

How Climate Change Impacts the Health of Long-Term Care Facility Occupants

An exploration of the specific health impacts to these vulnerable populations, and what solutions are available to decrease these impacts

Presented by: Sara Wollschlaeger



Context

1. Climate change is causing alterations to the geophysical system

- Rising global temperatures
- Sea-level rise
- Extreme weather events

3. Climate change is negatively impacting our most vulnerable populations, but there has been no quantitative data available

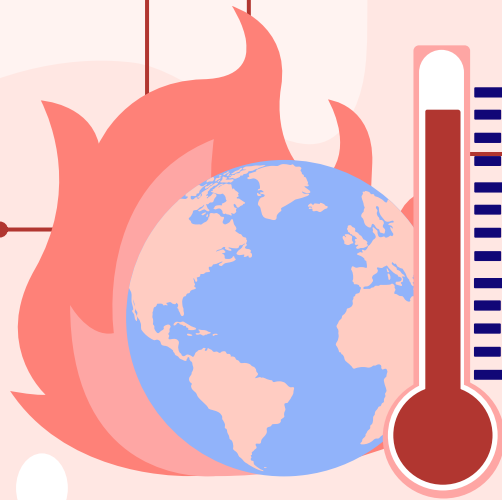
- This paper aims to quantify the proportions of long-term care facility occupants in B.C. with climate change sensitivities

2. Some populations (like long-term care facility occupants) are more sensitive to these impacts

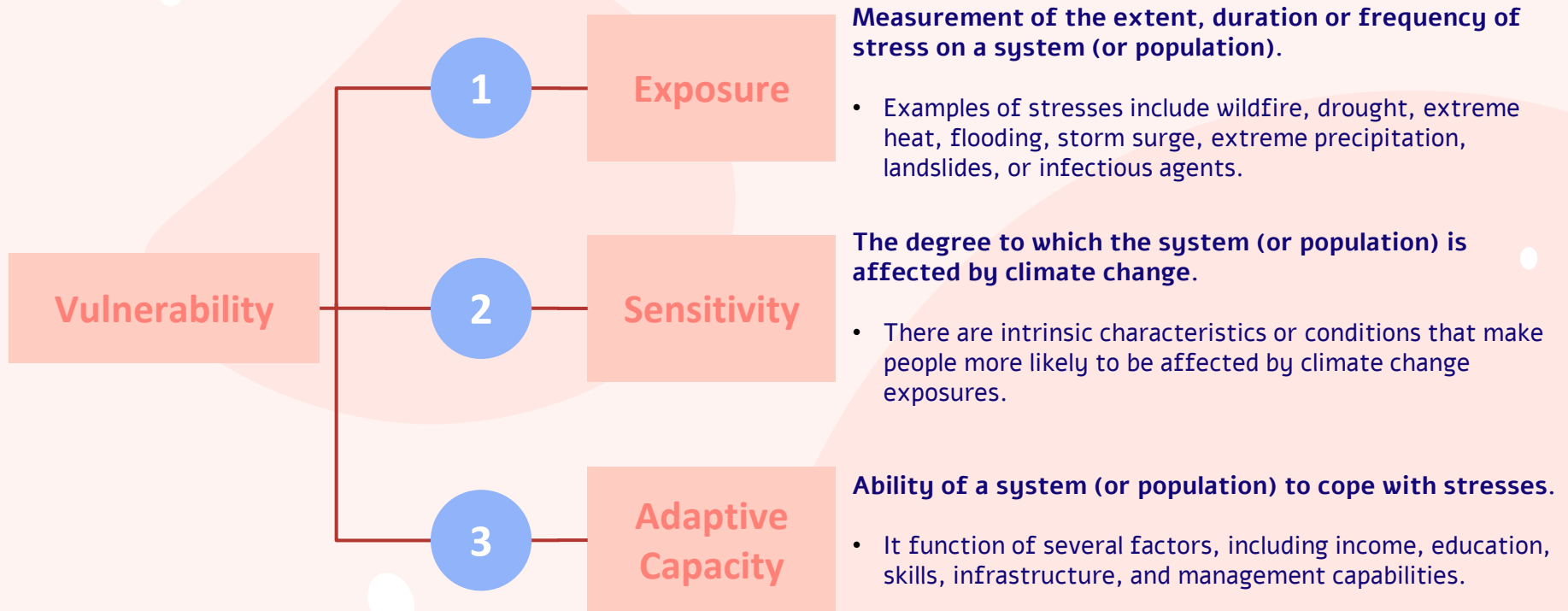
- Age and health conditions are factors of sensitivity

4. One way to decrease the negative impacts is through the built environment

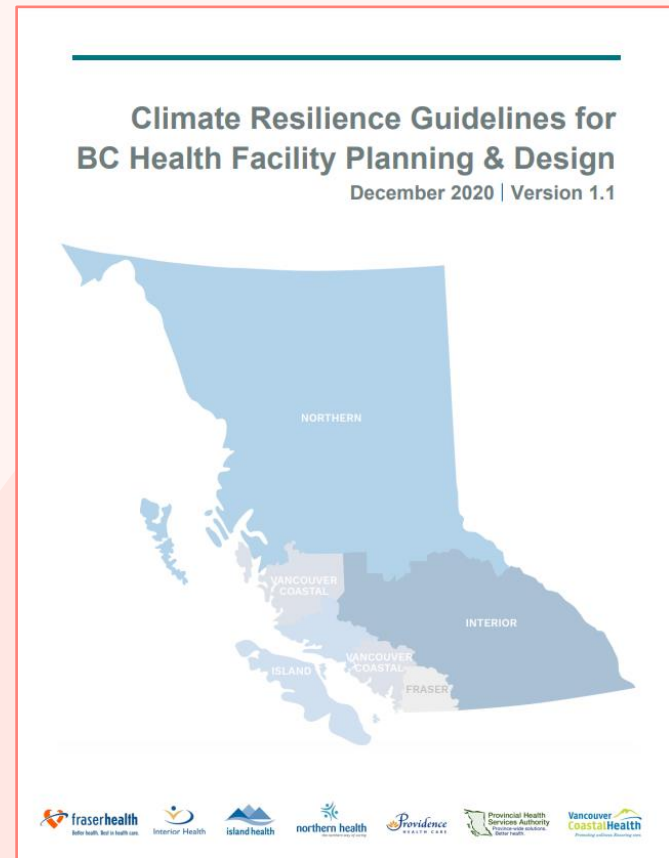
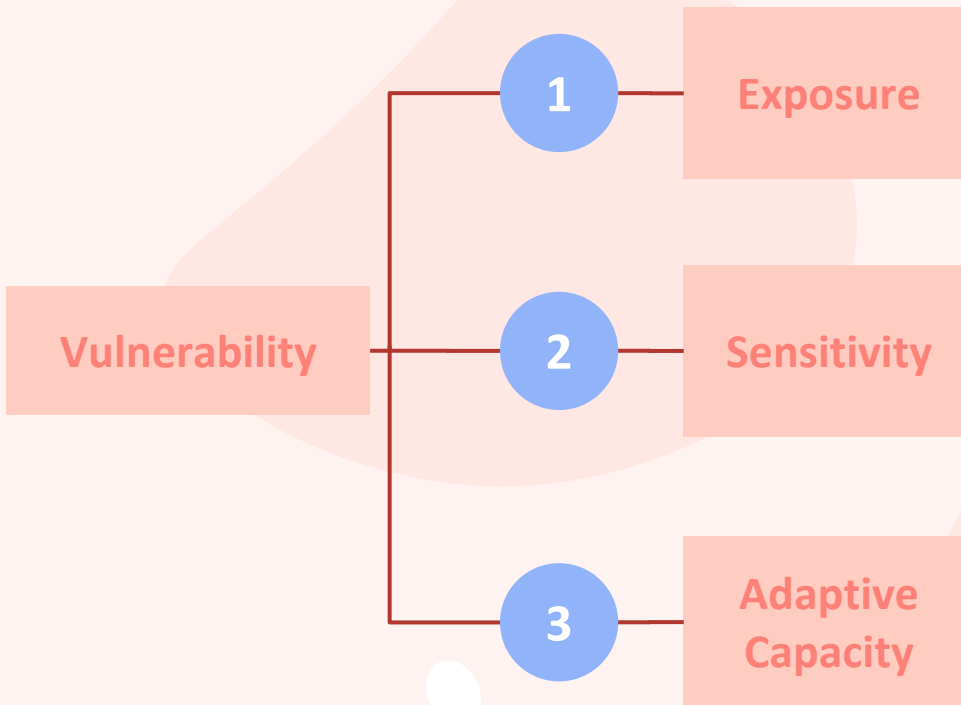
- Our goal is to identify which solutions can be utilized in long-term care facilities in B.C. to decrease these negative impacts



Understanding Vulnerability



Understanding Vulnerability



Research Questions

01 Climate Change Impacts

What are the climate change impacts of most concern (in terms of likelihood and severity) to residents in the province of B.C.?

02 Potential Health Impacts

What health impacts are caused by the previously identified climate change impacts?

03 Risk Factors

What are the physiological risk factors (i.e. age or health condition) for the previously identified health impacts?

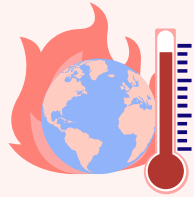
04 Long-Term Care Facility Health Profile

Of the previously identified physiological risk factors, which ones are present in long-term care facilities, and what proportion of occupants have these risk factors?



01 Climate Change Impacts in BC

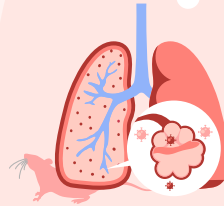
Extreme Heat



Flooding and Reduced Water Quality



Changes in Infectious Agents



Wildfires and Reduced Air Quality



01 Climate Change Impacts in BC

Extreme Heat

Heat warning thresholds vary by region, e.g. when there are two or more consecutive days of daytime maximum temperatures expected to reach 28°C or warmer and nighttime minimum temperatures are expected to fall to 13°C or warmer.

Changes in Infectious Agents

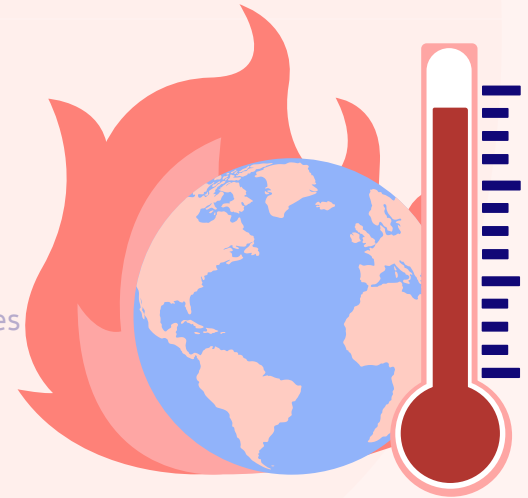
Long-term climate warming has been found to favour the geographic expansion of several infectious diseases through changes to the living environment of the pathogens, vectors and hosts; extreme weather events may help create opportunities for more clustered disease outbreaks.

Flooding and Reduced Water Quality

Floods are often accompanied by a decrease in water quality because runoff transports pollutants into surface water, groundwater, and soil. Notable pollutants include fertilizers, pesticides, heavy metals, persistent organic pollutants, and waterborne pathogens: bacteria, viruses, and parasites.

Wildfires and Reduced Air Quality

Sources of poor indoor air quality include off-gassing from building materials and furnishings, cooking, moisture and mould, pests, and infiltration from outdoor sources such as major roads, rail yards, industry, fireplaces and wildfire smoke events.



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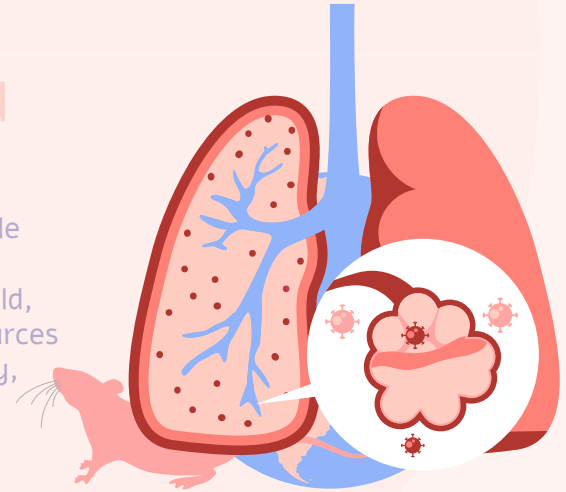
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02-03

Health Impacts & Risk Factors

- Health Impacts of Climate Change
- Risk Factors for these Health Impacts
- Proportion of Long-Term Care Facility Occupants with Risk Factors



02-03

Health Impacts & Risk Factors

Health conditions and diseases aggravated by climate change	Risk factor(s)	Aggravating climate change impact	Proportion of long-term care facility occupants with risk factor
Heat and humidity related illnesses (e.g. heat exhaustion, heatstroke)	Age 65 and over and/or existing chronic disease	Extreme heat	97%
Airborne infectious disease (e.g. influenza and coronavirus)	Ages 65 and over and/or existing chronic disease (most notably, asthma)	Changes in infectious agents	97%
Renal and urinary illnesses (e.g. fluid and electrolyte imbalance; renal failure, nephritis and other kidney disorders; urinary tract infection)	Age 65 and over	Extreme heat	95%
Vector-borne infectious disease (e.g. West Nile virus, Lyme disease)	Adults older than 55, but exposure is the greatest risk factor (i.e. living near endemic areas)	Extreme heat; flooding and reduced water quality; changes in infectious agents	>94%
Acute cognitive impairment	Dementia, including Alzheimer's disease	Wildfire smoke and reduced air quality	64%

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Medication – adverse side effects and/or decreased efficacy	Individuals taking medications that impair thermoregulation or psychiatric medications	Extreme heat	48%
Cardiovascular diseases (e.g. cardiac dysrhythmias, ischemic heart disease and heart attacks)	Hypertension, smoking, obesity, and diabetes	Extreme heat; wildfire smoke and reduced air quality	47%
Stroke	History of TIA or stroke events, hypertension, arteriosclerotic heart disease, smoking and/or diabetes	Extreme heat; wildfire smoke, and reduced air quality	47%
Mental health impacts	Mood or anxiety disorders	Extreme heat; flooding and reduced water quality; wildfire smoke and reduced air quality	30%
Exacerbate diabetes	Diabetes	Extreme heat	21%
Exacerbation or onset of chronic obstructive pulmonary disease (COPD): chronic bronchitis and emphysema symptoms	Cardiopulmonary disease	Wildfire smoke and reduced air quality	12%

02-03

Health Impacts & Risk Factors

Health conditions and diseases aggravated by climate change	Risk factor(s)	Aggravating climate change impact	Proportion of long-term care facility occupants with risk factor
Lower and upper respiratory infections	Cardiopulmonary disease	Wildfire smoke and reduced air quality	13%
Gastrointestinal infections and water-borne infectious diseases (e.g. cholera, giardia, leptospirosis, or appendicitis)	Gastrointestinal diseases	Extreme heat; flooding and reduced water quality; changes in infectious agents; wildfire smoke and reduced air quality	12%
Allergies	Allergies	Extreme heat; flooding and reduced water quality; wildfire smoke and reduced air quality	8%
Cancer, primarily breast and lung	Females have greater risk of breast cancer and former smokers are at greater risk for lung cancer, but all occupants have some risk	Wildfire smoke and reduced air quality	5-6%
Asthma-related medical problems	Asthma	Extreme heat; flooding and reduced water quality; wildfire smoke and reduced air quality	2%

04

Health Profile of Long-Term Care Facilities in BC

97%

Existing chronic disease

Sensitive to **extreme heat** and **changes in infectious agents**, because of the decreased ability to regulate body temperature or the increased severity of airborne infectious disease (e.g. influenza and coronavirus), if contracted.

64%

Dementia, including Alzheimer's disease

Sensitive to **wildfire smoke and reduced air quality** due to a decline in cognitive function.

47%

Hypertension

Sensitive to **extreme heat and wildfire smoke and reduced air quality** because hypertension (the leading cause of both cardiovascular disease and stroke) is exacerbated by extreme heat and long-term air pollution exposure.

48%

Take antidepressants

These occupants are more sensitive to extreme heat, as antidepressants impair thermoregulation; heat can both trigger adverse side effects of these psychiatric medications and increase the risk of heat and humidity-related illnesses.

>94%

Over the age of 55

Sensitive to **extreme heat, flooding and reduced water quality**, and **changes in infectious agents**.

How can we minimize the impacts to these vulnerable populations?



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**Solutions in the
built environment!**

Future-ready building design strategies

Design strategy	Climate change impact
<i>Cooling - Passive</i>	
Building shape and orientation	Extreme heat
Thermal mass	Extreme heat
Climatic data & simulations	Extreme heat
Window design (WWR, u-value, sealing)	Extreme heat; wildfire smoke, and reduced air quality
Window shading and coating	Extreme heat
Reflective or light-coloured building materials	Extreme heat
Vegetation	Extreme heat; flooding and reduced air quality; wildfire smoke and reduced air quality
Natural ventilation	Extreme heat

Design strategy	Climate change impact
<i>Cooling - Active</i>	
Heat recovery ventilation (HRV)	Extreme heat
Exhaust fans	Extreme heat
Temper air supply	Extreme heat
Heat pumps (central or distributed)	Extreme heat; wildfire smoke and reduced air quality
Hydronic integrated heating and cooling	Extreme heat
Variable refrigerant flow (VRF) or variable refrigerant volume (VRV) systems	Extreme heat
Mixed-mode systems	Extreme heat

Future-ready building design strategies

Design strategy	Climate change impact
<i>Ventilation</i>	
Dedicated outdoor air systems	Extreme heat; changes in infectious agents
High-efficiency air filtration	Changes in infectious agents; wildfire smoke, and reduced air quality
<i>Building Layout</i>	
Refuge room	Extreme heat; wildfire smoke, and reduced air quality
Manual entrances/exits	Flooding and reduced water quality
<i>Building materials and equipment</i>	
Fire retardant building materials	Wildfires and reduced air quality

Design strategy	Climate change impact
<i>Flooding</i>	
Sealants that can withstand pressures and water-resistant materials	Flooding and reduced water quality
Protect electrical equipment and key services from water damage	Flooding and reduced water quality
Stormwater management	Flooding and reduced water quality
<i>Power systems</i>	
Backup power to critical systems and areas	Extreme heat; wildfire smoke, and reduced air quality

Climate Resilience Guidelines for B.C. Health Facility Planning and Design



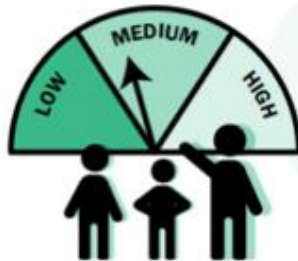
STEP 1:

Which climate hazards matter to our facility, and how might they impact patients, staff, health services and communities?



STEP 3:

What design choices best reduce risks and build in resilience?



STEP 2:

How can we minimize disruptions and be resilient to shocks and stresses?



STEP 4:

Does the design meet our climate resilience objectives?



Climate Resilience Considered in Recent Long-term Care Facility Projects

Fraser Health

- Abbotsford Long-term Care Facility
- Chilliwack Long-term Care Facility
- Delta Long-term Care Facility

Providence Health Care

- St. Vincent's Heather Long-term Care Facility

Vancouver Coastal Health

- Richmond Lion's Manor Fentiman Long-term Care Facility
- Hilltop House North Long-term Care Facility (Squamish)

In conclusion



Climate change is causing negative impacts to our health



Long-term care facility occupants are very sensitive to these impacts



By designing and upgrading our buildings to be future-ready, we can improve the health of these populations

Thank you

Any questions?

Link to full paper:

<https://doi.org/10.1016/j.cacint.2021.100077>

