BIOGRAPHICAL SKETCH

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NAME: Brokamp, Cole

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

POSITION TITLE: Assistant 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	B.S	06/2010	Biomedical Engineering
University of Cincinnati	Ph.D.	04/2016	Biostatistics and Bioinformatics
Cincinnati Children's Hospital Medical Center	Postdoctoral Research Fellow	10/2017	Biostatistics and Epidemiology

A. Personal Statement

As a biostatistician, epidemiologist, and geoinformatician, I have specialized myself in the areas of geospatial data science 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 history of collaboration with Drs. Sczcesniak and Gupta, especially with respect to our previous work leveraging clinical registry data to combine precision medicine predictive analytic tools and place-based data to improve outcomes of patients with respiratory disorders. In this proposed study, I will work to oversee the geocoding and attachment of geospatial data in order to assist with prediction model development, as well as will oversee the postdoctoral fellow to develop interactive web applications for the prediction model platform and discovery support map in R Shiny.

1. **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. 2018.

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, **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.

4. US Patent: Assem Ziady, Rhonda Szczesniak, John Clancy, **Cole Brokamp**, inventors; Cincinnati Children's Hospital Medical Center, assignee. Compositions and methods for treatment of lung function. United States patent US 10,761,099. 2020 Sep 1.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2017–	Assistant Professor of Pediatrics, the 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 & 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 Arnold W. Strauss Fellowship Award
2016	CCHMC Division of Biostatistics & Epidemiology Travel Award
2010	B.S. awarded with Distinguished Honors, University of Cincinnati

C. Contributions to Science

1. My early career has been 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.

    a. **Cole Brokamp**. A High Resolution Spatiotemporal Fine Particulate Matter Exposure Assessment Model for the contiguous United States. *Environmental Advances*. 7:100155. 2022.
    b. **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.
    c. **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.
    d. **Cole Brokamp**, Grace LeMasters, Patrick Ryan. Residential mobility impacts exposure assessment and community socioeconomic characteristics in longitudinal epidemiology studies. Journal of Exposure Science and Environmental Epidemiology. 26(4). 428-34. 2016.

2. Building on advanced exposure assessment models 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.

    a. **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*. 2019.
    b. 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.

c. 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*. 30. 37-43. 2019.

d. **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. 37-43. 2019.

3. 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.

    a. 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.

    b. **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. 2018.

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

4. 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.

    a. Erica Andrist, **Cole Brokamp**, Stuart Taylor, Carley Riley, Andrew Beck. Neighborhood Poverty and Pediatric Intensive Care Use. *Pediatrics*. 2019.

    b. Andrew F. Beck, Carley L. Riley, Stuart Taylor, **Cole Brokamp**, Robert S. Kahn. Toward a Culture of Health in Hospitals: Pervasive population disparities in inpatient bed-day rates across conditions and subspecialties. *Health Affairs*. 37(4). 551-559. 2018.

    c. Lauren C. Riney, **Cole Brokamp**, Andrew F. Beck, Wendy Pomerantz, Hamilton Schwartz, Todd A. Florin. Emergency Medical Services Utilization is Associated with Community Deprivation in Children. *Prehospital Emergency Care*. 2018.

5. Lastly, 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.

    a. 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. 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.
c. Rhonda D. Szczesniak, Dan Li, Weiji Su, **Cole Brokamp**, John Pestian, Michael Seid, John P. Clancy. Phenotypes of Rapid Cystic Fibrosis Lung Disease Progression during Adolescence and Young Adulthood. *American Journal of Respiratory And Critical Care Medicine*. 196(4). 471-478. 2017.
d. US Patent: Assem Ziady, Rhonda Szczesniak, John Clancy, **Cole Brokamp**, inventors; Cincinnati Children's Hospital Medical Center, assignee. Compositions and methods for treatment of lung function. United States patent US 10,761,099. 2020 Sep 1.

Complete List of Published Work in ORCiD:
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