**CANUE and GeoHealth Network:
Environment and Health Data 101 Series Seminar #2**

**Mar 26, 2021
Speaker: Mielle Michaux**

Exploring spatio-temporal patterns and environmental determinants of pediatric Inflammatory Bowel Disease in British Columbia

Mielle Michaux, MSc. Physical Geography

Supervisory committee: Dr. Brian Klinkenberg, Dr. Luke Bergmann, and Dr. Kevan Jacobson

I am from occupied Duwamish lands
(Seattle) and I am joining you today from the
traditional, ancestral, and unceded territory
of the Musqueam, Squamish, and
Tsleil-Waututh peoples (Vancouver).

Agenda

- My education/career background
- My research
  - Objectives
  - Methodology
- Workflow
  - live coding demonstration
- Results + lessons learned
- Questions
- Breakout groups for discussion
- Share from breakout groups

My background

- BA in Human Geography, UBC (2018)
  - Focus on GIS and cartography

- MSc in Physical Geography, UBC (2020)
  - Medical geography, environmental health

- GIS data work + cartography
  - UBC Campus + Community Planning
  - UBC School of Community and Regional Planning

VANCOUVER
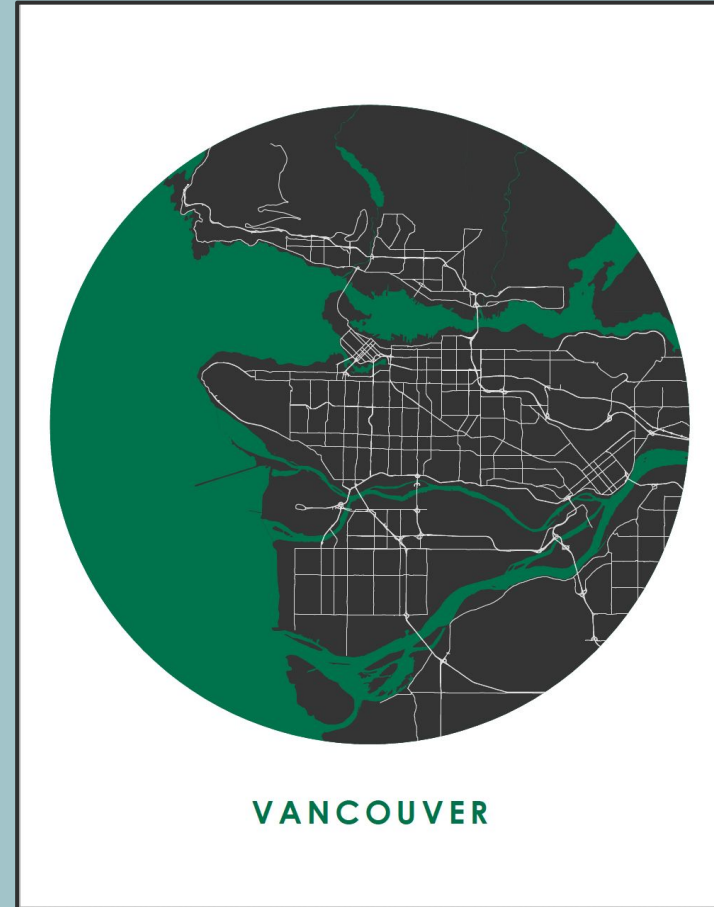
Current work

- Research assistant with UBC Faculty of Medicine: Department of Pediatrics / BC Children's Hospital
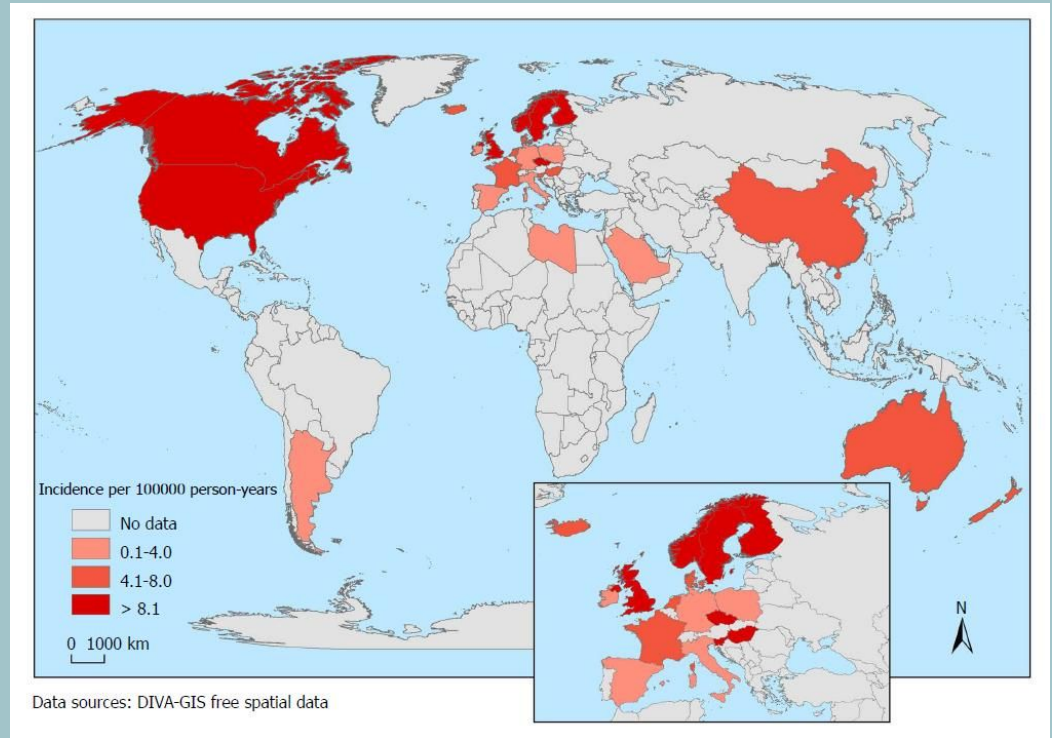
Inflammatory Bowel Disease (IBD)

- Crohn's disease (CD) + ulcerative colitis (UC)

- Chronic inflammation of gastrointestinal tract

- Interaction of genetic and environmental factors
  - Diet, lifestyle, physical environment

Inflammatory Bowel Disease (IBD)

- More common in industrialized countries, urban areas, higher SES

- Canada: high pediatric incidence

Sýkora J, Pomahačová R, Kreslová M, Cvalínová D, Štych P, Schwarz J. Current global trends in the incidence of pediatric-onset inflammatory bowel disease. World J Gastroenterol 2018; 24(25): 2741-2763

Research objectives

1)   Identify and describe **spatiotemporal patterns** in pediatric IBD in BC.

2)   **Model associations** between pediatric IBD and NO_2 air pollution, residential greenness, vitamin D-adjusted solar ultraviolet radiation, and area ethnicity.

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Study design

1) **spatial cluster detection analysis**
   - Moran's I as a local indicator of spatial association

2) **case control study**
   - Logistic regression to measure association

Data

Cases:

Patients diagnosed with IBD

BC Children's Hospital

Division of Gastroenterology,
Dr. Kevan Jacobson

Controls:

Patients who received diagnostic scope and did not have IBD

Propensity score matched with cases based on age

Data

air pollution (NO_2)

ultraviolet vitamin D

greenness (NDVI)

Material and social deprivation indices (MSDI)

area South Asian ethnicity

area Jewish ethnicity

area Indigenous identity

CANUE

Six digit postal codes

Data

air pollution (NO_2)

ultraviolet vitamin D

greenness (NDVI)

Material and social
deprivation indices (MSDI)

area South Asian ethnicity

area Jewish ethnicity

area Indigenous identity

Census

dissemination areas

UofT Computing in the Humanities and
Social Sciences

Workflow

1. **Research ethics application**
   a. **three months to approve, two rounds of provisos**
2. Data cleaning

3. Data joining
   a. spatial join postal code points with dissemination area polygons to assign census data
   b. Join all environment with patient data
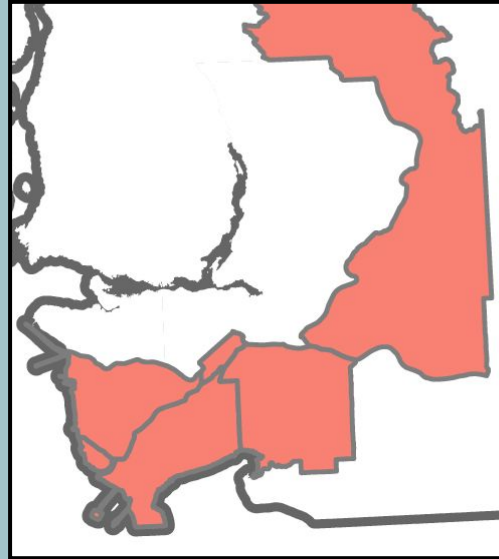4. Analysis

5. Visualization

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5. **Visualization**

Spatial patterns of IBD: cluster detection

incidence
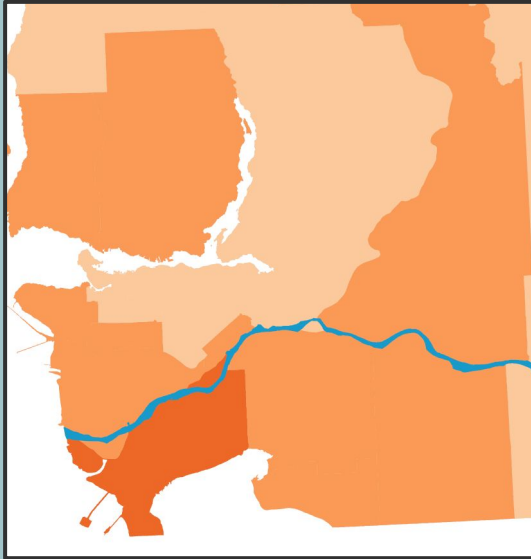
hot spot

- Smooth incidence rates toward neighborhood average

- Global Moran's I to quantify overall spatial pattern of IBD in BC

- Local Moran's I for detecting local clusters/spatial outliers (Local Indicator of Spatial Association)

Modelling potential determinants of IBD

Case control study: comparing cases (diagnosed with IBD) and controls (age matched patients without IBD) on their exposure to:

- air pollution (NO_2)
- ultraviolet vitamin D
- greenness (NDVI)
- area South Asian ethnicity
- area Jewish ethnicity
- area Indigenous identity

Logistic regression modelling

	NO$_2$	NDVI 100m	NDVI 1000m	Percent South Asian ethnicity	Percent Jewish ethnicity	Percent Indigenous identity
Variable of interest						
Control variables	Material deprivation Social deprivation NDVI at postal code	Material deprivation Social deprivation NO$_2$	Material deprivation Social deprivation NO$_2$	Material deprivation Social deprivation	Material deprivation Social deprivation	Material deprivation Social deprivation

Results + conclusions

- Moderate measured associations

- Lower incidence in some rural northern and eastern areas
- Possible lower CD risk in areas with higher Indigenous population

- Higher incidence in the Lower Mainland, particularly Surrey and Delta, but not Vancouver
  - Key area for understanding IBD in BC
- Higher risk of UC and IBD with NO_2 exposure in Fraser Health
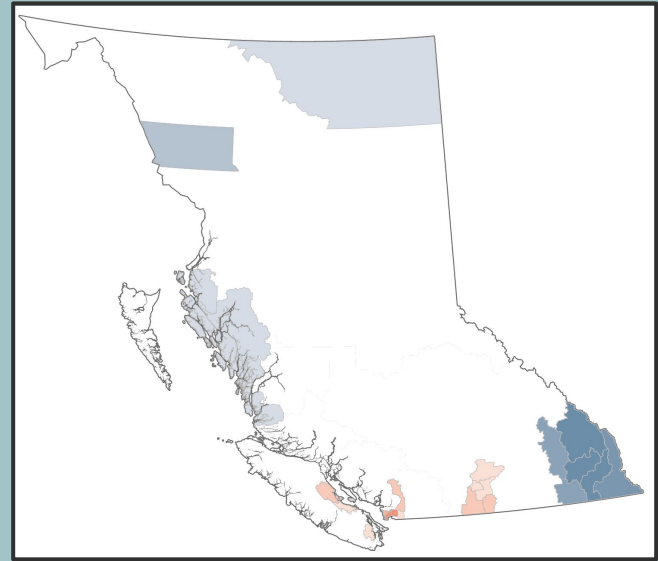
Key takeaways from research process

Nitty-gritty:
- Reproducible, adaptable workflow
- Importance of control selection
- Clean data (like CANUE) saves months of work

Big picture:
- Research ethics
  - Approval process can be lengthy
  - Importance of thinking about and articulating potential benefits

My experience + advice

- Heath geographers often the "bridge"
- Explain the value of geography to a non-geography audience (and vice versa)
  - Clinical researchers/healthcare providers with no exposure to spatial analysis
  - strengths/weaknesses of your methods + data needs
- Breadth of knowledge/making connections is its own skill
- Building trust/relationships with collaborators is key

Questions?

miellemichaux@gmail.com

Breakout groups

How can your chosen topic be used to address IBD risk along the rural-urban continuum (higher risk in urban areas, lower risk in rural areas)?

Topics:

1. Air quality
2. Green/blue space
3. Climate
4. Transit + built environment
5. Equity and gentrification

Breakout groups

1. Air quality
2. Green/blue space
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Instructions:

1) Introduce yourself + your research interests
2) If you meet someone with similar interest, share your email in the private chat function
3) Come up with a research question related to how your chosen topic could be used to study IBD risk along the rural-urban continuum.
    i) Relevant study area(s)
    ii) Data sets
    iii) Covariates
    iv) Type of analysis
    v) Research question

Next Seminar:

geohealthnetwork.com/upcoming-events/howellapr21

SEMINAR 3: WEDNESDAY APRIL 21ST, 1-2PM EST

ENVIRONMENT AND HEALTH DATA 101: WALKABILITY AND CARDIOVASCULAR HEALTH

Dr. Howell completed his PhD at the Institute of Health, Policy, Management and Evaluation at University of Toronto. He is currently in his MD at University of Toronto, Temerty Faculty of Medicine. Dr. Howell's research focuses on the links between the urban environment and cardiovascular disease. While great strides have been made in reducing rates of heart disease, it continues to be one of the largest sources of illness and death in Canada. This has led researchers to address the root causes of these illness at the population level. As part of this push, there has been an increasing focus on how features such as city planning might affect cardiovascular risk factors. Dr. Howell uses large administrative databases to study how features of urban design and pollution may provoke or prevent conditions like acute myocardial infarction. We will review the following research, using CANUE data:

Howell, N. A., Tu, J. V., Moineddin, R., Chen, H., Chu, A., Hystad, P., & Booth, G. L. (2019). Interaction between neighborhood walkability and traffic-related air pollution on hypertension and diabetes: the CANHEART cohort. Environment international, 132, 104799. https://doi.org/10.1016/j.envint.2019.04.070

CANUE: canue.ca; @CANUEConsortium

GeoHealth Network: geohealthnetwork.com; @GeoHlthNetwork