BIOGRAPHICAL SKETCH

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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 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 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. Leveraging these models, I've also lead epidemiologic studies demonstrating the roles of air pollution, greenspace, and poverty on psychiatric and neurobehavioral child health outcomes. 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.

I look forward to contributing as a mentor as a part of the Perinatal, Respiratory, Obesity/Diabetes and Neurodevelopment Together (PRONTO) program under the leadership of Drs. Szczesniak and Bowers. My experience and expertise in mentoring post graduate and clinical fellows in biostatistical and epidemiologic methods for clinical biomedical research will contribute to the success of the program.

1. 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.
2. 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.

3. **Cole Brokamp**. A High Resolution Spatiotemporal Fine Particulate Matter Exposure Assessment Model for the Contiguous United States. *Environmental Advances*. 7:100155. 2022.

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 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**, Eric B. Brandt, Patrick H. Ryan. Assessing Exposure to Outdoor Air Pollution for Epidemiological Studies: Model-based and Personal Sampling Strategies. *Journal of Allergy and Clinical Immunology*. . 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.

Community Material Deprivation Index

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. Additionally, I recently co-mentored a fellow to publish a scoping review and set of recommendations for the use of area based socioeconomic deprivation indices.

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.
2. Stephen Trinidad, Andrew Vancil, **Cole Brokamp**, Suzanne Moody, Dawne Gardner, Allison A. Parsons, Carley Riley, Rashmi Sahay, Nicole Sofer, Andrew F. Beck, Richard A. Falcone Jr., Meera Kotagal. Relationships Between Socioeconomic Deprivation and Pediatric Firearm-Related Injury at the Neighborhood Level. *Journal of Trauma and Acute Care Surgery*. Online. 2022.
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. Stephen Trinidad, **Cole Brokamp**, Andres Mor Huertas, Andrew Beck, Carley Riley, Erika Rasnick, Richard Falcone, Meera Kotagal. Use of Area Based Socioeconomic Deprivation Indices: A Scoping Review and Qualitative Analysis. *Health Affairs*. In Press. 2022.

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. 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.
3. **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.
4. Juliana Madzia, Patrick Ryan, Kimberly Yolton, Zana Percy, Nick Newman, Grace LeMasters, **Cole Brokamp**. Residential Greenspace Is Associated with Childhood Behavioral Outcomes. *Journal of Pediatrics*. . 2018.

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, 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.
2. 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.
3. **Cole Brokamp**. DeGAUSS: Decentralized Geomarker Assessment for Multi-Site Studies. *Journal of Open Source Software*. Online. 2018.
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.

Clinical forecasting in cystic fibrosis with geomarkers

I have contributed to a research team that has recently used functional data analysis combined with joint modeling (FD-JM) to identify and predict rapid decline in lung function among patients with cystic fibrosis (CF) lung disease. My work in translating this predictive model into an interactive application has allowed for patients and clinicians to take advantage of it at the bedside. Focus groups and partnerships with clinicians have allowed us to iteratively develop the application based on end-user feedback. Work with the CF Foundation Patient Registry (CFFPR) to implement these models and visualizations into clinical settings has improved prognostic care. Recent work has incorporate place-based geomarkers of poverty, greenspace, and air pollution to further enhance the accuracy and clinical-utility of the prediction tool.

1. Emrah Gecili, **Cole Brokamp**, Erika Rasnick, Pedro M Afonso, Eleni-Rosalina Andrinopoulou, Judith W Dexheimer, John P Clancy, Ruth H Keogh, Yizhao Ni, Anushka Palipana, Teresa Pestian, Andrew Vancil, Grace Chen Zhou, Weiji Su, Christopher Siracusa, Patrick Ryan, Rhonda D Szczesniak. Built environment factors predictive of early rapid lung function decline in cystic fibrosis. *Pediatric Pulmonology*. In Press. 2023.
2. 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.
3. Rhonda Szczesniak, Jessica L. Rice, **Cole Brokamp**, Patrick Ryan, Teresa Pestian, Yizhao Ni, Eleni-Rosalina Andrinopoulou, Ruth H. Keogh, Emrah Gecili, Rui Huang, John P. Clancy, Joseph M. Collaco. Influences of Environmental Exposures On Individuals Living with Cystic Fibrosis. *Expert Review of Respiratory Medicine*. Online. 2020.
4. Rhonda Szczesniak, **Cole Brokamp**, Weiji Su, Gary L. McPhail, John Pestian, John P. Clancy. Early Detection of Rapid Cystic Fibrosis Disease Progression Tailored to Point of Care: A Proof-of-Principle Study. *Healthcare Innovations and Point of Care Technologies*. (HI-POCT), 2017 IEEE; 204-207. 2017.

Complete list of published work in ORCID:

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