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CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

June 26 | 2019

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[1]University of Victoria

[2]Research Institute of the McGill University Health Centre

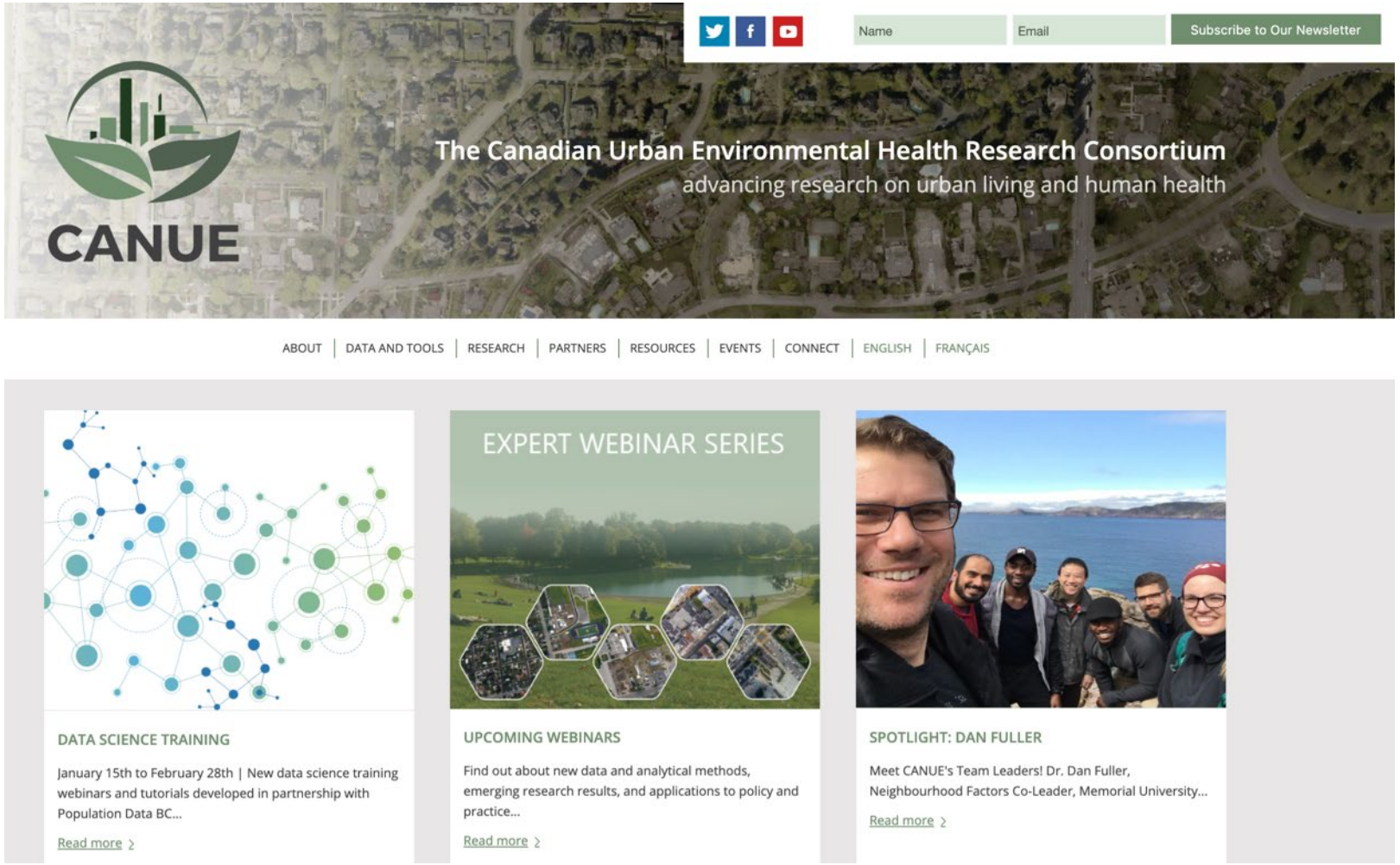
On behalf of the CANUE team

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

chat…

info@canue.ca

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

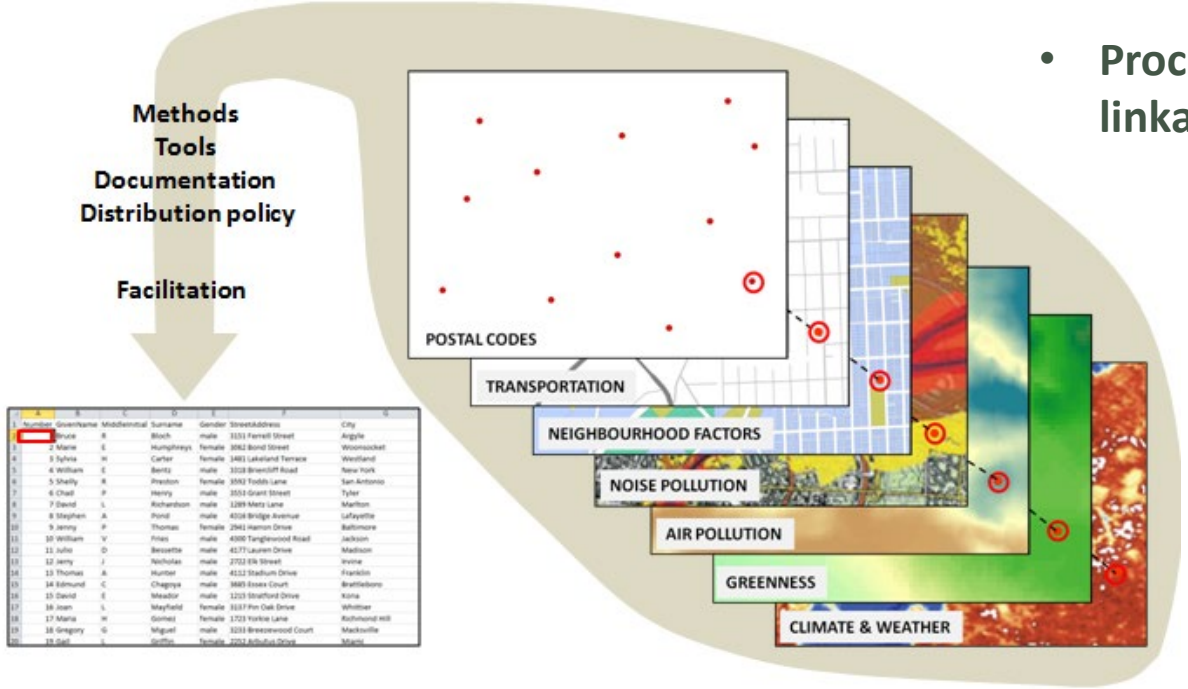


www.canue.ca

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

CANUE has a broad focus on outdoor environmental exposures/urban form metrics, and includes socio-economic information

- **Consistent spatial datasets going back to 1980 and into the future**
- **Procedures and tools to facilitate linkage with health databases**



- **Data teams working on developing exposure data covering 6 key domains**
- **Indexed at the postal code**
- **CSV format files for easy manipulation**

1980 **2050**

CANUE DATA

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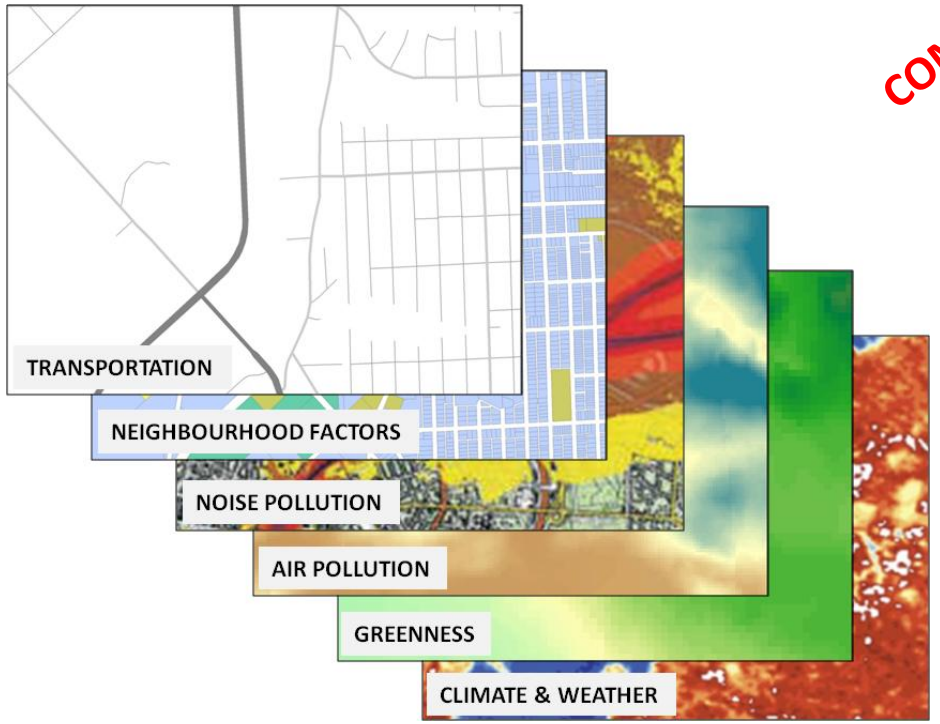
Transportation



COMING SOON

Highly detailed origin-destination modelled fleet mix and emissions in selected cities:

GTHA
Montreal
Halifax
Winnipeg
Calgary

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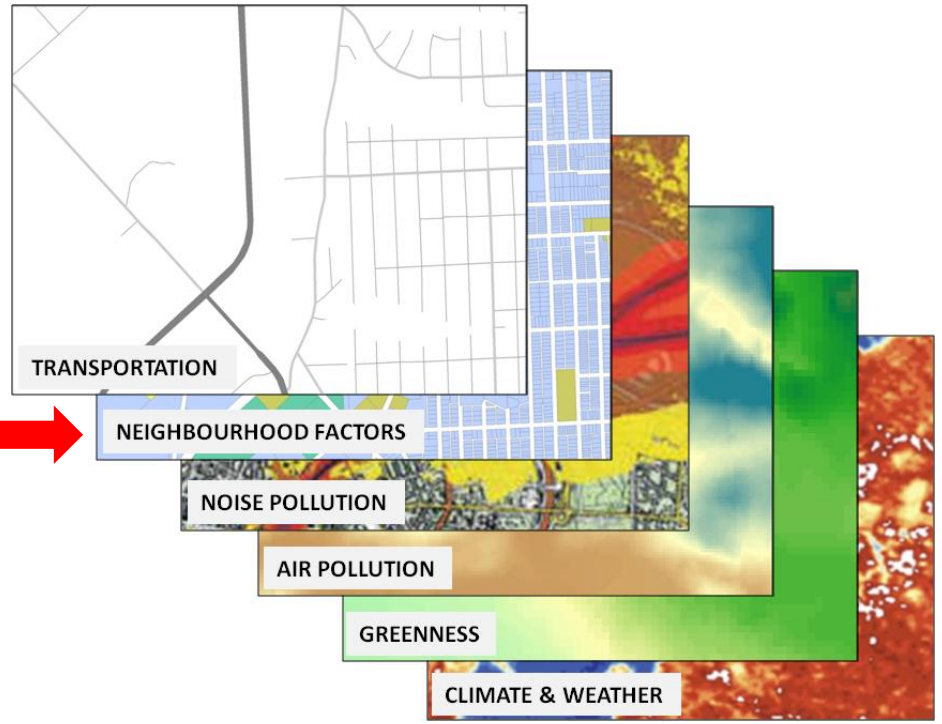
Neighbourhood factors



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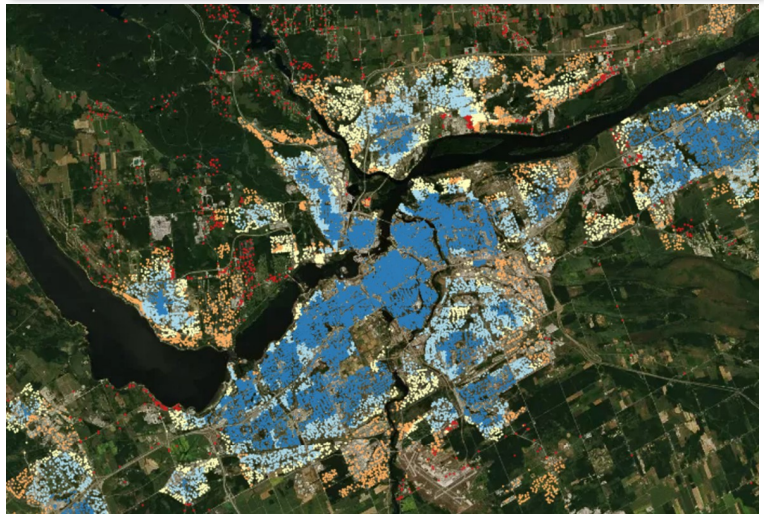
Neighbourhood factors

Canadian Active Living Environments Index (Can-ALE)

- N. Ross at McGill University
- Based on census dissemination areas for 2006 and 2016



Nighttime light

- Satellite imagery
- 1 km resolution
- Annual average brightness
- 1992 to 2013

COMING SOON

Food environment metrics based on StatsCan business registry

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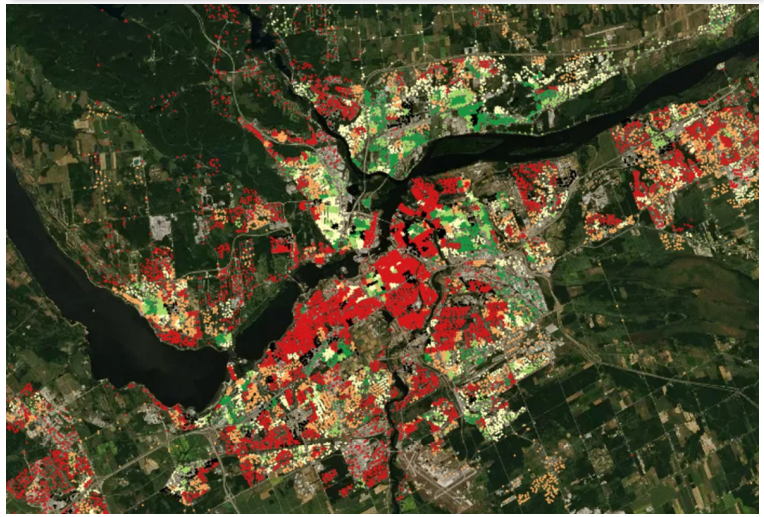
Neighbourhood factors

Access to Employment

- 18 different variables using car vs transit access
- Based on census dissemination areas for 2016

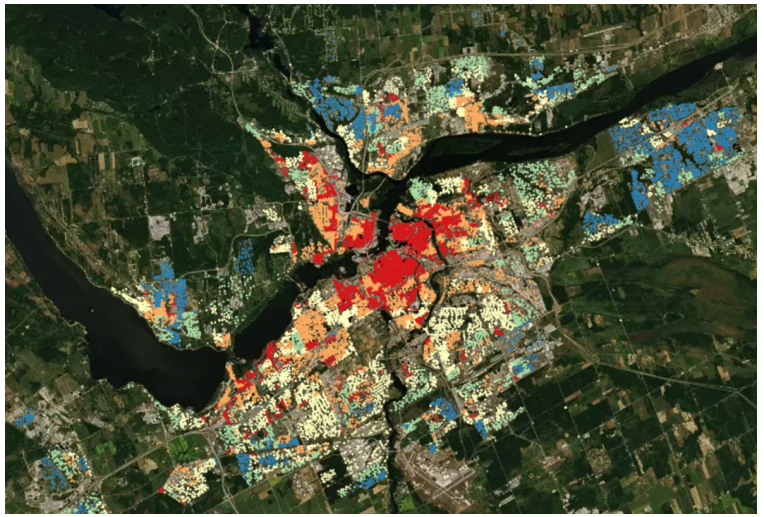
Material and Social Deprivation Index

- INSPQ using Pampalon method
- Based on census dissemination areas for 1991, 1996, 2001, 2006, 2011, 2016



Canadian Marginalization Index

- Flora McDonald / Statistics Canada
- Based on census dissemination areas for 1991, 1996, 2001, and 2006



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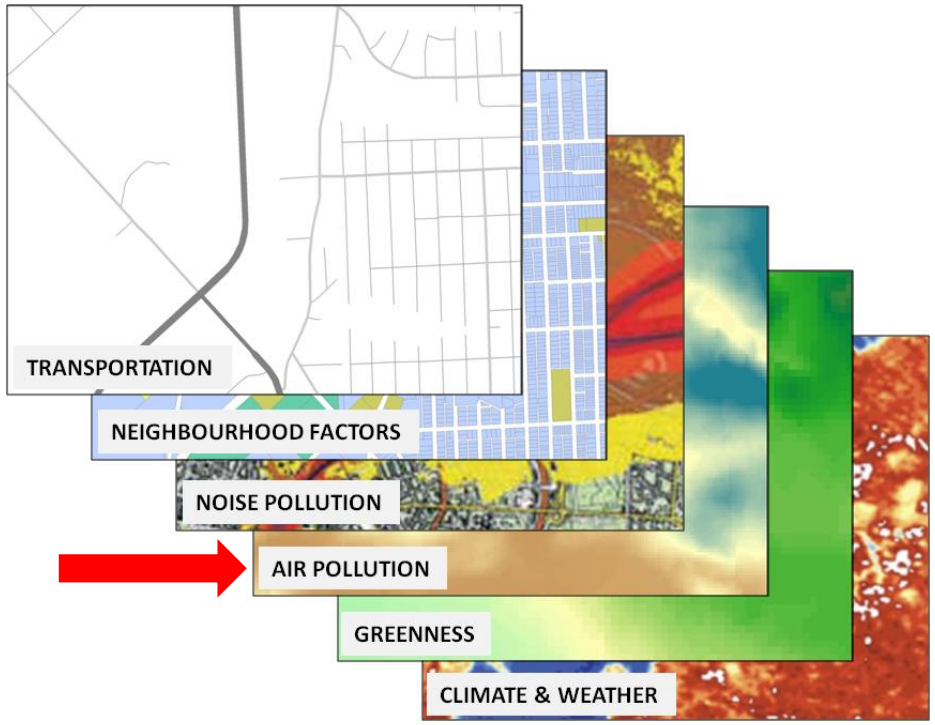
Air quality



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Air quality

Fine Particulates

- A. van Donkelaar and R. Martin at Dalhousie University
- Satellite data
- 1 km resolution
- Annual average concentrations
- 2000 - 2016

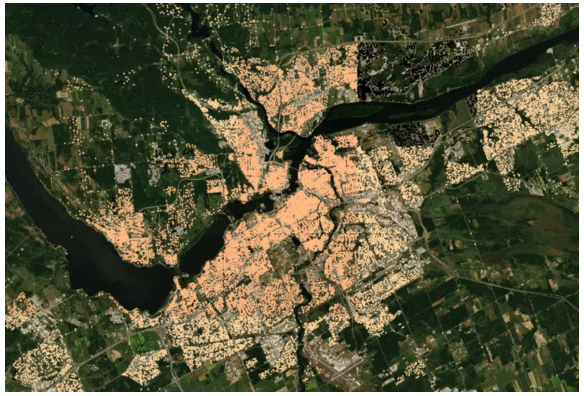
MONTHLY ALSO

Nitrogen Dioxide

- P. Hystad for Health Canada
- Estimated at postal codes
- Annual average concentrations
- 1984 – 2012

Sulphur Dioxide

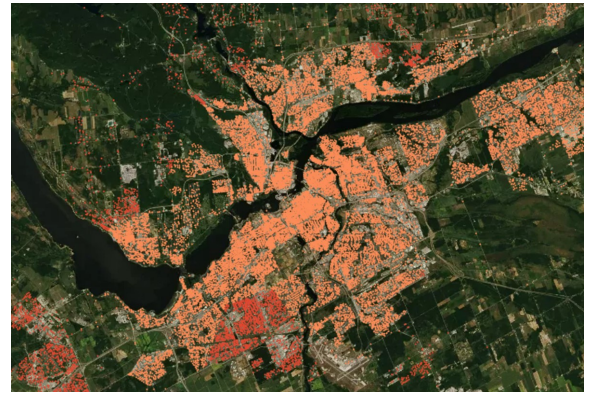
- Modelled by Environment Canada
- Satellite data
- 30km resolution
- Annual average concentrations
- 2007 - 2015



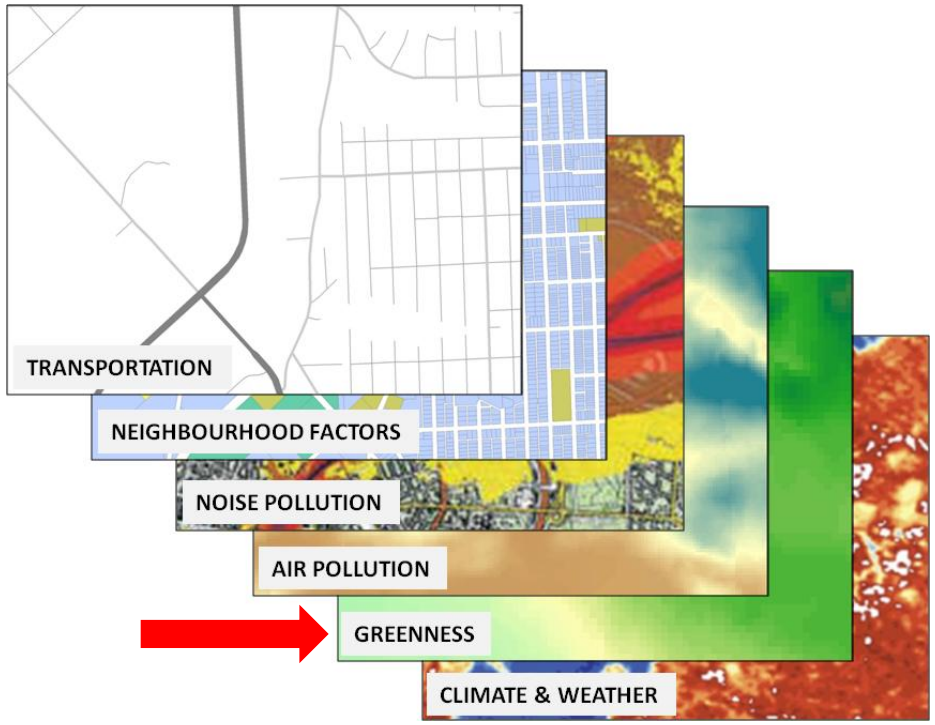
MONTHLY ALSO

Ozone

- Modelled by Environment Canada using CHRONOS and GEM-MACH
- 21- 10km resolution
- Monthly and annual average concentrations
- 2002 - 2015



Greenness


TRANSPORTATION
NEIGHBOURHOOD FACTORS
NOISE POLLUTION
AIR POLLUTION
GREENNESS
CLIMATE & WEATHER

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Green/Blue/Natural Spaces

NORMALIZED DIFFERENCE VEGETATION INDEX

- Processed using Google Earth Engine
- 30m/250m/1km resolution
- Annual average , annual maximum and growing season average at each postal code, and within set distance buffers
- 1984 - 2015

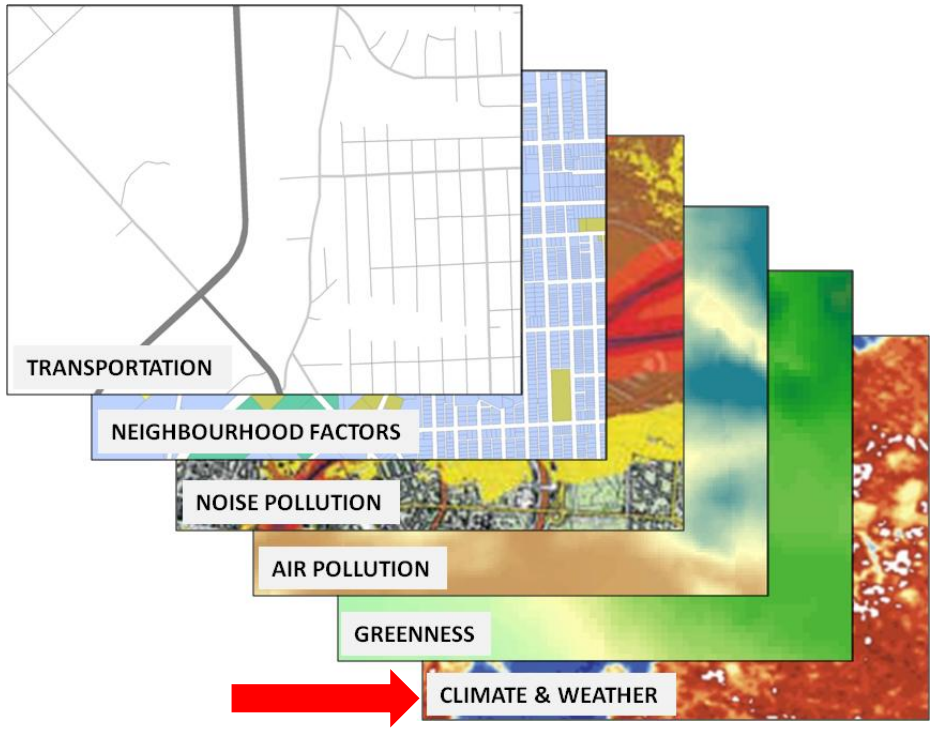
NEIGHBOURHOOD GREEN

- Processed using Google Earth Engine/ LandSat and Local Climate Zone classification system
- Estimated % within 1km
- Census years 1986 - 2016

NEIGHBOURHOOD BLUE (WATER)

- Processed using Google Earth Engine/ LandSat and Local Climate Zone classification system
- Estimated % within 1km
- Census years 1986 - 2016

Weather and Climate



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Weather and Climate

MONTHLY ALSO

INTERPOLATED WEATHER STATION DATA
- Processed from station observations by NRCAN
- Estimated at postal codes
- Daily max/min temperature, total precipitation, consecutive days above/below threshold, extreme events
- 1985 - 2015

MODELLED WATER BALANCE METRICS
- Processed from station observations by NRCAN with model developed by CANUE weather team
- Estimated at postal codes
- Estimated % within 1km
- Census years 1986 - 2016

LOCAL CLIMATE ZONES
- Processed using Google Earth Engine/ LandSat and Local Climate Zone classification system
- Land uses that impact local climate
- Estimated % within 1km of postal code
- Census years 1986 - 2016

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

INTERPOLATED WEATHER STATION DATA

- Processed from station observations by NRCAN
- Estimated at postal codes
- Daily max/min temperature, total precipitation, consecutive days above/below threshold, extreme events
- 1985 - 2015

35 annual variables

- 6 basic temperature metrics – max, min, average, average daily mx, average daily min, range
- 18 heat/cool event metrics – number, length, using max/min/95th percentile temps to define threshold for an event
- 10 rain and snow metrics – total amount, days with rain/snow, number of events, average amount per event, average length of events
- Number of frost free days

MONTHLY ALSO

MODELLED WATER BALANCE METRICS

- Processed from station observations by NRCAN with model developed by CANUE weather team
- Estimated at postal codes
- Estimated % within 1km
- Census years 1986 - 2016

21 annual/monthly variables

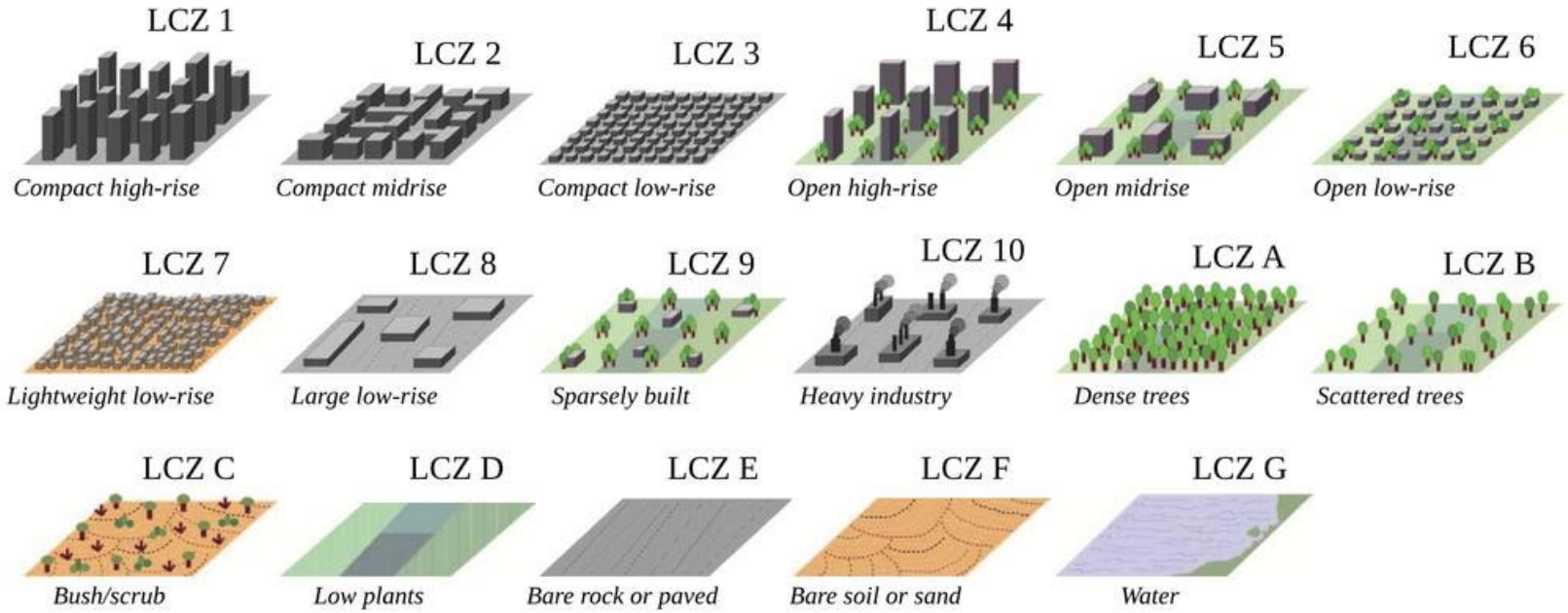
- 2 basic temperature metrics – max, min
- 7 basic precipitation metrics – total (and number of days with) precipitation, total rain, total snow, ratio of snow/rain,
- 11 water balance – snow melt, snow pack, days with snow on the ground, potential and actual evapotranspiration → total surplus/deficit of moisture, soil moisture, etc.
- Relative index of dryness/wetness
  - Ranges from -1 (dry) to 1 (wet), 0 indicates precipitation = evapotranspiration)

IMPACTS TYPE OF VEGETATION/SEASONALITY, ALLERGEN LOADS/MOLDS, OPPORTUNITIES FOR PHYSICAL ACTIVITY…

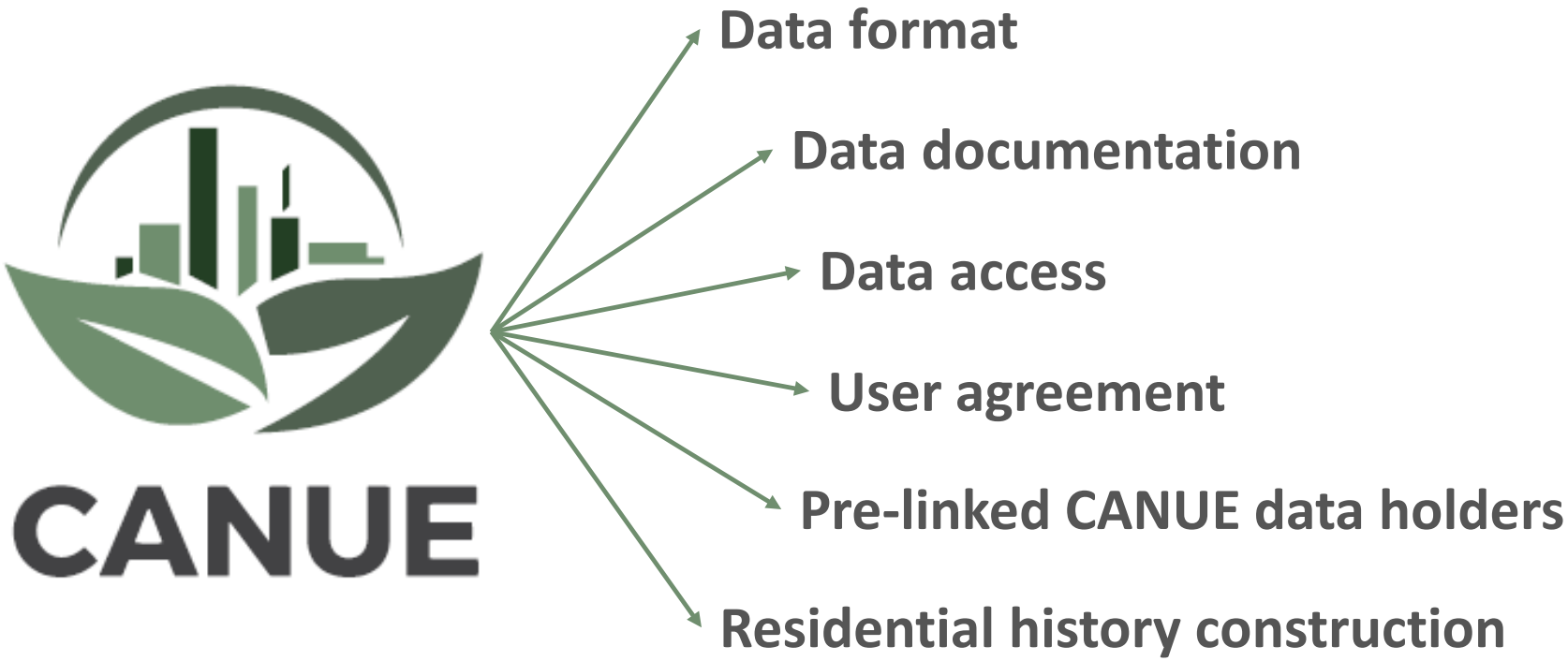
CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

LOCAL CLIMATE ZONES

- Processed using Google Earth Engine/ LandSat and Local Climate Zone classification system
- Land uses that impact local climate
- Estimated % within 1km of postal code
- Census years 1986 - 2016



Accessing and using CANUE data

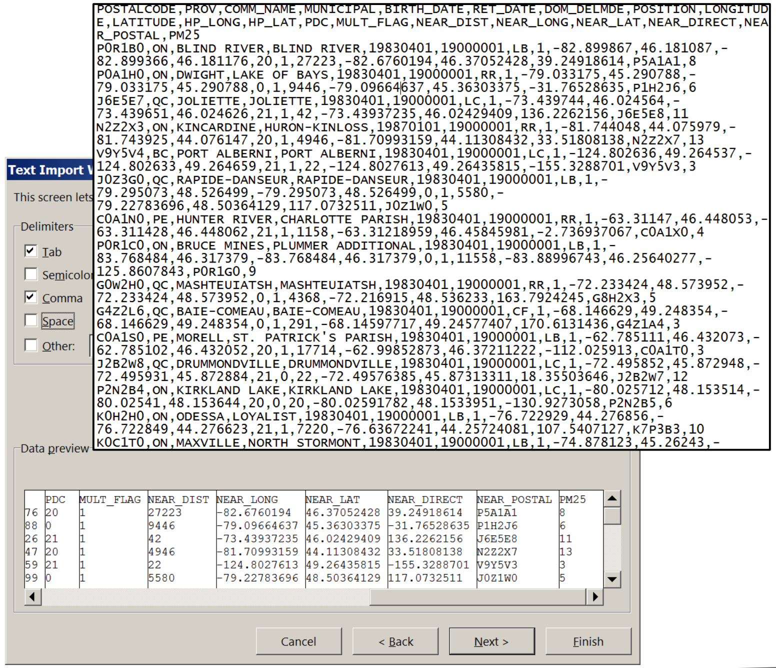


CIHR IRSC
Canadian Institutes of Health Research
Instituts de recherche en santé du Canada

CANUE

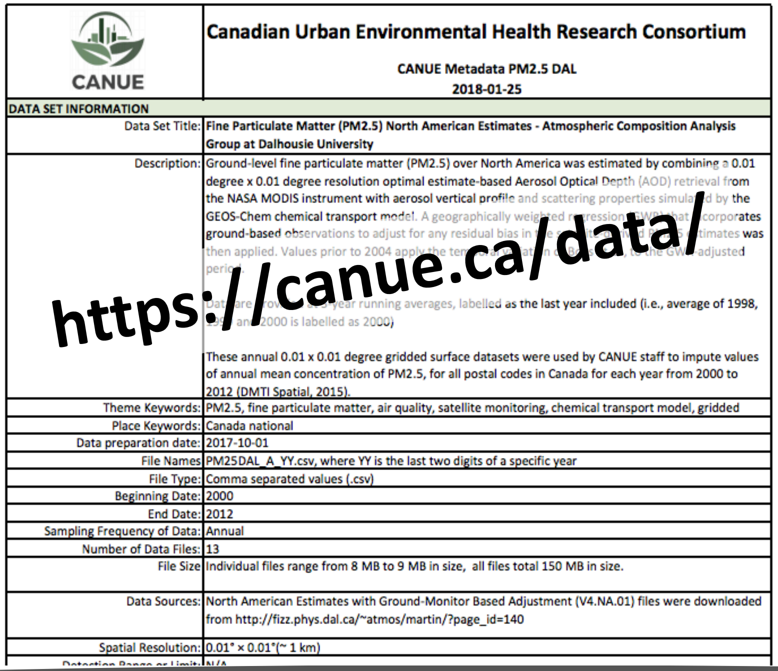
Data format

- Indexed to 6-digit postal code
- Comma-separated values (CSV)
- Data in tabular format
- Easy import and merge with health data using postal code



Data documentation (metadata)

- General dataset description, methodology
- Time and geography covered
- Variable names and definitions
- Required citations and other data use conditions



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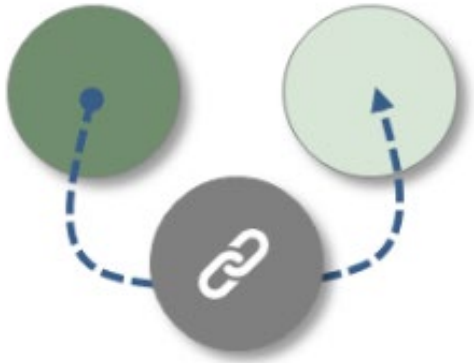
Data access

Option A:

Directly from CANUE
(to be linked with a health database)

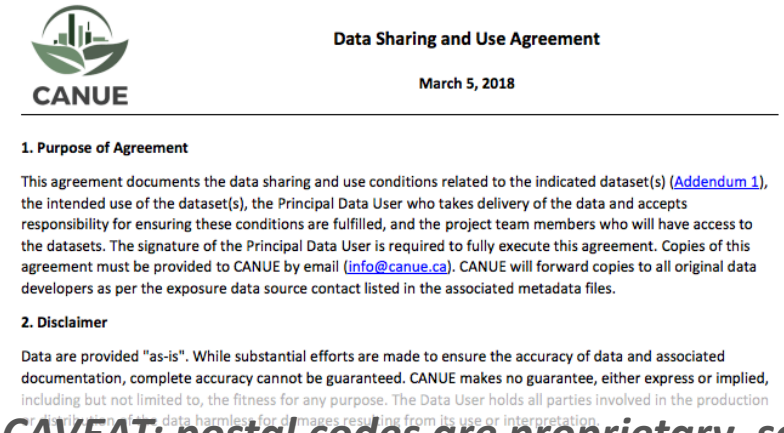
Option B:



Via health database (pre-linked data)

User agreement

- Condition of use:
  - Citations
  - Acknowledgements



CANUE

Data Sharing and Use Agreement

March 5, 2018

1. Purpose of Agreement

This agreement documents the data sharing and use conditions related to the indicated dataset(s) (Addendum 1), the intended use of the dataset(s), the Principal Data User who takes delivery of the data and accepts responsibility for ensuring these conditions are fulfilled, and the project team members who will have access to the datasets. The signature of the Principal Data User is required to fully execute this agreement. Copies of this agreement must be provided to CANUE by email (info@canue.ca). CANUE will forward copies to all original data developers as per the exposure data source contact listed in the associated metadata files.

2. Disclaimer

Data are provided "as-is". While substantial efforts are made to ensure the accuracy of data and associated documentation, complete accuracy cannot be guaranteed. CANUE makes no guarantee, either express or implied, including but not limited to, the fitness for any purpose. The Data User holds all parties involved in the production

CAVEAT: postal codes are proprietary, so we can only share freely with academics. Typically, academics request data, develop metrics that are of interest. These can be aggregated to dissemination areas or summarized in reports.

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

Postal code

POSTALCODE06	ALE06_01	ALE06_02	ALE06_03	ALE06_04	ALE06_05	ALE06_06	ALE06_07
T0A0A0	48130314	0.60000002	0.5	-1.2326522	-0.7681431	-2.0007954	1
T0A0B0	48120175	0	2.3	-1.2614889	-0.7665497	-2.0280385	1
T0A0C0	48120239	0	0.80000001	-1.2614889	-0.7678775	-2.0293665	1
T0A0E0	48130179	1	0.5	-1.2134278	-0.7681431	-1.9815708	1
T0A0J0	48120258	13.4	69.800003	-0.6174694	-0.7067964	-1.3242658	1
T0A0K0	48111554	15.1	148.39999	-0.5357655	-0.637217	-1.1729825	1
T0A0M0	48130184	14.7	64.900002	-0.5549899	-0.711134	-1.2661239	1
T0A0N0	48120240	0	0.89999998	-1.2614889	-0.767789	-2.0292778	1
T0A0P0	48130178	0	0.1	-1.2614889	-0.7684971	-2.0299861	1
T0A0R0	48130182	0	0.40000001	-1.2614889	-0.7682316	-2.0297205	1
T0A0T0	48120192	0.30000001	3.4000001	-1.2470706	-0.7655759	-2.0126464	1
T0A0Z0	48130312	0	0.89999998	-1.2614889	-0.767789	-2.0292778	1
T0A1A0	48120216	16.299999	77.099998	-0.4780921	-0.7003341	-1.1784263	1
T0A1B0	48130182	0	0.40000001	-1.2614889	-0.7682316	-2.0297205	1
T0A1C0	48120173	0	0.40000001	-1.2614889	-0.7682316	-2.0297205	1
T0A1E0	48120242	0.60000002	0.69999999	-1.2326522	-0.767966	-2.0006182	1
T0A1H0	48120174	0.60000002	2.0999999	-1.2326522	-0.7667267	-1.9993789	1
T0A1M0	48120210	0	1.3	-1.2614889	-0.7674348	-2.0289237	1
T0A1N0	48111560	20.200001	181.10001	-0.2906536	-0.6082698	-0.8989234	1

Pre-linked:

Canadian Partnership for Tomorrow Project

Projet de partenariat canadien Espoir pour demain

ALBERTA'S TOMORROW PROJECT
Inspiring research for a healthier tomorrow

BC GENERATIONS PROJECT
Your time today builds a healthier tomorrow.

Atlantic PATH

CARTaGENE

Ontario Health Study

clsa élcv
Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

CHILD COHORT STUDY

populationdata BC

Manitoba Centre for Health Policy

To come:

ICES Data Discovery Better Health

Statistics Canada / Statistique Canada

CRDCN Canadian Research Data Centre Network

and more...

CIHR Healthy Cities Research Initiative (HCRI) Funding Opportunity: Data Analysis Using Existing Databases and Cohorts

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

ALBERTA'S TOMORROW PROJECT

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

Atlantic PATH

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

BC GENERATIONS PROJECT

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

CARTAGENE

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

Ontario Health Study

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

Canadian Longitudinal Study on Aging (CLSA)

clsa élcv

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

Canadian Healthy Infant Longitudinal Development Study (CHILD)

CHILD COHORT STUDY

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

Administrative health data holders

Manitoba Centre for Health Policy

Manitoba Centre for Health Policy

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

Population Data BC

populationdata BC

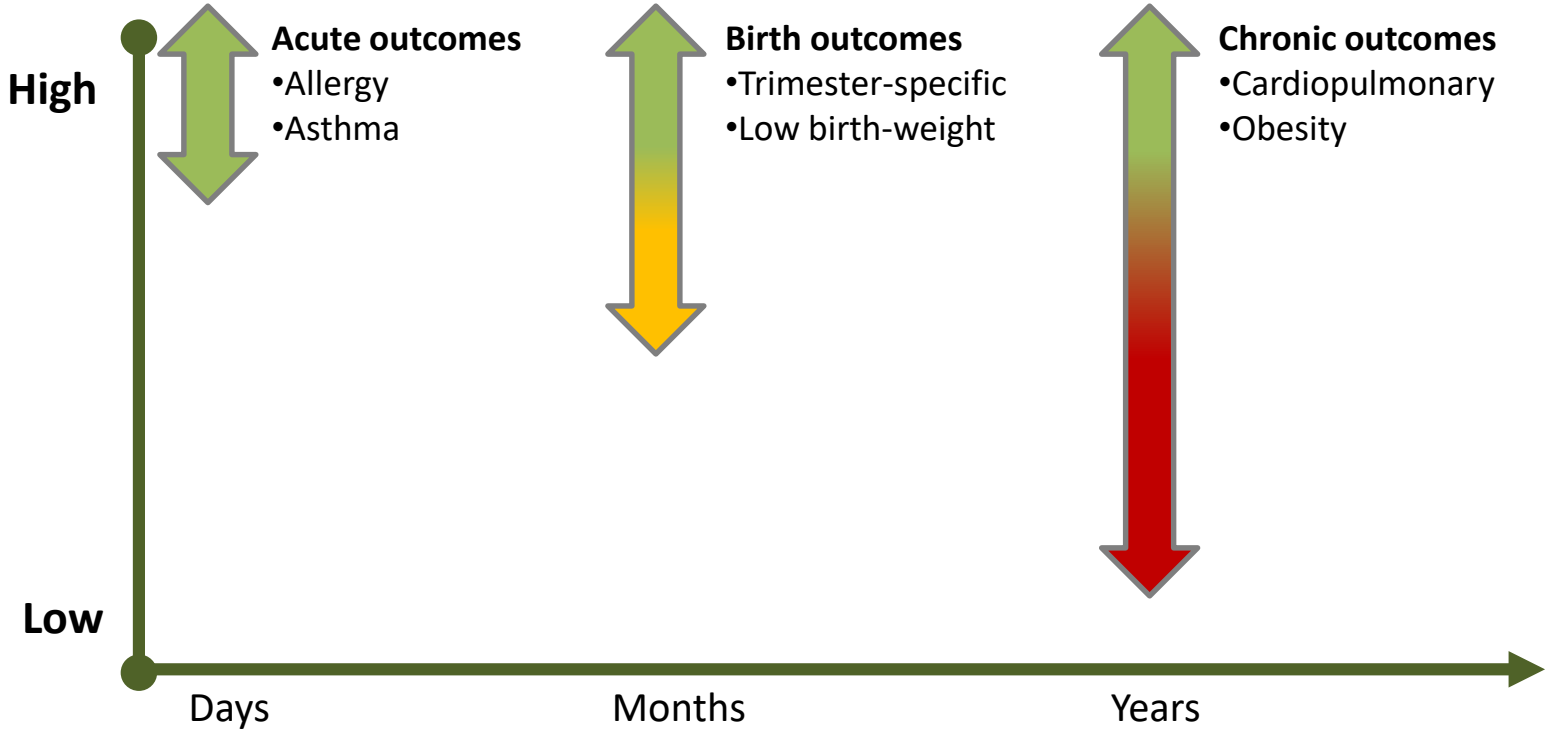
- Province of British Columbia
- Data on healthcare, health services, vital statistics, child development, education

Residential History Construction: Social Data Linkage Environment (SDLE)

Statistics Canada Statistique Canada

https://www.statcan.gc.ca/eng/sdle/index

The importance of residential history for environmental health research



Residential History Construction: Social Data Linkage Environment (SDLE)

Statistics Canada / Statistique Canada

https://www.statcan.gc.ca/eng/sdle/index

BC GENERATIONS PROJECT
Your time today builds a healthier tomorrow.

Ontario Health Study
Étude sur la santé Ontario

Study participant IDs and linkage fields

SDLE

Residential history created and exposure assigned by postal code/year

CANUE

Historical exposure data by postal code/year

Study participant IDs and yearly exposures

QUESTIONS

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