Health Impacts of Climate Change: APPENDICES

Peterborough Public Health

Contents

Appendix A - Data Source Information and Limitations

NOTE: All data sources have limitations. Limitations are only described for select data sources. The year(s) the data was collected for different data sources is noted where the data is presented within the Climate Change and Health Vulnerability Assessment.

Population and Health-Related Data

- Statistics Canada
  - Census of Population
    - A national survey of the population conducted by Statistics Canada every five years. Beyond the mandatory "Short-Form" census, additional questions are included in the Long-Form census, which is completed by a sample (around 25%) of the population. More information is available at www12.statcan.gc.ca/census-recensement/index-eng.cfm
  - Census of Agriculture (via Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)– business, agri-food, and farm data profile for Central - Peterborough)
    - More information is available at www.statcan.gc.ca/en/census-agriculture
    - Access to the OMAFRA data tables is available at data.ontario.ca/dataset/ontario-farm-data-by-county
  - Population Estimates and Projections (with Ontario Ministry of Finance)
    - Additional details are available upon request.
- Population-based surveys (e.g., the Rapid Risk Factor Surveillance System, Canadian Community Health Survey, Households and the Environment Survey)
  - Rapid Risk Factor Surveillance System
    - The Rapid Risk Factor Surveillance System (RRFSS) is an on-going telephone survey used to gather data, to monitor public opinion on key public health issues and to collect information on emerging issues of importance to public health. More information is available at www.rrfss.ca
    - RRFSS data was used for the analysis of:
      - Belief in Climate Change
      - Concern about Climate Change
      - Belief Climate Change Causes Extreme Weather
      - Belief Climate Change Will Cause More Heat Waves
      - Belief Climate Change Will Cause More Days with Poor Air Quality
      - Belief Climate Change Will Result in More Insects Carrying Diseases (WNv, Lyme)
      - Impacts of Climate Change on Health
      - Sunburns
      - Sunglasses Use
      - Sunscreen use
      - Sun-protective clothing use
      - Sun avoidance
    - The limitations associated with RRFSS data include:
      - Results are self-reported so there may be self-report bias.
      - Individuals not living in households (such as those in prison, hospitals, or the homeless) are excluded. As a result, the percentages may not represent the true estimates for the general population.
      - Some analyses are limited by sample size.
      - Questions are only asked of those age 18 years and older.
  - Canadian Community Health Survey

        - The CCHS is a national, voluntary cross-sectional survey that covers the population 12 years of age and over. The survey provides health information at the provincial and regional levels, though the following groups are excluded: Persons living on reserves and other Aboriginal settlements in the provinces; full-time members of the Canadian Forces; the institutionalized population, children aged 12-17 that are living in foster care. More information is available at www23.statcan.gc.ca/imdb/p2SV.pl?Function=getInstanceList&Id=1531795
        - The Canadian Community Health Survey (CCHS), Statistics Canada was used for the analysis of:
            - Alcohol use
            - Perceived Mental Health
            - Prevalence of mood disorders
            - Prevalence of anxiety disorders
            - Vegetable and Fruit Consumption
        - The limitations associated with CCHS data include:
            - Generalizability of the results is restricted to the household population aged 12 or older. Consequently, the results do not necessarily represent the experiences of the very young or the institutionalized population.
            - Selection of the sample was based on self-reported information.
            - This information has not been clinically validated.
            - Information about disease severity was not available. General health status measures, such as self-reported health, disability level and co-morbidities, were used as proxy indicators.
    - Households and the Environment Survey (NES)
        - NES data was used to estimate the percentage of households with an air conditioner in the Peterborough Census Metropolitan Area.
        - More information is available at www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3881
- Institute for Clinical Evaluative Sciences (ICES)
    - Chronic disease prevalence (data from chronic disease cohorts)
        - More information available at www.publichealthontario.ca/en/Data-and-Analysis/Chronic-Disease/Chronic-Disease-Incidence-Prevalence , "View Technical Notes"
    - Estimating the size of the population at increased risk for health-related problems due to poor air quality
        - Additional details are available upon request.
- Better Outcomes Registry & Network (BORN) Ontario
    - Funded by the Government of Ontario, the Better Outcomes Registry & Network (BORN) is Ontario's prescribed perinatal, newborn and child registry with the role of facilitating quality care for families across the province. BORN collects, interprets, shares and rigorously protects high-quality data essential to making Ontario one of the safest places in the world to have a baby. More information is available at www.bornontario.ca/en/about-born/about-born.aspx
- Office of the Chief Coroner, Ontario
    - Opioid-related mortality
        - Additional details are available upon request.
- Peterborough County-City Paramedics - Paramedic calls for service
    - Opioid-related calls for service
        - Additional details are available upon request.
- Ontario Health (Cancer Care Ontario), Surveillance and Cancer Registry - Ontario Cancer Registry SEER*Stat package
    - Rates of Lung Cancer and Malignant Melanoma
        - Additional details are available upon request.
- Peterborough Public Health - Ontario Nutritious Food Basket data
    - Food affordability and food availability data is collected annually by Peterborough Public Health. The Ontario Nutritious Food Basket is based on Health Canada's National Nutritious Food Basket. Minor methodology

changes were made to availability tracking between 2022 and 2023. Therefore, 2022 availability data was adjusted to allow for comparisons to 2023.
    - See www.peterboroughpublichealth.ca/reports-and-data for Addressing Food Insecurity in Peterborough Reports, which outline data and details of the food affordability monitoring process.
- Integrated Public Health Information System (iPHIS)
    - Rates of Lyme disease, Food and Waterborne Disease monthly incidence and annual incidence rate (Ontario data presented)
        - More information is available at www.publichealthontario.ca/en/Data-and-Analysis/Infectious-Disease/Reportable-Disease-Trends-Annually
        - Additional details are available upon request.
- National Ambulatory Care Reporting System (NACRS), Canadian Institute for Health Information (CIHI) - Emergency department visits
    - The National Ambulatory Care Reporting System (NACRS) Canadian Institute for Health Information (CIHI), extracted from intelliHEALTH, was used for analysis of Emergency Department Visits. Data is recorded according to the residential address (postal code) of the patient.
    - The limitation of NACRS data is that the "Main Problem" represents the patient's main problem or diagnosis as determined during the ED visit. All visits have one main problem and up to nine other problems, therefore each ED visit can have multiple (up to 10) diagnoses. The only diagnosis types available are ‘main' or ‘other'. This could lead to errors in reporting.
- Ontario Climate Change and Health Modelling Study: Report
    - More information available at www.ontario.ca/page/ontario-climate-change-and-health-toolkit
- Mapped population data utilizes Census of Population data (by dissemination area). This assessment includes mapped population data from the following sources:
    - Public Health Ontario, Ontario Marginalization Index (www.publichealthontario.ca/en/Data-and-Analysis/Health-Equity/Ontario-Marginalization-Index)
    - Université Laval (vaguesdechaleur.ffgg.ulaval.ca/en/)
    - HealthyPlan.city (healthyplan.city/en)
    - Public Health Ontario - Per cent of the population exposed to Traffic Related Air Pollution by Public Health Unit, Ontario, 2011 (data is not presented in a mapped format but was prepared using census data)
        - Additional details available upon request

Climate and hazard data

- Internal (PPH) data
    - heat warnings and frostbite alert data
    - beach testing
    - vector (tick and mosquito) surveillance
        - Additional details are available upon request.
- Otonabee Regional Conservation Authority (ORCA)
    - flood warnings and low water declarations
        - More information is available at:
            - https://www.otonabeeconservation.com/watershed-health/water-levels-and-flooding/
            - https://www.otonabeeconservation.com/watershed-health/water-levels-and-flooding/low-water-conditions-and-drought/
- ClimateData.ca
    - ClimateData.ca was relied upon for much of the climate indicators relating to temperatures and precipitation. The platform makes it possible to visualize and download climate data for health regions (e.g., Peterborough Public Health health region) according to the selected timeframes of this report.

    - Climatedata.ca uses CMIP6 models in their climate projections. Most data is available to download from the interactive platform.
    - A custom analysis was completed for the heat wave frequency data (see Figure 5-7).
    - Short-duration rainfall Intensity-Duration-Frequency (IDF) data was extracted August 23, 2023 from the Peterborough Airport weather station.
    - More information is available at climatedata.ca
- Air Quality Ontario (Ministry of the Environment, Conservation and Parks)
    - All local air quality data was accessed from airqualityontario.com. Presented data relates to measurements taken at the Peterborough air quality monitoring station located on Hospital Dr., Peterborough.
    - Data from 2015 to 2020 comes from Air Quality Ontario annual reports available at www.airqualityontario.com/press/publications.php . Data from 2021, 2022, 2023 are automatically polled data, retrieved from www.airqualityontario.com, and have not undergone final verification. Data for 2023 is up to July 31, 2023.
- Mapped hazard data for PPH region were accessed from the following external sources:
    - Université Laval
        - Extreme heat (vaguesdechaleur.ffgg.ulaval.ca/en/)
    - HealthyPlan.city
        - Canopy cover (relates to extreme heat) (healthyplan.city/en)
    - ORCA
        - Floodplain mapping
            - The process for mapping floodplain hazards is set out in federal and provincial guidelines. More information is available from www.otonabeeconservation.com/permits-planning/floodplain-mapping/

Appendix B - Climate Data Inclusive of SSP2-4.5 and SSP5-8.5 Scenarios

Table B-1. Mean Temperature and Precipitation Variables for PPH Region Baseline Time Period and Projected for 2050s and 2080s Under Middle of the Road (SSP2-4.5) and Fossil-Fueled Development Scenarios (SSP5-8.5).

Variable	Baseline (1981-2010)	2050s		2050s		2080s		2080s	
		SSP2-4.5	Difference from baseline	SSP5-8.5	Difference from baseline	**SSP2-4.5**	Difference from baseline	SSP5-8.5	Difference from baseline
Annual mean temp °C	6.4	9.1	2.7	9.9	3.5	10	3.6	12.4	6.0
Spring mean temp °C	5.3	7.9	2.6	8.8	3.5	8.7	3.4	11.3	6.0
Summer mean temp °C	18.8	21.2	2.4	22.1	3.3	22.2	3.4	24.8	6.0
Fall mean temp °C	8.2	10.6	2.4	11.4	3.2	11.5	3.3	14.1	5.9
Winter mean temp °C	-7.1	-4.1	3.0	-2.8	4.3	-3.0	4.1	-0.1	7.0
Annual total precip (mm)	854	946	92	939	85	948	94	990	136
Spring total precip (mm)	211	239	28	243	32	244	33	259	48
Summer total precip (mm)	217	226	9	220	3	226	9	223	6
Fall total precip (mm)	238	257	19	259	21	259	21	267	29
Winter total precip (mm)	204	230	26	235	31	243	39	261	57

Source: ClimateData.ca, 2023.[21]

Table B-2. Frost-related data for PPH Region Baseline Time Period and Projected for 2050s and 2080s Under Middle of the Road (SSP2-4.5) and Fossil-Fueled Development Scenarios (SSP5-8.5).

Variable	Baseline (1981-2010)	2050s		2050s		2080s		2080s	
		SSP2-4.5	Difference from baseline	SSP5-8.5	Difference from baseline	**SSP2-4.5**	Difference from baseline	SSP5-8.5	Difference from baseline
Last spring frost	May 7	April 26	11 days	April 24	13 days	April 23	14 days	April 14	23 days
First fall frost	Oct 3	Oct 16	13 days	Oct 21	18 days	Oct 21	18 days	Nov 3	31 days
Frost-free season	148 days	172 days	24 days	180 days	32 days	182 days	34 days	201 days	53 days
Number of days outside of the frost-free season	217 days	193 days	/	185 days	/	183 days	/	164 days	/
Frost days (# days temp goes below 0°C)	162 days	134 days	28 days	125 days	37 days	126 days	36 days	97 days	65 days
Ice days (# days temp does not go above 0°C)	69 days	49 days	20 days	39 days	30 days	40 days	29 days	22 days	47 days

Source: ClimateData.ca, 2023.[21]

Appendix C - RRFSS Responses Regarding Opinions on Climate Change

Table C-1. Percentage of PPH Residents (Sample of Adults (age 18+)) Responding to Questions About Climate Change in the Rapid Risk Factor Surveillance System (RRFSS) Survey, 2019.

	Agree	Disagree	N/A*	
They agree that the world's climate is changing.	95.1%	3.8%	1.1%	
	Likely	**Not likely**	**N/A***	
They think that climate change is likely to cause:				
more frequent and severe local heatwaves.	89.8	5.6	4.6	
more local extreme weather events.	88.7	7.3	4.0	
more days with poor air quality or smog, locally.	86.4	8.2	5.3	
more insects carrying diseases, locally.	79.8	7.0	13.3	
	Negative	**Positive**	**Positive and Negative**	**N/A***
They think that climate change will have an effect on human health.	63.7	19.5	11.8	5.0
	Concerned	**Not concerned**	**N/A***	
They are concerned about climate change.	91.2	5.8	3.0	

Source: Rapid Risk Factor Surveillance System (RRFSS), 2019.

* - N/A is inclusive of responses: "Refused", "Not sure/Don't know/Depends", or "don't think climate change is happening or will happen", depending on the question.

Appendix D - ICD-10 Codes Used for Emergency Department Data

Mental health-related ICD-10 codes:

- F10–F19, F55 = substance-related disorders
- F20–F29 = schizophrenia, delusional & other psychotic disorders
- F30–F34, F38, F39, F53.0 = mood/affective disorders
- F40, F41, F42, F43.0, F43.1, F43.8, F43.9, F93.0, F93.1, F93.2 = anxiety disorders
- F60, F61, F62, F68, F69 = selected disorders of adult personality and behaviour

Heat related ICD-10 codes:

- T67 (heatstroke and sunstroke) with X30 (exposure to excessive natural heat), X32 (exposure to sunlight), or X59.9 (unspecified cause of injury);
- X30 with any diagnosis except T35 (frostbite; coding error)

Cold-related ICD-10 codes:

- T33–T35 (frostbite) with X31 (exposure to excessive natural cold) or X30 (exposure to excessive natural heat; coding error);
- T69 (chillblains) with X31
- T68 (hypothermia) with any external cause of injury except W93 (exposure to excessive cold of man-made origin)
- X31 with any diagnosis

Falls due to Ice and Snow ICD-10 codes:

- W00 = fall on same level involving ice and snow
- NOTE: Falls involving ice or snow on stairs and steps are not included.

Asthma-related ICD-10 codes:

- J45 = asthma

Seasonal Allergies-related ICD-10 codes:

- J30.1 = allergic rhinitis due to pollen
- J30.2 = other seasonal allergic rhinitis

Chronic Obstructive Pulmonary Disorder-related ICD-10 codes:

- J40 = bronchitis, not specified as acute or chronic
- J41 = simple and mucopurulent chronic bronchitis
- J42 = unspecified chronic bronchitis
- J43 = emphysema
- J44 = other chronic obstructive pulmonary disease

Appendix E - Additional Methodology Notes

I. Heat Wave Frequency – averages for the 2080s (Extreme Temperature chapter, Heat Waves and Warnings section)

Frequency of heat waves data was acquired through a custom analysis from climatedata.ca. The custom analysis does not provide 30 year averages as it does for the standard variables on the climatedata.ca website. The 30 year average frequency of heat waves projected for the 2080s time period for the two selected climate scenarios was presented. These averages were calculated from "the mean of the medians over the 30-year time period." This is not the full calculation used by climatedata.ca, but correspondence with their Support Desk (Canadian Centre for Climate Services) (August 21, 2023) stated that this calculation can be used "for a rough comparison's sake" to comment "on the differences between the two 30-year periods."

II. Estimating the number of dwellings and population living in the floodplain (Extreme Weather Events Chapter, Table 6-3)

Population and occupied dwellings within the floodplain were estimated using GIS by overlaying 2021 Statistics Canada dissemination blocks and the Otonabee Region Conservation Authority floodplain layers. Areas where these layers had differing boundaries were overlaid with address points zoned as residential to estimate a percentage of properties within the dissemination block and inside the floodplain. Where residential zoning addresses were not available the percentages were estimated visually based on building footprints and aerial photography. The percentages were multiplied by the dissemination block population and occupied dwelling data and summed for the population centres to get the total population and occupied dwellings within the floodplain.
(Data analysis by: City of Peterborough Geomatics/Mapping Division, 2023.)

III. Public Health Ontario definition of major roads and highways[197] (Air Quality chapter)

A major road includes road classes defined in the Ontario Road Network (ORN) as:

- Arterial: a major thoroughfare with medium to large traffic capacity, or
- Expressway highway: a high-speed thoroughfare with a combination of controlled access and intersections at grade level.

A highway is the road class defined in the ORN as a:

- Freeway: An unimpeded, high-speed controlled-access thoroughfare for through traffic with typically no at-grade intersections, usually with no property access or direct access and which is accessed by a ramp.