Assessment of Vulnerability to the Health Impacts of Climate Change

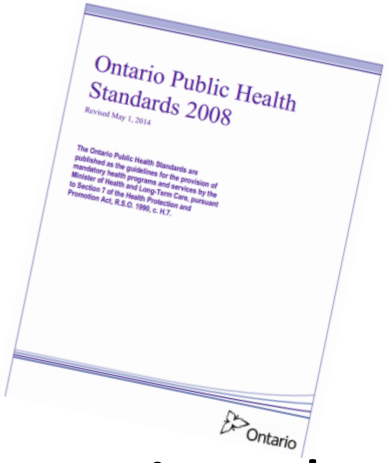
Peterborough City and County

Peterborough County-City HEALTH UNIT
...because health matters!

Climate Change in Canada

- Since 2008, strong evidence of health risks due to changing climate
- Local evidence is JUST starting to emerge on impacts to health
- Increased knowledge of climate change and vulnerabilities
- Greater efforts to increase public awareness

OPHS

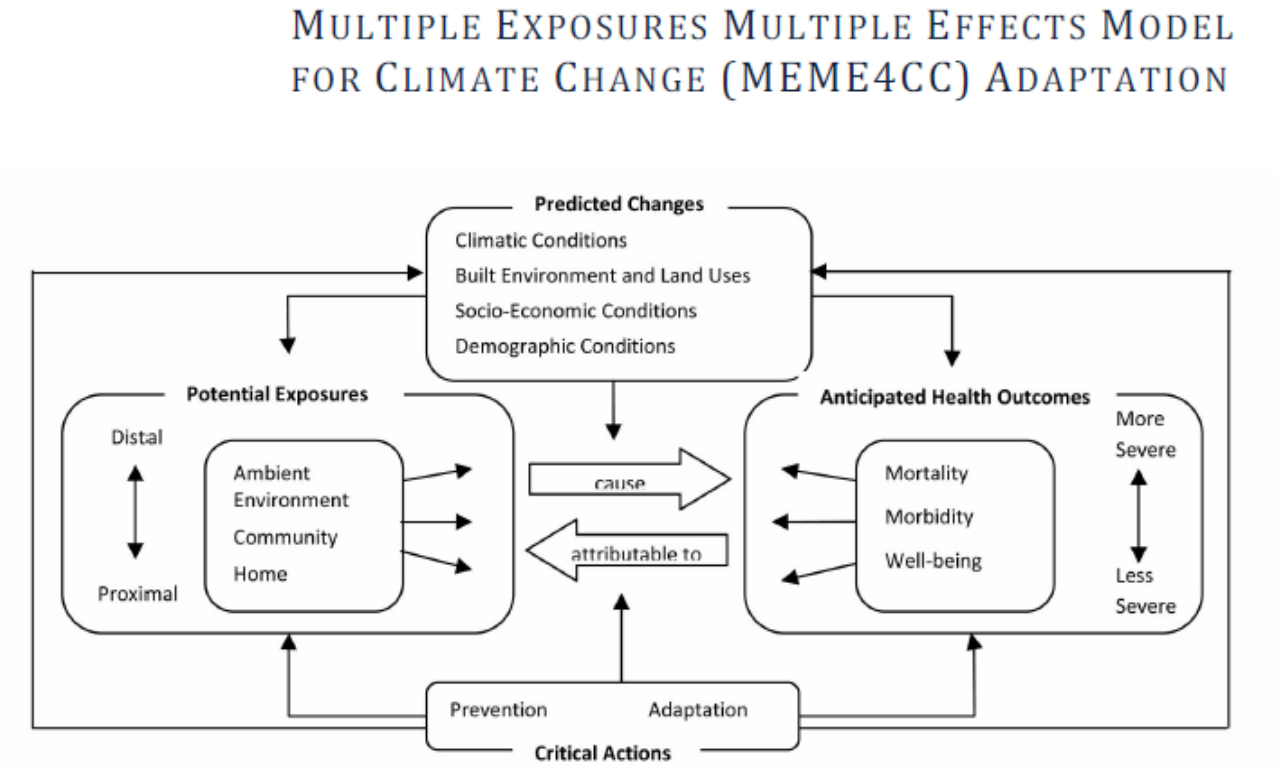


- PCCHU is required to increase public awareness of the health risk factors associated with climate change
- Vulnerability assessments should provide information for decision makers on the extent and magnitude of likely health risks attributable to climate change

Key Threats

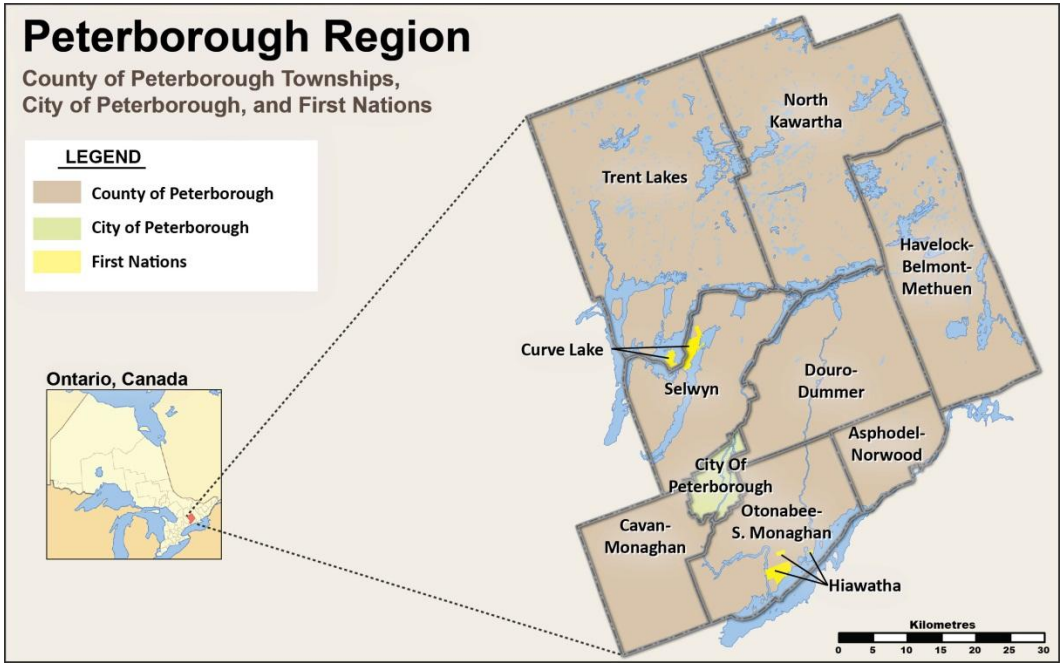
- Extreme Weather – heat, cold, flooding
- Air Quality and UV radiation
- Waterborne and Foodborne Illness
- Vectorborne Disease

MEME model


MULTIPLE EXPOSURES MULTIPLE EFFECTS MODEL FOR CLIMATE CHANGE (MEME4CC) ADAPTATION
Predicted Changes
Climatic Conditions
Built Environment and Land Uses
Socio-Economic Conditions
Demographic Conditions
Potential Exposures
Distal
Proximal
Ambient Environment
Community
Home
cause
attributable to
Anticipated Health Outcomes
Mortality
Morbidity
Well-being
More Severe
Less Severe
Prevention
Adaptation
Critical Actions

Demographics

- City of Peterborough, eight municipal townships and two First Nation communities



Demographics – con't

- 2011 – City 78,700, County 54,000, FN 1400
- To the south – agriculture, urban communities
- To the north – lakes, rivers, diverse landscapes, seasonal recreational use
- 48,848 private dwellings (CMA) (75% owner occupied)
- 23.9% minor repairs, 7.9% major repairs

Demographics – con't

- CMA – males 48%, females 52%
- From 2006, saw a decrease in 0-14 and increase in 65+
- Median age increased to 44.6 from 40.4
- 2030 – 28.6% will be 65+ (ONT 21.9%)

Demographics – con't

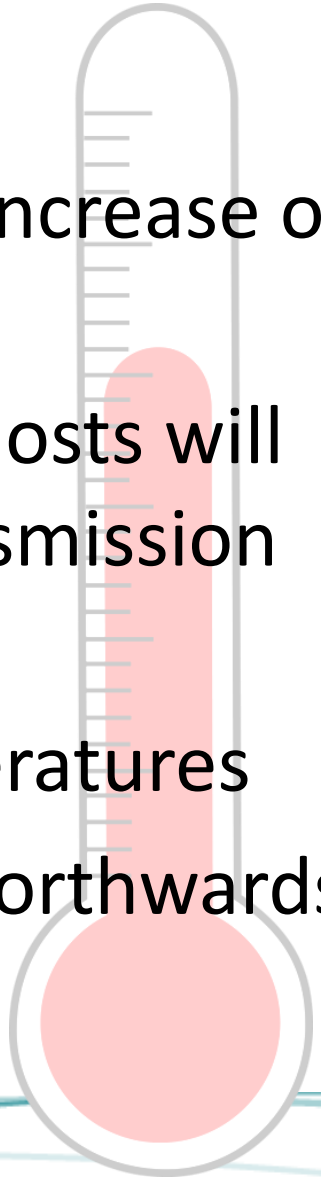
- Education – one of the main determinants of health at population level
- 24% of 15+ who do not have at least high school
- 16.3% - University level (ONT 24.6%)

Vectorborne Disease

- Mosquito borne – West Nile virus, eastern Equine encephalitis
- Tick borne – Lyme, Powassan encephalitis
- Peterborough County not risk area for Lyme
- Powassan emerging in the USA – PHAC will be testing ticks to determine activity

VBD – Climate

- 2100 – average global temperature increase of 1.0-3.5^{o}C
- Biology and ecology of vectors and hosts will be affected and risks of disease transmission can increase
- Larvae mature faster in warm temperatures
- EEE and Powassan are evidence of northwards expansion of VBD



VBD – Built Envr

- 25 VBD associated with changes in urbanization, deforestation and agricultural practices
- Human encroachment into wildlife habitats
- Impervious surfaces – pooling water
- Rural – water irrigation management, vaccination of livestock

VBD– Socio-economic

- Lower income – condition of homes (screens), tenants, closer proximity housing (failure to remove breeding sites)
- Access to physicians
- PPM can be a financial burden
- Education level – access to information
- Outdoor employment

Peterborough County-City HEALTH UNIT
...because health matters!

VBD - Demographics

- Aging population = potential for more serious VBD cases
- 0-14 are reliant on caregivers for PPM
- 93% English speaking – educational materials in other languages

VBD - Exposures

- Mosquitoes – anywhere
- Ticks – forests and tall grass
- Travel may increase risk
- Mosquito pools fluctuate with weather, as do WNv positive ones

YEAR	WNv Positive Mosquito Pools
2010	0
2011	3
2012	7
2013	1
2014	0

VBD - Vulnerable

- > 50 years of age, chronic disease, immunosuppressed – mosquitoes
- Persons who work outdoors or partake in outdoor activities in forests/trails – ticks
- Those reliant on others for protection (children, persons with disability)

VBD – Health Outcomes

- Mild to severe illnesses
- Missed work, missed school
- Increased strain on healthcare system

VBD - Preventative

- PCCHU education, awareness, testing, surveillance for vectors
- Human surveillance
- City of Peterborough – larviciding, Stagnant Water Bylaw
- MOHLTC – adulticide emergency plan

Waterborne/Foodborne Illness

- Exposure to chemicals or microbes in drinking water and recreational water
- Human illness indicating a food was the source of exposure to the contaminant causing the illness – bacteria, virus, parasite, toxins

WB/FB - Climate

- WB diseases particularly sensitive to changes in the hydrologic cycle
- Heavy rainfall can overwhelm WTP due to increased turbidity resulting in inadequate disinfection
- Increased temperature is linked to increased incidences of blue-green algae

Year	Number of reported blue-green algal blooms in Peterborough County
2008	1
2009	0
2010	2
2011	3
2012	2
2013	2
2014	0

WB/FB - Climate

- Warm weather allows bacteria to grow more readily in foods
- Favours flies and pests
- Floodwater can impact food supplies – silt, sewage, oil, chemical waste

WB/FB – Socio-economic/Demographic

- Access to information on safe food handling
- Differential exposure to contaminated water
- Low income – potentially no water treatment, limited access (transportation) for lab sampling
- Large proportion aged 65+ - most vulnerable
- Also young, chronic disease, immunocompromised, pregnant women

WB/FB - Exposures

- Drinking water
- Rec Water
- Fish – Guidelines

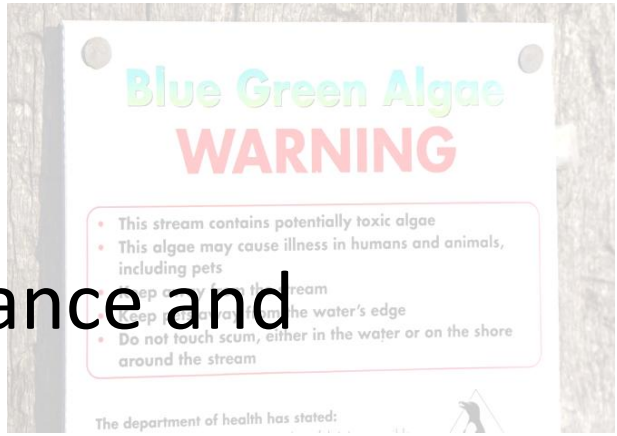
- Increased public events in summer, warmer temp food handling
- Increased consumption of fruits and vegetables, home gardening and preserving

WB/FB – Health outcomes

- Range of symptoms from mild to severe
- Nitrate in well water – methaemoglobinaemia
- Pathogens are threat to animal health

DISEASE	2010		2011		2012		2013		2014	
CAMPYLOBACTER ENTERITIS	36	*5.4*	27	*3.8*	30	*4.0*	36	*5.4*	33	*4.6*
GIARDIASIS	21	*3.1*	8	*1.1*	11	*1.5*	25	*3.8*	20	*2.8*
SALMONELLOSIS	27	*4.0*	18	*2.5*	27	*3.6*	30	*4.5*	29	*4.0*

WB/FB - Preventative



- PCCHU inspection services
- PCCHU human disease surveillance and outbreaks
- BWAs
- MOE oversight of drinking water systems
- Rec water testing

Air Quality and UV Radiation

- Air pollution from forest fires, dust, emissions, smog (mainly ground level ozone and fine particulate matter)
- More than half of ONT's smog comes from south of the border, travelling north in wind
- Thinning of ozone layer allows for greater exposure to UV rays

AQ and UV - Climate

- Air pollution episodes in Canada are predicted to get longer and more severe with climate change
- Increases in emissions also causes changes in optimal growing conditions, increased heat stress, threat of new pests, extreme weather
- Four-fold increase in forest fires in USA

AQ and UV – Built Envr

- Planning and design of smart design communities – reduced emissions
- Maintain forests, wetlands – important in removal and storage of atmospheric carbon dioxide
- Agricultural products and forestry can be alternative fuels

AQ and UV – Socio-economic

- Low-income – more likely to live closer to major roads and industrial pollution sources AND have underlying health conditions exacerbated by poor air
- 8% of Peterborough houses require major repair – possibility of poor ventilation in these homes leading to air quality issues

AQ and UV - Demographics

- 65+ experience adverse impacts from poor air quality
- Melanoma rates increased which can be attributed to differences in proportion of visible minorities in Peterborough in addition to the aging population

AQ and UV – Exposure

- MOECC AQI revealed 1 poor air quality day and 34 moderate air days in both 2013 and 2014
- PM in home from wood burning appliances
- Warmer temperatures – spend more time outdoors
- No large point source emissions in Ptbo

AQ and UV - Vulnerable

- Young children
- Elderly
- Respiratory, cardiovascular conditions
- Those active outdoors
- UV – light coloured skin/eyes/hair, work or play outdoors, medications causing increased sensitivity to the sun
- Children rely on caregivers for PPM

AQ and UV – Health Outcomes

- OMA predicts over 7000 premature deaths in 2015 from air pollution
- Modelling estimated 119 premature deaths in Ptbo (smog related)
- 2014 Canadian Cancer Society report – Ptbo third highest rate of malignant melanoma in ONT
- 26.7 cases per 100,000 (ONT 15.6 cases)

AQ and UV - Preventative

- AQI/AQHI
- PCCHU smog alerts
- Education on reducing impacts and protection from poor air quality
- PCCHU cancer prevention
- Drive Clean, reduction/elimination of coal fired plants, carpool lots, transit increases, bike lanes, land use planning policies

Extreme Weather

- Extreme heat
- Extreme cold
- Increased precipitation
- Increased incidence of tornados

Extreme Weather - Climate

- Over the past 66 years – annual average temperatures across Canada increased 1.6^{o}C
- Projections for communities across the country to experience increases in heat events
- Precipitation intensity is expected to increase over much of the globe
- As planet becomes warmer there is potential for increased storms

Extreme Weather – Built Envr

- Population growth and urbanization generally reduces the capacity of watersheds to absorb run-off
- Resilient building needed to withstand extreme weather events
- On-site renewable power generation
- Social connectivity

Peterborough County-City HEALTH UNIT
...because health matters!

Extreme Weather – Socio-economic/demographic

- Income - home repairs, recovery from extreme events
- Education – access to adaptive behaviours in the event of an extreme weather event, understanding health risks
- Homeless
- Young children and 65+ vulnerable

Extreme Weather - Exposure

- No air conditioning or access to cooling
- Power surges can cause power failures
- Poorly insulated homes
- Outdoor work or activities
- Flood waters into homes, sewage back-ups
- Re-connection of hydro following flood, replacement of water heaters

Extreme Weather - Vulnerable

- Children and elderly
- Chronic diseases
- Medications (heat related illnesses)
- Athletes, outdoor workers
- Mental health and homelessness

Extreme Weather – Health Outcomes

- Vary based on individual and community preparedness
- Adverse health effects in response to extreme heat and cold
- Additionally drownings, fires, carbon monoxide poisoning
- Flooding injuries, foodborne and waterborne illness, mould, mental health
- Healthcare system – temperature related illness

Extreme Weather – Preventative

- Emergency management and response plans!
- Training, mock exercises, partnerships
- PCCHU alerts

YEAR	ALERT
Summer 2011, Winter 2011 – 2012	2 heat warnings, 2 heat alerts, 1 heat warning with smog alert, 2 frostbite alerts
Summer 2012, Winter 2012 – 2013	1 heat warning, 2 heat alerts, 1 frostbite alert
Summer 2013, Winter 2013 – 2014	2 heat warnings, 4 heat alerts, 9 frostbite alert, 1 frostbite warning
Summer 2014, Winter 2014 - 2015	1 heat alert, 9 frostbite alerts (as of Feb 22, 2015)

- City of Ptbo Flood Reduction Master Plan
- Flood forecasting

Conclusion

- Important that all PCCHU programs identified to protect health incorporate climate change perspectives to better inform policies and programs
- Gaps exist in knowledge and data – address gaps to more fully understand vulnerability

Coming up…

- Review of adaptation practices and additional exploration of preventative activities at the home, community and ambient levels
- Future – closer look at local predicted changes in temperature and precipitation