



## 3.0 Extreme Temperatures: Key Findings

### Climate change projections

#### Extreme Heat

- The study area expects to see increases upwards of 5°C in the minimum, average, and maximum seasonal temperatures by the 2080s, including an increase in the frequency and duration of heat warnings.
- The number of extreme heat days (above 30°C) is expected to increase from 7 to 60 by 2080s for Wellington-Dufferin-Guelph, and from 10 to 61 by the 2080s for Waterloo Region.
- The number of tropical nights (above 20°C) is also expected to increase.

#### Extreme Cold

- Climate projections indicate that the study area will experience a decrease in the frequency of extreme cold days, and overall milder, wetter winters.
- Despite the overall warming trend that will result in fewer extreme cold events, climate change may still exacerbate the severity of extreme cold events (such as freezing rain and ice storms).

### Population-level exposure

- Urban heat islands (UHIs) increase temperatures in urban areas, increasing exposure and exacerbating health risks. Areas most impacted from UHIs include the of Waterloo, Kitchener, Cambridge and Guelph, and Township of Wilmot. These areas also have a higher degree of impermeable surfaces, and lower tree cover, which further exacerbate UHI effects.
- Individuals who work outdoors or participate in outdoor recreation or active transportation may be more exposed to extreme heat.

### Population-level sensitivities

- Both children and older adults have physiological sensitivities to extreme heat, which reduce their ability to regulate body temperature. In the study area, the proportion of people aged 65 and older is growing.
- Those with pre-existing health conditions, including mobility limitations, psychiatric illnesses, and those with circulatory and respiratory diseases, are more sensitive to extreme heat.



### Population-level adaptive capacity

- Individuals experiencing physical or social isolation may lack the capacity to respond to or prepare for extreme heat events.
- Those who speak neither English nor French (0.9% in Wellington-Dufferin-Guelph and 1.8% in Waterloo Region), new immigrants (16.4% in Wellington-Dufferin-Guelph and 22.6% in Waterloo Region), and other visible minorities (11.6% in Wellington-Dufferin-Guelph and 19.0% in Waterloo Region) may have limited adaptive capacity in the face of extreme temperatures.
- People experiencing housing insecurity and insufficiency are particularly vulnerable to extreme heat and cold. Data for the study area suggest that housing insufficiency is 5.1% in Wellington-Dufferin-Guelph relative to 5.0% in Waterloo Region, both of which are lower than the provincial average of 6.1%.

### Adaptive actions

- Individual actions include limiting exposure by seeking out warm environments on cold days, and cool environments on hot days. Additional strategies include knowing the weather forecast before going outside and modifying plans according to weather; wearing weather appropriate clothing (e.g., layers in cold weather, light colored clothes in hot weather); staying hydrated; and knowing the signs and symptoms of temperature related illness (e.g., frostbite, hypothermia, heat stroke). Frequently checking in on vulnerable neighbours, friends, and family can also help to identify early signs of temperature-related illnesses.
- ROWPH updates and circulates the Waterloo Region Heat Warning Response Plan (a key component of the Heat Alert Response System for Waterloo Region) and the Waterloo Region Extreme Cold Warning Response Plan.
- WDGPH implements a Heat Warning and Information System, and offers support to local stakeholders (including, but not limited to municipalities, long-term care facilities, childcare facilities, and school boards) for the development of local Heat Alert Response Systems.
- Extreme heat alert notifications from Environment and Climate Change Canada are shared with the public and stakeholders through websites and social media.
- Public Health supports municipal and regional partners in incorporating extreme heat and cold considerations into strategic and land use planning, and community program and public space design.
- Warming and Cooling Centres are provided by member municipalities, the Region of Waterloo, and community partners within the study area, and each respective health unit is available to provide input into their planning and coordination.



- Public Health collaborates with a variety of local, regional, and provincial partners to institute novel programming and share information, wherever possible.
- Surveillance systems, such as the Acute Care Enhanced Surveillance (ACES) system are available for receiving alerts and tracking heat-related illnesses in the community.

### Baseline health impacts

- Temperatures are strongly associated with a variety of human health impacts, and heat-related morbidity in Canada is typically associated with elevated temperature and humidex values during summer months.
- Emergency department visits seem to be generally higher today than they were in 2008 for temperature-related illnesses, and roughly follow trends of heat warning occurrences.



## 4.0 Ultraviolet Radiation: Key Findings

### Climate change projections

- Climate change is not expected to exacerbate the relationship between ozone depletion and UVR exposure, and there is currently low confidence that climate change will appreciably alter conditions that influence UVR exposure.
- High UV index in the summer, spring, and autumn, will continue to be an issue of concern as people spend more time outdoors during projected warmer than average weather across all seasons and have not increased their personal sun protection practices.
- Areas with low tree canopy cover may be more exposed to UVR due to reduced shade cover. Guelph, Orangeville, Shelburne, Grand Valley, and Amaranth, have lower tree canopy coverage as a proportion of total area, and the more densely populated areas of Guelph, Waterloo, Kitchener, and Cambridge have lower proportions of natural climate zones (i.e., a spatial measure of 'greenness') than surrounding areas.

### Population-level exposure

- The study area experiences consistently higher than national average UVR due to its southern geographical location within the country.
- The stratospheric ozone layer provides protection from radioactive energy from the sun. Previous depletion (pre-1987) of the layer translates to a 3% reduction of this protective layer compared to historical normal levels above Canada.

### Population-level sensitivities

- Infants, children, and youth have thin skin and their eyes allow more UVR light in, and therefore are more susceptible to long-term harms associated with UVR exposure. This can magnify their cancer risk and related health risks over the course of a lifetime. Children are also more likely to rely on caregiver support to engage with sun safety behaviours.
- While those with immigrant status who have darker skin pigmentation tend to be at lower risk for damaging effects, when skin cancer does develop in people with darker skin pigmentation, it is often in a later stage when diagnosed.
- People who work outdoors or those who participate in physical activity outdoors can have higher exposure to UVR and are at heightened risk for negative health impacts, especially as sweating can increase photosensitivity of the skin.



### Population-level adaptive capacity

- People with lower incomes, education, or who are facing other forms of material disadvantage (e.g., poverty, homelessness) may be inadequately able to protect themselves from UVR.

### Adaptive actions

- Individual actions include actively seeking information on the UV index value, seeking shade, covering up exposed skin, wearing a hat and UV sunglasses, and using a water-resistant sunscreen with a sun protective factor (SPF) rating of 30 or higher.
- Public Health activities include:
  - » Epidemiological surveillance of cancer incidence and health promotion activities (including risk communication and policy development);
  - » Sharing information on sun safe behaviours on their websites with associated information links;
  - » Working with partners to develop local UVR exposure reduction strategies by taking a comprehensive approach rooted in strategies of awareness raising, creating supportive environments (such as shade), skill building, and policy development;
  - » Participating in reviewing municipal strategic plans, including official plans and other land-use planning documents to promote inclusion of healthy land-use planning policies (i.e., policies that relate to trees, shade, green spaces, etc.); and
  - » Providing support to municipalities on outdoor public space projects, which may include conducting shade audits.

### Baseline health impacts

- UVR is associated with an array of health impacts stemming primarily from exposure to UV-A and UV-B, including sunburns and skin damage (e.g., wrinkling), skin and eye cancers, cataracts, DNA damage, immune suppression, and cell atrophy.
- Emergency department visits for sunburn are slightly higher in Wellington-Dufferin-Guelph than Waterloo Region, ranging between 13.1 to 21.9 per 100,000 (relative to 3.7-10.8 per 100,000).
- Respondents living within the study area self-reported slightly higher likelihood to have had a sunburn in the past 12 months (36.0% for Wellington-Dufferin-Guelph and 37.2% for Waterloo Region, respectively) relative to the Ontario average (31.6%).



## 5.0 Extreme Weather: Key Findings

### Climate change projections

- Annual precipitation levels are expected to increase marginally by the end of the century. Most increases would occur in the spring and winter season.
- Extreme precipitation events – where total rainfall is in the 95th or 99th percentile - are likely to increase in the study area.
- Severe freezing rain events (those lasting longer than six hours per day) are projected to increase up to 30% by 2100.

### Population-level exposure

- The study area has recently experienced increasing precipitation in the spring, fall, and winter that can increase the risk of flooding, slippery conditions, and flash freeze events.
- While changes to local climates have been observed across the study area, current climate models do not accurately predict changes to flood risk, tornadoes, or other extreme weather events, making projections for human health and well-being difficult to predict.

### Population-level sensitivities

- Older adults may be more physiologically sensitive to extreme weather. Falls are the most common cause of injury and a leading cause of hospitalization among older Canadians, and it is estimated that one in three people aged 65 or older are likely to fall at least once. Extreme weather can increase the risk of falls.

### Population-level adaptive capacity

- Children and older adults are more dependent on caregivers than working aged populations. This translates into a greater reliance on others during an emergency to engage in adaptive behaviours or remove oneself from harm, and can be particularly acute for older populations with mobility restrictions.
- People who are underhoused, housing insecure, or experiencing homelessness may be differentially exposed to climate-related health hazards by virtue of not having safe housing during an emergency.
- Commuters to and from the study area may experience greater exposure to extreme events, particularly when commuting on highways at high speeds, or rural roads where risk of getting stranded or being in an collision may be higher.



### Adaptive actions

- Individual actions to reduce health risks of extreme weather primarily involve listening to weather alerts and following safety orders issued by emergency agencies, checking in on vulnerable neighbours, having an adequate supply (typically three days) of essential supplies in the event of power outages and service disruptions, and removing oneself from a disaster affected area.
- Early warning and forecasting systems for extreme weather events from conservation authorities and Environment and Climate Change Canada provide critical information for emergency planning and response.
- Local Ontario Health Teams develop surge plans in consultation with key stakeholders to plan and budget for potential surge capacity on healthcare systems and create accountability systems for all facilities potentially impacted by a surge in demand or usage.
- Local conservation authorities undertake a variety of flood mitigation work. For example, the Grand River Conservation Authority (GRCA) completed a [flood mitigation study](#) with aid from the National Disaster Mitigation Program. This study estimates average annual flood damages and reviews options to mitigate flood risk along the Nith River in New Hamburg, conducting a cost-benefit analysis to analyze feasibility of implementation options.
- Upper-tier and lower-tier municipalities have mutual aid agreements to support one another during weather-related events or emergencies.

### Baseline health impacts

- In recent years, crude hospitalization rates from falls are increasing throughout the study area. Falls are intended to be proxy measure of accidental morbidity resulting from extreme weather given their association with bouts of cold weather and ice formation, but caution should be utilized as the source of falls is not able to be distinguished.
- From 2015-2019 significant evidence of bacterial contamination has been found in about 11% of the samples submitted from private wells in the study area. However, multiple samples are frequently submitted for the same well. A closer analysis of samples submitted in the Wellington-Dufferin-Guelph area indicated that in 2018, 21% of wells that were tested showed evidence of bacterial contamination. Moreover, the wells that were sampled only represented 10% of the wells in Wellington-Dufferin-Guelph. This suggests that testing rates are low and contamination rates may be significant. Water quality can be affected by flood events.
- Disasters documented across the study area from 1950-2020 include nine significant events since 1973, resulting in 13 deaths, more than 500 persons with injuries, and almost \$100 million in damages.



## 6.0 Food- and Water-borne Illnesses: Key Findings

### Climate change projections

- In general, temperature is expected to increase, resulting in warmer winters and hotter summers. Hotter and drier summers, when punctuated by extreme precipitation events, are more likely to increase the risk of outbreaks of both food- and water-borne illnesses.
- Precipitation is expected to increase in the spring and the fall, and extreme rainfall events are projected to increase across the study area through the spring, summer, and fall. Extreme rainfall can increase the risk of outbreaks of drinking water-related illness through contaminated flood waters.
- Climate change is expected to alter precipitation patterns and water flows and increase risk of drought which may impact future seasonal produce/food availability.
- Climate change is expected to increase the incidence of harmful algal blooms across Ontario, which could impact the safety of recreational waters and beaches in the study area.

### Population-level exposure

- People who live in rural areas and those who live in flood plains may be at greater risk of water-borne illnesses, particularly if they rely on private wells or small drinking water systems that may not be adequately treated or regularly monitored, and which can be impacted by intense precipitation and flooding.

### Population-level sensitivities

- Older adults (aged 65 and older) are at higher risk of health complications due to the diminished functionality of their immune response, and older populations are more likely to have chronic conditions.
- Children under the age of five are sensitive to food- and water-borne illnesses as they have developing immune systems and may be more reliant on caregivers to translate risk messaging and engage in protective behaviours.
- Individuals with compromised immune systems (e.g., cancer and transplant recipients on immunosuppressive drugs) are more susceptible to serious illness due to suppressed immune response.

### Population-level adaptive capacity

- University students tend to experience higher incidents of food-borne illnesses due to a lack of food safety knowledge and appropriate food safety practices.



- Newcomers to Canada may lack the adaptive capacity to address food- and water-borne illnesses due to language barriers that reduce the effectiveness of Public Health communications.

### Adaptive actions

- Individuals can take a variety of precautions to protect themselves from the spread of food- and water-borne illnesses, such as ensuring proper food preparation and avoiding suspected contaminated food and water sources. For individuals on private well water supply systems, proper maintenance and regular well testing is strongly encouraged.
- Public Health assessment and surveillance actions include monitoring incidences of water- and food-borne illnesses, monitoring costs of healthy eating (the Nutritious Food Basket), disease and outbreak case investigation, and investigation of enteric diseases and exposure sources.
- Public Health undertakes several education, advocacy, and policy-support initiatives, including supporting safe food handler training, providing support and funding for peer programs that support food skills for people living with low income and newcomers, supporting the creation of community and school gardens to create access to locally grown food, and advising on policy statements regarding local food systems and protection of agricultural land.
- Public Health also supports disease prevention through food safety inspections, monitoring of small drinking water systems and wells, and issuing boil water advisories.
- WDGPB conducted a survey of private well owners to collect data on well characteristics and well owner attitudes towards water safety and testing. WDGPB has also been analyzing well water testing results to assess local testing rates and well contamination rates.

### Baseline health impacts

#### Food-borne Illnesses & Food Security

- Food-borne illness stems from consuming contaminated or improperly prepared foods and is expected to increase under climate change, due to more people spending time outdoors or attending outdoor events where food may not be prepared with appropriate risk mitigation practices in place.
- Climate change poses a risk to global food security, and food insecurity is strongly related to nutritional deficiency and the risk of chronic conditions. As an agricultural producing region, food security is not only a household issue, but one of strategic concern for the long-term sustainable development of agricultural industries, and overall community resilience.



### Water-borne Illnesses

- Extreme weather events and flood waters may pose risks to drinking water sources, especially for private wells via the transmission of *E. coli* and other harmful bacteria.
  - » Between 1974 and 2001, two-thirds of waterborne outbreaks in Canada occurred in private or semi-private systems, with *Campylobacter spp.*, *Cryptosporidium spp.*, *Giardis spp.*, and *E. coli 0157* being responsible for 58% of these outbreaks.
  - » Bacterial lab analysis of private drinking wells between 2015-2019 in the study area indicated that 10.7% of samples submitted from wells in Wellington-Dufferin-Guelph and 12.2% of samples submitted from wells in Waterloo Region were found to have “evidence of bacterial contamination”.<sup>1</sup> However, multiple samples are often submitted for the same well. A closer analysis of samples submitted in the Wellington-Dufferin-Guelph area indicated that in 2018, 21% of wells tested showed evidence of bacterial contamination. Moreover, the wells that were sampled only represented 10% of the wells in Wellington-Dufferin-Guelph. This suggest that testing rates are low and contamination rates may be significant.
  - » Project mapping indicated that Centre Wellington, Puslinch, the southwest region of Wellington North, southern Grand Valley and Amaranth, central and southwest Melancthon, and the southeastern area of Guelph/Eramosa are higher risk areas for flood water contamination of wells in Wellington-Dufferin-Guelph. Similarly, Waterloo, Kitchener, and Cambridge have the highest risk of flood water contamination of wells in Waterloo Region, although further floodplain modeling is required to ensure an accurate representation for watersheds other than the Grand River. Additional areas identified by workshop participants as experiencing significant flooding impacts historically, that fell outside of the areas mapped in floodplain analyses, include Minto (Harriston) and Hockley Valley in Mono.



<sup>1</sup> “Evidence of bacterial contamination” includes both “significant evidence of bacterial contamination” and “unsafe to drink” results as defined by Public Health Ontario (see: <https://www.publichealthontario.ca/en/laboratory-services/well-water-testing?tab=4>)



## 7.0 Air Quality: Key Findings

### Climate change projections

- Globally, concentrations of PM<sub>2.5</sub> (particulate matter that is 2.5 microns or less) are expected to increase marginally by 0.43µg/m<sup>3</sup> under RCP8.5. Similar projections forecast increases of <0.2 µg/m<sup>3</sup> over much of North America, although these concentrations may be modified by increases in episodic wildfires.
- Ozone concentrations are expected to increase across southwestern Ontario by up to four to five parts per billion by volume by 2050 when anthropogenic emissions are kept constant.
- Warming will likely produce an increase in moderate to high-risk air quality days with smog episodes for urban areas with dense transportation networks, leading to more Special Air Quality Statements (SAQS) or Smog and Air Health Advisories (SAHA) issued by Environment and Climate Change Canada (ECCC), accompanied by increasing health impacts and rising healthcare costs.
- Warming will lead to earlier onset of the pollen season with implications for seasonal allergies, with ragweed season becoming longer.

### Population-level exposure

- Outdoor workers may have greater exposure to ambient air pollution while on the job (10.8% of the Wellington-Dufferin-Guelph population and 8.0% of the Waterloo Region population work in construction and/or agricultural industries).
- Other populations that may experience greater exposure include those that commute in cars to and from the Greater Toronto Area.
- Evidence suggests that active transportation commuters may experience higher doses of pollution along busy roadways, but there appears to be limited risk for negative effects on lung function while using active transportation relative to utilizing motorized transport.

### Population-level sensitivities

- Older adults (aged 65 and older) are at a higher risk of health complications resulting from poor air quality, especially if they have cardiovascular or respiratory conditions.
- Children (under the age of 15) can be negatively impacted by short-term and chronic exposure to air pollution by contributing to early onset of childhood asthma and inhibiting lung function.
- People with pre-existing respiratory conditions (e.g., chronic obstructive pulmonary disease, asthma) and cardiovascular conditions (e.g., heart disease) are more likely to have these existing conditions exacerbated by poor air quality.



### Population-level adaptive capacity

- People who have low-income, are unemployed or who have precarious occupational status may have greater exposure to poor indoor and outdoor air quality, as low-income housing is often located near busy roadways or other sources of industrial emissions.

### Adaptive actions

- Individuals most at risk, including those who exercise outdoors, children, and seniors, should reduce time spent outdoors during days with higher Air Quality Health Index (AQHI) values (i.e., AQHI of seven or more).
- Public Health's assessment and surveillance actions to address air quality include identifying populations at risk from poor air quality, and monitoring SAQs and SAHAs from ECCC.
- Public Health also participates in health promotion activities, including sharing information about the AQHI, participating in Official Plan and key strategic document reviews on built environment and shade policies, supporting policy development and community engagement on active transportation and vehicle electrification.
- Community actions to address air quality concerns include using tree planting and urban forest strategies to address extreme heat and air pollution, as well as working with Public Health to include air quality considerations in municipal and regional planning activities.

### Baseline health impacts

- There are many health outcomes associated with poor air quality such as lower respiratory tract infections, allergic reactions precipitating hay fever, and chronic conditions such as asthma, chronic obstructive pulmonary disorder (COPD), and/or lung cancer.
- According to Health Canada, the annual number of premature deaths associated with air pollution (PM<sub>2.5</sub>, ozone and nitrogen dioxide) in 2016 was 257 in Waterloo Region and 138 in Wellington-Dufferin-Guelph.
- Emergency department visits for COPD have remained stable across the study area, however Wellington-Dufferin-Guelph has twice the rates of emergency department visits than Waterloo Region at baseline.
- Emergency department visit rates for asthma have been consistently falling over the past 10 years and are generally higher for Wellington-Dufferin-Guelph relative to Waterloo Region.
- Emergency department visits due to allergy to pollen are typically less than 2 per 100,000 people per year across the study area, although since pollen is also a trigger for asthma symptoms, this figure may under-represent the true burden of illness.



## 8.0 Vector-borne and Zoonotic Diseases: Key Findings

### Climate change projections

- In general, temperature is expected to increase, resulting in warmer winters that may allow for certain vectors to withstand harsh conditions and have prolonged development cycles.
- Precipitation is expected to increase in the spring and the fall, and extreme rainfall events may pose risks for growth of mosquito populations in the summer months if stagnant water is allowed to accumulate following extreme rainfall.
- Climate change increases the climatic suitability for the survival of disease vectors and is expected to increase their range across southwestern Ontario.

### Population-level exposure

- West Nile virus is typically present in the summer and fall across most of Ontario, including southwestern Ontario and the study area. Human case counts for the study area appear generally low, however ROWPH experienced a significant spike in cases in 2018.
- Passive surveillance of tick populations in Canada revealed a tenfold increase in ticks infected with *Borrelia burgdorferi* when comparing 1990-2003 with submissions from 2004-2012. The study area borders regions of southwestern Ontario where black-legged ticks are now endemic.
- Comparisons of 2016 and 2020 Lyme disease estimated risk areas in Ontario reveal that risk areas are growing quickly and moving into the southern portion of the study area.
- People who spend greater amounts of time outdoors for recreational or work purposes may also be differentially exposed.

### Population-level sensitivities

- Older adults (aged 65 and older) are at high risk of health complications due to the diminished functionality of immune response, and the fact that older populations are more likely to have chronic conditions.
- Children under the age of 15 are susceptible to vector-borne and zoonotic diseases as they have developing immune systems and may be more reliant on caregivers to translate risk messaging and engage in adaptive behaviours such as wearing insect repellent.



### Population-level adaptive capacity

- There is currently limited evidence that people with low adaptive capacity to other climate-related health issues (e.g., those experiencing poverty) are at greater risk of vector-borne disease transmission.

### Adaptive actions

- Individuals can take a variety of precautions to protect themselves from the spread of vector-borne diseases, including using protective clothing or equipment when outside, using window and door screens to keep out mosquitos, and avoiding areas with known harmful species.
- Public Health activities include public education and outreach, human case and vector surveillance programs, and biological treatments (e.g., larvicide) on both known and possible reservoirs of mosquito vectors.
- Public Health conducts passive tick surveillance to identify black-legged ticks before they are sent to lab testing for *Borrelia burgdorferi*.
- Each municipality within the study area can play a role in reducing the impact of vectors and zoonoses through official planning processes to reduce standing water and/or expanding urban greening strategies.

### Baseline health impacts

- Symptoms of Lyme disease typically include fever, headache, chills, muscle and joint pain, swollen lymph nodes, and sometimes a 'bull's eye' rash around the bite. If left untreated, long-term symptoms such as skin rashes, heart palpitations, arthritic symptoms, extreme fatigue, and central and peripheral nervous system disorders could present themselves.
- Between 2008-2018, ROWPH had a cumulative 47 cases of Lyme disease, the most of which were recorded in 2018. WDGPH had 33 identified cases of Lyme disease in the same period, with 2017 and 2018 having among their highest incidence rates. Current data collection may not accurately reflect where cases were exposed to the vector and exposure may have occurred outside of the study area.
- Symptoms of West Nile virus (WNV) are typically mild and flu-like, although a small percentage (less than 1%) of infected persons develop encephalitis or paralysis.
- Case counts of WNV were low in both the ROWPH and WDGPH for the period of 2008-2018 with 14 and 7 cases, respectively.



## 9.0 Mental Health: Key Findings

### Climate change projections

- Climate change projections show a general warming trend for the study area, an increase in the frequency and severity of extreme weather events, warmer winters, and wetter spring and summer periods. Changing climatic conditions may exacerbate mental health conditions into the future.

### Population-level exposure

- Outdoor labourers, particularly farmers, who have strong and regular connections to the land and climate conditions, and where anxiety and fear over crop or livestock loss can negatively impact their financial livelihoods, are differentially exposed to mental health impacts relative to the population at large.

### Population-level sensitivities

- Children, particularly those with pre-existing depression and anxiety, are at risk of worsening mental health symptoms under climate change.
- Older adults (e.g., aged 65 and older) are more likely to have existing cognitive challenges which naturally present with age, and may be more reliant on caregivers to seek adequate treatment options.
- Populations with pre-existing addictions or mental health conditions may be exacerbated by acute and indirect impacts of climate change, and may drive increases in violence, crime, and substance misuse.

### Population-level adaptive capacity

- Factors such as: social capital, sense of community, government assistance, access to resources, community preparedness, intersectoral/transdisciplinary collaboration among stakeholders, vulnerability and adaptation assessments, communication and outreach, mental health literacy, and culturally relevant resources may increase adaptive capacity.
- Some populations may have less ability to adapt to the mental health impacts of climate change relative to others, these include people who have low-income, people with low social connectedness, and Indigenous Peoples, who may experience a sense of cultural loss associated with changes to land and associated cultural practices.
- Urban areas in the study area tended to have higher rates of people experiencing both homelessness and complex mental health-related disorders than rural parts of the study area.



### Adaptive actions

- WDGPH has developed an opioid tracking system (Flexible, Accessible, Scalable, and Timely (FAST) Overdose Alert Platform) that works to quickly identify overdose patterns in the community and enhance response time.
- ROWPH participates as a member of the Waterloo Region Integrated Drugs Strategy to prevent, reduce, or eliminate problematic substance use and its consequences with an emphasis on prevention and harm reduction.
- The Waterloo Region Suicide Prevention council implemented two mental health strategies across the region that seek to connect community partners, raise awareness, and coordinate efforts to deliver programs that are well-received by clients.
- The establishment of the Crime Prevention Council in Waterloo Region, the Well-being Waterloo Region initiative, and Children's Needs Planning Tables are other examples of allied initiatives that support service delivery across the region.

### Baseline health impacts

- Rates of emergency department visits for posttraumatic stress disorder (PTSD)—which could be exacerbated under a changing climate—have remained stable, with incidence rates consistently below 50 per 100,000 people across the study area from 2008-2018.
- Emergency department visits for both depression and suicide/self-harm have increased in Waterloo Region since 2013, whereas Wellington-Dufferin-Guelph has seen increases since 2011.





# 10.0 Rapid Risk Assessment of Climate Change and Health Risks : Key Findings

## Background

- This chapter describes the development and implementation of Rapid Risk Assessment tool used to rank climate-related impacts and Public Health risks identified in previous chapters.
- Climate events considered in the Rapid Risk Assessment include: extreme heat and cold; air quality; ultraviolet radiation; severe thunderstorms and winter storms; flooding; food- and water-borne illnesses; vector-borne diseases; and harmful algal blooms.
- The results of the Rapid Risk Assessment provide a comparison of the relative risks between key climate-related health impacts the study area is currently facing and can expect in the future; and will support prioritization of adaptation strategies.

## Methodology

- The Rapid Risk Assessment tool was developed using best practice approaches outlined by the WHO, Health Canada, and Emergency Management Ontario.
- A 5-point Likert scale was used to rank the likelihood and consequence of climate-related exposures at present and into the future.
- The Rapid Risk Assessment tool was developed to measure the likelihood and consequences of climate-related health risks. Rankings examined both present and future risks to public health.
- The likelihood of climate-related exposures was evaluated using data on:
  1. The frequency of climate events, and
  2. The likelihood (or degree) of population exposure.
- Consequences of climate events were also evaluated using two measures:
  1. Health outcomes associated with exposure, and
  2. Impact on vulnerable populations.



- A novel scoring approach was developed and used to assess risk. A separate set of scoring criteria was used to assess present risks and future risks.
- Risks were scored independently by each member of ROWPH, WDGPH, and the ICLEI project team before employing a consensus-based decision-making approach to build agreement where scores were different across teams.
- Risks were plotted to illustrate the threat of climate impacts on health locally.

### Results

- The results of the Rapid Risk Assessment identified extreme heat and poor air quality as the most impactful climate-related health risks now and into the future. Increased summer temperatures, as well as longer and hotter heatwaves, have the potential to increase burden of health outcomes related to extreme heat exposure. Additionally, adverse impacts to air quality are expected to become more frequent as ground-level ozone (the main component of smog) becomes more prevalent on hot, sunny days.
- Flooding will pose an increased risk to health into the future due to an increased likelihood of extreme precipitation and annual increases in precipitation (particularly in spring and autumn).
- Vector-borne disease is projected to become an increasing risk in the future as increased annual temperatures make the study area more hospitable to disease-carrying vectors.
- Extreme cold was the only risk assessed that is projected to decrease in both likelihood and consequences, as winter temperatures are projected to rise in the future.
- Risks to monitor that were outside of the scope of the Rapid Risk Assessment include cascading climate events, food and water security, and the mental health impacts of climate change.