
BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES**

NAME: Brokamp, Cole

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 Epidemiology

A. Personal Statement

As a biostatistician, epidemiologist, and geospatial data scientist, I have specialized myself in the areas of informatics and machine learning with applications to large environmental, community, and health outcome datasets. Recent democratization of “big spatial data” and advances in geoinformatics have allowed unprecedented access to environmental and socioeconomic characteristics that vary highly with respect to both time and space. More precise environmental features require more complex modeling and I have dedicated my early career to furthering exposure science methodology in order to bring more precise exposure assessment tools to environmental and population health studies. This includes high resolution spatiotemporal exposure assessment models for fine particulate matter as well as a longitudinal measure of material community deprivation. Furthermore, I have developed a novel approach and accompanying software package called DeGAUSS which allows for user-friendly attachment of geospatial variables to existing research cohorts while mitigating key privacy challenges. I am the founding director of the Geospatial Research Accelerator for Precision Population Health (GRAPPH), which is a shared facility at Cincinnati Children's Hospital Medical Center that works to develop and democratize geospatial data and methodologies across the institution.

Leveraging these advanced exposure assessment models, I've lead epidemiologic studies demonstrating the roles of air pollution, greenspace, and poverty on psychiatric and neurobehavioral child health outcomes. Furthermore, I co-lead health equity research with investigators who are seeking to quantify and identify causal drivers of racial and ethnic health disparities. My research also extends into the racial and ethnic fairness of precision health algorithms, including applications within asthma, cystic fibrosis, and assessment of socioeconomic status and environmental exposures.

I look forward to continuing my close mentor/mentee relationship with Dr. Colegate throughout the Strauss Award and his postdoctoral fellowship. I have used my experience and expertise in mentoring junior scientists throughout Stephen's dissertation work and the first 20 months of his fellowship. This line of work is already benefitting from previous work completed by two Summer Undergraduate Research Fellows (SURF) and and two Summer Medical Student Respiratory Research Fellows (SMSRFF), who have gone on to publish manuscripts and abstracts about early findings in racial fairness. Specifically, I mentored a SMSRFF fellow on a similar precision medicine project

with asthma, which results in a first author publication for the mentee. I look forward to continuing my work with Stephen in precision medicine for lung exacerbation forecasting with specific applications to fairness. My unique background in cystic fibrosis research, predictive modeling, and racial/ethnic fairness will provide Dr. Colegate with the ideal mentor to accomplish his professional and scientific goals.

Ongoing projects 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-review publications I would like to highlight include:

1. 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.
2. 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.
3. **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.
4. Christopher Wolfe, Teresa Pestian, Emrah Gecili, Weiji Su, Ruth H. Keogh, John P. Pestian, Michael Seid, Peter J. Diggle, Assem Ziady, John P. Clancy, Daniel H. Grossoehme, Rhonda D. Szczesniak, **Cole Brokamp**. Cystic Fibrosis Point of Personalized Detection (CFPOPD): An Interactive Web Application. *JMIR Med Inform*. 8(12):e23530. 2020.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2022–	Associate Professor of Pediatrics, University of Cincinnati College of Medicine and Cincinnati Children's Hospital Medical Center
2017–2022	Assistant Professor of Pediatrics, University of Cincinnati College of Medicine and Cincinnati Children's Hospital Medical Center
2016–2017	Research Fellow, Cincinnati Children's Hospital Medical Center
2012–2016	Research Associate, Department of Environmental Health, University of Cincinnati

Honors

2020	CCHMC Epidemiology & Biostatistics Top Publication
2017	CCHMC Epidemiology & Biostatistics Top Publication and Top Research Achievement
2016	CCHMC Division of Biostatistics & Epidemiology Travel Award
2016	CCHMC Arnold W. Strauss Fellowship Award

C. Contributions to Science

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.

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**, Roman Jandarov, Monir Hossain, Patrick Ryan. Predicting Daily Urban Fine Particulate Matter Concentrations Using Random Forest. *Environmental Science & Technology*. 52 (7); 4173-4179. 2018.
3. **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.

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**, 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.

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 lead the first study to associate fine particulate matter with psychiatric outcomes in children and adolescents, using both electronic health record studies, as well as smaller, longitudinal panel studies.

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 Zundel, Patrick Ryan, **Cole Brokamp**, Autumn Heeter, Yaoxian Huang, Jeffrey Strawn, Hilary Marusak. Air Pollution, Depressive and Anxiety Disorders, and Brain Effects: A Systematic Review. *NeuroToxicology*. In Press. 2022.
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 Health Disparities

I have used advanced causal modeling techniques coupled with population-wide health registries linked to extant social and environmental determinants of health data sources to study the mechanisms behind racial health disparities. This has included neighborhood-level drivers of all-cause hospitalization disparities and more detailed analyses within specific disease groups, including pediatric inflammatory bowel disease, asthma, sickle cell anemia, type I diabetes, and psychiatric disorders.

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. Julia Smith, Chunyan Liu, Andrew Beck, Lin Fei, **Cole Brokamp**, Syeda Meryum, Kaitlin G Whaley, Philip Minar, Jennifer Hellmann, Lee A Denson, Peter Margolis, Jasbir Dhaliwal. Racial Disparities in Pediatric Inflammatory Bowel Disease Care: Differences in Outcomes and Health Service Utilization Between Black and White Children. *Journal of Pediatrics*. 260:113522. 2023.
3. 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.
4. 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.

Privacy-based Methods and Software for Geocoding and Geomarker Assessment

I have developed 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. 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.

Fairness in Precision Medicine

My research group has lead several studies on the racial and ethnic fairness of 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 commonly used exposure assessment and community characteristics tools.

1. 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.
2. 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.

Complete list of published work in ORCID:

<https://orcid.org/0000-0002-0289-3151>