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## 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.**

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NAME: Brokamp, Cole

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

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POSITION TITLE: Assistant Professor

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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.*)

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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 and geoinformatician, I have dedicated my early career to conducting interdisciplinary and collaborative research around the place-based determinants of health. Recent democratization of “big spatial data” and advances in geoinformatics have allowed unprecedented access to environmental and socioeconomic characteristics that can be linked to individuals, their families, and care providers. My experience in creating interactive applications that display health and spatial information will be a valuable resource for our team as we work towards making information on community health resources and neighborhood-level health disparities more findable, accessible, and understandable to all. I look forward to working as a part of this team in order to utilize community stakeholder feedback into our iterative design process for a health information resource to improve population health.

1. 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. *IEEE Journal of Translational Engineering on Health and Medicine*. 2017.
2. 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. Online ahead of print. 2018.
3. **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.

## B. Positions and Honors

### Positions and Employment

2012–2016	Research Associate, Department of Environmental Health, University of Cincinnati
2016–2017	Research Fellow, Cincinnati Children's Hospital Medical Center Division of Biostatistics & Epidemiology
2017–	Assistant Professor of Pediatrics, the University of Cincinnati Department of Pediatrics and Cincinnati Children's Hospital Medical Center Division of Biostatistics & Epidemiology

### Honors

2010	B.S. awarded with Distinguished Honors, University of Cincinnati
2016	CCHMC Division of Biostatistics & Epidemiology Travel Award
2016	CCHMC Arnold W. Strauss Fellowship Award
2017	CCHMC Epidemiology & Biostatistics Top Publication
2017	CCHMC Epidemiology & Biostatistics Top Research Achievement

## C. Contribution to Science

1. The main aim of my early career work has been to develop exposure assessment models for airborne pollutants based on machine learning techniques. Specifically, applying random forest to land use models results in higher accuracy and precision of air pollution exposure assessment by elucidating complex interactions and nonlinear relationships between land use predictors and pollutant concentrations. 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 from 2000 - 2015 at a resolution of 1 x 1 km across the Greater Cincinnati area.
  - a. **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.
  - b. **Cole Brokamp**, MB Rao, Patrick Ryan, Roman Jandarov. A comparison of resampling and recursive partitioning methods in random forest for estimating the asymptotic variance using the infinitesimal jackknife. *Stat.* 6(1). 360-372. 2017.
  - 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.
2. The work in developing land use random forest methods has helped me gain expertise in geospatial computing. Along with other collaborators, I have applied these geospatial techniques to analyze the effect on health of other environmental exposures such as combined sewer overflows, elemental components of particulate matter, community deprivation, greenspace, and ozone.
  - a. **Cole Brokamp**, Andrew F. Beck, Louis Muglia, Patrick Ryan. Combined Sewer Overflow Events and Childhood Emergency Department Visits: A Case-Crossover Study. *Science of the Total Environment*. 607-608. 1180-1187. 2017.
  - b. Lusine Yaghjian, R Aroa, **Cole Brokamp**, E O'Meara, B Sprague, G Ghita, Patrick Ryan. Association of air pollution with mammographic breast density in the Breast Cancer Surveillance Consortium. *Breast Cancer Research*. 19:36. 1-10. 2017.
  - c. Kelly J Brunst, Patrick H Ryan, **Cole Brokamp**, David Bernstein, Tiina Reponen, James Lockey, Gurjit K Khurana Hershey, Linda Levin, Sergey A Grinshpun, Grace LeMasters. Timing and duration of traffic-related air pollution exposure and the risk for childhood wheeze and asthma. *American Journal of Respiratory and Critical Care Medicine*. 192(4). 421-427. 2015.
3. Collaborating with other researchers wishing to use geospatial characteristics of research participants within existing cohorts and multisite studies has highlighted the significant need for a reproducible and distributed

method for extracting place-based information from a residential address while maintaining the privacy of protected health information. I recently developed a novel approach and accompanying software package called DeGAUSS which overcomes the multiple challenges in the use of address data in multi-site studies and also serves as a more general reproducible research tool for geocoding and geomarker assessment. This approach is currently being implemented in a wide variety of national environmental health studies.

- a. **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.
  - b. **Cole Brokamp**. DeGAUSS: Decentralized Geomarker Assessment for Multi-Site Studies. *Journal of Open Source Software*. 2018.
  - c. 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. *IEEE Journal of Translational Engineering on Health and Medicine*. 2017.
4. As a trained biostatistician, I also have a general interest in collaborating with others and often use my expertise in spatial statistics to study the effect of place-based and community characteristics on health outcomes.
- a. **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. *Journal of Pediatrics*. *In Press*.
  - 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. Online ahead of print. 2018.

#### **Complete List of Published Work in MyBibliography:**

<https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/49821426>

#### **D. Research Support**

##### **Ongoing Research Support**

#### **Internal Processes and Methods Award - Center for Clinical & Translational Science & Training**

Using Machine Learning to Supplement Electronic Health Record databases with Individual Socioeconomic Status  
Brokamp, PI (9/1/17 - 6/30/19)

Retrospective epidemiological studies are often created using electronic health record databases. Although these records are “wide”, they are not “deep” with respect to individual level demographic data. We propose a novel machine learning based approach that uses open city and auditor databases to predict individual level income and family socioeconomic status. This will solve the urgent problem of unconfounding for individual SES in the execution of EHR based research.

Role: PI

#### **NIH 5UG3OD023282-02**

Children’s Respiratory Research and Environment Workgroup (CREW)

Gern, PI (9/01/2016 - 8/31/2023)

This consortium will identify asthma endotypes and overcome shortcomings of individual cohorts by providing a large (nearly 9000 births and long-term follow-up of 6000-7000 children and young adults) and diverse national data set, harmonizing data related to asthma clinical indicators and early life environmental exposures, developing standardized measures for prospective data collection across CREW cohorts and other ECHO studies, and conducting targeted enrollment of additional subjects into existing cohorts.

Role: Co-I

**NIH 5K23AI121325**Biomarkers and Risk Stratification in Pediatric Community

Florin, PI (01/01/16 - 12/31/19)

The extensive variation in care, in addition to the lack of evidence-based decision aids, highlights the critical need for an improved understanding of disease severity and tools to guide management for pediatric CAP. The proposed research will address this important knowledge and practice gap.

Role: Biostatistician

**NIH/NINDS R01 NS030678**Comparison of Hemorrhagic & Ischemic Stroke Among Blacks and Whites

Kleindorfer, PI (04/01/15 - 03/31/20)

Tracking of population-based stroke incidence in the Greater Cincinnati and Northern Kentucky region, with special emphasis on stroke in the young and stroke recurrence.

Role: Biostatistician

**Ohio Department of Medicaid**Ohio Opioid Analytics Project

Hall, PI (5/14/18 - 4/30/20)

This project will develop and implement point-of-care predictive models to identify risk factors for opioid endpoints in order to guide clinicians and service delivery as well as identify interventions that can be used to implement public health policies.

Role: Co-I

**Recently Completed Research Support****Internal Arnold W. Strauss Fellowship Award - Cincinnati Children's Hospital**Assessing Exposure to Air Pollution Across Time and Space

Brokamp, PI (7/1/16 - 6/30/17)

The primary objective of this award is to combine satellite-based measurements, land use characteristics, and meteorologic data to create a hybrid spatiotemporal model for ground level exposure to particulate matter using exact addresses and dates.

Role: PI

**Internal Processes and Methods Award - Center for Clinical & Translational Science & Training**Validating a Geocoding Approach for Multi Site Studies

Brokamp, PI (1/24/17 - 6/30/17)

The primary objective of this award is to compare the geocoding (assigning latitude and longitude coordinates to addresses) accuracy of our software DeGAUSS (DEcentralized Geomarker Assessment for mUlti Site Studies) to with other common geocoding software. Furthermore, each method will be evaluated based on its ability to correctly estimate environmental exposures and community-level characteristics.

Role: PI

**NIH/NIEHS 1R01ES019890-01**Neurobehavioral and Neuroimaging Effects of Traffic Exposure in Children

Ryan, PI (7/1/12 - 3/31/18)

The association between exposure to traffic-related air pollutants (TRAP) during early childhood and neurobehavioral and neuroimaging outcomes has not been thoroughly examined. The objective of the proposed study is to determine if children exposed to increased levels of TRAP during critical time periods of brain development have altered neurobehavior in childhood as measured by a battery of valid and reliable tests and to assess the physiologic impact of TRAP exposure on brain structure, organization, and function using quantitative magnetic resonance imaging (MRI). These results will fill important gaps in current scientific knowledge related to the relationship between TRAP exposure and neurobehavior and central nervous system effects.

Role: Biostatistician

**Academy Health**Community Health Peer Learning Program: Participant Community

Beck, PI (2/1/16 - 6/30/17)

The goals of this project are to reduce by 10% the inpatient bed-day rate for one high risk neighborhood in Cincinnati through interventions promoted by shared data and improved data visualization.

Role: Biostatistician

**NIH U01HG008666**EMERGE: Better Outcomes for Children: Promoting Excellence in Healthcare Genomics to Inform Policy

Harley, PI (09/01/15 - 05/31/19)

We have developed algorithms for the electronic health record (EHR), led the Pediatric Workgroup, developed pharmacogenomics, evaluated the preferences of parents and caregivers to advance genomic medicine and assimilated technical advances into our EHR. The eMERGE effort has become the basic fabric of the institutional initiative to incorporate the extraordinary advances of genetics, genomics and the electronic medical record into healthcare.

Role: Biostatistician

**Internal ARC - Cincinnati Children's Hospital**CARPE DIEM

Ambroggio, PI (7/1/15 - 7/1/18)

The goals of this award are to develop a diagnostic tool based on the urinary metabolome that can differentiate between viral and bacterial community-acquired pneumonia in children.

Role: Biostatistician

**HEI 4784-RFA08-1/09-5**Analysis of Personal and Home Characteristics Associated with the Elemental Composition of PM2.5 in Indoor, Outdoor, and Personal Air in the RIOPA Study

Ryan, PI (12/1/12 - 11/30/13)

The purpose of this study is to assess the relationship between concurrent measurements of the elemental composition of PM2.5 in indoor, outdoor, and ambient air and the elemental composition of indoor, outdoor and personal air across individuals and cities. The study will also identify personal, home, and environmental factors significantly associated with specific elements or clusters of elements in PM2.5.

Role: Biostatistician

**Internal ARC - Cincinnati Children's Hospital**Mother Infant Data Hub

Marsolo, PI (7/1/15 - 7/1/18)

The goals of this award are to create a research database of comprehensive clinical coverage for neonates born throughout the greater Cincinnati area including linkage of medical records to external data sets at the individual- and area-level during the first year of life.

Role: Biostatistician