Pediatric Health Equity by Responding to Identified Sociomedical risks with Effective Unified Purpose – Co-design and Evaluation of the RISEUP System

NIH/NIEHS R01ES031621

Yolton K, Ryan P, Cecil K (PI)

3/3/21 - 12/31/25

Longitudinal Impact of Air Pollution on Mental Health and Neuroimaging Outcomes during Adolescence in the Cincinnati Combined Childhood Cohorts (C4)

NIH/NLM R01LM013222

Brokamp C (PI)

8/1/20 - 7/31/24

A Framework for Automated and Reproducible Geomarker Curation and Computation at Scale

NIH/NIEHS R01ES031054

Brunst K (PI)

7/1/20 - 4/29/25

Epigenetics, Air Pollution, and Childhood Mental Health

Peer-reviewed publications I would like to highlight include:

1. Erika Rasnick Manning, Qing Duan, Stuart Taylor, Sarah Ray, Alexandra MS Corley, Joseph Michael, Ryan Gillette, Ndidi Unaka, David Hartley, Andrew F Beck, **Cole Brokamp**. Development of a Multimodal Geomarker Pipeline to Assess the Impact of Social, Economic, and Environmental Factors on Pediatric Health Outcomes. *Journal of the American Medical Informatics Association*. In press. 2024.
2. Erika Rasnick, Patrick Ryan, Jeff Blossom, Heike Luttmann-Gibson, Nathan Lothrop, Rima Habre, Diane R Gold, Andrew Vancil, Joel Schwartz, James E Gern, **Cole Brokamp**. High Resolution and Spatiotemporal Place-Based Computable Exposures at Scale. *AMIA Summits on Translational Science Proceedings*. 2023:62-70. 2023.
3. Patrick H. Ryan, **Cole Brokamp**, Jeff Blossom, Nathan Lothrop, Rachel L. Miller, Paloma I. Beamer, Cynthia M. Visness, Antonella Zanobetti, Howard Andrews, Leonard B. Bacharier, Tina Hartert, Christine C. Johnson, Dennis Ownby, Robert F. Lemanske Jr., Heike Gibson, Weeberb Requia, Brent Coull, Edward M. Zoratti, Anne L. Wright, Fernando D. Martinez, Christine M. Seroogy, James E. Gern, Diane R. Gold, on behalf of the CREW Consortium. A Distributed Geospatial Approach to Describe Community Characteristics for Multi-Site Studies. *Journal of Clinical and Translational Science*. 5:e86, 1-8. 2021.
4. **Cole Brokamp**, Chris Wolfe, Todd Lingren, John Harley, Patrick Ryan. Decentralized and Reproducible Geocoding and Characterization of Community and Environmental Exposures for Multi-Site Studies. *Journal of American Medical Informatics Association*. 25(3); 309-314. 2017.

B. Positions, Scientific Appointments, and Honors

Positions

2022 – Present	Associate Professor, Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Department of Pediatrics, University of Cincinnati, College of Medicine
2017 – 2022	Assistant Professor, Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Department of Pediatrics, University of Cincinnati, College of Medicine

Scientific Appointments

2024	NIH ZES1 LWJ-W (KA)
2023	NIH ZES1 BWD-D (HS)
2023	NIH ZES1 LWJ-W (K)
2023	NIH ZES1 LKB-K (P2)
2023	NIH ZRG1 MCST-B (14)
2023	NIH ZCTA1 TCRB-J (M2)
2022	NIH ZES1 WL-W (K)
2022	NIH ZES1 LWF-S (K9)
2022	NIH ZES1 LKB-S (KS)
2019	NIH SIEE study section, early career reviewer

Awards

2020	Cincinnati Children's Epidemiology and Biostatistics Top Publication
2017	Cincinnati Children's Epidemiology and Biostatistics Top Publication and Top Research Achievement
2016	Cincinnati Children's Arnold Strauss Fellowship Awardee

C. Contributions to Science

Privacy-based Methods and Software for Geocoding and Geomarker Assessment

Our group developed and maintains a novel approach and accompanying software package called DeGAUSS which overcomes multiple privacy-related challenges in the use of address data in multi-site studies and also serves as a more general reproducible and scalable research tool for geocoding and geomarker assessment. This approach is currently being implemented in a wide variety of national environmental health studies and in several clinical electronic health data warehouses. Extending this approach into a scalable and sustainable framework for automated integration of disparate and heterogeneous geomarkers via spatiotemporal location has reduced the need for manual data curation and specialized expertise required to utilize them within biomedical research studies.

1. Erika Rasnick Manning, Qing Duan, Stuart Taylor, Sarah Ray, Alexandra MS Corley, Joseph Michael, Ryan Gillette, Ndidi Unaka, David Hartley, Andrew F Beck, **Cole Brokamp**. Development of a Multimodal Geomarker Pipeline to Assess the Impact of Social, Economic, and Environmental Factors on Pediatric Health Outcomes. *Journal of the American Medical Informatics Association*. In press. 2024.
2. Erika Rasnick, Patrick Ryan, Jeff Blossom, Heike Luttmann-Gibson, Nathan Lothrop, Rima Habre, Diane R Gold, Andrew Vancil, Joel Schwartz, James E Gern, **Cole Brokamp**. High Resolution and Spatiotemporal Place-Based Computable Exposures at Scale. *AMIA Summits on Translational Science Proceedings*. 2023:62-70. 2023.
3. Patrick H. Ryan, **Cole Brokamp**, Jeff Blossom, Nathan Lothrop, Rachel L. Miller, Paloma I. Beamer, Cynthia M. Visness, Antonella Zanobetti, Howard Andrews, Leonard B. Bacharier, Tina Hartert, Christine C. Johnson, Dennis Ownby, Robert F. Lemanske Jr., Heike Gibson, Weeberb Requia, Brent Coull, Edward M. Zoratti, Anne L. Wright, Fernando D. Martinez, Christine M. Seroogy, James E. Gern, Diane R. Gold, on behalf of the CREW Consortium. A Distributed Geospatial Approach to Describe Community Characteristics for Multi-Site Studies. *Journal of Clinical and Translational Science*. 5:e86, 1-8. 2021.
4. **Cole Brokamp**, Chris Wolfe, Todd Lingren, John Harley, Patrick Ryan. Decentralized and Reproducible Geocoding and Characterization of Community and Environmental Exposures for Multi-Site Studies. *Journal of American Medical Informatics Association*. 25(3); 309-314. 2017.

Spatiotemporal Exposure Assessment Methods and Machine Learning Models

My early career was spent developing spatiotemporal exposure assessment models for environmental pollutants and community characteristics based on machine learning techniques. This work includes the first machine learning or ensemble model used to assess exposure to elemental components of particulate matter. Recent introduction of remote sensing satellite data has allowed for extension of the land use random forest model to produce daily estimates of air pollution back to 2000 at a resolution of 1 x 1 km. I created a nationwide, census tract-level, and validated community material deprivation index that has been used and cited by over 75 different published scientific studies. It was originally created to estimate the causal impact of community material deprivation on hospitalization during the first year of life, but has also been used across several medical subspecialties to quantify health disparities.

1. **Cole Brokamp**. A High Resolution Spatiotemporal Fine Particulate Matter Exposure Assessment Model for the Contiguous United States. *Environmental Advances*. 7:100155. 2022.
2. **Cole Brokamp**, Andrew F. Beck, Neera K. Goyal, Patrick Ryan, James M. Greenberg, Eric S. Hall. Material Community Deprivation and Hospital Utilization During the First Year of Life: An Urban Population-Based Cohort Study. *Annals of Epidemiology*. 30. 2019.

3. **Cole Brokamp**, Roman Jandarov, Monir Hossain, Patrick Ryan. Predicting Daily Urban Fine Particulate Matter Concentrations Using Random Forest. *Environmental Science & Technology*. 52 (7); 4173-4179. 2018.
4. **Cole Brokamp**, Roman Jandarov, MB Rao, Grace LeMasters, Patrick Ryan. Exposure assessment models for elemental components of particulate matter in an urban environment: A comparison of regression and random forest approaches. *Atmospheric Environment*. 151; 1-11. 2017.

Built Environment and Pediatric Psychiatric Disorders

Building on advanced exposure assessment has allowed me to lead epidemiological studies on the impacts of the built environment (e.g., fine particulate matter, greenspace, community deprivation) on psychiatric and neurobehavioral pediatric health outcomes. I led the first study to associate fine particulate matter with psychiatric outcomes in children and adolescents, using both electronic health record studies, as well as more detailed longitudinal panel studies. Multi-site cohort studies, such as the Adolescent Brain Cognitive Development (ABCD) study, have facilitated steps towards understanding the neurodevelopmental mechanisms underlying the associations between air pollution, cognition, and mental health.

1. Andrew Vancil, Jeffrey R Strawn, Erika Rasnick, Amir Levine, Heidi K Schroeder, Ashley M Specht, Ashley L Turner, Patrick H Ryan, **Cole Brokamp**. Pediatric Anxiety and Daily Fine Particulate Matter: A Longitudinal Study. *Psychiatry Research Communications*. In Press. 2022.
2. Clara G Zundel, Samantha Ely, **Cole Brokamp**, Jeffrey R Strawn, Tanja Jovanovic, Patrick Ryan, Hilary Marusak. Particulate Matter Exposure and Default Mode Network Equilibrium during Early Adolescence. *Brain Connectivity*. Online. 2024.
3. Erika Rasnick, Patrick H. Ryan, A. John Bailer, Thomas Fisher, Patrick J. Parsons, Kimberly Yolton, Nicholas C. Newman, Bruce P. Lanphear, **Cole Brokamp**. Identifying Sensitive Windows of Airborne Lead Exposure Associated with Behavioral Outcomes at Age 12. *Environmental Epidemiology*. 5(2):e144. 2021.
4. **Cole Brokamp**, Jeffrey R. Strawn, Andrew F. Beck, Pat Ryan. Pediatric Psychiatric Emergency Department Utilization and Fine Particulate Matter: A Case-Crossover Study. *Environmental Health Perspectives*. 127(9). 2019.

Causal Mediation of Place-Based Factors on Pediatric Health Disparities

I have applied advanced causal modeling techniques within population-wide health registries and multi-site prospective cohort studies. By linking study participants' addresses to extant social and environmental determinants of health data sources, we study the mechanisms behind racial and socioeconomic disparities in pediatric health outcomes.

1. **Cole Brokamp**, Margaret N Jones, Qing Duan, Erika Rasnick Manning, Sarah Ray, Alexandra MS Corley, Joseph Michael, Stuart Taylor, Ndidi Unaka, Andrew F Beck. Causal Mediation of Neighborhood-Level Pediatric Hospitalization Inequities. *Pediatrics*. In Press. 2024.
2. Esteban Correa, Lili Ding, Andrew F. Beck, **Cole Brokamp**, Mekibib Altayeb, Robert S. Kahn, Tesfay Mersha. Understanding Racial Disparities in Childhood Asthma Using Individual- and Neighborhood-Level Risk Factors. *Journal of Allergy and Clinical Immunology*. In Press. 2022.
3. Antonella Zanobetti, Patrick H. Ryan, Brent Coull, **Cole Brokamp**, Soma Datta, Jeffrey Blossom, Nathan Lothrop, Rachel L. Miller, Paloma I. Beamer, Cynthia M. Visness, Howard Andrews, Leonard B. Bacharier, Tina Hartert, Christine C. Johnson, Dennis Ownby, Gurjit K. Khurana Hershey, Christine Joseph, Song Yiqiang, Eneida Mendoza, Daniel J. Jackson, Heike Luttmann-Gibson, Edward M. Zoratti, Anne L. Wright, Fernando D. Martinez, Christine M. Seroogy, James E. Gern, Diane R. Gold, for the Children's Respiratory and Environmental Workgroup (CREW) Consortium. Childhood Asthma Incidence, Early and Persistent Wheeze, and Neighborhood Socioeconomic Factors in the ECHO/CREW Consortium. *JAMA Pediatrics*. Online. 2022.
4. Patrick H Ryan, Antonella Zanobetti, Brent A. Coull, Howard Andrews, Leonard B Bacharier, Dakota Bailey, Paloma I. Beamer, Jeff Blossom, **Cole Brokamp**, Soma Datta, Tina Hartert, Gurjit K. Khurana Hershey, Daniel J Jackson, Christine C Johnson, Christine Joseph, Jorja Kahn, Nathan Lothrop, Margee Louisias, Heike Luttmann-Gibson, Fernando D. Martinez, Eneida Mendonça, Rachel L. Miller, Dennis Ownby, Sima Ramratnam, Christine M Seroogy, Cynthia M Visness, Anne L Wright, Edward M. Zoratti, James E. Gern, Diane R. Gold. The Legacy of Redlining: Increasing Childhood Asthma

Fairness in Pediatric Precision Medicine

My research group has lead several studies on the racial and ethnic fairness of pediatric precision medicine tools used in clinical and epidemiologic settings. We have been the first to uncover racial biases in commonly used asthma diagnosis and cystic fibrosis exacerbation clinical precision medicine tools. Additionally, we have focused on the racial biases that can be introduced into epidemiologic research through the use of common exposure and socioeconomic status assessment tools.

1. Harsimran Makkad, Amisha Saini, Erika Rasnick Manning, Qing Duan, Stephen Colegate, **Cole Brokamp**. Racial Fairness of Individual- and Community-Level Proxies of Socioeconomic Status Among Birthing Parent–Child Dyads. *Journal of Racial and Ethnic Health Disparities*. Online. 2024.
2. Stephen P Colegate, Anushka Palipana, Emrah Gecili, Rhonda D Szczesniak, **Cole Brokamp**. Evaluating Precision Medicine Tools in Cystic Fibrosis for Racial and Ethnic Fairness. *Journal of Clinical and Translational Science*. In press. 2024.
3. Jordan Pennington, Erika Rasnick, Lisa J. Martin, Jocelyn M. Biagini, Tesfaye B. Mersha, Allison Parsons, Gurjit K. Khurana Hershey, Patrick Ryan, **Cole Brokamp**. Racial Fairness in Precision Medicine: Pediatric Asthma Prediction Algorithms. *American Journal of Health Promotion*. 37(2). 2022.