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 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 nine months of his fellowship. This line of work is already benefitting from previous work completed by two Summer Undergraduate Reseach 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 accopmlish his professional and scientific goals.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2022–	Associate Professor of Pediatrics, University of Cincinnati Department of Pediatrics and Cincinnati Children's Hospital Medical Center Division of Biostatistics & Epidemiology
2017–2022	Assistant Professor of Pediatrics, University of Cincinnati Department of Pediatrics and Cincinnati Children's Hospital Medical Center Division of Biostatistics & Epidemiology
2016–2017	Research Fellow, Cincinnati Children's Hospital Medical Center Division of Biostatistics and Epidemiology
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
2010	B.S. awarded with Distinguished Honors, University of Cincinnati

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. Additionally, I have built a validated community material deprivation index that has been used and cited by over 75 different published scientific studies.

a. **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.

b. **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.

c. **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.

d. **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 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.

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.

Pediatric Health Disparities

I have also contributed to several studies on the disparities of health outcomes within children and the contribution of the place-based and social determinants of health to these disparities in order to identify root causes and meaningful solutions.

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.

Complete list of published work in ORCID: https://orcid.org/0000-0002-0289-3151