

# Data Linkages between CANUE and CPTP Highlights and Opportunities

Jeff Brook

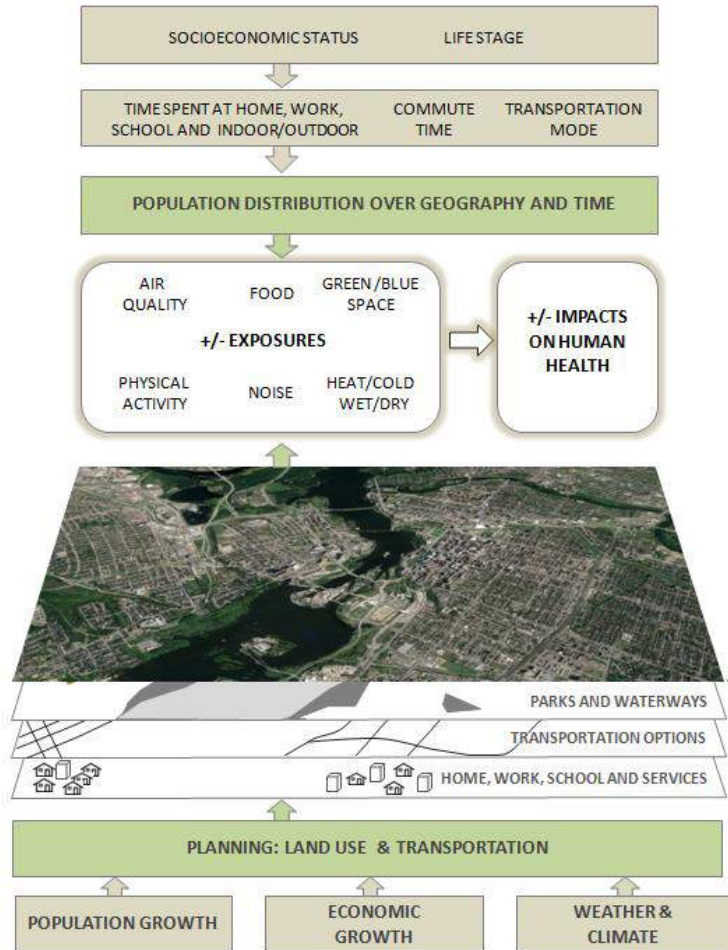


UNIVERSITY OF  
TORONTO



UNIVERSITY OF TORONTO  
DALLA LANA SCHOOL OF PUBLIC HEALTH

**SOCAAR**



*>80% of  
Canadians live  
in urban areas*

*Toronto,  
Montreal and  
Vancouver  
hold over  
1/3<sup>rd</sup> of  
Canada's  
population*

## Short-term:

- compilation and distribution of nationally-consistent environmental data

## Medium-term:

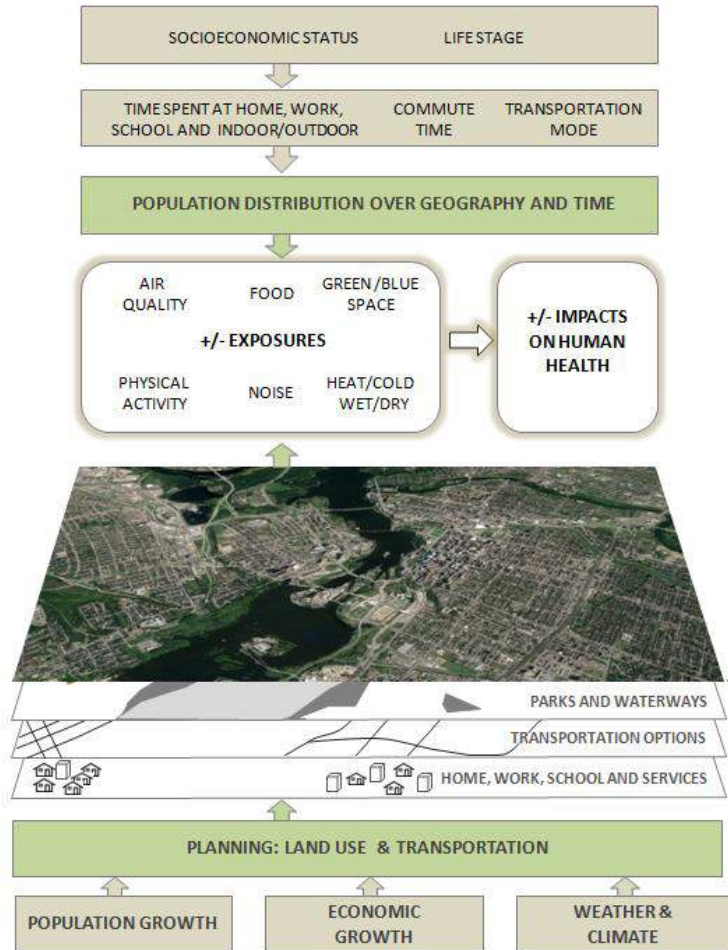
- increase knowledge on how multiple environmental factors related to the urban environment, individually and in combination, affect health

## Longer-term:

- inform decisions on how our urban/suburban environment can be modified to improve health.



# CANUE's Objectives



## NEIGHBOURHOOD FACTORS



AIR QUALITY

## GREEN/BLUE SPACES



NOISE

## CLIMATE

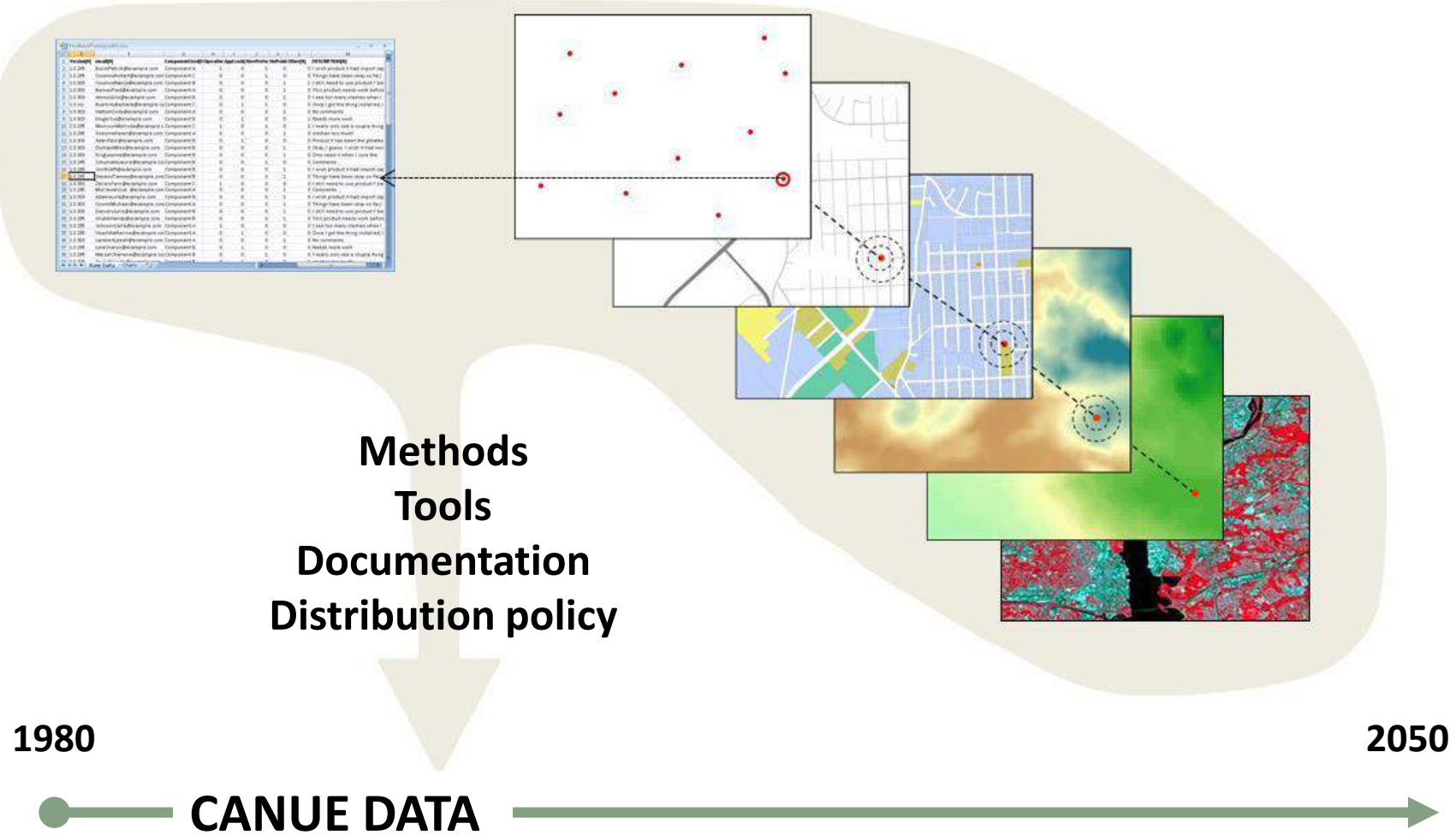


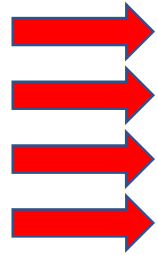
TRANSPORTATION

>80% of Canadians live in urban areas

Toronto, Montreal and Vancouver hold over 1/3<sup>rd</sup> of Canada's population







# I hope you like maps ...





## DATA PORTAL

Home

-  MENU
-  AVAILABLE DATA
-  MAP BROWSER
-  DATA REQUEST
-  DATA DOWNLOAD
-  RESTRICTED AREA



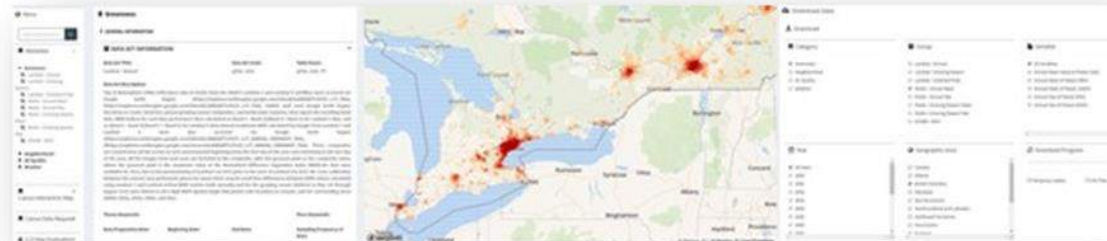
The Canadian Urban Environmental Health Research Consortium  
advancing research on urban living and human health

WELCOME TO THE CANUE DATA PORTAL | databeta.1

DOCUMENTATION

MAP BROWSER

REQUEST AND DOWNLOAD





Help us improve! Send a report of any issues to [info@canue.ca](mailto:info@canue.ca) along with browser and computer operating system information

<https://www.canuedata.ca/>













## DATA PORTAL

 Available Data




📍 Annual Datasets



**Greenness**

-  Landsat - Annual
-  Landsat - Growing Season
-  Landsat - Greenest
-  Modis - Annual Mean
-  Modis - Annual Max
-  Modis - Growing
-  Season Mean
-  Modis - Growing
-  Season Max
-  AVHRR - NDVI


**Neighborhood**

-  Active Living


Environments


-  Nighttime Light
-  Material and Social

Deprivation Index

-  Canadian

Marginalization Index

-  Canadian Access to Employment

 Greenness - Landsat - Annual (Annual Dataset)

Dataset Description

Data Source and Quality Assessment

Data Use Conditions

Support Documentation

Variables

Maintenance and Contact

**Description:**

Top of Atmosphere (TOA) reflectance data in bands from the USGS Landsat 5 and Landsat 8 satellites were accessed via Google Earth Engine. CANUE staff used Google Earth Engine functions to create cloud free annual growing season composites, and mask water features, then export the resulting band data. NDVI indices for each time period were then calculated as (band 4 - Band 3)/(Band 4 + Band 3) for Landsat 5 data, and as (band 5 - band 4)/(band 5 + band 4) for Landsat 8 data. Annual maximum NDVI calculated by Google from Landsat 5 and Landsat 8 were also accessed via Google Earth Engine. These composites are created from all the scenes in each annual period beginning from the first day of the year and continuing to the last day of the year. All the images from each year are included in the composite, with the greenest pixel as the composite value, where the greenest pixel is the maximum value of the Normalized Difference Vegetation Index (NDVI). No data were available for 2012, due to decommissioning of Landsat 5 in 2011 prior to the start of Landsat 8 in 2013. No cross-calibration between the sensors was performed, please be aware there may be small bias differences between NDVI values calculated using Landsat 5 and Landsat 8. Final NDVI metrics both annually and for the growing season (defined as May 1st through August 31st) were linked to all 6-digit DMTI Spatial single link postal code locations in Canada, and for surrounding areas within 100m, 250m, 500m, and 1km.

**Keywords:**

Greenness - Landsat - NDVI - satellite monitoring - normalized difference vegetation index - annual - growing season

**Place Keywords:**


Canada - national

**Metadata PDF:**

[Download Metadata](#)

**Geographic Coverage:**

65.14N , -141.02W



41.68S , -52.62E

**Coordinate System:** Geographic  
Coordinate System

**Datum:** WGS84

**Type:** Point      **Unit:** Decimal Degree      **EPSG:** 4326

**Geometry Data Source:**  
DMTI Spatial Inc. postal codes

## DATA PORTAL

Available Data

Annual Datasets

Greenness

Landsat - Annual

Landsat - Growing

Landsat - Greenest

Modis - Annual Mean

Modis - Annual Max

Modis - Growing

Season Mean

Modis - Growing

Season Max

AVHRR - NDVI

Neighborhood

Active Living

Environments

Nighttime Light

Material and Social

Deprivation Index

Canadian

Marginalization Index

Canadian Access to Employment

Greenness - Landsat - Annual (Annual Dataset)

Dataset Description

Data Source and Quality Assessment

Data Use Conditions

Support Documentation

Variables

Maintenance and Contact

Variables:

Annual Mean Value at Postal Code

Annual Mean of Means 100m

Annual Mean of Means 250m

Annual Mean of Means 500m

Annual Mean of Means 1000m

Annual Max of Means 100m

Annual Max of Means 250m

Annual Max of Means 500m

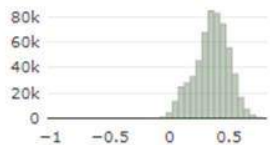
Annual Max of Means 1000m

VIEW MAP

GRLAN84\_01 - Annual Mean Value at Postal Code

Annual mean NDVI at postal code (range -1 to 1)

Histogram



Summary

Total Number of Postal Codes:

572927

Postal Codes with Value:

572374

Postal Codes with No Data:

553

Min Value:

-1.00


Max Value:

0.79

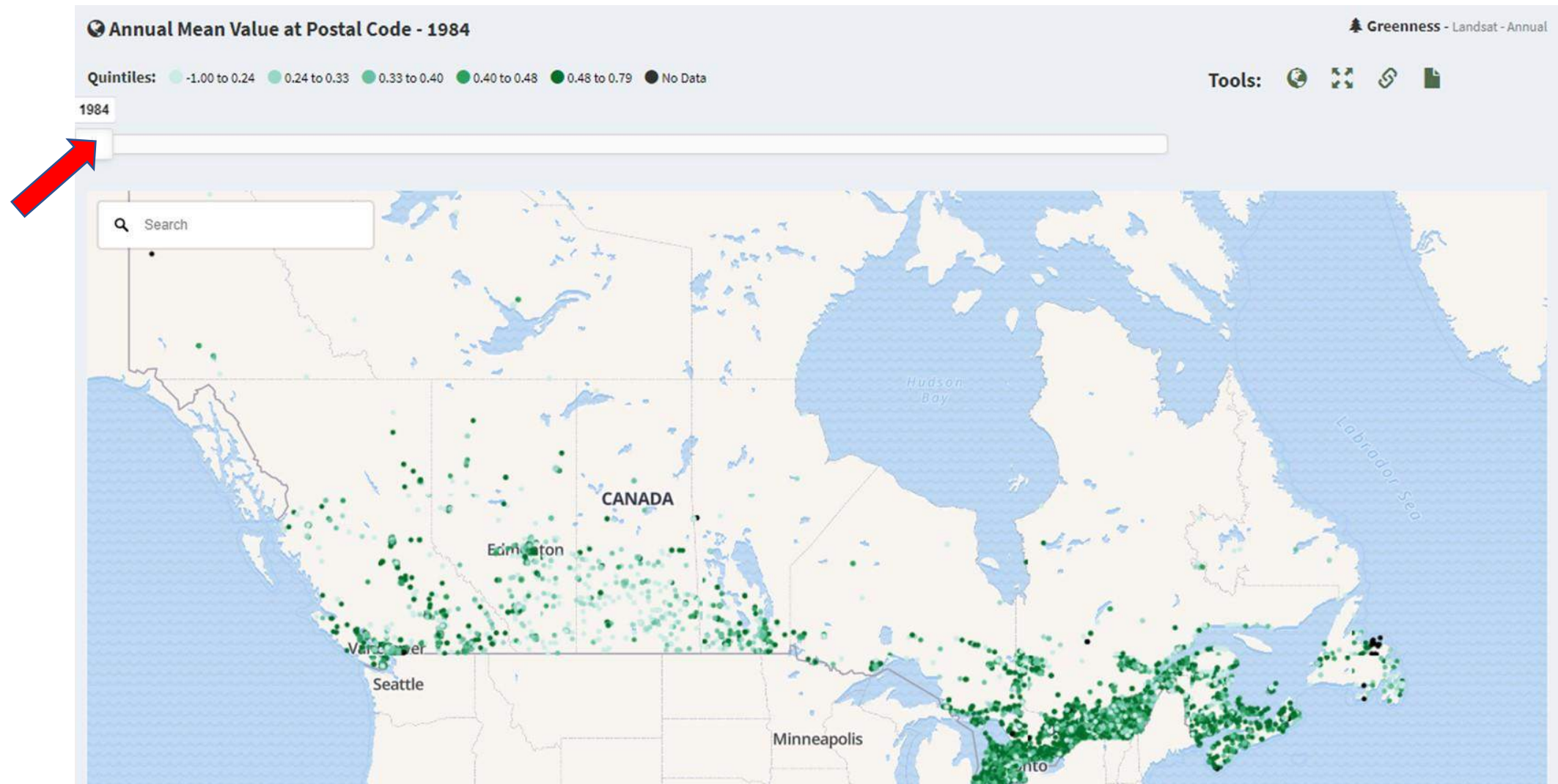
Average:

0.36

% of Postal Codes with Value(blue) and No Data(red)



Canadian Urban Environmental Health Research Consortium





## Pre-linked CANUE data holders

### Observational cohort studies

#### Canadian Partnership for Tomorrow Project (CPTP)

##### *National harmonized cohort*



- 8 Canadian provinces
- 300 000 participants
- Age 30 to 74 years

##### *Regional cohorts*



- Province of Alberta
- 55 000 participants
- Age 35 to 69 years



- 4 Atlantic provinces
- 35 935 participants
- Age 18 to 78



- Province of British Columbia
- 29 850 participants
- Age 35 to 74



- Province of Quebec
- 43 046 participants
- Age 40 to 69



- Province of Ontario
- 225 000 participants
- Minimum age 18 years

#### Canadian Longitudinal Study on Aging (CLSA)



- 10 Canadian provinces
- 50 000 participants
- Age 45 to 85 years

#### Canadian Healthy Infant Longitudinal Development Study (CHILD)



- Vancouver, Edmonton, Winnipeg, Toronto
- 3 621 pregnant mothers + 3 455 children

### Administrative health data holders

#### Manitoba Centre for Health Policy



- Province of Manitoba
- Data on healthcare, health services, vital statistics, education, social/family support

#### Population Data BC



- Province of British Columbia
- Data on healthcare, health services, vital statistics, child development, education

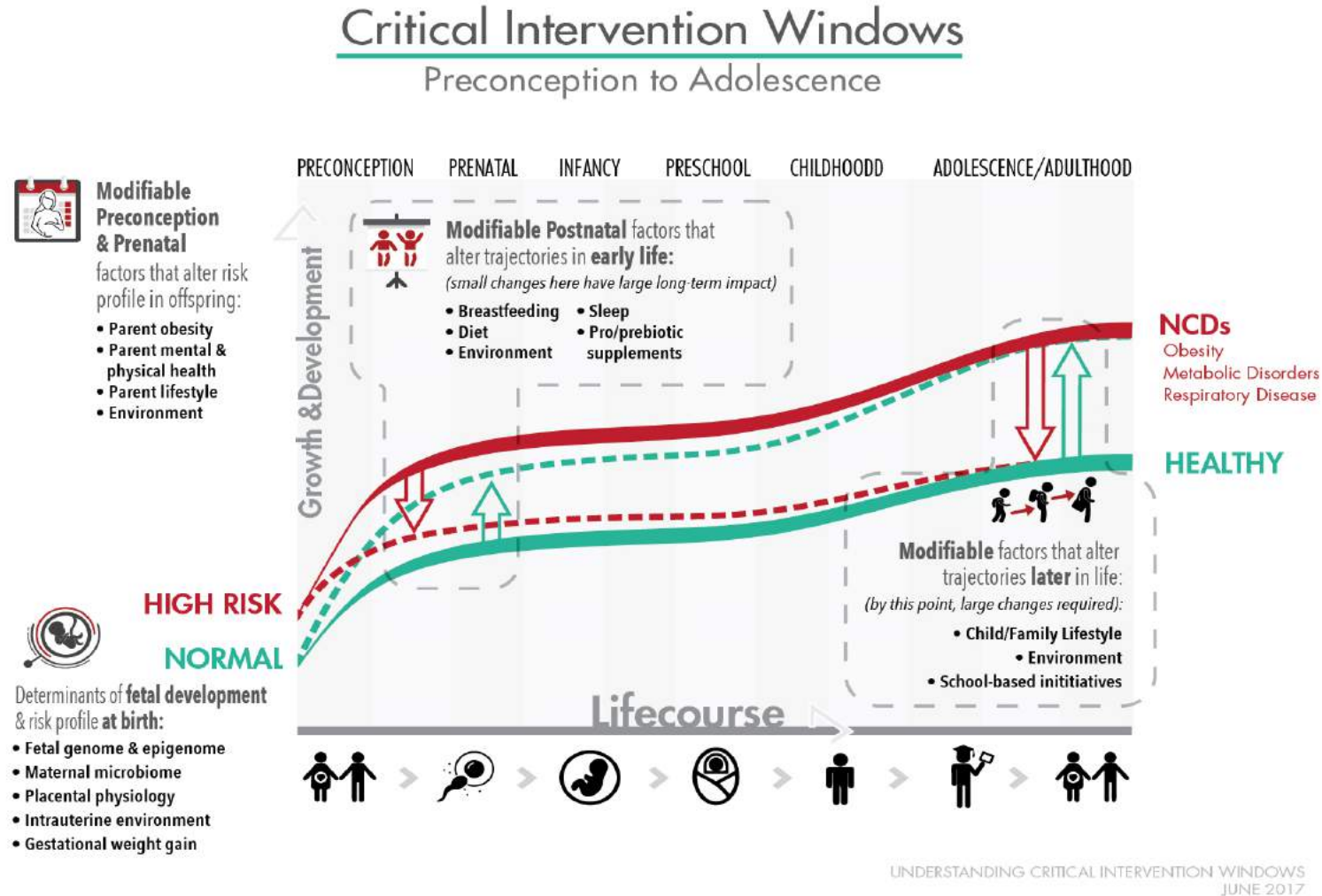
# Top 10 Research Priorities in Spatial Life Course Epidemiology

Jia et al., EHP 2019

---

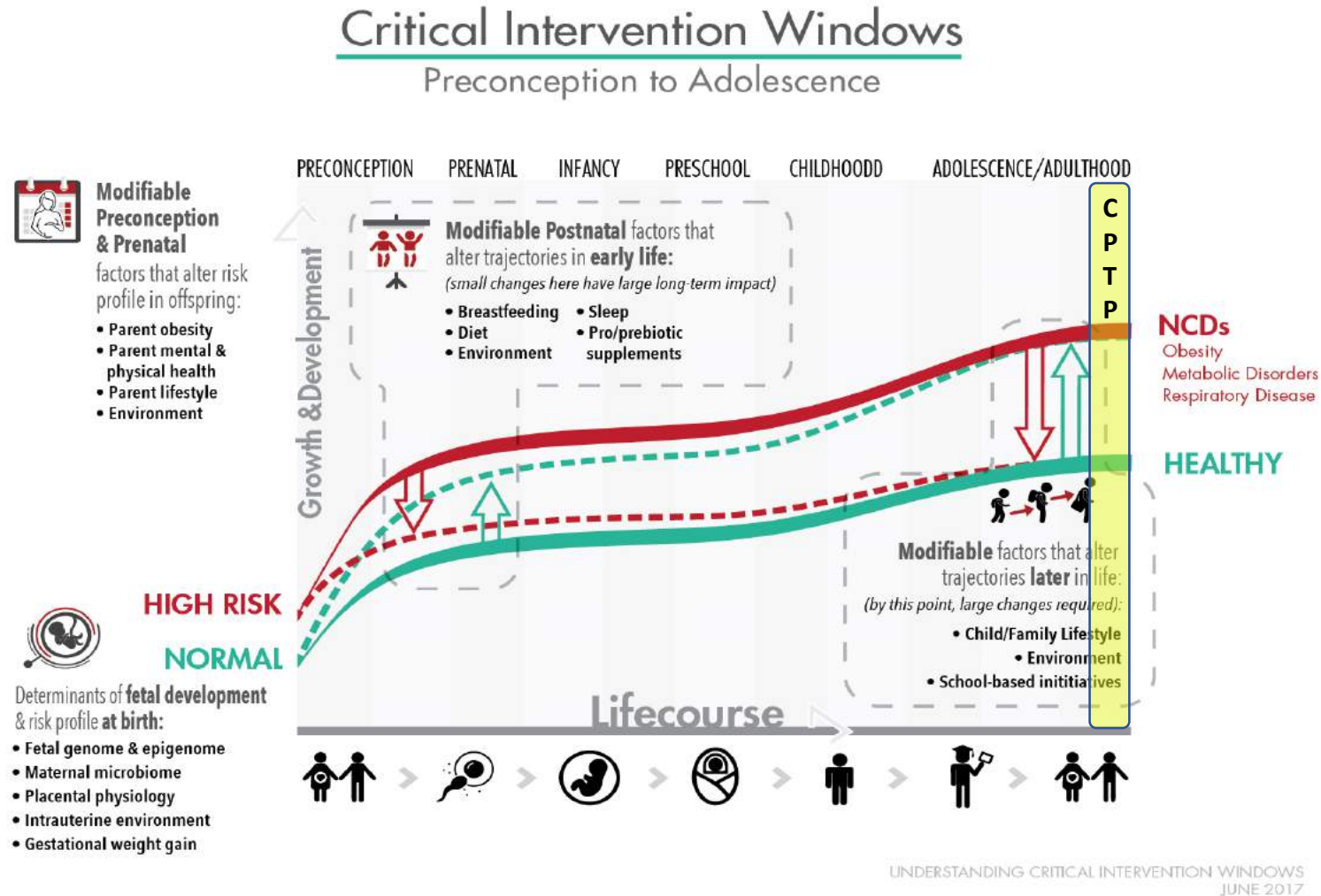
- **Create life course spatial exposure metrics**
- **Define and operationalize composite and cumulative exposure concepts**
- Improve personalized exposure assessment in prospective studies
- Understand the role of residential self-selection
- Tap into emerging Big Data streams to capture spatial exposure and behavior information
- Facilitate the development and use of complex systems models
- Increase transdisciplinary collaboration to capitalize on innovative data and methods
- Examine and address health equity
- Expand the scope and scale of research from local and regional to national and global
- Safeguard privacy while ensuring research needs.

# Why Life course? - Common origins hypothesis

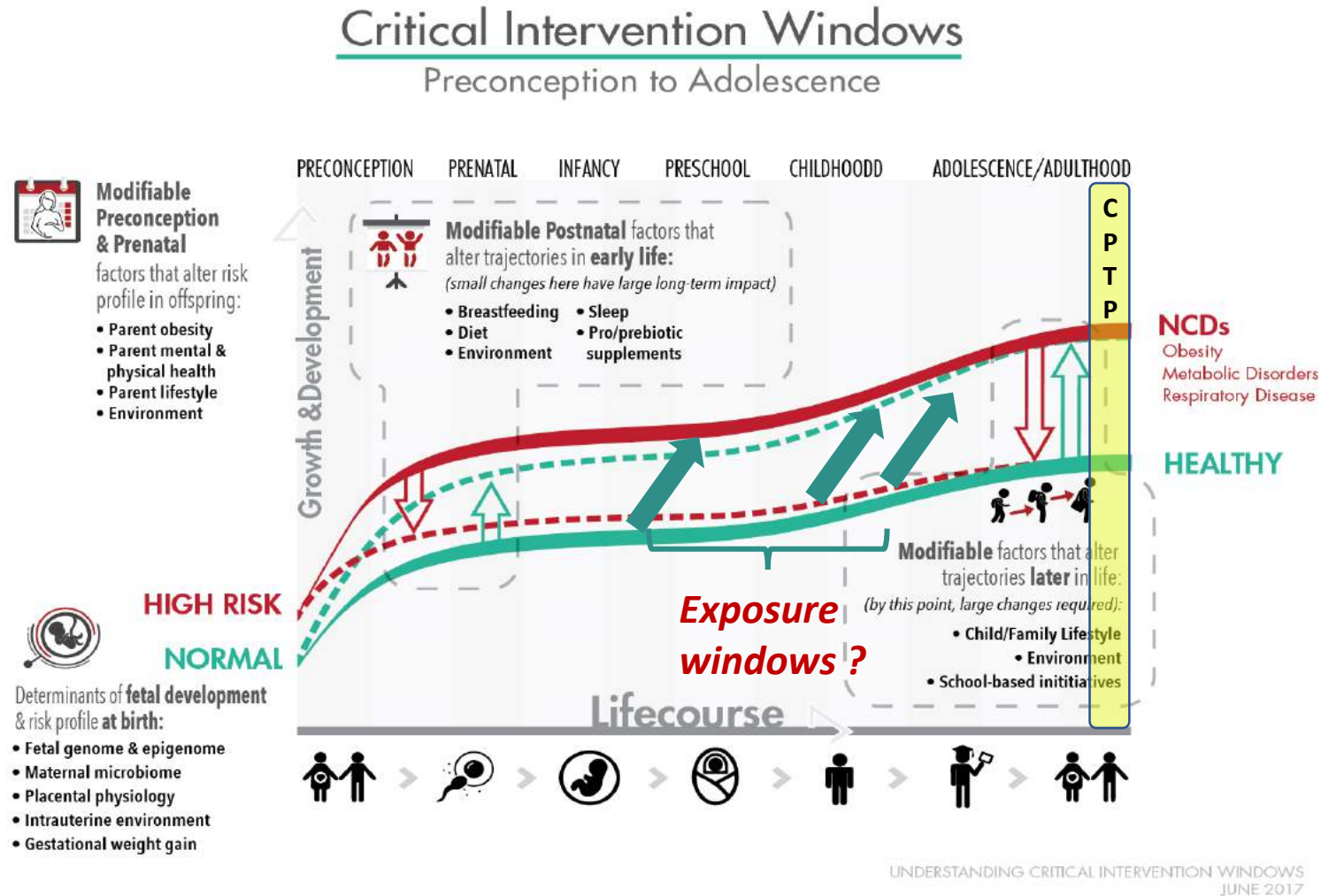




# Why Life course? - Common origins hypothesis



# Why Life course? - Common origins hypothesis





# The Canadian Urban Environmental Health Research Consortium

advancing research on urban living and human health

A PAN-CANADIAN EFFORT THAT IS ADVANCING RESEARCH ON URBAN LIVING AND HUMAN HEALTH

## DATA AND TOOLS

## LINKING TO HEALTH

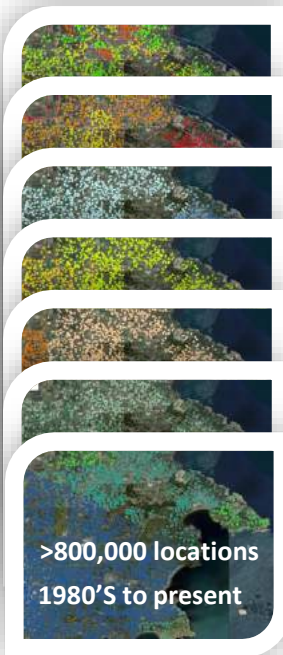
## ENVIR HEALTH RESEARCH

### CANUE DATA PORTAL

- Nitrogen Dioxide
- Fine Particulates
- Sulfur Dioxide
- Ground-level Ozone
- NDVI greenness
- Nighttime Light
- Heat & Cold events
- Rain, Snow & Soil Moisture
- Local Climate Zones
- Material & Social Deprivation
- Marginalization
- Active Living Index
- Access to Employment

#### COMING SOON

- Food environment
- Noise
- Microscale urban features via machine learning and high-res images



### Key HEALTH DATA PARTNERS



CANADA'S LARGEST AGING COHORT



CANADA'S LARGEST BIRTH COHORT



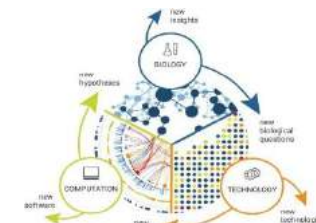
CANADA'S LARGEST POPULATION COHORT



Databases



"Omics"

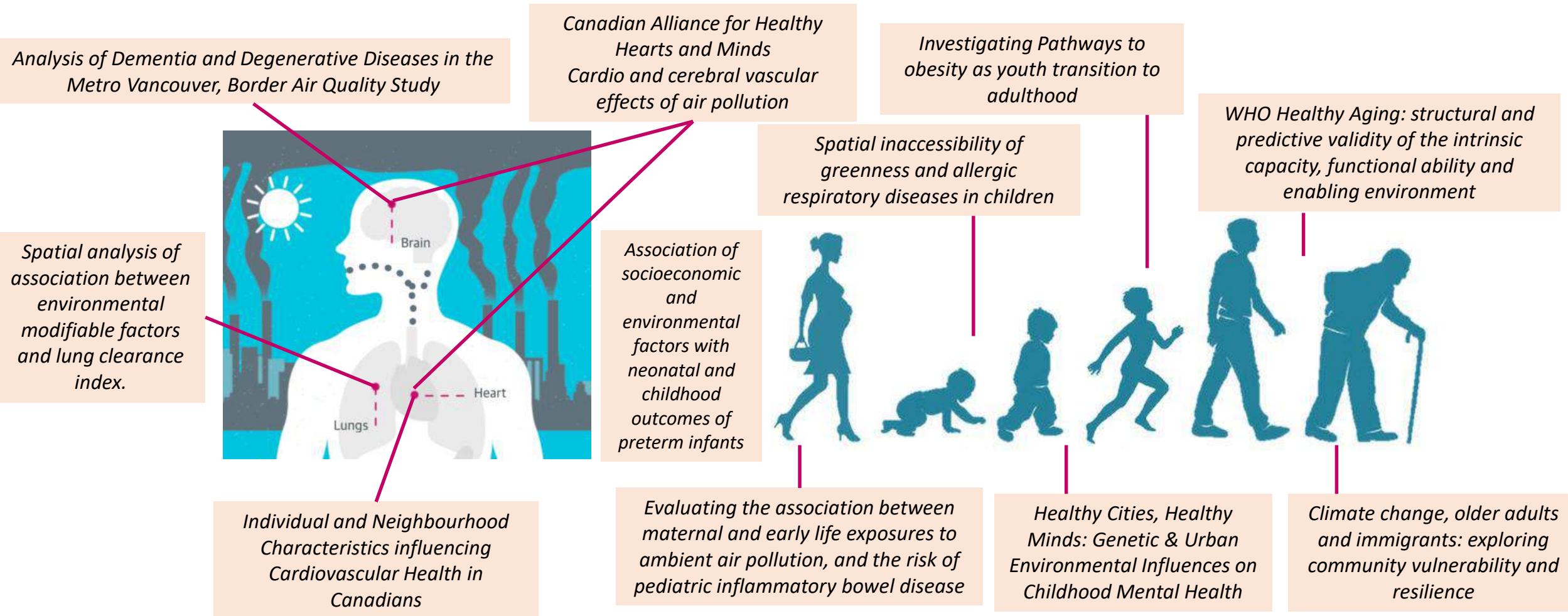


Bioinformatics



# Data request examples:

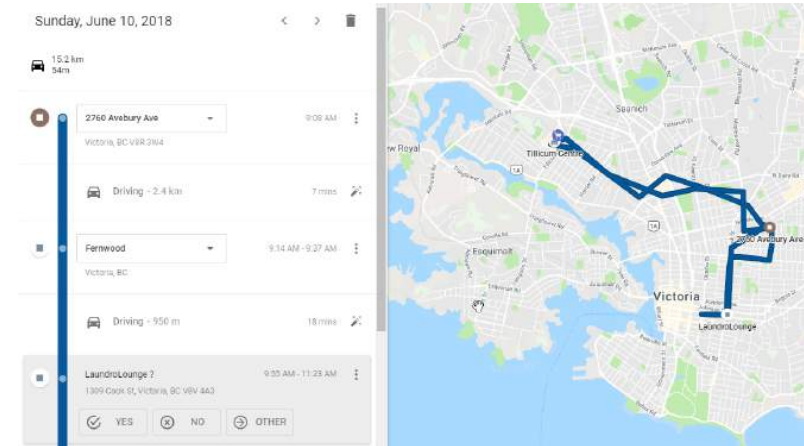
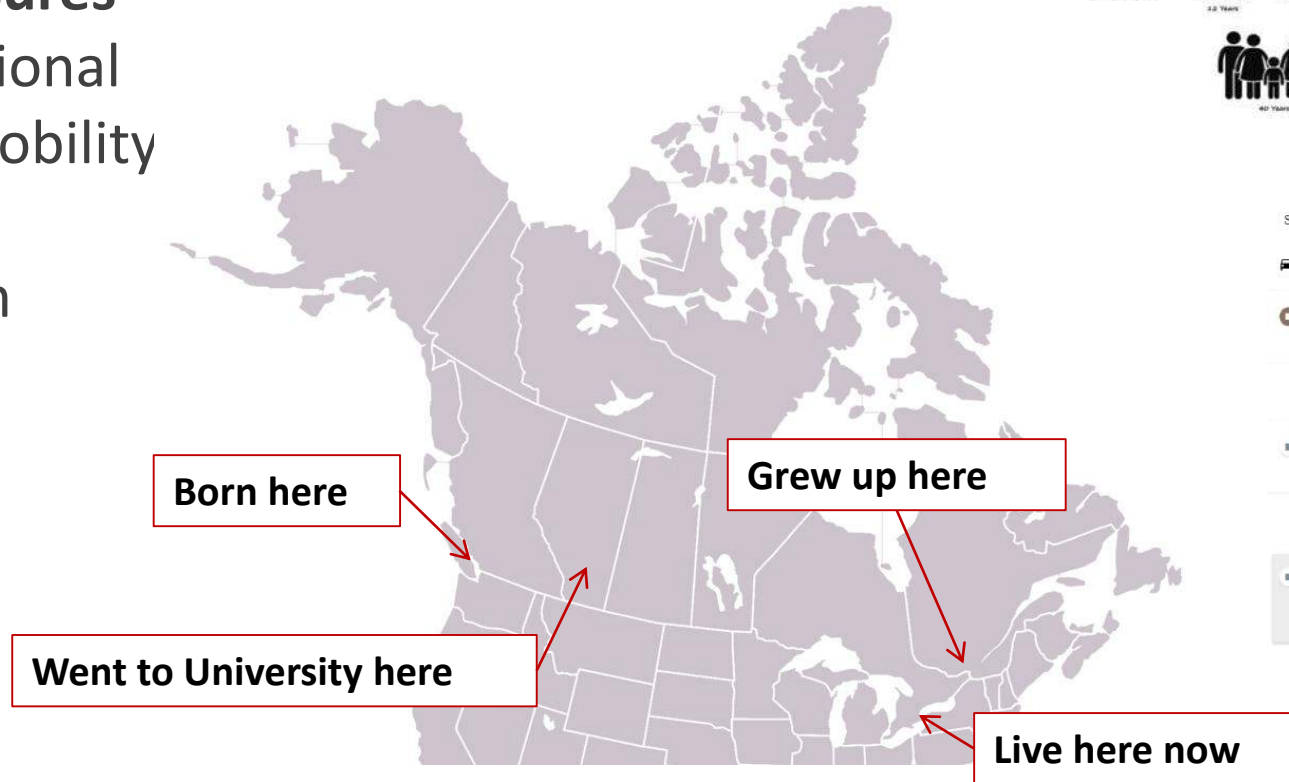
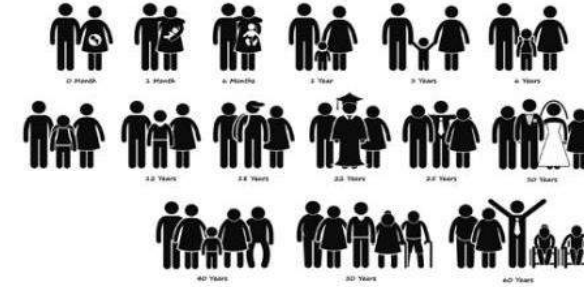
## Facilitating environmental health research through the lifecourse



# Taking into account Residential Mobility

## A challenge for estimating lifecourse exposures

- Multi-generational
- Geographic mobility
  - Long term
  - Short term



## Health databases with residential history via CANUE and the SDLE

### Canadian Partnership for Tomorrow Project (CPTP) regional cohorts



- Province of British Columbia
- 29 850 participants aged 35 to 74
- Baseline data collection: 2009-2016
- Residential history: **1981 to 2016**
- **99.9% linkage rate**



- Province of Ontario
- 225 000 participants, age  $\geq 18$  years
- Baseline data collection: 2010-2017
- Residential history: **1981 to 2016**
- **97% linkage rate**



- 4 Atlantic provinces
- 35 935 participants age 18 to 78
- Baseline data collection: 2009-2015
- Residential history: **1981 to 2016**
- **99.4% linkage rate**



Exposure	Years covered
PM2.5	2000-2016
NO2 ( <i>annual and monthly</i> )	1984-2012
SO2	2007-2015
O3 ( <i>annual and monthly</i> )	2002-2015
NDVI Landsat (greenness)	1984-2016
MSDI (SES measure)	1989-2016 ( <i>index years + lead/lag time</i> )
Can-Marg (SES measure)	1989-2008 ( <i>index years + lead/lag time</i> )
Access to employment	2001-2016 ( <i>index year + lead/lag time</i> )
Can-ALE (walkability)	2001-2016 ( <i>index years + lead/lag time</i> )
Night light	1992-2013
Weather metrics	1983-2016
Water balance	1985-2015w
Local climate zones	1984-2016 ( <i>index years + lead/lag time</i> )



# Do we see more than a glimpse of our integrated lifecourse exposures?

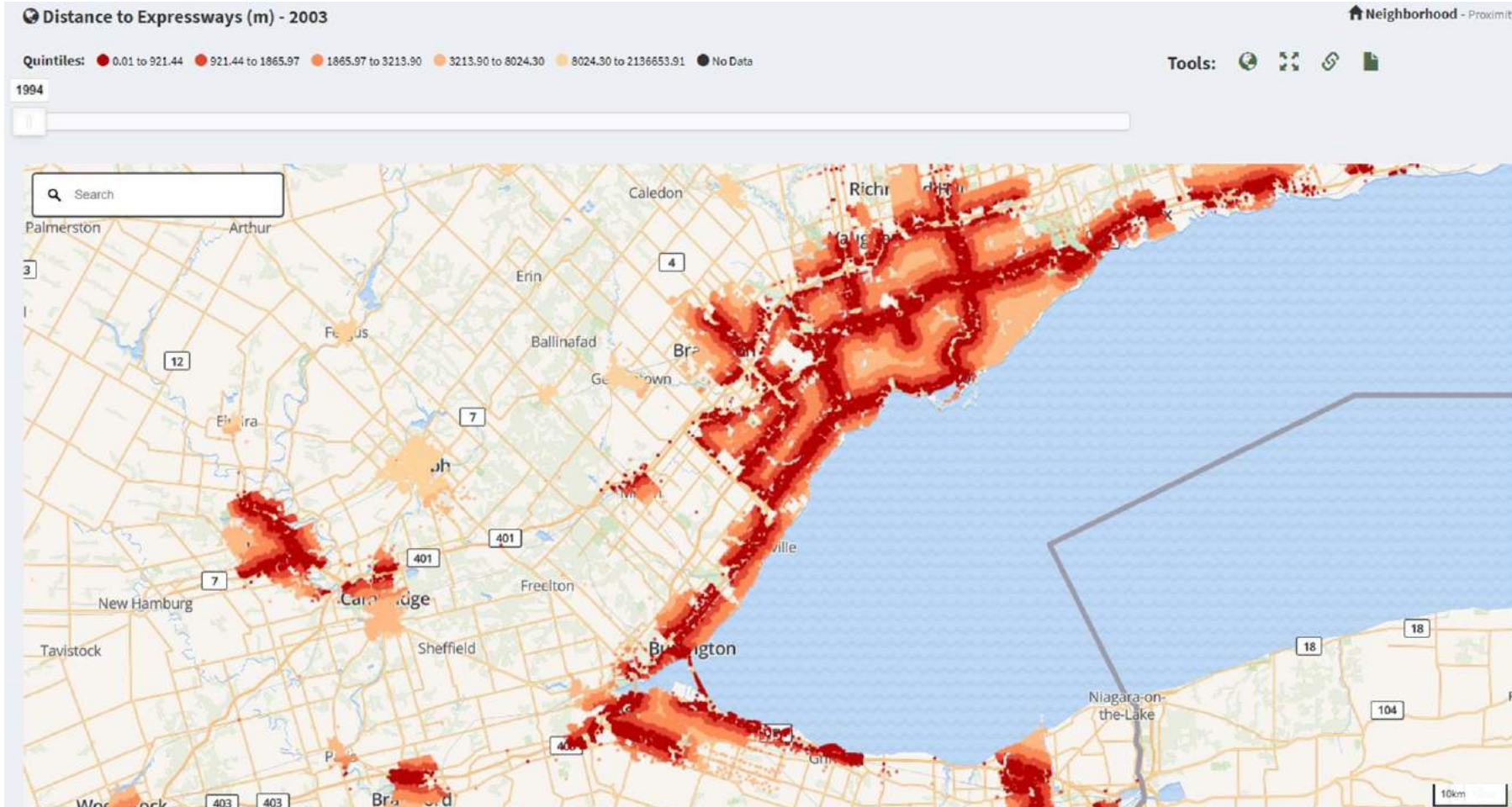




Monthly mean  
of daily vitamin  
D dose at  
ground level  
(based on  
monitoring  
data from  
1990- 2002)

Estimated ultraviolet  
exposure levels for a  
sufficient vitamin D status  
in North America.  
Fioletov VE1, McArthur LJ,  
Mathews TW, Marrett L.  
DOI:  
10.1016/j.jphotobiol.2010.  
05.002

Other variables now processing: monthly mean of daily vitamin D dose at sea level, monthly mean vitamin D index at noon, monthly 95<sup>th</sup> percentile vitamin D index at noon



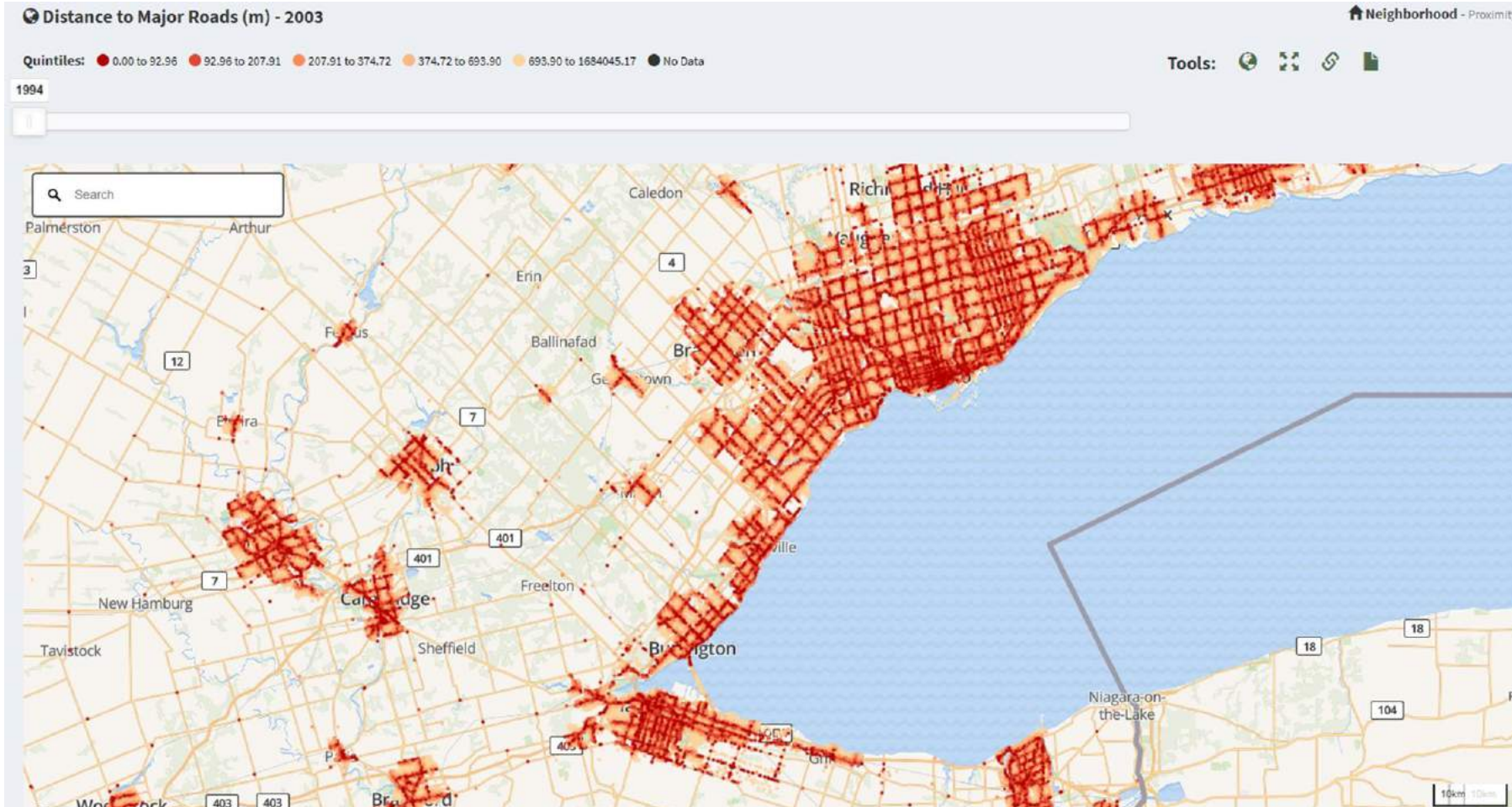
Now processing:

Proximity to roads by road type

Expressways

- based on DMTI road networks from 1996, 2001, 2006, 2011, 2016
- Postal codes from 1994, 1995, 1996, 1997 and 1998 are associated with the 1996 road network, and so on up to 2018)



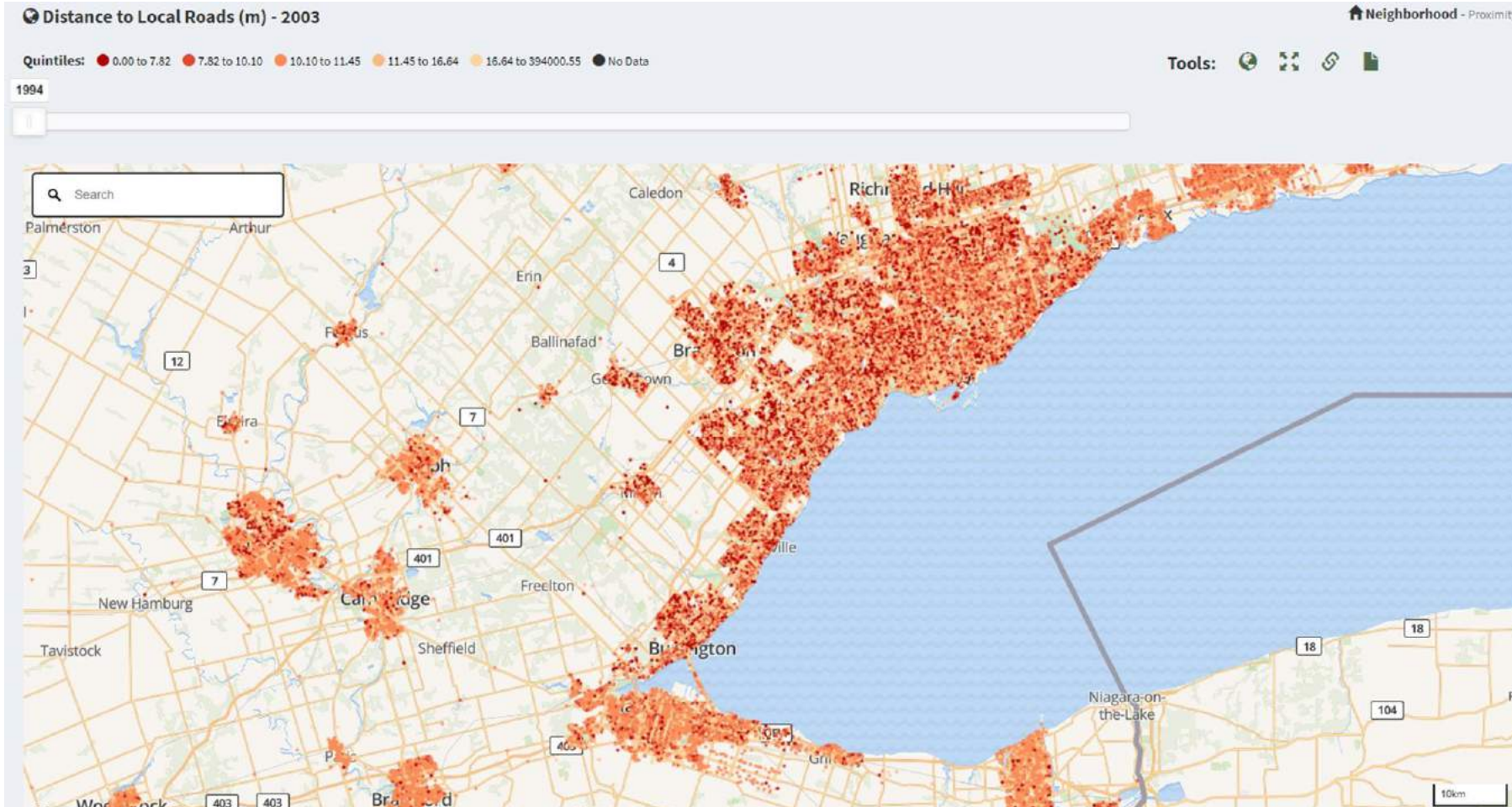


Now processing:

Proximity to roads by road type

Major Roads

- based on DMTI road networks from 1996, 2001, 2006, 2011, 2016
- Postal codes from 1994, 1995, 1996, 1997 and 1998 are associated with the 1996 road network, and so on up to 2018)



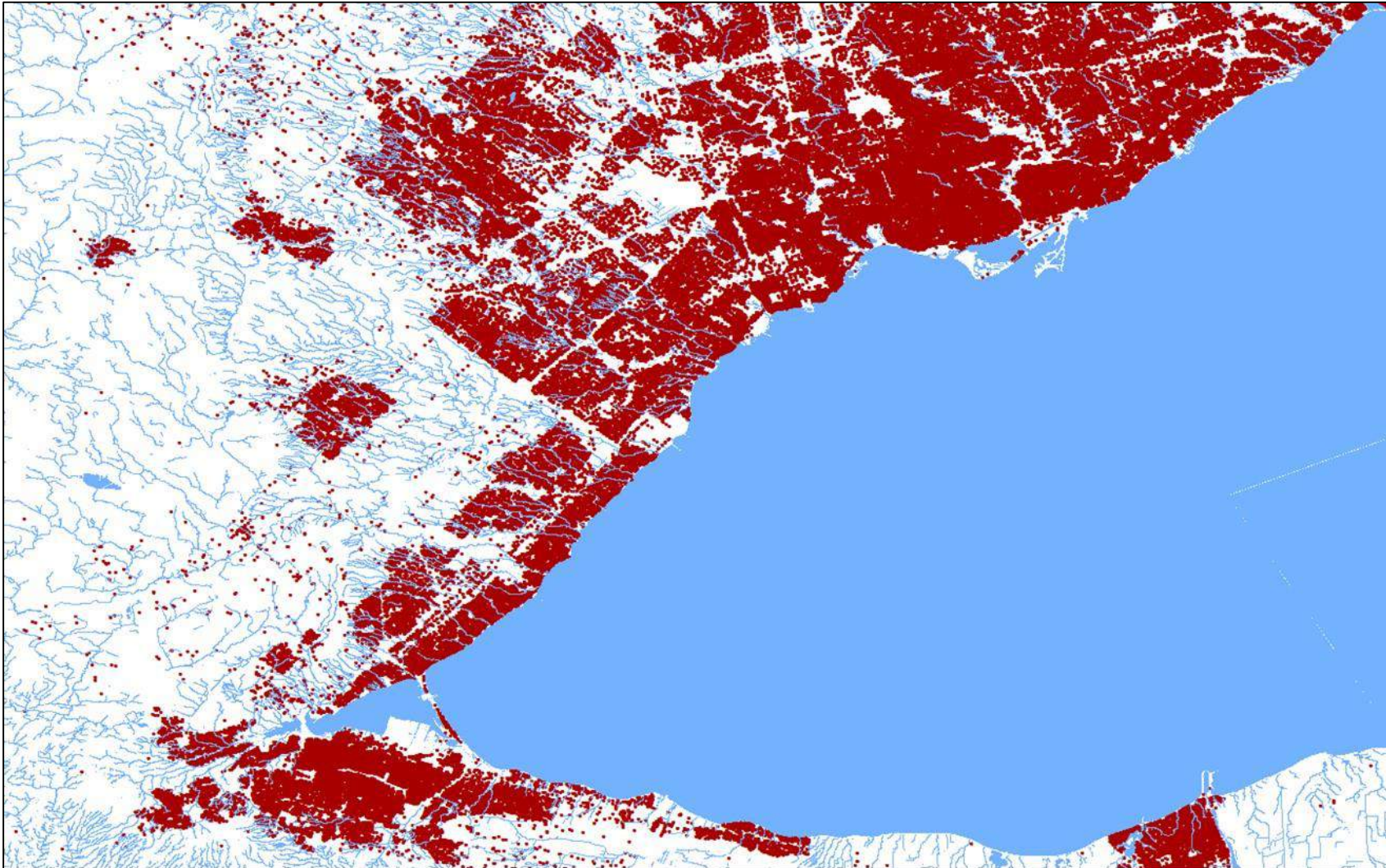
Now processing:

Proximity to roads by road type

Local Roads

- based on DMTI road networks from 1996, 2001, 2006, 2011, 2016
- Postal codes from 1994, 1995, 1996, 1997 and 1998 are associated with the 1996 road network, and so on up to 2018)





Now processing:

Proximity to water by water type

Ocean

Lake/reservoir/pond

Freshwater/tidal river

Canal

- All years based on DMTI hydrological network from 2018

(postal code locations shown in red)



# Building blocks of new metrics

- Emissions Inventories (NPRI)
- Satellite measurements of air pollutants
- LUR predictors
- High resolution visual imagery (street view, satellite)
- Accelerometry and GPS on 8 year olds in CHILD (activity spaces, locations of physical activity vs. neighbourhood structure)



# EHP | Environmental Health Perspectives

[Environ Health Perspect.](#) 2017 Aug; 125(8): 087025.  
Published online 2017 Aug 31. doi: [10.1289/EHP1279](#)  
Research

PMCID: PMC5783665  
PMID: [28934721](#)

## Association of Long-Term Exposure to Transportation Noise and Traffic-Related Air Pollution with the Incidence of Diabetes: A Prospective Cohort Study

[Charlotte Clark](#),<sup>1</sup> [Hind Sbihi](#),<sup>2</sup> [Lillian Tamburic](#),<sup>2</sup> [Michael Brauer](#),<sup>2</sup> [Lawrence D. Frank](#),<sup>3</sup> and [Hugh W Davies](#)<sup>2</sup>

[Author information](#) ► [Article notes](#) ► [Copyright and License information](#) ► [Disclaimer](#)

What are CANUE teams working on  
National high resolution noise model



# Building Blocks for a National to Global Multi-Pollutant Index

Pollutants	Data Source
<b>NO<sub>2</sub></b>	OMI Satellite ( <a href="https://disc.gsfc.nasa.gov/datasets/OMNO2_V003/summary">https://disc.gsfc.nasa.gov/datasets/OMNO2_V003/summary</a> )
<b>SO<sub>2</sub></b>	OMI Satellite ( <a href="https://disc.gsfc.nasa.gov/datasets/OMSO2_V003/summary">https://disc.gsfc.nasa.gov/datasets/OMSO2_V003/summary</a> )
<b>PM<sub>2.5</sub></b>	Dalhousie University ( <a href="http://fizz.phys.dal.ca/~atmos/martin/?page_id=140">http://fizz.phys.dal.ca/~atmos/martin/?page_id=140</a> )
<b>HCHO</b>	OMI Satellite ( <a href="http://www.temis.nl/index.php">http://www.temis.nl/index.php</a> )
<b>NH<sub>3</sub></b>	CrIS Satellite (Mark Shephard, Environment and Climate Change Canada)
<b>CO</b>	MOPITT Satellite ( <a href="https://eosweb.larc.nasa.gov/project/mopitt/mopitt_table">https://eosweb.larc.nasa.gov/project/mopitt/mopitt_table</a> )
<b>Night Lights</b>	DMSP-OLS Satellite ( <a href="https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html">https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html</a> )

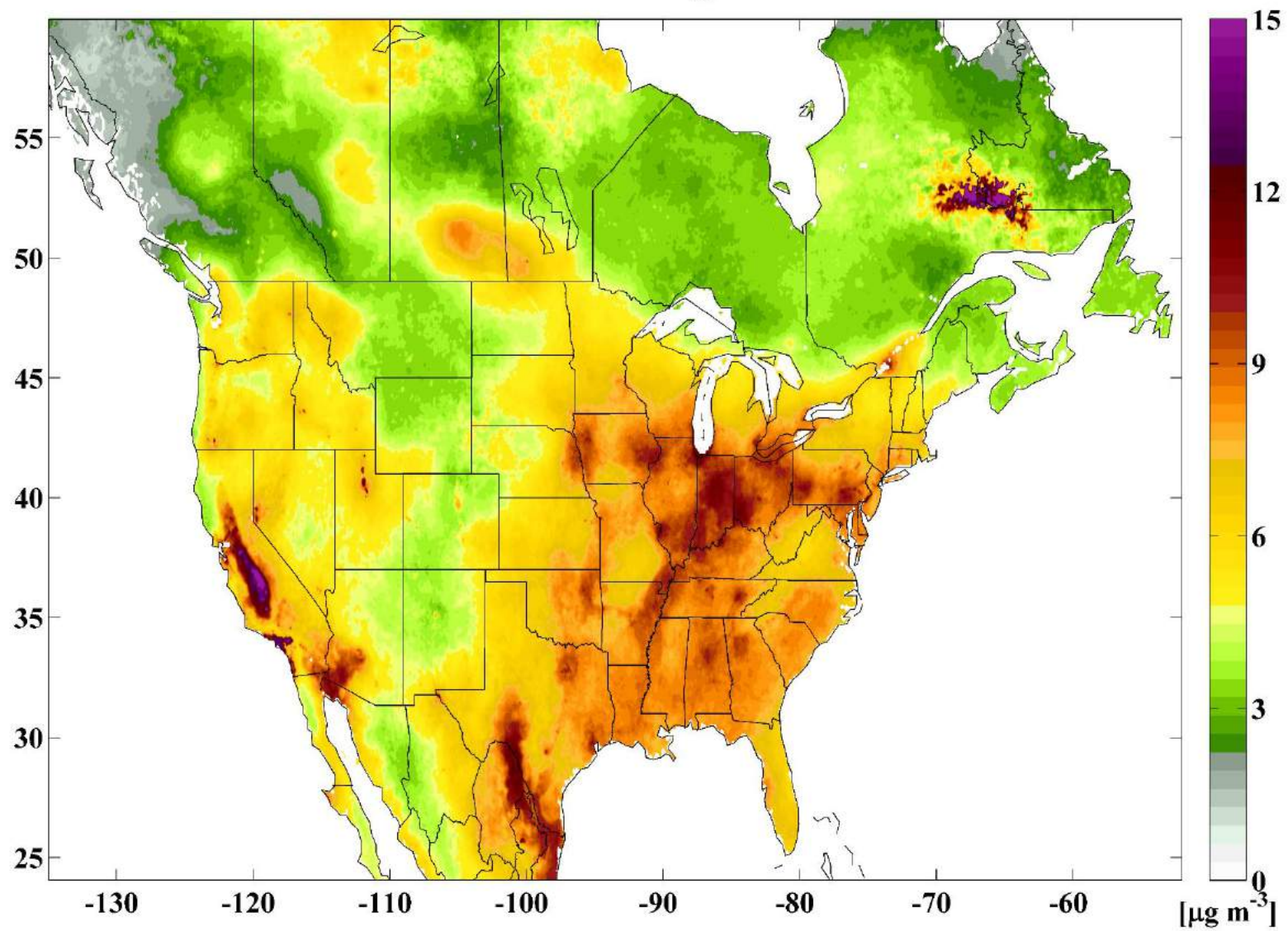
*Plus:*

Model Estimates of Global **Surface Ozone**

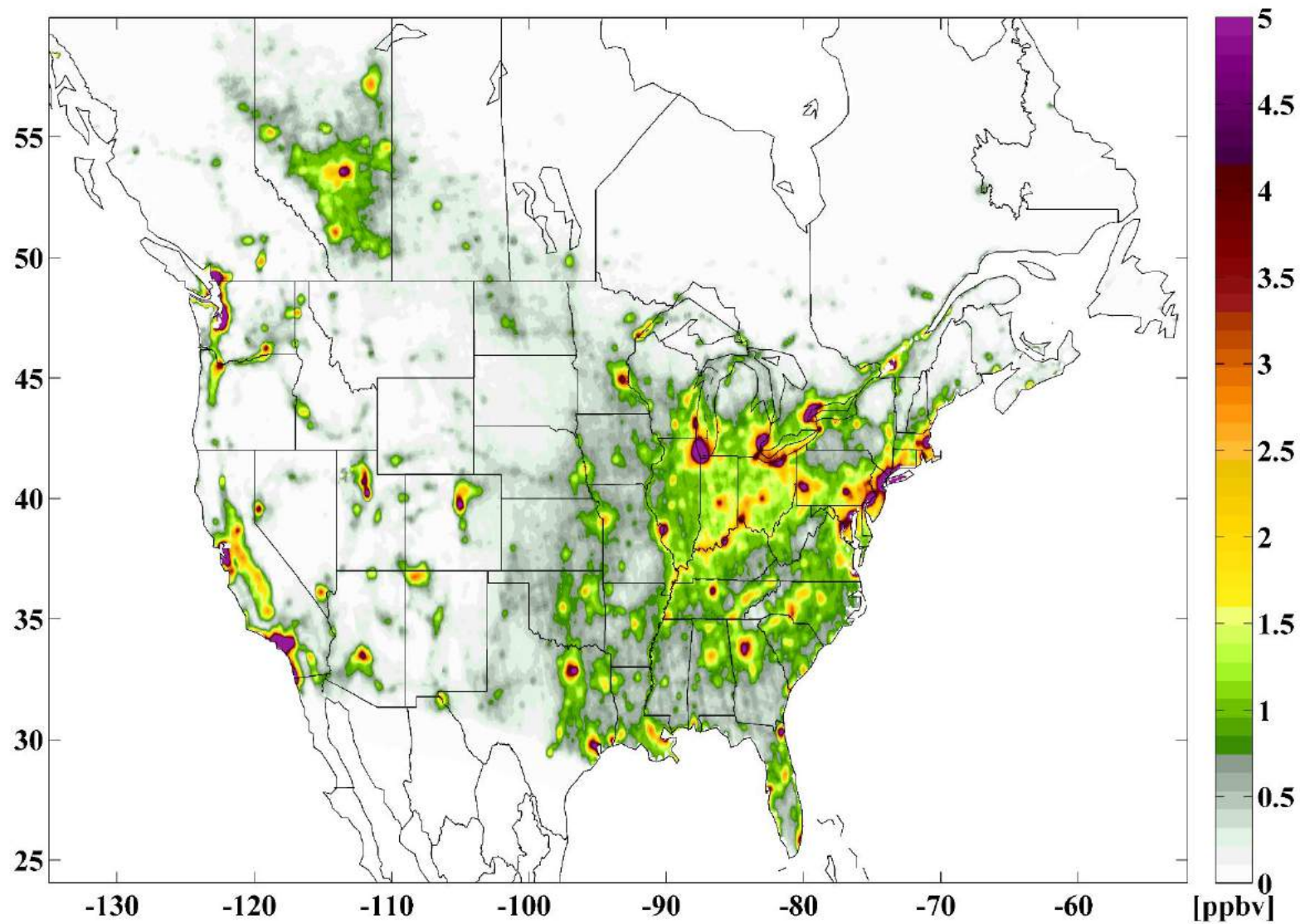
NA: Robichaud et al., 2014. Global: Anenberg et al., 2018 ; Galmarini et al., 2017  
Phase 2 of the Task Force on Hemispheric Transboundary Air Pollution project.



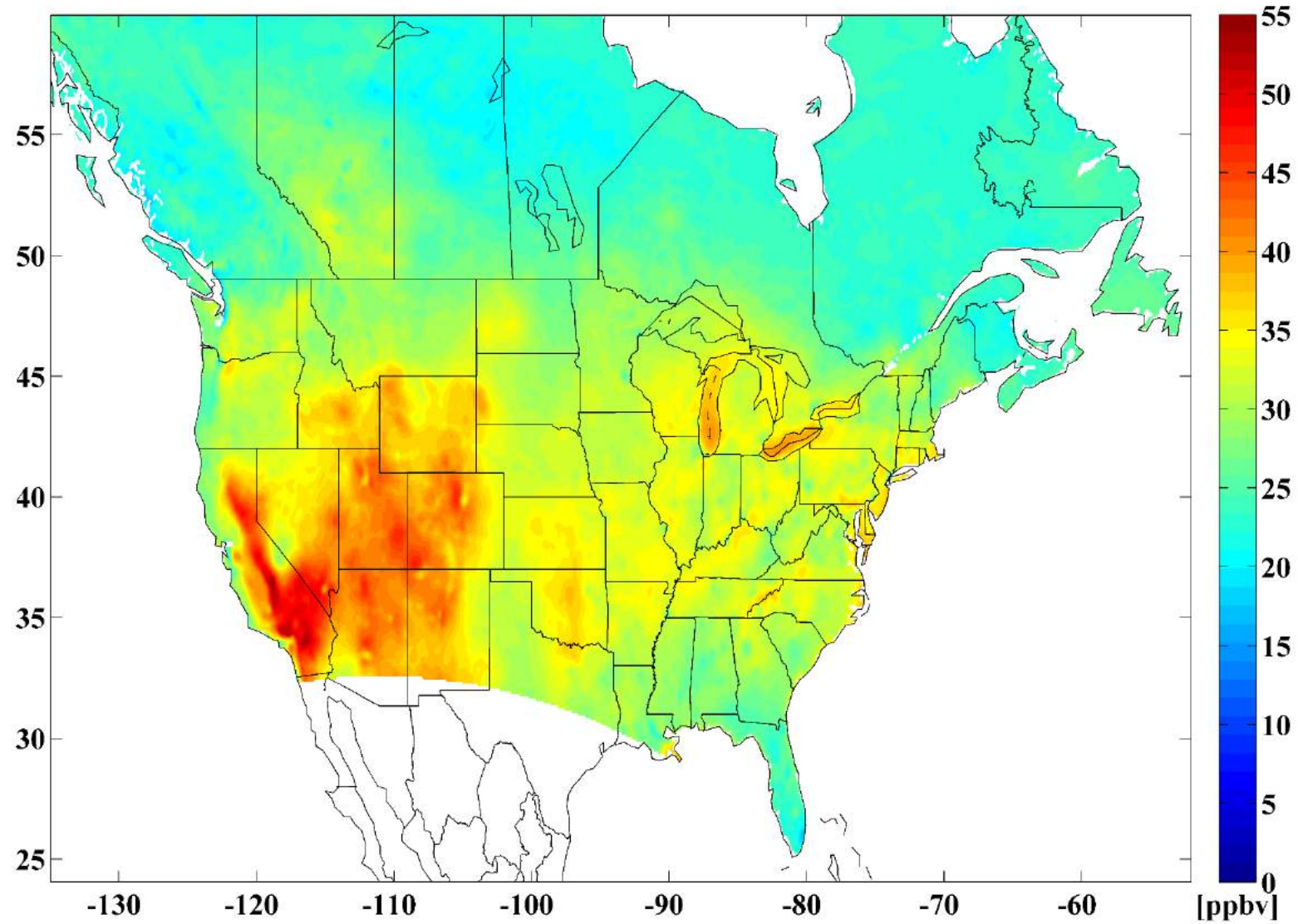
Satellite-derived PM<sub>2.5</sub> (2013)



OMI NO<sub>2</sub> Surface Mixing Ratio (2013)

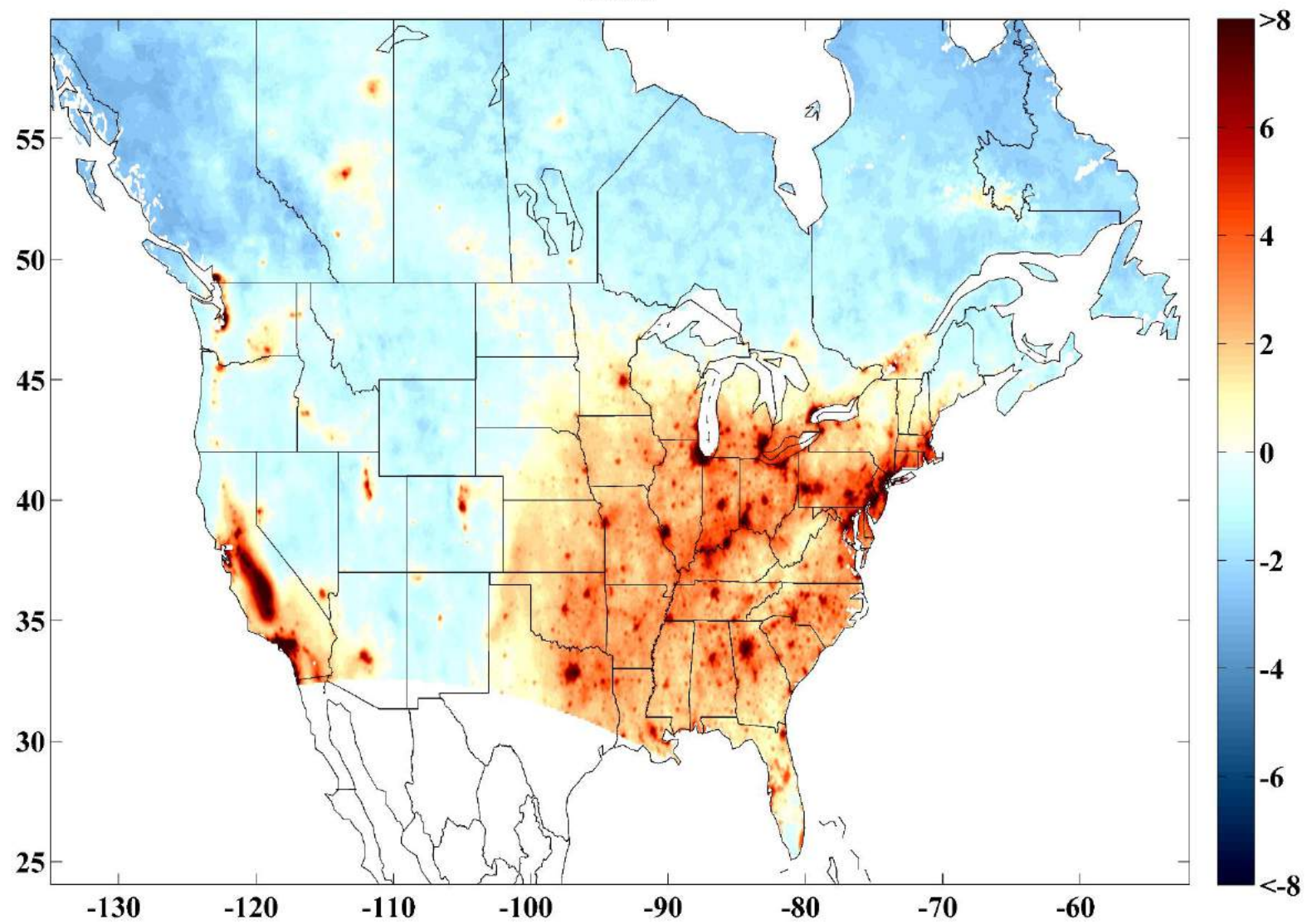


Surface O<sub>3</sub> Concentration

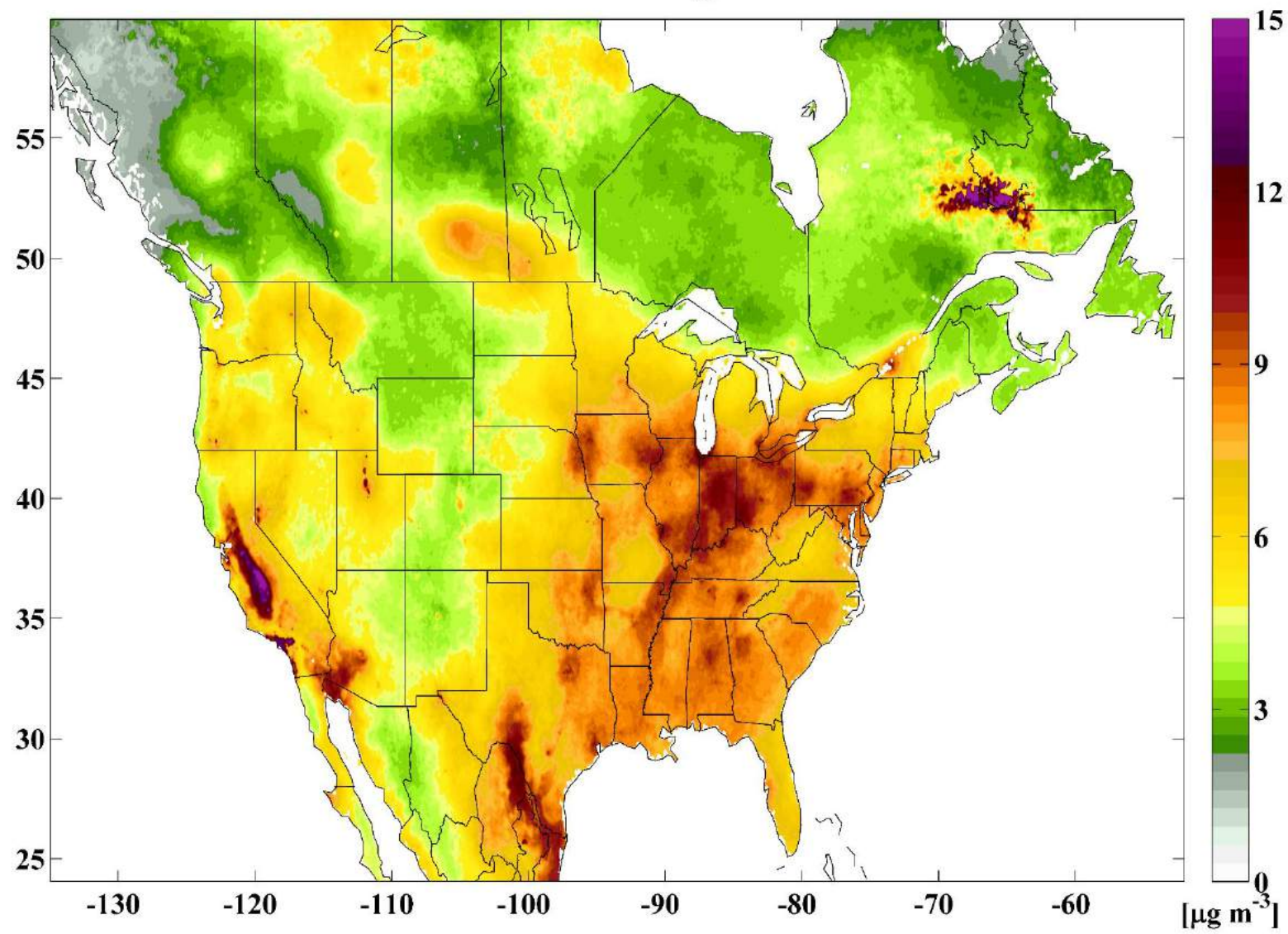




PCA1



Satellite-derived PM<sub>2.5</sub> (2013)





# Next Generation of exposure mapping



A picture tells a thousand...exposures: Opportunities and challenges of deep learning image analyses in exposure science and environmental epidemiology

Scott Weichenthal<sup>a,\*</sup>, Marianne Hatzopoulou<sup>b</sup>, Michael Brauer<sup>c</sup>

<sup>a</sup> McGill University, Department of Epidemiology, Biostatistics and Occupational Health, Montreal, QC, Canada

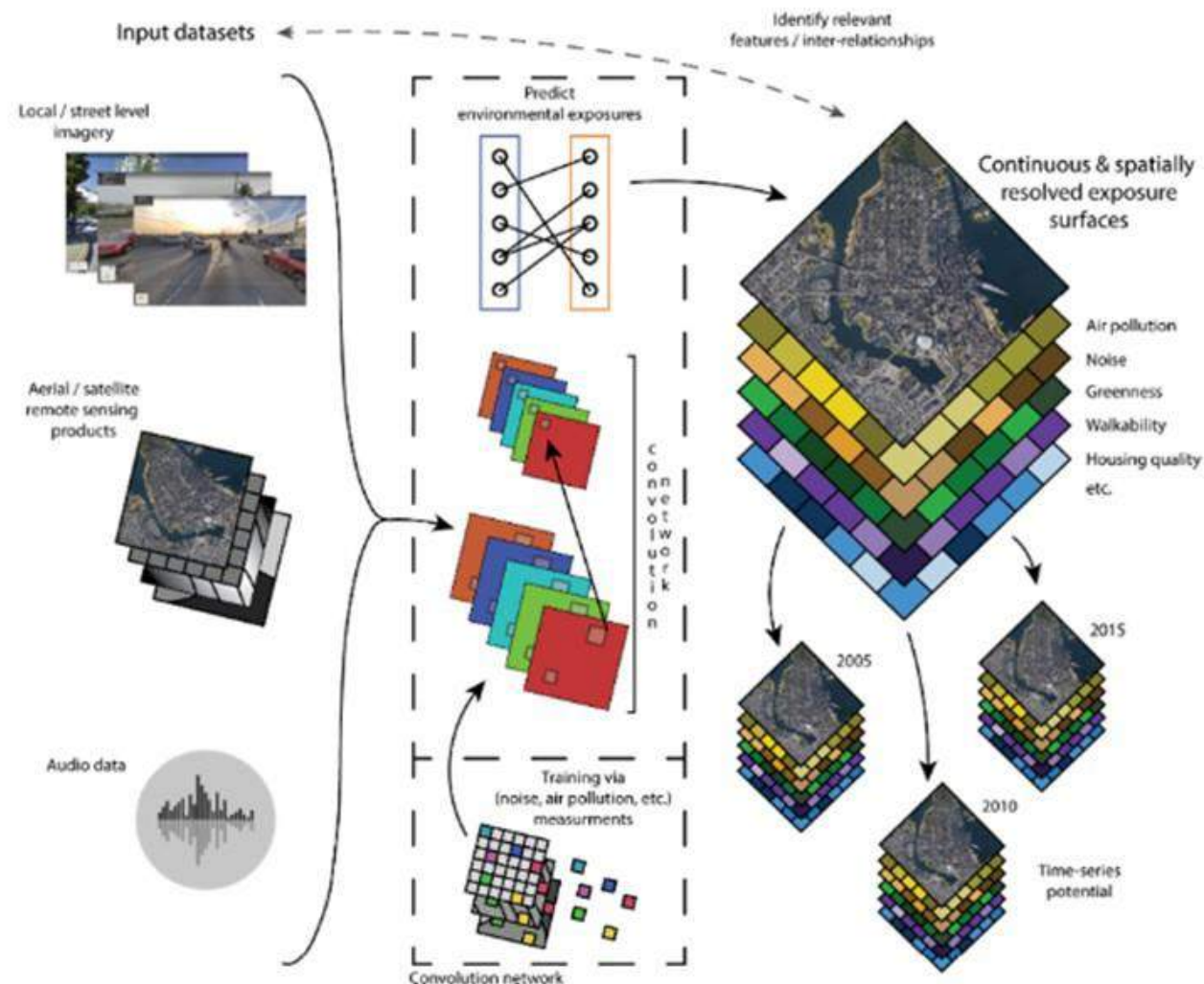
<sup>b</sup> University of Toronto, Department of Civil Engineering, Toronto, ON, Canada

<sup>c</sup> University of British Columbia, School of Population and Public Health, Vancouver, BC, Canada

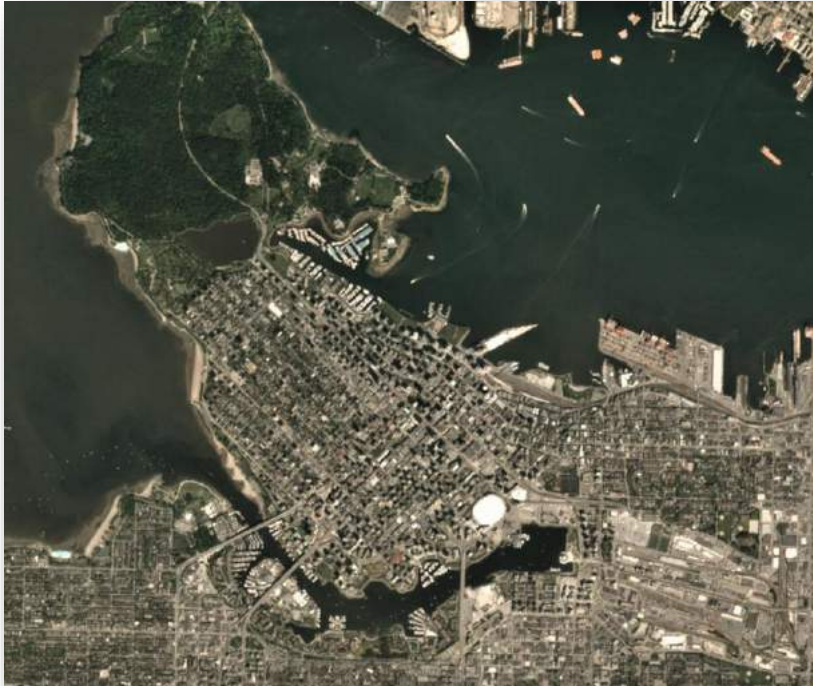


CANUE specialists are applying deep learning image analysis to develop urban environment metrics

Because the metrics are based on images rather than traditional GIS data, it may be possible to standardize micro-scale local metrics globally...







### Now working on:

Can we use machine learning to extract features of the built environment that impact micro → meso → macro climate?

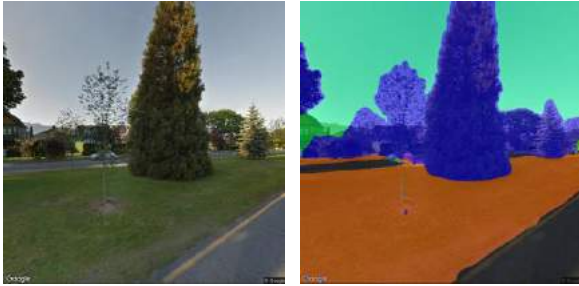
High resolution satellite data:

- PlanetScope (3m), RapidEye (5m)

Street-level images:

- green, building types, paved areas, etc.





- Greenness – trees, grass, street green vs backyard green vs parks, matching urban tree inventories to GSV to map species → shade, water needs, allergens...
- Paved/impervious, sky view, building heights/materials → micro climate influencers
- Sidewalks, curbs, bikes → physical activity promoters
- Traffic congestion, building heights, street canyons → noise, air quality modelling
- Developing input variables for models
- Identifying urban form features, changes over time
- Use existing metrics to train classifiers – i.e., what does walkability ‘look’ like and can we identify from satellites?
- And more....



AIR QUALITY



NOISE



TRANSPORTATION



NEIGHBOURHOOD FACTORS



GREEN/BLUE SPACES





CLIMATE

*Int. J. Environ. Res. Public Health* **2018**, *15*(8), 1719; <https://doi.org/10.3390/ijerph15081719>

Open Access Article

## Comparing the Normalized Difference Vegetation Index with the Google Street View Measure of Vegetation to Assess Associations between Greenness, Walkability, Recreational Physical Activity, and Health in Ottawa, Canada

Paul J. Villeneuve <sup>1,\*</sup> , Renate L. Ysseldyk <sup>1</sup> , Ariel Root <sup>1</sup>, Sarah Ambrose <sup>1</sup>, Jason DiMuzio <sup>1</sup>, Neerija Kumar <sup>1</sup>, Monica Shehata <sup>1</sup>, Min Xi <sup>1</sup>, Evan Seed <sup>2</sup>, Xiaojiang Li <sup>3</sup>, Mahdi Shooshtari <sup>4</sup> and Daniel Rainham <sup>5</sup>

<sup>1</sup> Department of Health Sciences, Carleton University, Ottawa, ON K1S 5B6, Canada

<sup>2</sup> Dalla Lana School of Public Health, University of Toronto, Toronto, ON M5T 3M7, Canada

<sup>3</sup> Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, MA 02139, USA

<sup>4</sup> Department of Geography, University of Victoria, Victoria, BC V8W 2Y2, Canada

<sup>5</sup> Healthy Populations Institute, Dalhousie University, Halifax, NS B3H 4R2, Canada





# Developing input variables for models

Current Fields of Interest:



Road Extraction

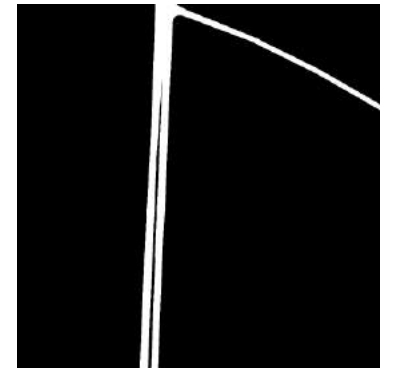
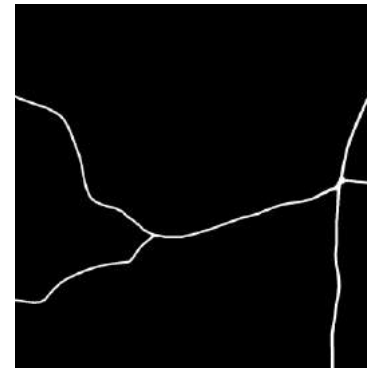
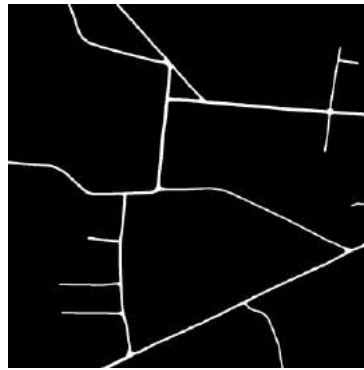


Building Detection



Land Cover Classification

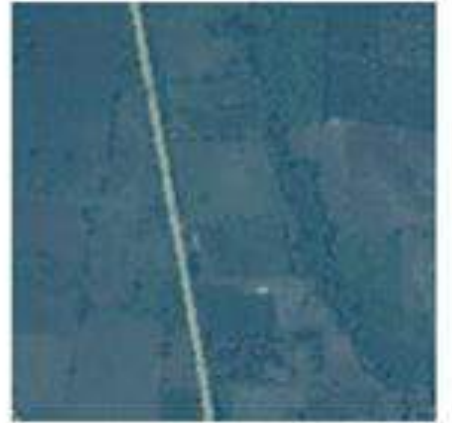
# Road Segmentation



# Results

## Challenges:

- Tree canopy obscures roads sometimes!

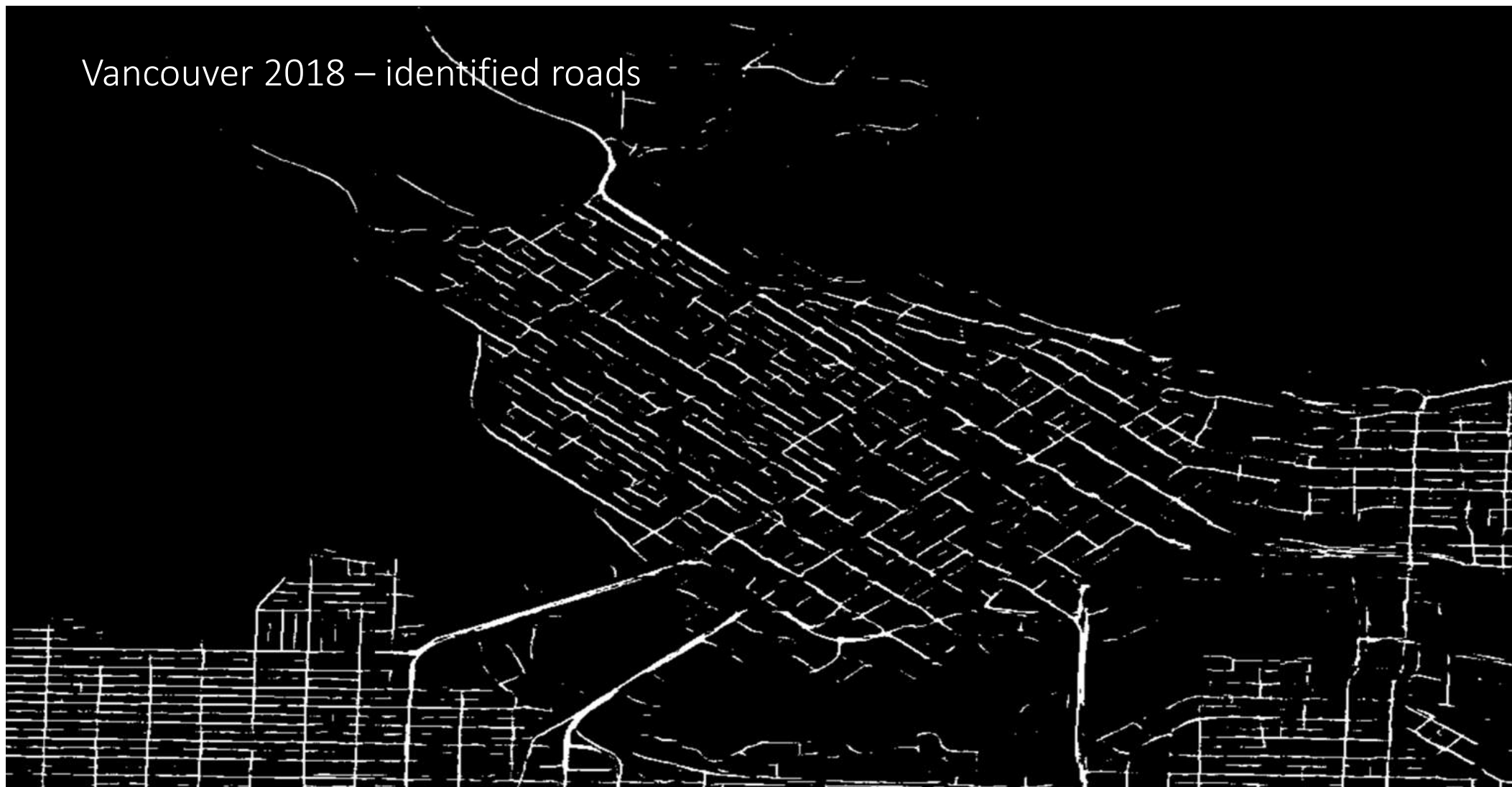




Vancouver 2018 – identified roads

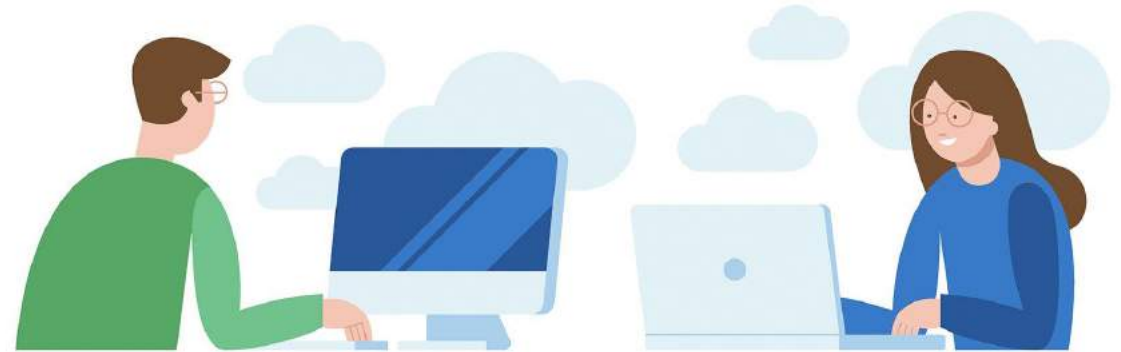


Vancouver 2018 – identified roads



# What else are we doing with CANUE data?

- Sweet and sour spots
- Mapping environmental inequities
- Good score





# What else are we doing with CANUE data?

- Sweet and sour spots
- Mapping environmental inequities
- Good score mobile web-based app



Eleanor Setton  
Managing Director



Evan Seed  
Geospatial Data Lead



Dany Doiron  
Data Linkage Specialist



Mahdi Shooshtari  
Data Scientist/Developer



Mary  
Speck  
Admin  
Liaison



Shailesh  
Kharol  
AQ Data  
Specialist

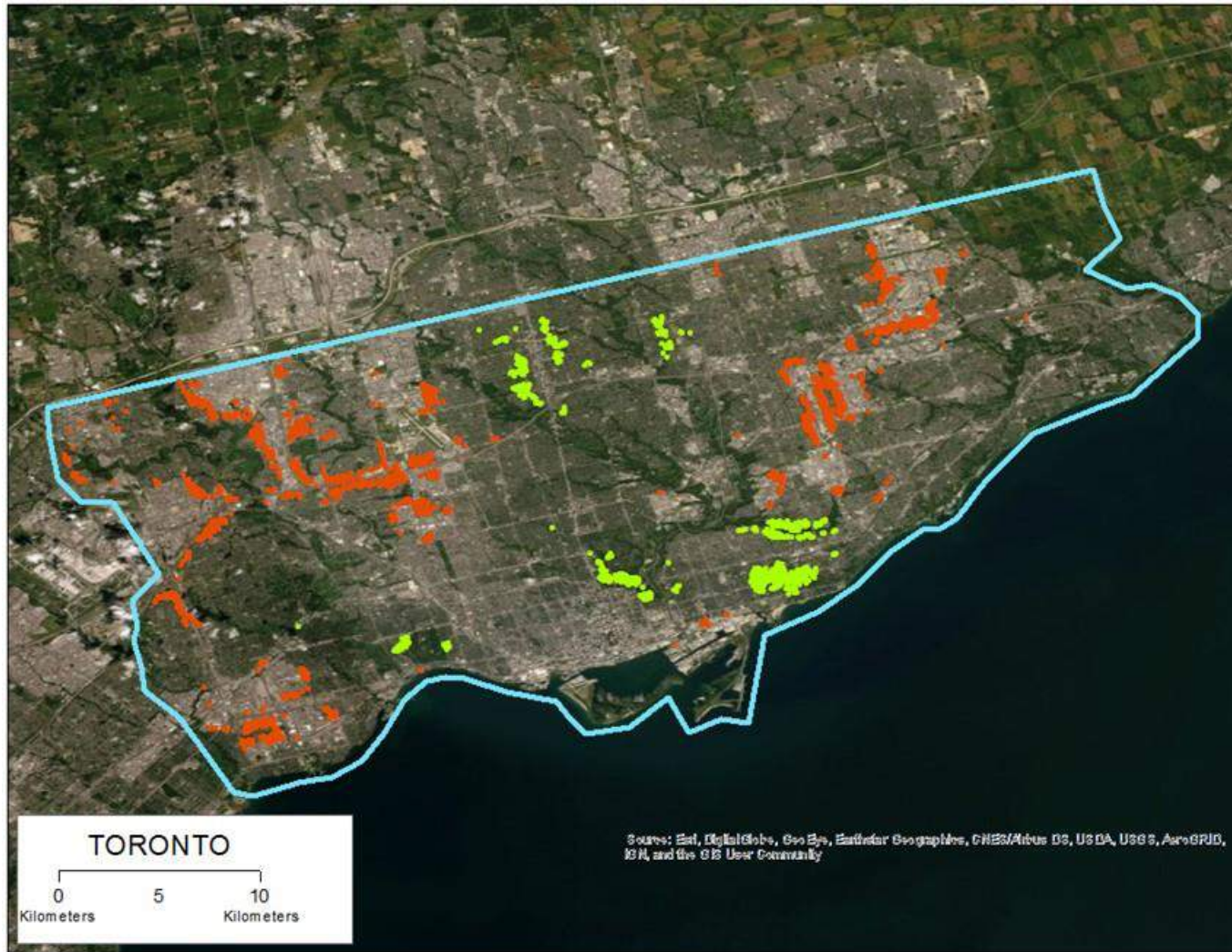


Kerolyn  
Shairsingh  
PDF



Andre Redivo  
Programming

# Spatial distribution and intersections between walkability, air pollution, greenness and deprivation in Toronto, Montreal and Vancouver



This maps shows postal code locations in orange where NO<sub>2</sub> concentrations are in the top tertile, and greenness (NDVI) and CanALE values are bottom tertile.

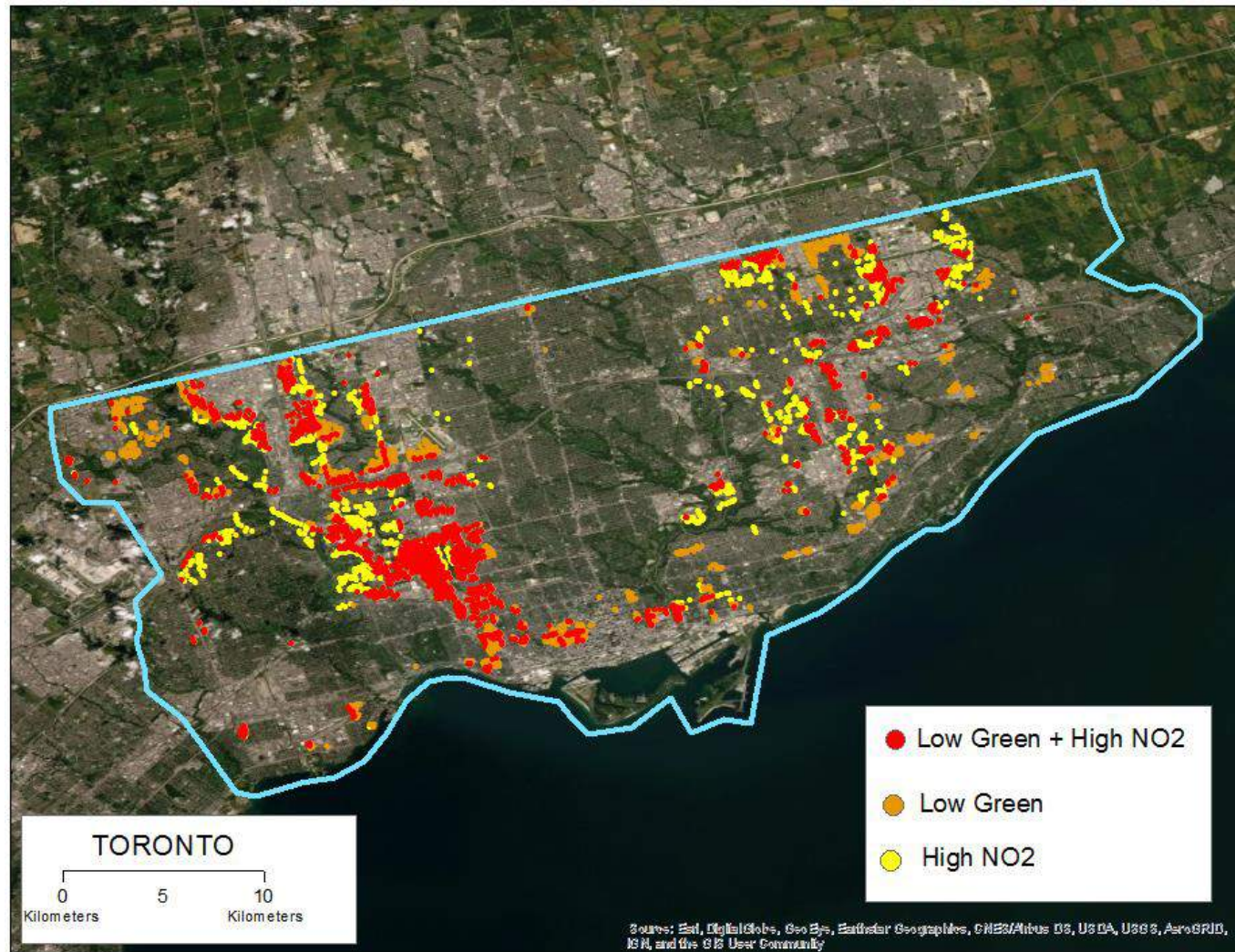
These “sour” spots could be prioritized for interventions by planners and public/population health specialists.

- Urban tree planting
- Increased park/natural areas
- Traffic diversion away from residential areas
- Increasing land use mix

(Green indicates postal codes in ‘sweet’ spots – low NO<sub>2</sub>, high greenness and CanALE)

**Doiron et al. (in prep.)**





This map shows only postal code locations with the highest tertile of material deprivation,

AND

High NO2 (yellow)

OR

Low greenness (orange)

OR

Both high NO2 and low greenness (red)

This illustrates multi-factor exposure burden experienced by the most deprived segment of the population, and could help prioritize actions to improve health-promoting neighbourhood design.

**Doiron et al. (in prep.)**



# Under development: GoodScore.City

Is your  
neighbourhood  
good for your  
health?

Active Living Environment   Natural Areas

Extreme Heat   Smoke pollution

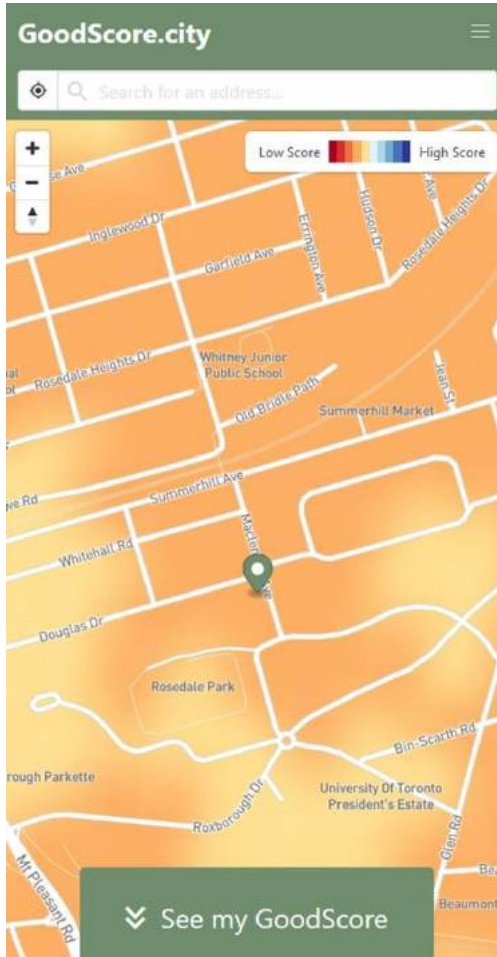
Traffic Pollution

Discover your GoodScore

910 Douglas Drive

- 910 Douglas Drive Toronto, Ontario
- 910 Douglas Woods Hill SE Calgary, Alberta
- 910 Douglas Woods Drive SE Calgary, Alberta
- 910 Douglas Woods Drive SE Calgary, Alberta
- 910 Douglas Woods Drive SE Calgary, Alberta

Brought to you by the Canadian Urban Environmental  
Health Research Consortium



## Your GoodScore



Your GoodScore is **40**! This GoodScore indicates how the selected neighbourhood compares with other neighbourhoods in Canada.

An area's score is  
environmental  
factor below

## Active Living Environment



**Active Living Environment** is a measure of how well your neighborhood was designed to promote an **active lifestyle**. It is based on the **accessibility** of your local public transit network, as well as the number of parks, schools, shops businesses,

## Traffic Pollution

Score importance: Medium



**Traffic Pollution** is a measure of how much **nitrogen dioxide** is detected in the air. This kind of air pollution is a good indicator of how much traffic exhaust is in your neighbourhood.

## Extreme Heat

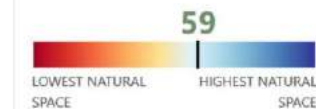
Score importance: Medium



**Extreme Heat** is a measure of the number of days per year that are part of an extreme heat event in your neighbourhood. Heat events are defined as three or more consecutive days with a maximum daily temperature above the 95th percentile of normal daily maximum temperatures recorded in

## Natural Areas

Score importance: Medium



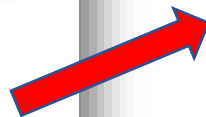
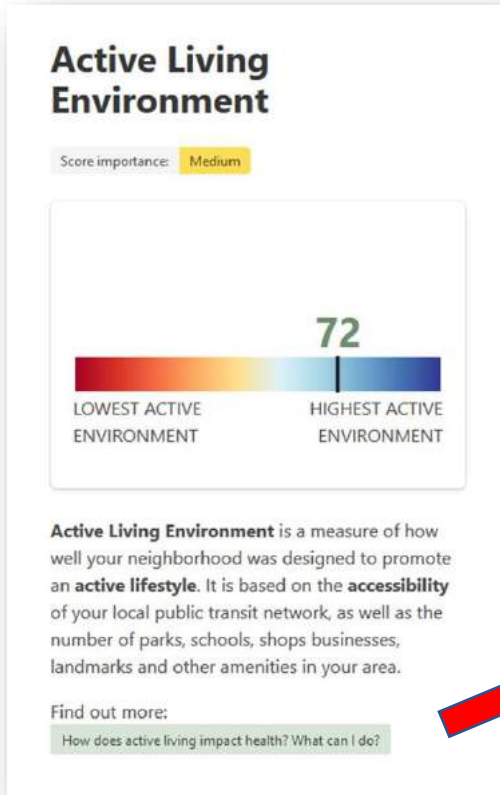
**Natural Areas** is a measure of how much open **water and green vegetation** is in your neighborhood. Higher values mean there are more lakes, streams, wetlands, parks, trees and gardens located in your community.

## Smoke pollution

Score importance: Medium



**Smoke pollution** is a measure of **fine particles** in the air in your neighbourhood. This kind of air pollution comes mostly from industrial stacks, forest fires, agricultural burns, local fireplaces and woodstoves, with smaller amounts coming from



### Active Living

## WHAT IS AN ACTIVE LIVING ENVIRONMENT?

The Canadian Active Living Environment (Can-ALE) index measures how well your neighbourhood is designed to promote an active lifestyle. There are more opportunities to be active in neighbourhoods where:

- There are many people living nearby
- It is easy to walk or cycle along and cross streets
- The number of bus stops, parks, schools, stores, restaurants and other interesting places within walking distance is higher

The Can-ALE score is high in urban areas and city centres, and low in suburban areas, smaller towns and rural areas.



Find out more about the Canadian Active Living

Each factor has a link to popup content:

- What is this metric?
- How does it affect health?
- How is it related to climate change?
- What can I do about it?

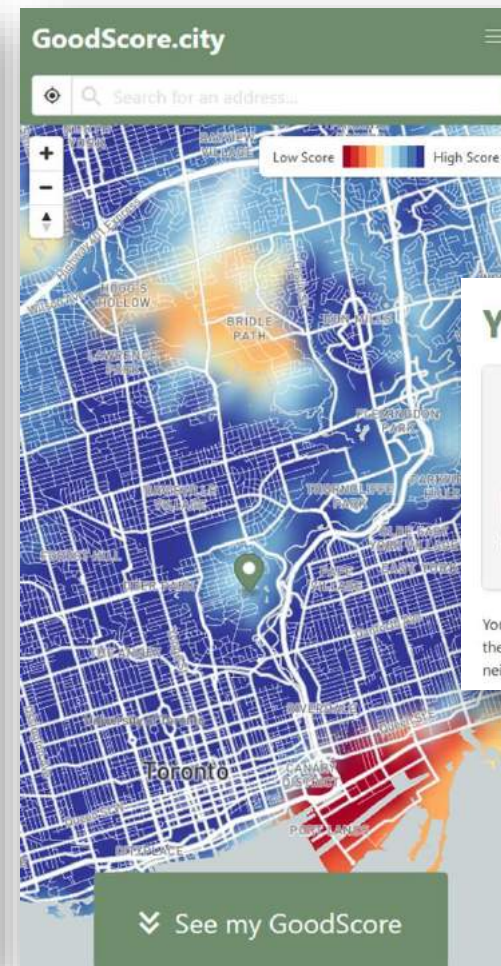
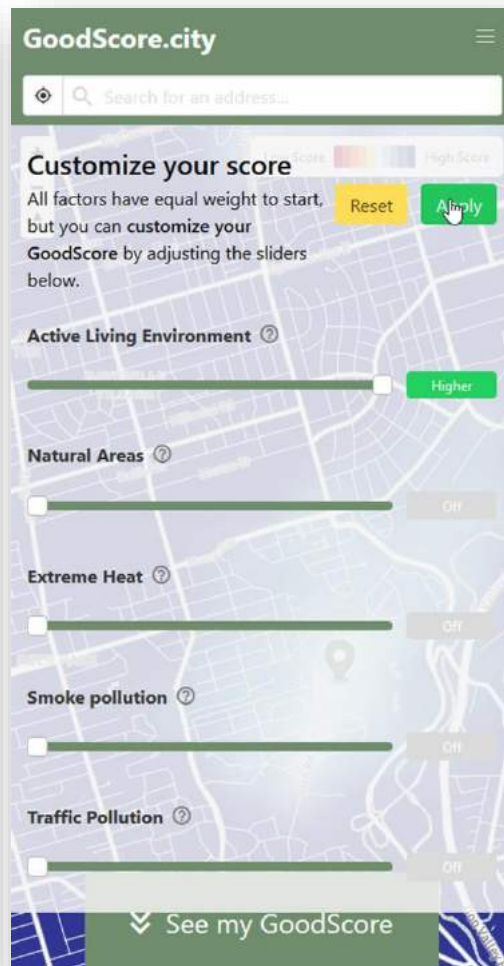
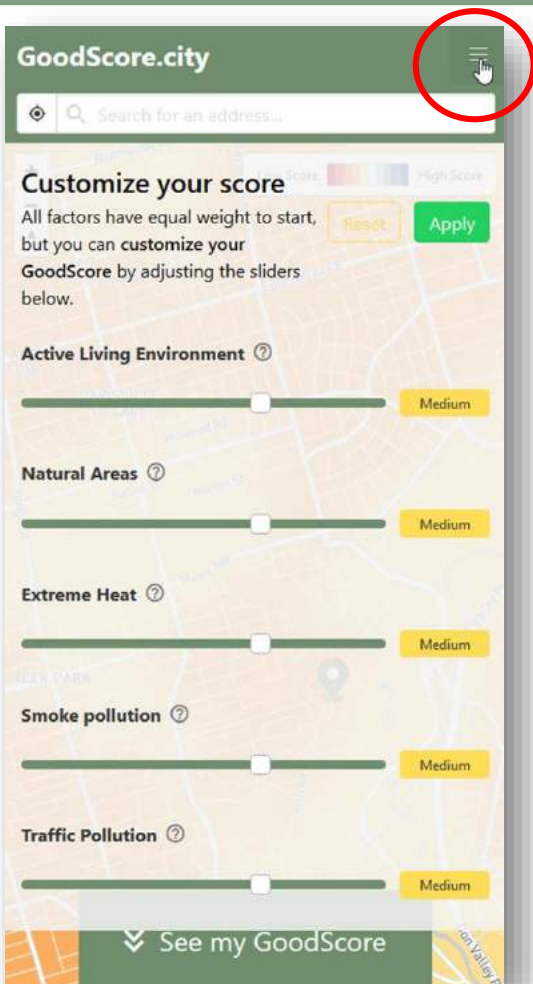
KEY AUDIENCE:

- General public, with focus on kids 8-18

OBJECTIVE:

- Increase awareness and understanding of outdoor built environment impacts on health AND how to engage in community planning





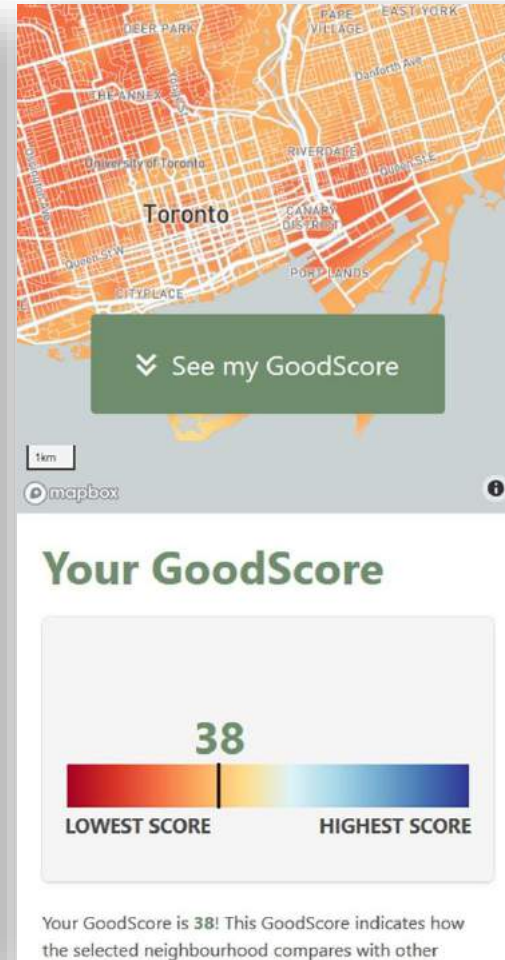
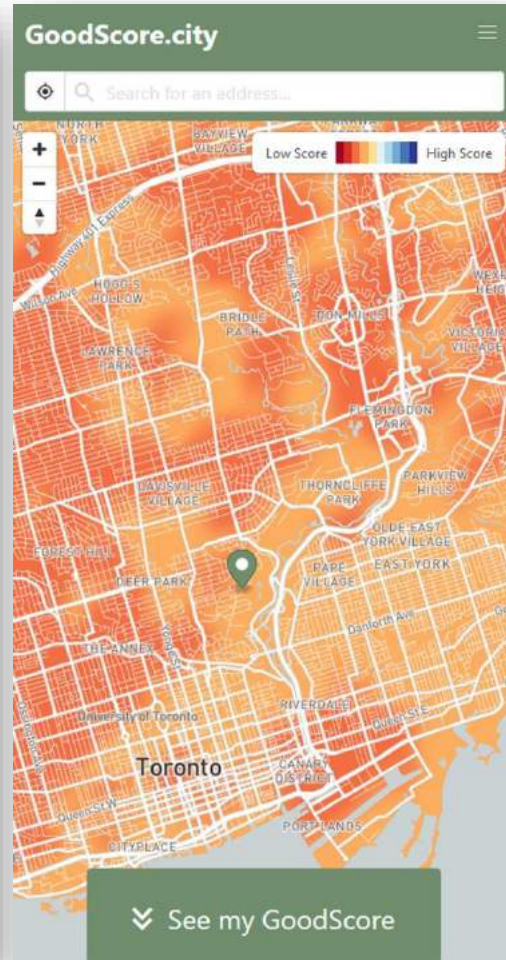
**Your GoodScore**

72

LOWEST SCORE HIGHEST SCORE

Your GoodScore is 72! This GoodScore indicates how the selected neighbourhood compares with other neighbourhoods in Canada.





In development:

Automated customized local report generation

- Professional planners, population and public health specialists, advocacy groups
- Include social/environmental equity maps/metrics

New factors:

- Food environment
- Noise

# Opportunity for CPTP: Harnessing the trend in new technologies

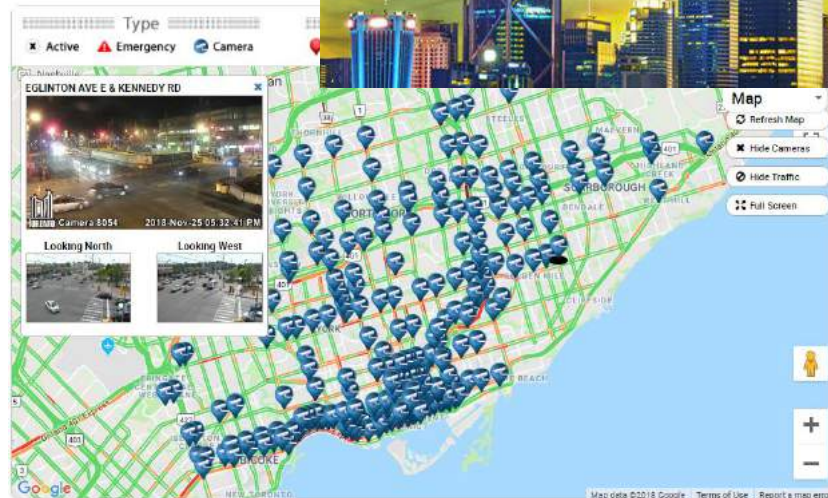
- Can we engage study participants in taking the next great leap in exposure data?
  - **WE HAVE THE TECHNOLOGY!**
  - Will participants agree to share their data this way?



Phone Apps

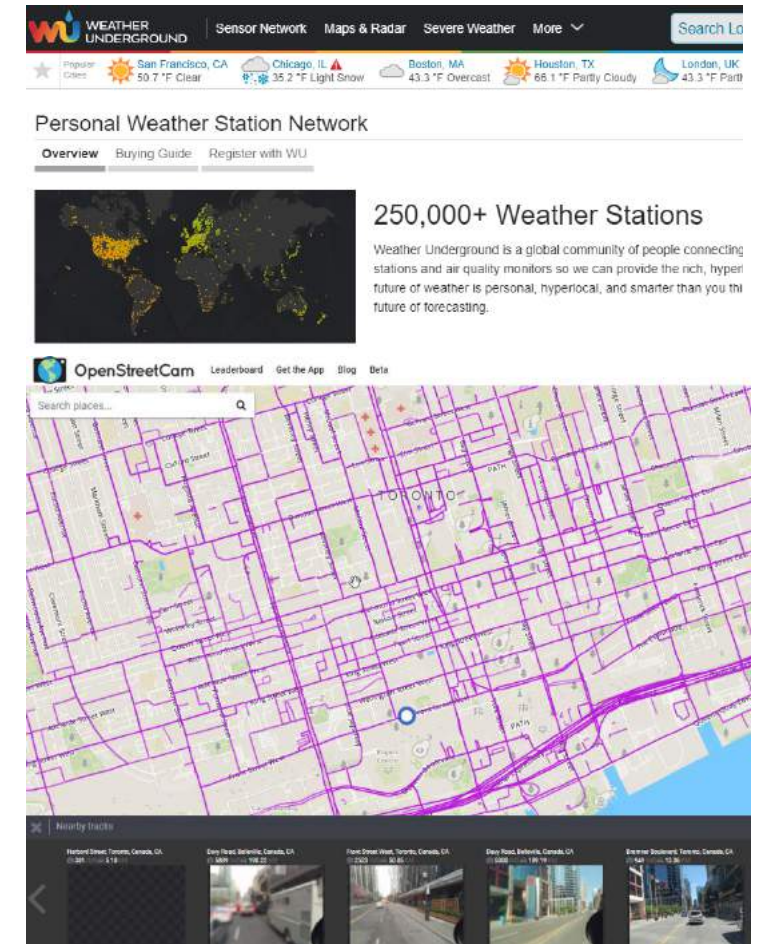


SMART Cities



Ephemeral data!

## Citizen Science



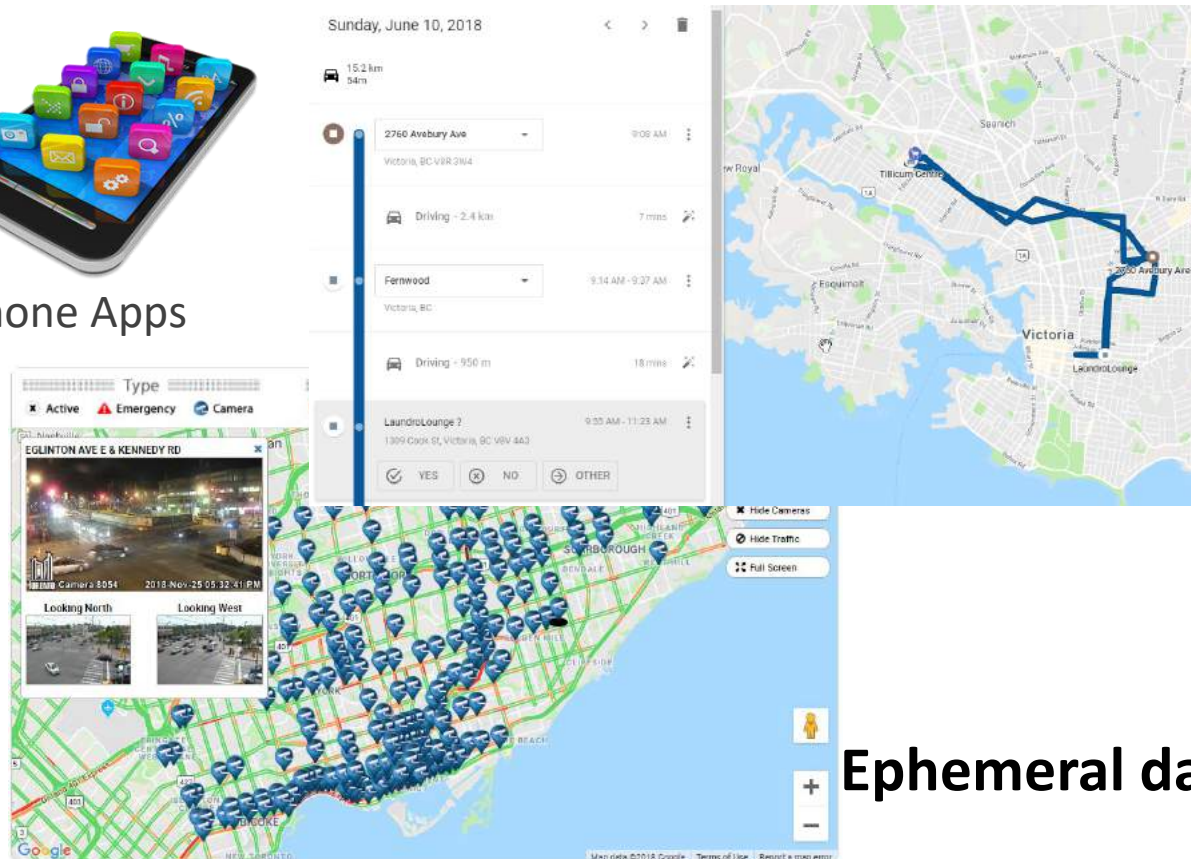


# Opportunity for CPTP: Harnessing the trend in new technologies

- Can we engage study participants in taking the next great leap in exposure data?
  - **WE HAVE THE TECHNOLOGY!**
  - Will participants agree to share their data this way?

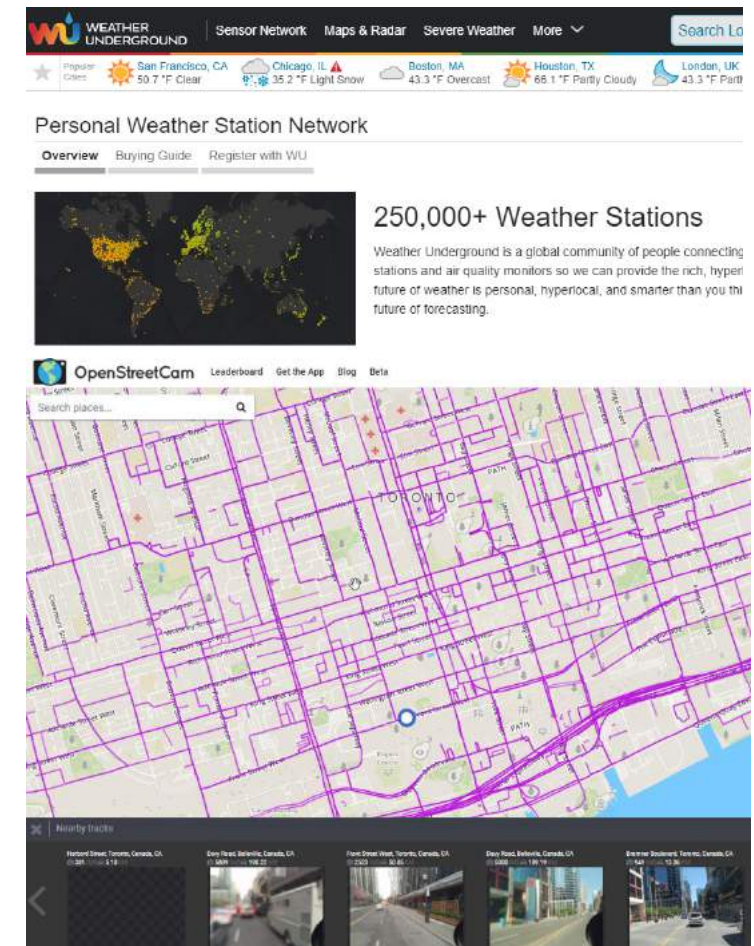


Phone Apps



**Ephemeral data!**

## Citizen Science
















# Upcoming CPTP-relevant CANUE outputs

- Assessment of the exposure patterns within CPTP vs. all Canadians within selected, relevant demographic groups
  - Representativeness of CPTP cohort in terms of exposure experiences
- Influence of residential history on trajectories of exposure
  - Assesses the potential to launch future studies exploring how health responds to modifications in exposure possibly leading to stronger causal evidence
- Study of the interaction between demographics + SES factors and residential movement to more/less walkable areas in the BC Generation cohort

## Top 10 Research Priorities in Spatial Lifecourse Epidemiology

Peng Jia , Jeroen Lakerveld, Jianguo Wu, Alfred Stein, Elisabeth D. Root, Clive E. Sabel, Roel Vermeulen, Justin V. Remais, Xi Chen, Ross C. Brownson, Sherif Amer, Qian Xiao, Limin Wang, W. M. Monique Verschuren, Tong Wu, Youfa Wang and Peter James

Published: 4 July 2019 | CID: 074501 | <https://doi.org/10.1289/EHP4868>

1.  Create life course spatial exposure metrics
2.  Define and operationalize composite and cumulative exposure concepts
3.  Improve personalized exposure assessment in prospective studies
4.  Understand the role of residential self-selection
5.  Tap into emerging Big Data streams to capture spatial exposure and behavior information
6.  Facilitate the development and use of complex systems models
7.  Increase transdisciplinary collaboration to capitalize on innovative data and methods
8.  Examine and address health equity
9.  Expand the scope and scale of research from local and regional to national and global
10.  Safeguard privacy while ensuring research needs.

# Needs for Future Advances in Environmental Data

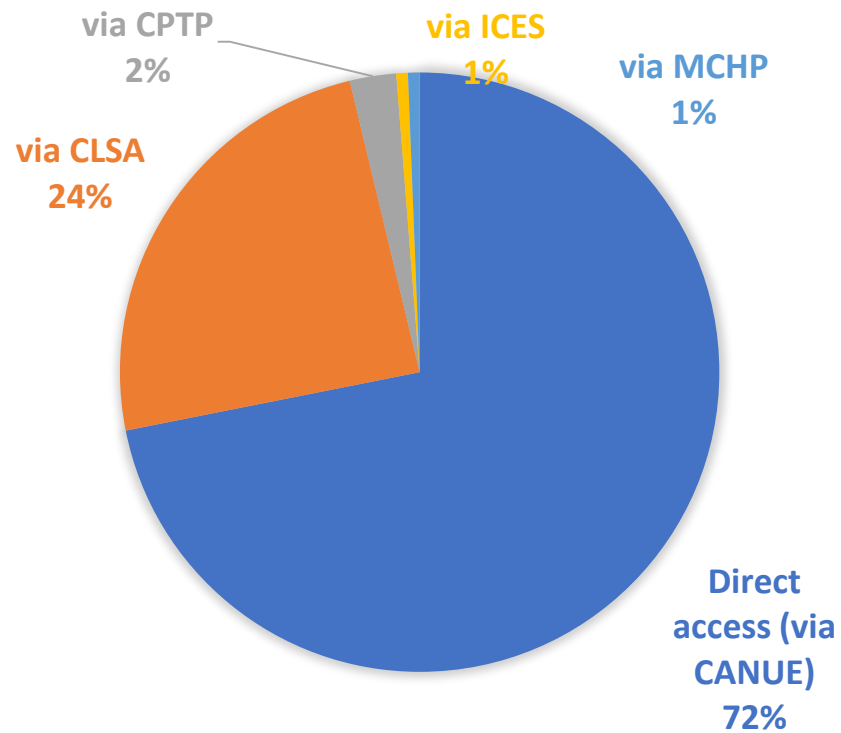


- Training data for AI model development and testing
- Updated urban scale models of air pollution (e.g., NO<sub>2</sub>, ultrafine particles)
- Harnessing participation of cohort subjects for exposure-relevant data collection (apps)
- Knowledge of *why* people moved (i.e., to gain insight on self selection bias)
- Greater resolution of Active Living Environment types (e.g., kids, adults, seniors)
- Residential history for CLSA to refine exposure estimates and study exposure time windows
- Exposure metrics that capture, in a standardized way, significant interventions/infrastructure investments across the country
- More-relevant climate and extreme weather metrics covering a wider range of potential risks (e.g., metrics that capture spatial patterns of disaster impact such as flooding or fires)
- Food environment metrics

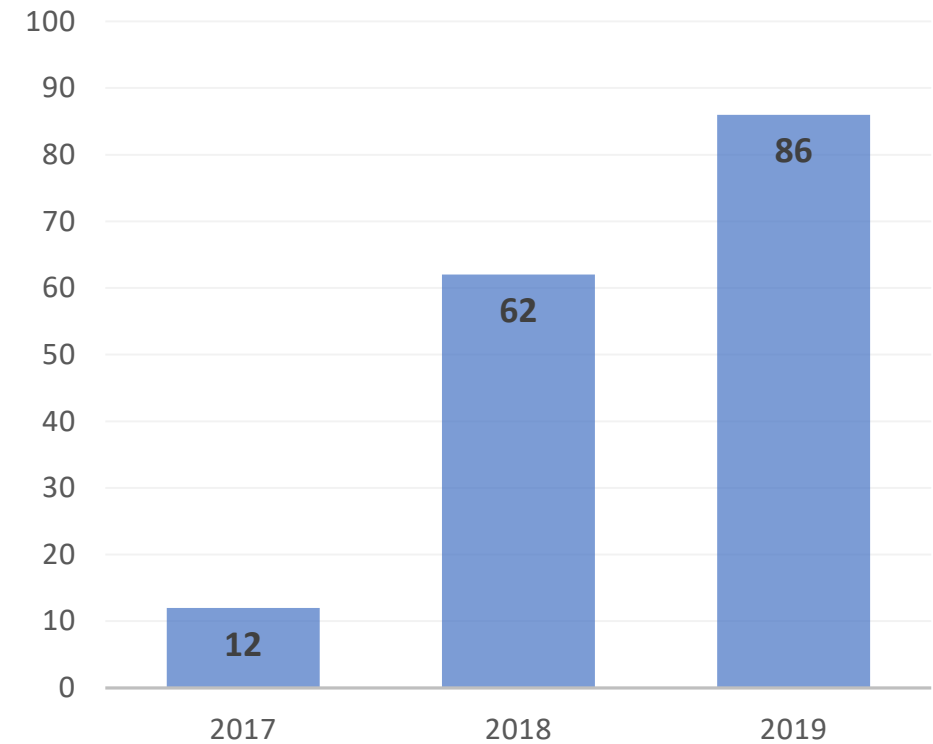


## 160 research projects supported so far!

CANUE data requests by source



CANUE data requests by year



# Thank You!

## *Acknowledgements*



Health  
Canada

Santé  
Canada



Environment  
Canada

Environnement  
Canada



Statistics  
Canada

Statistique  
Canada

### **Eleanor Setton**

Dany Doiron

Mahdi Shooshtari

Shailesh Kharol

Kerolyn Shairsingh

Andre Redivo

CANUE Directors

CANUE WG Leads

CANUE members

