Preparing for Extreme Heat & Poor Air Quality Events: Health Impacts

14 May 2019
Preparing for Extreme Heat and Poor Air Quality Events: Health Impacts
Introduction
<table>
<thead>
<tr>
<th>Outline</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Welcome and Introductions</td>
<td>Jackie Kanyuk, BCNPHA</td>
</tr>
<tr>
<td>2. Why? Changing Climate</td>
<td>Tamsin Mills, City of Vancouver</td>
</tr>
<tr>
<td>3. Health Impacts – Big Picture</td>
<td>Sarah Henderson, BCCDC</td>
</tr>
<tr>
<td>4. Health Impacts on Individual &amp; What To Do</td>
<td>Michael Schwandt, BCCDC</td>
</tr>
<tr>
<td>5. Preparing for the Summer, City Resources and Activities</td>
<td>Tamsin Mills, City of Vancouver</td>
</tr>
<tr>
<td>6. Preparing for the Summer, Staff and Tenant Resources</td>
<td>Magdalena Szpala, BC Housing</td>
</tr>
<tr>
<td>7. Q&amp;A, Wrap-up</td>
<td>Jackie Kanyuk, BCNPHA</td>
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</tbody>
</table>
A Changing Climate

Hotter, Drier Summers
with poor air quality events
A number of temperature records were broken on Tuesday August 29, 2018:

- Vancouver Harbour 30.5 C (28.9 C in 1967)
- Kamloops 38.5 C (35.6 C in 1915)
- Princeton 36 C (35 C in 1897)
- Sparwood 32.1 C (30.6 C in 1972)
- Williams Lake 31.9 C (31.1 C in 1967)
- Pemberton 35.1 C (34.4 C in 1974)
- Whistler 31.8 C (31.1 C in 1996)
Air Quality – Metro Van

- Summer 2015: wildfire smoke degraded air quality for 8 days
- Summer 2017: unprecedented total of 19 days of advisories
- In August of 2018, health impacts reported among populations more sensitive to heat impacts.
Warmer, wetter winters

Hotter, drier summers
When it rains it pours

Longer Growing Season

MAJOR IMPACTS:

- 15% longer growing season
- 72% decrease in frost days
- Snow melts earlier
- 20% increase in April showers

heavy rain events
- 35% more intense
- 21% more rain on the wettest days

Which means
- a higher flood risk
Climate Projections to 2050

Vancouver:
• Doubling of days above 25°C
• Warmest days are 4°C warmer
• Very hot days intensify 32°C to 37°C
• Cooling degree days increase from 60 to 250dd/yr.
• Days above 30°C occur 12 times more frequently.
• High confidence in increased wildfire smoke impacts
BC Climate Projections 2050

- Van. Isl.: Similar to Vancouver projections
- Interior: also hotter and drier with a longer dry season and increased risk of wildfire.
- Cariboo: Increase in hot and dry conditions in the summer
- North: Increased precipitation in summer. Temps up as well.
CC Impacts

• Increased risk for heat related illness
• Increased risk for conflict due to heat
• Increased energy costs for cooling
• Increased need for shelter during inclement weather (heat and storms)
• Increased need for air filtration
Extreme Heat and Extreme Air Pollution in BC: Health Effects and Health Protection

May 14, 2019
Sarah Henderson, PhD
Senior Scientist
BC Centre for Disease Control
Overview

1) The extreme hot weather event of 2009
   • Health effects
   • Those most at risk
   • Health protection

2) The extreme 2017 and 2018 wildfire seasons
   • Health effects
   • Those most at risk
   • Health protection

3) When smoke and heat meet
Lower Mainland 2009

~110 excess deaths
### Initial Analysis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Comparison Group</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;65</td>
<td>≥ 85</td>
<td>1.1</td>
<td>0.9 – 1.5</td>
</tr>
<tr>
<td>65 – 74</td>
<td>≥ 85</td>
<td>1.5</td>
<td>1.1 – 2.1</td>
</tr>
<tr>
<td>75 – 84</td>
<td>≥ 85</td>
<td>1.0</td>
<td>0.8 – 1.4</td>
</tr>
<tr>
<td>Male</td>
<td>Female</td>
<td>1.1</td>
<td>0.9 – 1.4</td>
</tr>
<tr>
<td>Died out of care</td>
<td>Died in care</td>
<td>1.5</td>
<td>1.2 – 2.0</td>
</tr>
<tr>
<td>&gt;1000 persons/km²</td>
<td>≤1000 persons/km²</td>
<td>1.2</td>
<td>1.0 – 1.5</td>
</tr>
<tr>
<td>&gt;40% of 65+ living alone</td>
<td>≤40% of 65+ living alone</td>
<td>1.3</td>
<td>0.9 – 1.8</td>
</tr>
<tr>
<td>&gt;20% low income</td>
<td>≤20% low income</td>
<td>1.2</td>
<td>1.0 – 1.4</td>
</tr>
</tbody>
</table>
## Follow-Up Analysis on 73 Deaths

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group</th>
<th>% in 73 deaths</th>
<th>% in usual deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 75</td>
<td><strong>78.1</strong></td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>≥ 75</td>
<td>21.9</td>
<td><strong>62.6</strong></td>
</tr>
<tr>
<td>Location of death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital</td>
<td>34.2</td>
<td><strong>51.9</strong></td>
</tr>
<tr>
<td></td>
<td>Long-term care</td>
<td>19.1</td>
<td>30.9</td>
</tr>
<tr>
<td></td>
<td>Home</td>
<td><strong>38.4</strong></td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>8.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Deprivation index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>0</td>
<td><strong>20.7</strong></td>
</tr>
<tr>
<td></td>
<td>Low/moderate</td>
<td>0</td>
<td><strong>20.7</strong></td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>13.7</td>
<td><strong>19.2</strong></td>
</tr>
<tr>
<td></td>
<td>Moderate/high</td>
<td>26.3</td>
<td><strong>19.1</strong></td>
</tr>
<tr>
<td></td>
<td>High</td>
<td><strong>60.3</strong></td>
<td><strong>20.2</strong></td>
</tr>
</tbody>
</table>
### Follow-Up Analysis on 73 Deaths

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group</th>
<th>% in 73 deaths</th>
<th>% in usual deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population density</strong></td>
<td>Low</td>
<td>0</td>
<td>20.1</td>
</tr>
<tr>
<td></td>
<td>Low/moderate</td>
<td>5.5</td>
<td>19.5</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>8.2</td>
<td>19.9</td>
</tr>
<tr>
<td></td>
<td>Moderate/high</td>
<td>30.1</td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>56.2</td>
<td>20.7</td>
</tr>
<tr>
<td><strong>Cause of death</strong></td>
<td>Cardiovascular</td>
<td>22.2</td>
<td>27.1</td>
</tr>
<tr>
<td></td>
<td>Respiratory</td>
<td>2.8</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Cancer</td>
<td>26.4</td>
<td>30.7</td>
</tr>
<tr>
<td></td>
<td>External</td>
<td>13.9</td>
<td>3.1</td>
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</tbody>
</table>

- Accidental pharmaceutical poisonings
- Accidental illicit/unknown poisonings
- Intentional self harm
Drugs of Particular Concern

- Some drugs interfere with temperature regulation and heat perception
  - Anticholinergics (inhibit nerve impulses)
    - Used to treat incontinence, asthma, COPD, and Parkinson’s, among others
  - Other anti-Parkinson’s agents
  - Diuretics
  - Antihistamines
  - Cocaine
## New Evidence on Greenness

<table>
<thead>
<tr>
<th>Residential greenness index</th>
<th>Increased risk of mortality during 2009 event [95% confidence interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>reference</td>
</tr>
<tr>
<td>High/moderate</td>
<td>1.99 [1.08 – 2.63]</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.26 [1.25 – 4.07]</td>
</tr>
<tr>
<td>Moderate/low</td>
<td>3.59 [2.03 – 6.35]</td>
</tr>
<tr>
<td>Low</td>
<td>3.64 [2.06 – 6.44]</td>
</tr>
</tbody>
</table>
Staying Cool = Staying Safe

- AC is most effective
- Hydration is essential
- Wet skin improves evaporative cooling
- Trees and water features cool surrounding area
BC Heat Impacts Prediction System

https://maps.bcccdc.ca/bchips
2016-2018 Wildfire Seasons

Population−Weighted PM$_{2.5}$, 2016−2018

Population−Weighted PM$_{2.5}$ (ug/m$^3$)

2016
2017
2018
Fine Particulate Matter (PM$_{2.5}$)

- HUMAN HAIR
  50-70 µm (microns) in diameter

- PM$_{2.5}$
  Combustion particles, organic compounds, metals, etc.
  < 2.5 µm (microns) in diameter

- PM$_{10}$
  Dust, pollen, mold, etc.
  < 10 µm (microns) in diameter

- 90 µm (microns) in diameter
  FINE BEACH SAND
Smoke PM$_{2.5}$ ≠ Pretty Pink Spheres
<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Susceptible due to age, asthma, COPD, heart disease, or diabetes</th>
<th>Pregnant</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>108,000</td>
<td>108,000</td>
<td></td>
</tr>
<tr>
<td>10-14</td>
<td>53,000</td>
<td>5,460</td>
<td>468</td>
</tr>
<tr>
<td>15-19</td>
<td>60,000</td>
<td>6,300</td>
<td>540</td>
</tr>
<tr>
<td>20-24</td>
<td>70,000</td>
<td>7,070</td>
<td>2,100</td>
</tr>
<tr>
<td>25-34</td>
<td>138,000</td>
<td>13,938</td>
<td>9,660</td>
</tr>
<tr>
<td>35-44</td>
<td>133,000</td>
<td>15,162</td>
<td>3,059</td>
</tr>
<tr>
<td>45-64</td>
<td>281,000</td>
<td>57,605</td>
<td>562</td>
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<tr>
<td>65-74</td>
<td>88,000</td>
<td>30,448</td>
<td></td>
</tr>
<tr>
<td>75+</td>
<td>69,000</td>
<td>69,000</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,000,000</td>
<td>313,983 (31.4%)</td>
<td>16,389 (1.6%)</td>
</tr>
</tbody>
</table>

Biggest Effects are on Breathing

• 37.6% increase
• 43,000 extra puffers

% Change in Ventolin Dispensations 2017-2018

• 18.6% increase
• 10,000 extra visits

% Change in Asthma Visits 2017-2018
In 1,000,000 Population on a Very Smoky Day

• From **2-4 excess deaths** *(within the range of normal variability)*

• From **65-140 excess asthma visits** *(well beyond normal variability)*

• From **140-290 excess Ventolin** dispensations *(well beyond normal variability)*

• From **2-4 excess out-of-hospital cardiac arrests** *(somewhat beyond normal variability)*

*Based on BC data from Henderson and Yao (2019). Environmental Health; submitted

**Based on BC data from Yao et al. (2016). JESEE; 26, 233–240

***Based on Australian data from Dennekamp et al. (2015). EHP; 123(10), 959–964
In 16,000 Pregnant Women Exposed to a Smoky Month

- Assuming the national **average birth weight of 3375 g** with a standard deviation of 555 g
- This provides a distribution with 6% of infants <2500 g (the national average)
- Assuming a **6.1 g [3.5 – 8.7 g]** average decrease in birth weight from a Californian study*
- Approximately **20 [6 – 22] babies shifted** to low birth weight category

*Based on Californian data from Holstius et al. (2012). EHP; 120(9), 1340–1345*
Less Smoke Inhaled = Less Risk

- People spend more than 90% of time indoors
- Cleaner indoor air is first line of defense

![Graph showing PM2.5 concentration over time with and without HEPA filter, indicating lower concentrations with the filter.](image-url)
Less Smoke Inhaled = Less Risk

- Exertion = breathing faster and deeper
- More air = more smoke
- Take it easy, especially outdoors!

Assuming outdoor PM$_{2.5}$ from smoke is 100 $\mu$g/m$^3$ and indoor PM$_{2.5}$ from smoke is 20 $\mu$g/m$^3$
When Smoke and Heat Meet

- Hot weather causes thermal stress
- Smoke causes irritation and inflammation
- Different environmental exposures can add up
- Those vulnerable to both are at highest risk
  - Chronic conditions, elderly, pregnant women and infants
- Heat is a bigger health risk than smoke for most people, so cooling should be prioritized
- Cooler, cleaner indoor air is the ideal
Thank you!
sarah.henderson@bccdc.ca
Preparing for Extreme Heat and Poor Air Quality Events: Health Impacts

May 14, 2019

Michael Schwandt, MD MPH
Public Health Physician, BCCDC
Video: "Extreme Heat Can Be a Killer" https://youtu.be/RBwgS_1D5FM
2:45min animation by National Collaborating Centre for Environmental Health & BC Center for Disease Control
Outline

• Heat-related illness
• Vulnerability to heat
  • Physiological
  • Social
  • Environmental
• Planning for extreme heat
• Resources
Outline

• Heat-related illness

• Vulnerability to heat
  • Physiological
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  • Environmental

• Planning for extreme heat

• Resources
More than 90 deaths now linked to heat wave in Quebec

By ALLAN WOODS Quebec Bureau
Wed., July 18, 2018
Heat illness

Spectrum of impacts:

- Heat rash
- Cramps
- Heat exhaustion
- Confusion, lightheadedness
- Loss of consciousness (from syncope/fainting to prolonged)
- Coma
- Risk of death

Source: Kosatsky et al. 2012
Symptoms and responses across the heat illness spectrum

**HEAT STROKE**
- High body temperature (103°F or higher)
- Hot, red, dry, or damp skin
- Fast, strong pulse
- Headache
- Dizziness
- Nausea
- Confusion
- Losing consciousness (passing out)
- Call 911 right away — heat stroke is a medical emergency
- Move the person to a cooler place
- Help lower the person’s temperature with cool cloths or a cool bath
- Do not give the person anything to drink

**HEAT EXHAUSTION**
- Heavy sweating
- Cold, pale, and clammy skin
- Fast, weak pulse
- Nausea or vomiting
- Muscle cramps
- Tiredness or weakness
- Dizziness
- Headache
- Fainting (passing out)
- Move to a cool place
- Loosen your clothes
- Put cool, wet cloths on your body or take a cool bath
- Sip water
- Get medical help right away if:
  - You are throwing up
  - Your symptoms get worse
  - Your symptoms last longer than 1 hour

**HEAT CRAMPS**
- Heavy sweating during intense exercise
- Muscle pain or spasms
- Stop physical activity and move to a cool place
- Drink water or a sports drink
- Wait for cramps to go away before you do any more physical activity
- Get medical help right away if:
  - Cramps last longer than 1 hour
  - You’re on a low-sodium diet
  - You have heart problems
Key factors affecting heat burden

- Temperature
- Humidity
- Ventilation (wind)
- Radiation (direct light)
- Behavioural (exertion, clothing, etc)
A note on ventilation and heat burden indoors

- Generally, at air temperatures below body temperature (~37°C), wind/ventilation reduces heat burden.
- Thus, air movement as well as temperature are important to heat burden experienced indoors.
- Air conditioning and fans can both provide benefits.
Outline

• Heat-related illness

• Vulnerability to heat
  • Physiological
  • Social
  • Environmental

• Planning for extreme heat

• Resources
Heat vulnerability

• Factors in vulnerability/resilience to heat illness may be **physiological, social, and environmental**.

• Body temperature is maintained within a narrow range, can only tolerate minor elevations in temperature.
Physiological vulnerability to extreme heat

• Evaporation (via sweating) is the body’s main mechanism for heat dissipation (along with radiation of heat from skin)

• Processes for cooling are affected by:
  o Physical fitness/obesity
  o Pre-existing medical conditions (heart and lung disease, other circulatory diseases, diabetes, neurological conditions)
  o Acute illness
  o Acclimatization
  o Medications and drugs
  o Age
Medications and drugs affecting risk of heat illness

- Antihistamines
- Decongestants
- Some antipsychotic medications (including phenothiazines)
- Tricyclic antidepressants
- Lithium
- Diuretics
- Anticholinergic agents (wide variety of conditions)

- Antiepileptic agents
- Stimulants
- Beta blockers (blood pressure management)
- Alcohol
- Cocaine
- Amphetamines
- And more...
Social vulnerability to extreme heat

- Reduced access to cooling facilities and other heat mitigation measures (e.g. A/C)
- Social isolation and barriers to reaching help
- *Socially* vulnerable groups may be more likely to live in neighbourhoods with *environmental* vulnerability
Environmental vulnerability to extreme heat

- High population density
- Sparse vegetation
- Lack of open space in the neighborhood
- Darkly hued roofing and paving materials
- Higher heat load in urban areas (cars, ventilation systems)
Environmental vulnerability: urban heat islands

This image, taken from an aircraft, depicts a midday surface urban heat island in Salt Lake City, Utah, on July 13, 1998. White areas are around 160°F (70°C), while dark blue areas are near 85°F (30°C). Note the warmer urban surface temperatures (left side of image) and cooler surfaces in the neighboring foothills (on the right).

Source: https://www.epa.gov/heat-islands/heat-island-compendium
Urban heat islands

Source: https://www.epa.gov/heat-islands/heat-island-compendium
Protective environments

- Trees and vegetation
- Green roofs
- Cool roofs (reflective)
- Cool pavement surfaces
- Ventilation, air conditioning
Considering heat and air quality together

- Air contaminants can exacerbate conditions of the lungs, airways and heart
  - e.g. Fine particulate matter, ground-level ozone, nitrogen dioxide
- Periods of poor air quality may overlap with extreme heat events (NB: wildfire season)
- Many vulnerabilities for effects of extreme heat are also important for air quality impacts
  - Older adults, infants/children, pre-existing conditions, homelessness/underhousing, access to filtered indoor air
Outline

• Heat-related illness
• Vulnerability to heat
  • Physiological
  • Social
  • Environmental
• Planning for extreme heat
• Resources
Components of heat response planning

• Develop clear plan of action with roles and responsibilities
• Identify susceptible individuals *prior* to the hot-weather season
• Create list of cooling facilities and strategies
• Identify and establish links with partners in community, municipal government, health agencies, community-based organizations
• Develop/share communication materials for staff and residents
• Monitoring and surveillance
• Post-season evaluation of heat response
For the Public

Do

- Use air conditioners or spend time in air-conditioned locations such as malls and libraries
- Use portable electric fans to exhaust hot air from rooms or draw in cooler air
- Take a cool bath or shower
- Minimize direct exposure to the sun
- Stay hydrated – regularly drink water or other nonalcoholic fluids
- Eat light, cool, easy-to-digest foods such as fruit or salads
- Wear loose fitting, light-colored clothes
- Check on older, sick, or frail people who may need help responding to the heat
- Know the symptoms of excessive heat exposure and the appropriate responses.

Don’t

- Direct the flow of portable electric fans toward yourself when room temperature is hotter than 90°F
- Leave children and pets alone in cars for any amount of time
- Drink alcohol to try to stay cool
- Eat heavy, hot, or hard-to-digest foods
- Wear heavy, dark clothing.

For Public Officials

Send a clear public message

- Communicate that EHEs are dangerous and conditions can be life-threatening. In the event of conflicting environmental safety recommendations, emphasize that health protection should be the first priority.

Inform the public of anticipated EHE conditions

- When will EHE conditions be dangerous?
- How long will EHE conditions last?
- How hot will it FEEL at specific times during the day (e.g., 8 A.M., 12 P.M., 4 P.M., 8 P.M.)?

Assist those at greatest risk

- Assess locations with vulnerable populations, such as nursing homes and public housing
- Staff additional emergency medical personnel to address the anticipated increase in demand
- Shift/expand homeless intervention services to cover daytime hours
- Open cooling centers to offer relief for people without air conditioning and urge the public to use them.

Provide access to additional sources of information

- Provide toll-free numbers and Web site addresses for heat exposure symptoms and responses
- Open hotlines to report concerns about individuals who may be at risk
- Coordinate broadcasts of EHE response information in newspapers and on television and radio.
Outline

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Resources

Health Canada Infographics and factsheets on heat and health:

Resources

BC Centre for Disease Control

• Wildfire smoke and public health: evidence reviews and fact sheets
  http://www.bccdc.ca/health-professionals/professional-resources/wildfire-smoke-response-planning

• Resource documents including “Developing a municipal heat response plan: A guide for medium-sized municipalities”

Health Effects of Wildfire Smoke

Wildfire smoke is a complex mixture of fine particulate matter (PM$_{2.5}$) and gases, such as carbon monoxide, nitrogen oxides, and volatile organic compounds. The mixture can change depending on the fuels, the weather, and distance from the fire. Wildfire smoke causes episodes of the worst air quality that most people will ever experience in British Columbia.
Thank you
Preparation for Extreme Heat
City of Vancouver
Curtis Brick dies from heat exposure in Grandview Park on July 29th, 2009.

Council Resolution to reduce extreme heat vulnerability of homeless populations, homebound seniors, and other vulnerable populations.
2010 Extreme Hot Weather Preparedness and Response Plan

Extreme Heat IRG

• Event Escalation & Notification
• Preparedness Activities
• Response Activities
  – Increase access to drinking water
  – Provide shelter from heat
  – Monitor outdoor spaces & SROs
  – Messaging

• Tools
  – Notification templates & agendas, contact list, key messaging by topics, web links, handouts, etc.
Climate Change Adaptation Actions

Summary of Climate Change for Peace River in the 2050s

<table>
<thead>
<tr>
<th>Climate Variable</th>
<th>Season</th>
<th>Projected Change from 1961-1990 Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ensemble Median</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range (10th to 90th percentile)</td>
</tr>
<tr>
<td>Mean Temperature (°C)</td>
<td>Annual</td>
<td>+1.8 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1.4 °C to +2.8 °C</td>
</tr>
<tr>
<td>Precipitation (%)</td>
<td>Annual</td>
<td>+8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+1% to +16%</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>+3%</td>
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<tr>
<td></td>
<td></td>
<td>-7% to +12%</td>
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<tr>
<td></td>
<td>Winter</td>
<td>+11%</td>
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<tr>
<td></td>
<td></td>
<td>-4% to +22%</td>
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<tr>
<td>Snowfall (%)</td>
<td>Winter</td>
<td>+7%</td>
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<tr>
<td></td>
<td></td>
<td>-7% to +17%</td>
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<tr>
<td></td>
<td>Spring</td>
<td>-55%</td>
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<tr>
<td></td>
<td></td>
<td>-65% to -16%</td>
</tr>
<tr>
<td>Growing Degree Days* (degree days)</td>
<td>Annual</td>
<td>+225 degree days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+139 to +380 degree days</td>
</tr>
<tr>
<td>Heating Degree Days* (degree days)</td>
<td>Annual</td>
<td>-651 degree days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-969 to -405 degree days</td>
</tr>
<tr>
<td>Frost-Free Days** (days)</td>
<td>Annual</td>
<td>+16 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+10 to +25 days</td>
</tr>
</tbody>
</table>

The table above shows projected changes in average (mean) temperature, precipitation and several derived climate variables from the baseline historical period (1961-1990) to the 2050s for the Peace River region. The ensemble median is a mid-point value, chosen from a PCIC standard set of GCM projections (see the 'Notes' tab for more information). The range values represent the lowest and highest results within the set. Please note that this summary table does not reflect the 'Season' choice made under the 'Region & Time' tab. However, this setting does affect results obtained under each variable tab.

* These values are derived from temperature and precipitation. Please select the appropriate variable tab for more information.
Climate Adaptation

- Pilot clean air shelters
- Planting trees in tree deficit areas
- Adding water fountains
- Temporary spray parks
- Non-market housing temporary cooling and study of long term fixes
- Climate Risk project with Evergreen
Clean Air Shelters

- Pilot summer season
- Combined with Cooling Centres
- Portable HEPA filters and assessment overall ventilation system
Climate Risk Project

• Evergreen with FCM and City funding
• Interviews with social housing and community centre staff
• Engagement activities with seniors and residents to understand how the city can better support people during heat and air quality events
Canopy Cover
City of Van Water Fountains
Cooling Centres
Passive Cooling for Buildings

Communication Tools

Brochure (fan/map), website, maps (online and hardcopy)
### 4.3 Monitoring Outdoor Spaces for People Suffering Heat-Related Illness

<table>
<thead>
<tr>
<th>Function</th>
<th>Activity</th>
<th>Department/Agency</th>
<th>Special Weather Statement</th>
<th>Heat Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase Vigilance for People Outside</td>
<td>Activate VVC to patrol at risk neighbourhoods to advise vulnerable groups on locations to water fountains and to report malfunctioning water fountains</td>
<td>ODM, CNS (OPS)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Perform drive-by in parks and in commercial areas to assist people exhibiting signs of heat-related illness and to encourage people to look after each other (where operationally feasible.)</td>
<td>VFRS</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Patrol neighbourhoods and nearby parks (particularly the DTES) by Neighborhood Policing Officers and other officers to refer vulnerable populations to nearby water access points</td>
<td>VPD</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Increased park patrols by Park Rangers to locate and assist people suffering from heat-related illness</td>
<td>PARKS</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Increasing Hours of Operations for Spray Parks</td>
<td>Extend wading pool and spray park hours of operations (dependent on approvals)</td>
<td>PARKS</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
## 5.6 Conference Call Agenda for Severe Weather Statement or Heat Warning

The purpose for this conference call/meeting is to continue revisions of impacts, review specific response functions and determine whether an Advanced Planning Unit is required and/or EOC activation is required.

### ATTENDEES
- CMO / OEM
- ENG Waterworks
- Q3
- ENG Special Events
- VPFL
- ENG Sustainability
- MHQ
- VFRS
- ENG OH&S
- Health (VCH)
- Corp Comm/PR Comm
- Facilities
- Metro Van ATD
- 311
- Parks
- Other

**Conference Call:** 604.829.4222  
**Meeting ID:** 84400  
**Meeting password:** 159251

<table>
<thead>
<tr>
<th>#</th>
<th>Agenda</th>
<th>Speaker</th>
<th>Desired Outcome</th>
<th>Actions/Next Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Convene Meeting (CMO or EM Duty Officer or OEM Management Team)</td>
<td></td>
<td>• Ensure all departments are represented on the call</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Introduce Chair, facilitator, experts (EC, VCH, Metro Van)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Roll Call</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Update from Last Conference Call (Facilitator/EOC Deputy/Director)</td>
<td></td>
<td>• As applicable</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Hazard Update (Current &amp; Future)</td>
<td></td>
<td>• What is the short-term, long-term weather forecast (weather improving, stable or worse)?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Weather (Environment Canada)</td>
<td></td>
<td>• Is there an impact to health that requires immediate attention?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Health (Vancouver Coastal Health)</td>
<td></td>
<td>• Is there going to be an air quality issue?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Air Quality (Metro Van)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Regional Situation Awareness Update</td>
<td></td>
<td>• Any new or emerging issues?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• City/Departmental and stakeholders (Function Leads)</td>
<td></td>
<td>• Any downstream impacts?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FASE (Film &amp; Special Events Office)</td>
<td></td>
<td>• Any major special events?</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Conduct Risk Assessment Update (All)</td>
<td></td>
<td>• Review risk matrix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Review risk matrix and identify current and emerging potential risks</td>
<td></td>
<td>• Are there any new aggravating factors like special planned events, etc.?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Review and identify further required mitigation measures</td>
<td></td>
<td>• Are current mitigation efforts enough?</td>
<td></td>
</tr>
</tbody>
</table>
Thank you

Tamsin.mills@vancouver.ca
Sustainability Group
City of Vancouver
Staff & Tenant Resources

Magdalena Szpala, Senior Sustainability Advisor, BC Housing

Photos: Global News, showing Prince George on 17 Aug. 2018, 9:09am
Outline

• Preparing & Planning
• Checking on Tenants
• Creating Community Connections
• New & Existing Resources
Extreme Heat Response Plan

- Before the summer
- Regular summer
- Extreme Heat weather: high risk
**Before the summer:**

1. Know the risks and what to do (staff training).

2. Identify tenants most vulnerable (create a list).

3. Prepare your building:
   - assess risk of overheating and prepare spaces where tenants may cool-off such as: shaded areas outside, a ‘cooling room’ in the common area in the building

4. Get what you may need during extreme heat:
   - portable air conditioning units
   - air purifiers with HEPA filters
   - fans
   - communication tools such as “*Tips to Beat the Heat*" poster”
# Before Summer Actions – Pod Groups

<table>
<thead>
<tr>
<th>Team Members</th>
<th>Building Cooling</th>
<th>Completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>1. I’m familiar with extreme heat health risks, symptoms, and appropriate action.</td>
<td>□</td>
</tr>
<tr>
<td>Site Staff and PPM</td>
<td>2. I have assessed where there might be potential cooling opportunities within the property for the tenants. (E.g. creation of a “cool rooms” or “chill zones” by installing a portable air conditioning or fans in the common rooms, or creation of a shaded area outside of the building if there’s adequate space, or creating air flow by opening windows when it’s colder outside than inside)</td>
<td>□</td>
</tr>
<tr>
<td>Site Staff</td>
<td>3. If my building has a common area, I have set it up as a “chill zone” using fans or air-conditioning.</td>
<td>□</td>
</tr>
<tr>
<td>Site Staff</td>
<td>4. If my building already has a portable air-conditioning unit I have maintained it (e.g. cleaned the filters) as recommended and checked that it works.</td>
<td>□</td>
</tr>
<tr>
<td>Role</td>
<td>Tasks</td>
<td>Complete</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Site Staff</td>
<td>5. If appropriate, I have provided shaded outdoor areas for tenants to spend time.</td>
<td>☐</td>
</tr>
<tr>
<td>Site Staff</td>
<td>6. I have signs for the ‘chill room’. (So that I can use them when the chill room is activated). Ensure water cooler/station is available.</td>
<td>☐</td>
</tr>
<tr>
<td>All</td>
<td>7. I have all equipment or items I may want to use this summer during an extreme heat event for distribution to tenants (such as: fans)</td>
<td>☐</td>
</tr>
</tbody>
</table>
| All          | 8. I have communication materials for the tenants which I may need during an extreme hot weather event, such as:  
* Tip to Beat the Heat! poster & flyer, neighbourhood maps showing places with air conditioning such as community centers, libraries, shopping malls, etc. | ☐        |
| All          | 9. Pod Team Members, I have identified tenants who might be most at risk of heat related illnesses (created a list) | ☐        |
### Regular Summer Actions

**Building Cooling**

1. If my building has a common area, I have set it up as a “chill zone” using fans or air-conditioning.  
   - [ ]

2. I have posted signs for the ‘chill room’, if it’s activated.  
   - [ ]

3. If appropriate, I have provided shaded outdoor areas for tenants to spend time.  
   - [ ]

4. I check the weather forecast on regular basis for hot weather or air quality warnings and alerts.  
   - [ ]

5. I posted Tips to Beat the Heat poster around my site/s.  
   - [ ]

6. I checked that all the heating in the building is turned off. (And reported up if there are any challenges with it)  
   - [ ]

7. I have opened windows in hallways slightly to allow air to circulate (if appropriate).  
   - [ ]

8. I encourage tenants to reduce solar heat gain by putting blinds down or drawing the curtains; and have windows open only when outdoor air is cooler than indoor air (e.g. at night).  
   - [ ]
High Risk Level Response - activated when Environment and Climate Change Canada issues Heat Warnings and Air Quality Warnings for the specific regions in the province. Local Health Authorities and Municipalities create public announcements based on these alerts.
## Hot! Weather Checklist

### Once you receive notification of extreme heat, the following action items are to be completed

<table>
<thead>
<tr>
<th>Extremely Hot Weather Actions – Pod Team Members (High Risk)</th>
<th>Completed? – check box Or write NA: Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Cooling</strong></td>
<td></td>
</tr>
<tr>
<td>1. If my building has a common area, I have set it up as a “chill zone” using fans or air-conditioning.</td>
<td>[ ]</td>
</tr>
<tr>
<td>2. I have posted signs for the ‘chill room’, if it’s activated.</td>
<td>[ ]</td>
</tr>
<tr>
<td>3. If appropriate, I have provided shaded outdoor areas for tenants to spend time.</td>
<td>[ ]</td>
</tr>
<tr>
<td>4. I check the weather forecast on regular basis for hot weather or air quality warnings and alerts.</td>
<td>[ ]</td>
</tr>
<tr>
<td>5. I posted Tips to Beat the Heat poster around my site/s.</td>
<td>[ ]</td>
</tr>
<tr>
<td>6. I checked that all the heating in the building is turned off. (And reported up if there are any challenges with it)</td>
<td>[ ]</td>
</tr>
<tr>
<td>7. I have opened windows in hallways slightly to allow air to circulate (if appropriate).</td>
<td>[ ]</td>
</tr>
<tr>
<td>8. I encourage tenants to reduce solar heat gain by putting blinds down or drawing the curtains; and have windows open only when outdoor air is cooler than indoor air (e.g. at night).</td>
<td>[ ]</td>
</tr>
<tr>
<td>9. I have checked on tenants that might be at high risk and notified Health &amp; Housing Services if further assessment should be conducted.</td>
<td>[ ]</td>
</tr>
</tbody>
</table>
1. Check directly with the tenants most vulnerable to heat related illness (using your list).

2. When talking to the tenants assess:
   a) home environment:
      e.g. Does it feel very hot?
      Are there any forms of cooling such draughts or fans?, etc.;
   b) tenants:
      e.g. Do they show physical signs of being in distress?
      Do they know where they can go to cool off? Can they get there?
      Is s/he at risk from exposure to extreme heat?

3. Take action. (e.g. advise how to stay cool and about places to cool off, call 911 if you suspect tenant might be suffering from heat stroke).

Below is a sample recording sheet:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Door opened/Not</th>
<th>Observations/Comments</th>
<th>Items given out</th>
<th>High risk Yes/No</th>
<th>Further action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Yes</td>
<td>Tenant looked hot but had drawn curtains, open windows and fan. Aware of risk and how to stay cool.</td>
<td>Cooling bandana</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>102</td>
<td>Yes</td>
<td>Tenant wearing heavy clothing. Advised to wear something lighter and looser. Unaware of risks. Hard to communicate with.</td>
<td>Fan, how to stay cool poster</td>
<td>Yes</td>
<td>Someone should revisit tomorrow</td>
</tr>
<tr>
<td>103</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Yes</td>
<td>Potential heat stroke</td>
<td></td>
<td>Yes</td>
<td>Called 911</td>
</tr>
</tbody>
</table>

Conducted by: **Jo Smith**
**Sample recording sheet**

### Extreme Heat - Tenants at Risk List

<table>
<thead>
<tr>
<th>Date</th>
<th>Unit #</th>
<th>Address</th>
<th>Tenant Name</th>
<th>Age</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Requires Further Action</th>
<th>Staff Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>08-Aug-18</td>
<td>104</td>
<td></td>
<td></td>
<td>45</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>203</td>
<td></td>
<td></td>
<td>87</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>305</td>
<td></td>
<td></td>
<td>51</td>
<td>C</td>
<td></td>
<td></td>
<td>In hospital</td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>306</td>
<td></td>
<td></td>
<td>80</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>401</td>
<td></td>
<td></td>
<td>85</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>402</td>
<td></td>
<td></td>
<td>72</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>504</td>
<td></td>
<td></td>
<td>61</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>505</td>
<td></td>
<td></td>
<td>84</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>605</td>
<td></td>
<td></td>
<td>61</td>
<td>E</td>
<td></td>
<td></td>
<td>wants to be off list</td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>705</td>
<td></td>
<td></td>
<td>64</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>801</td>
<td></td>
<td></td>
<td>59</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-Aug-18</td>
<td>905</td>
<td></td>
<td></td>
<td>76</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Legend: Requires Further Action

- **A**: Call 911
- **B**: Contact Health Services
- **C**: No One Home
- **D**: No Answer
- **E**: OK
- **NO INFO**: no information provided

### Running Tally

- **A**: 0
- **B**: 0
- **C**: 5
- **D**: 1
- **E**: 6
- **NO INFO**: 0

---
Creating Community Connections

Building Neighbourliness:

- building trust, respect and social ties between neighbours in BC Housing buildings.

Co-operation and Taking Care of Each Other:

- building a culture and practice of mutual aid—neighbours helping neighbours.

Emergency Preparedness:

- building a community that is better able to respond to extreme weather (heat, cold, floods, storms, etc.).

Source: Shift Collaborative
Cooling Rooms with Tenant Engagement

Community event at BC Housing site
For additional resources see BC Housing’s website: https://www.bchousing.org/partner-services/non-profit-training-resources/extreme-heat-resources
Natural Disasters and Severe Weather

Outline:
- Earthquakes
- Extreme Heat
- About Extreme Heat
  - Protecting Vulnerable Groups from Extreme Heat
  - Hot Weather Tips
  - Warning Signs and Symptoms
- FAQs
- Social Media
- Extreme Heat PSAs
- Related Links

About Extreme Heat

Heat related deaths and illnesses are preventable. Despite this, around 618 people in the United States are killed by extreme heat every year. This website provides helpful tips, information, and resources to help you stay safe in the extreme heat this summer.

What is Extreme Heat?

Extreme heat is defined as summertime temperatures that are much hotter and/or humid than average. Because some places are hotter than others, this depends on what’s considered average for a particular location at that time of year. Humid and muggy conditions can make it seem hotter than it really is.

What Causes Heat-Related Illness?

Heat-related illnesses, like heat exhaustion or heat stroke, happen when...
Heat illnesses are preventable.

Drink plenty of cool liquids, especially water, before you feel thirsty to decrease your risk of dehydration. Thirst is not a good indicator of dehydration.

Never leave people or pets in your care inside a parked vehicle or in direct sunlight.
Using Existing Resources

Air Quality Advisories

We are experiencing higher than normal e-mail volume from the public at this time. Due to the increase there may be delays in receiving a response. We appreciate your patience and apologize for any inconvenience.

Issued Advisories

<table>
<thead>
<tr>
<th>Location</th>
<th>Advisory Type</th>
<th>Status</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>All areas</td>
<td>Smoky Skies Bulletin (PDF)</td>
<td>Ended</td>
<td>Sep. 13 2018</td>
</tr>
</tbody>
</table>

Advisories are updated during regular business hours. Outside business hours, visit Environment Canada's Public Weather Alerts for BC.

About Air Quality Advisories

An air quality advisory is issued when pollutant concentrations approach or exceed predetermined limits, or when degraded air-quality episodes are expected to continue or worsen.

Advisories are issued in order to:
- Inform about degraded air quality;
- Help people make informed choices about reducing their exposure to elevated concentrations of air pollutants;
- Affect emission reduction actions (such as a limit on industrial emissions and/or wood stove use); and
- Provide vulnerable individuals and the general public with health advice developed by BC health agencies.

About Smoky Skies Bulletins

Source: https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-quality/air-advisories
Using Existing Resources

Air Quality Health Index - What's the Air Like Today?

Find the current and forecast Air Quality Health Index (AQHI) values to help you understand what the air quality around you means to your health.

**AQHI Scale - Learn more about AQHI Categories and Explanations**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW Health Risk</td>
<td>MODERATE Health Risk</td>
<td>HIGH Health Risk</td>
<td>VERY HIGH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

View Current Air Monitoring Station Data

View a list of air monitoring stations or use our [interactive map](http://www.env.gov.bc.ca/epd/bcairquality/readings/aqhi-table.xml) below to view current air quality data in your area.

<table>
<thead>
<tr>
<th>Station</th>
<th>Current</th>
<th>Maximum AQHI Forecast*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Today</td>
</tr>
<tr>
<td>Castlegar</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>Comox Valley</td>
<td>LOW</td>
<td>2</td>
</tr>
<tr>
<td>Cranbrook</td>
<td>LOW</td>
<td>N/A</td>
</tr>
<tr>
<td>Duncan</td>
<td>LOW</td>
<td>1</td>
</tr>
<tr>
<td>Fort St. John</td>
<td>LOW</td>
<td>2</td>
</tr>
<tr>
<td>Fraser Valley (Central)</td>
<td>LOW</td>
<td>2</td>
</tr>
<tr>
<td>Fraser Valley (Eastern)</td>
<td>LOW</td>
<td>2</td>
</tr>
<tr>
<td>Kamloops</td>
<td>LOW</td>
<td>1</td>
</tr>
<tr>
<td>Metro Vancouver (North East)</td>
<td>LOW</td>
<td>1</td>
</tr>
<tr>
<td>Metro Vancouver (North West)</td>
<td>LOW</td>
<td>1</td>
</tr>
<tr>
<td>Metro Vancouver (South East)</td>
<td>LOW</td>
<td>1</td>
</tr>
</tbody>
</table>

Please note that air quality data may be missing for many reasons that are beyond our control including local power or communications outages, instrument calibration cycles or failure.

Additional Resources

If you have a comment or concern about the air quality content on this website please contact us.

**Smoke Forecast**

Visit the BlueSky Canada smoke forecast page for up to date forecast information.
Thank you!

Magdalena Szpala
Senior Sustainability Advisor
BC Housing
mszpala@bchousing.org
Questions / Discussion
Conclusion