canadian partnership for children's health & environment
partenariat canadien pour la santé des enfants et l'environnement

A Collective Call for Action to Protect Children from Extreme Heat In Schools and Child Care Settings

APRIL 2025

Extreme heat in educational settings is a growing concern as heat waves get hotter, longer and more common as a result of our changing climate driven primarily by the burning of fossil fuels.[1] There is an urgent need for planning, investment and policy change to ensure that all schools, early learning and child care settings in Canada are climate-ready and equipped to protect children from heat-related health risks, and to mitigate adverse impacts on learning associated with elevated temperatures. Left unaddressed, extreme heat in educational settings will exacerbate systemic inequities in housing, neighbourhood infrastructure and green space, contributing to an unequal burden of risk and impact for children growing up in communities affected by social and economic injustices including the ongoing impacts of colonialism.[2,3] Equipping learning environments for climate resilience can be a tangible and hopeful opportunity for realizing multiple benefits of climate action, including climate justice, health equity and every child's right to a healthy environment.

Extreme heat is a danger to children's health

Extreme heat is a serious health risk for everyone – and especially dangerous for children.[4]

Children are at increased risk of heat-related illness due to a variety of physiological and behavioural factors.[5] Their bodies have limited ability to acclimatize to heat, their higher metabolism increases the risk of dehydration, and their sweating rates are lower than adults which may limit their ability to cool down.[6,7] Children also tend to be more physically active, which generates body heat that further increases their health risk on hot days.[8] Young children are dependent on adults for protection from the heat, they may not perceive the signs of heat stress, and they may not be able to express their feelings of overheating.[9,10]

Physical health effects of extreme heat in children include heat stroke, heat exhaustion, heat rash, heat cramps and swelling of hands, feet and ankles.[11] Children most at risk of heat-related illnesses include those with breathing difficulties (e.g., asthma), heart conditions, kidney problems, mental and physical disabilities, developmental disorders, and those who take certain medications.[12,13]

Heat-related health risks for children are not limited to extreme heat days. A range of warm season temperatures, including those not considered extremely hot, have been associated with higher rates of children's emergency department visits for heat-related illnesses, injuries and other health concerns.[14,15] Humidity combined with high temperatures can contribute significantly to heat stress.[16] Geography is also a factor: children in northern climates, who may have been less exposed to heat and thus less acclimatized, may be more vulnerable.[17] Lack of relief from elevated temperatures at night (e.g., due to lack of cooling in home environments) compounds the threat to children's well-being during extreme heat events.[18,19]

Extreme heat jeopardizes children's learning

Extreme heat also puts children's learning at risk. Extended exposure to heat can lead to slowed cognition as well as impaired information processing, attention and memory.[20] Elevated temperatures are also linked to emotional and behavioural challenges such as increased irritability, frustration, and lack of motivation.[21] Heat's effects on sleep can also lead to learning difficulties and emotional and behavioural challenges in children.[22] Warm days, and in particular hot days, are associated with increased school absences.[23] Research suggests that the preferred indoor temperature for children is lower than that for adults.[24] Outdoor learning and access to nature – which have well-documented benefits for children's learning, physical health and mental well-being[25,26] – may become less accessible or safe due to the impacts of climate change, including extreme heat.[27,28,29]

While data are limited on the impact of extreme heat on student learning, one study from the United States showed a 4.5 percent reduction in student performance on a high school exam taken on a 90°F (32.2°C) day relative to a 72°F (21.1°C) day.[30]

A subsequent study estimated that, without air conditioning, a 1°F (0.56°C) hotter school year reduces that year's learning by one percent.[31] The research, which looked at student performance on standardized testing, found that hot school days disproportionately affected minority students, accounting for roughly five percent of the racial achievement gap.[32]

The flip side of this reality is that improved educational infrastructure can have positive impacts on learning and equity. Researchers found that following a US$1.4 billion investment in heating, ventilation and air conditioning (HVAC) upgrades in a U.S. school serving an under-resourced inner-city community, students' reading scores drastically improved to be comparable to the benefits gained from attending a high-performance charter school.[33] Similarly, investments in outdoor learning spaces through improved tree canopy and other forms of shade can provide protection from heat and improve learning.[34]

Extreme heat exacerbates existing inequities

Children experiencing structural disadvantages and living in socio-economically marginalized communities are at greater risk of excessive heat – often having less access to cooling methods such as air-conditioned homes and schools, and lower availability of green spaces.[35] People who are socially and economically disadvantaged, racialized populations, Indigenous Peoples and people with existing health conditions are at increased risk from climate-related health impacts, including extreme heat, and such communities may lack the means to take adequate protective measures.[36] Extreme heat is a factor in environmental racism and environmental injustice, given its intersection with multiple risks of climate change (e.g., wildfire smoke) and other sources of degraded air quality affecting children.[37]

As the climate crisis and extreme heat events escalate, the ongoing effects of colonialism exacerbate disproportionate climate-related health risks borne by Indigenous students. Such inequities stem from multiple factors including chronic underfunding of on-reserve educational settings as well as inequities associated with poverty, housing, health status, access to health services, and political marginalization affecting Indigenous communities including those in urban settings.[38] Climate-related changes can interfere with traditional land-based practices, interrupting the transmission of cultural knowledge and teachings to the next generation.[39]

Places where children live, learn and play are getting hotter

Communities all across Canada are seeing an increase in the number of extreme heat events.[40] The number of days above 30°C is expected to double or triple in some parts of Canada in the near term (2021 – 2050) as a result of climate change caused primarily by the burning of fossil fuels.[41,42,43]

The increasing frequency, intensity and duration of extreme heat events due to climate change are jeopardizing children's ability to learn, play and grow in safe, healthy settings. These include indoor settings such as schools and homes, and outdoor areas such as playgrounds and natural areas.

Classrooms without air conditioning can exceed safe temperatures during extreme heat events. The recommended upper limit for indoor temperature – which is based on research with adults and not necessarily reflective of children's susceptibilities to heat – is 26°C.[44] During an extreme heat event, indoor temperatures can readily exceed 26°C in settings that are not equipped with mechanical cooling. Data collected during the B.C. heat dome showed a "worst-case scenario" home without air conditioning had steadily increasing temperatures between 30°C and 40°C.[45] Data from a 2023 CBC investigation showed that more than half of the 50 homes monitored across five cities – Vancouver, Winnipeg, Toronto, Montreal and Windsor – had indoor temperatures at or above 26°C.[46] There is limited data available on indoor temperatures in schools and early learning settings during periods of extreme heat. Nor are data available on the impact of overheated classrooms on students' absences, student learning and other indicators associated with exposure to extreme heat.

Playground surfaces, including playground equipment, can become dangerously hot without shade protection.[47] Artificial surface materials, such as pavement and artificial turf, contribute to increased surface and air temperature.[48,49]

One study found that the hottest areas of a city neighbourhood were on playground surfaces.[50] Another study found that the availability of school playground shade was negatively associated with the socioeconomic position of student families.[51]

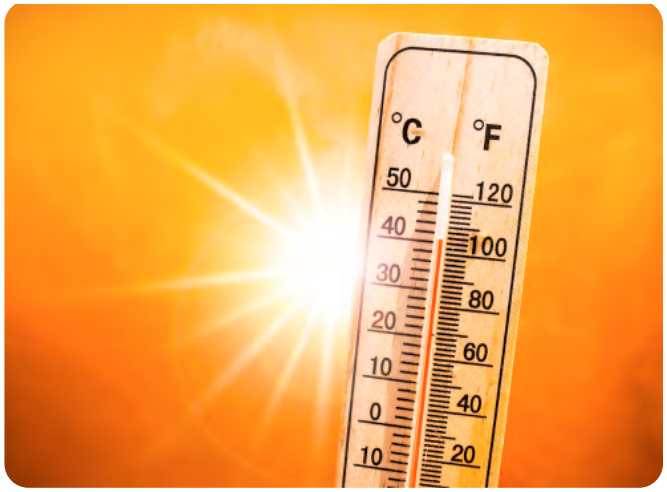
The 2021 B.C. heat dome demonstrated the devastating health impacts of extreme heat, with over 600 heat-related deaths in just one week.[52] Lack of air-conditioned spaces and lack of surrounding green space contribute to elevated temperatures indoors, which is where the vast majority of the heat-related deaths occurred.[53,54]

Researchers predict that by the 2050s—when children born today reach 30 years of age—the number of extreme heat days will increase by 1.5 times in Ontario and Manitoba and more than six times in the Yukon.[55]

Many educational settings across Canada are ill-equipped to protect children from extreme heat

Children typically spend 6-8 hours a day or more in educational settings, many of which are ill-equipped to protect students and staff from extreme heat. Comprehensive data are lacking on the extent to which educational settings in Canada are ill-equipped to deal with rising temperatures as the climate crisis worsens, but evidence suggests the problem is widespread. For example, according to recent media coverage, few schools in Quebec have air-conditioned classrooms,[56] most Nova Scotia schools do not have air conditioning,[57] and fewer than one-third of schools in the Toronto District School Board have central air conditioning.[58] In a 2023 media report, the Winnipeg School Division reported that 27 of their facilities had no air conditioning, 16 were partly air conditioned and 42 were fully air conditioned.[59] Outdoor learning settings are similarly ill-equipped to protect children from extreme heat. They are often not designed to account for extreme weather and thermal comfort.[60] Many lack adequate shade, and the increasing use of artificial materials can lead to higher surface temperatures.[61]

When indoor settings lack adequate cooling, extreme heat can lead to school closures, cancelled classes and programs – resulting in significant



disruptions to learning and related equity concerns. While some students may choose to stay home to escape the heat,[62] not all children have this option. Over one-third of Canadian households reported not being equipped with any type of air conditioner.[63] Missed and cancelled classes have significant impacts on children's academic performance and do little to protect the health of students who lack access to cooling at home. Systemic inequities in housing and green space heighten the disproportionate burden of extreme heat.[64] In the case of inadequate housing, for example, children who live in homes and attend home based child care that both lack air conditioning are at increased risk from extreme heat.

In outdoor settings, the widespread use of pavement and artificial turf contributes to elevated heat and other environmental health concerns. Pavement, especially that which is dark in colour, collects and traps heat leading to hotter ambient temperatures. Artificial turf similarly retains heat, while also increasing children's exposures to toxic chemicals and contributing to microplastic pollution.[65,66,67] These types of surfaces also lead to stormwater run-off that can contribute to flooding and contamination of surface and groundwater sources.[68,69] In a 2022 survey of approximately 2000 child care professionals, nearly 40 percent reported the presence of outdoor artificial turf at the child care setting where they work.[70]

Options exist to protect children and staff from extreme heat

Actions to safeguard children's health and learning from extreme heat include upgrading or installing mechanical cooling and ventilation systems in educational buildings, greening outdoor spaces, and adopting other heat mitigation and exposure reduction measures.[71] These types of upgrades can also help address the existing backlog of needed repairs in educational facilities.[72] The added bonus for many of these actions is increased environmental sustainability, enhanced child-nature connections, and creation of climate-resilient spaces for children and their communities.

A. Measures to address heat in buildings and indoor settings

Clear and measurable targets, investment in mechanical and passive cooling and other mitigation measures can equip educational settings to be health-protective and resilient in the face of escalating extreme heat events.

- **Setting a maximum temperature threshold**

  Current and evolving research supports an indoor temperature threshold of 26°C to prevent heat-related illness and death in residential settings.[73,74,75,76,77,78,79,80,81] Children's higher vulnerability to extreme heat justifies the establishment of 26°C as a maximum temperature threshold in educational facilities. Ongoing monitoring of the air temperature throughout the building is needed to ensure that the threshold is not exceeded.

- **Passive and behavioural measures to help maintain safer indoor temperatures**

  A number of passive building features and behavioural interventions can help keep indoor spaces cool during extreme heat events.[82,83,84,85] These include:

  - using window shading to block direct sunlight (e.g., outdoor sun awnings or reflective film; indoor blinds or curtains)
  - opening windows and doors and using fans (e.g., windows fans) to draw in cooler outdoor air (e.g., during cooler parts of the da y, overnight, whenever there is a cool breeze)
  - keeping windows and doors closed when indoor temperatures are cooler than outdoor temperature
  - turning off heat-generating devices such as appliances, electronics and lights when not needed.

- **Mechanical cooling and ventilation**

  Mechanical cooling and ventilation, such as that provided by well-functioning HVAC systems and heat pumps, are essential for protecting children and staff from extreme heat and other indoor air quality concerns, such as wildfire smoke. Installation and/or retrofitting to ensure mechanical ventilation and cooling is a priority for investment.

  Low-energy space-cooling such as heat pumps, in combination with passive building envelope strategies (e.g., cool envelope material, reflective roofs or walls) and building shading (e.g., trees and vegetation) can help ensure resilient heat protection and have the added benefit of reducing carbon emissions.[86] Compared to conventional air conditioning, heat pumps are more energy efficient and can help reduce strain on electricity grids.[87]

- **Energy efficiency upgrades and other building improvements**

  In addition to mechanical cooling and ventilation, other building retrofits such as upgrading the building envelope (e.g., cool envelope material, improved building insulation, energy efficient windows and doors) and structural repairs (e.g., repairing/replacing roofs, better sealing of windows and doors) can improve occupant health and resilience to extreme weather events such as heat waves, flooding and wildfire smoke.[88] Such climate-relevant retrofits can also help avoid the damage and costs associated with extreme weather events, and significantly reduce energy consumption.[89]

B. Measures to address heat in outdoor settings

Well-designed outdoor spaces equipped with heat-protective measures can lower air and surface temperature, ensuring children can safely engage in outdoor learning and play, which is vital for their physical health, mental well-being and social development. Strategies such as increasing tree canopy can reduce outdoor air and surface temperatures, and can also reduce the overheating of buildings through tree shading.[90]

- **Natural and constructed seasonal shade**

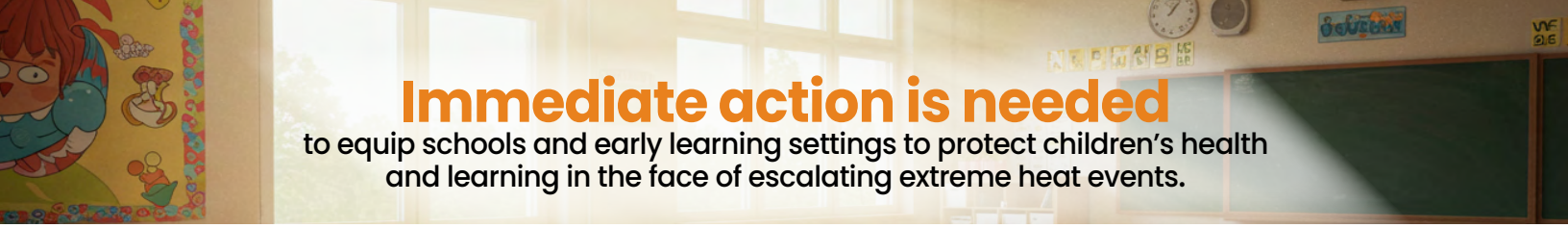
  Maximizing shade, through natural vegetation (e.g., tree canopy) and constructed shade (e.g., shade sails) can help keep outdoor learning settings cool during hot weather and extreme heat events, with the added benefit of protecting children from UV radiation.[91] Trees not only provide shade but can cool ambient air through evapotranspiration.[92] Well-designed outdoor shade can shield the building from incoming solar radiation, helping to keep indoor temperatures cooler.

- **Cooler and natural surfaces**

  Cool roofs (e.g., green roofs, light-coloured roofs), cool pavements (paving surfaces that are light in colour) and natural surfaces (grass, vegetation) have been shown to reduce outdoor temperatures, and can help to keep the building cool inside, as well.[93,94] Health Canada advises that playgrounds and other outdoor settings should include cool features such as trees, vegetation, water fountains, shade structures and lighter-coloured surfaces.[95] Splash pads and misting stations can also offer cooling during extreme heat.

Across all of these actions is the need for adequate planning, training, capacity and communication. School boards' Hot Weather/Heat Response Plans are important tools to protect students and staff from heat-related health impacts during extreme heat events, and to identify how the board is preparing for the increasing frequency, severity and duration of extreme heat that is expected as a result of climate change.[96,97] Effectively communicating the Hot Weather/Heat Response Plans to everyone who may be affected or involved in response actions, including students, parents, caregivers, staff and community partners (public health, municipal services), will help ensure that the plan achieves its goal of protecting the school community from heat-health risks. Multi-sectoral engagement and multi-pronged approaches are key components of hot weather response plans, including involvement of local public health.[98,99,100]

Examples of measures to be considered within a Hot Weather/Heat Response Plan include identification of indoor temperature thresholds that trigger immediate action (e.g., moving students to an identified cool space), regular monitoring of temperatures, and use of passive and behavioural cooling strategies to help keep indoor spaces cool. Hot Weather/Heat Response Plans can also outline additional actions the board has identified and prioritized to address extreme heat, such as upgrades to mechanical cooling and outdoor greening initiatives.



Immediate action is needed

to equip schools and early learning settings to protect children's health and learning in the face of escalating extreme heat events.

The Canadian Partnership for Children's Health and Environment (CPCHE), with our partners, affiliates and collaborators, calls upon all levels of government to ensure that all schools, early learning and child care settings are equipped to protect children and staff from the escalating risks to health and learning posed by climate-related extreme heat events, starting with the following priority actions:

1. **Adopt a maximum indoor temperature standard of 26°C in learning environments** and update, as needed, to ensure continued alignment with health-based guidance and emerging research on temperature thresholds in indoor environments from authoritative sources.[101,102,103,104,105,106]

2. **Leverage education and early child care legislation, occupational health and safety laws, public health standards** and other available regulatory measures[107] to expeditiously implement the maximum indoor temperature standard, coupled with the required resources, technical support and guidance to support schools and early learning and child care programs in meeting the standard.

3. **Invest in building retrofits to support climate resiliency in educational settings**. This must include installation/upgrading of energy-efficient cooling systems, with continuous improvement targets – in the form of incremental percentages of regularly occupied spaces equipped with mechanical cooling – towards the achievement of facility-wide cooling in all educational facilities. All new builds should be equipped with energy efficient, low/zero-carbon cooling to ensure heat health protection.

4. **Immediately equip all educational settings with the means and guidance to implement passive and behavioural cooling measures**, such as window shading (awnings and window coverings) to block incoming solar radiation, keep indoor temperatures low and make buildings more energy efficient. In the case of schools, such measures should be clearly outlined in Hot Weather/Heat Response Plans, with effective communication across the school community, transparent tracking and accountability.

5. **Promote and require, where applicable, measures to ensure that outdoor spaces and learning settings are equipped** to mitigate the effects of extreme heat and other climate-related concerns (e.g., flooding) by:
   a. maximizing natural and constructed seasonal shade
   b. using natural play surfaces
   c. restricting the use of tarmac/pavement and other impervious surfacing options, and opting for lighter coloured heat-reflecting surfaces
   d. prohibiting the installation of artificial turf (with limited exceptions).

6. **Collect the data required to drive extreme heat mitigation measures** in indoor and outdoor educational settings, in order to decrease the risk of heat-related illness and disruptions to children's learning. Data collection should include tracking of existing infrastructure needs (e.g., percentage and geographic distribution of educational facilities without adequate cooling), ongoing tracking of indoor and outdoor temperatures, and measurements to capture impact on student learning (e.g., school closures, student absences, test scores and other measures of student learning).

7. **Prioritize investment in extreme heat mitigation for learning environments in under-resourced communities** to promote health equity, including prioritizing socio-economically marginalized communities for upgrades to, or installation of, mechanical cooling systems. Such efforts must be undertaken with active involvement of community representatives and leadership to ensure that interventions are effective, culturally responsive, and aligned with local needs.

8. **Optimize and coordinate investments across all levels of government** and relevant ministerial mandates (i.e., education, climate change, energy retrofits, infrastructure, health) to realize the multiple benefits of healthy, climate resilient learning settings.

9. **Build strong intersectoral collaboration**, including routine communications and coordinated decision-making, across all relevant domains including education, public health, infrastructure, land use planning, environment, climate change, and occupational health and safety – to protect children's health, advance health equity, mitigate and adapt to climate change, and model action for a resilient, equitable and hopeful future for children across Canada.

Indigenous Learning Environments

This Collective Call for Action does not identify specific policy actions linked to Indigenous education, early learning and child care. We recognize and affirm the rights of Indigenous governments to design and develop educational systems and services that are distinctions-based and self governed, consistent with the vision and principles set out in the Indigenous Early Learning and Child Care Framework and commitments under the United Nations Declaration on the Rights of Indigenous Peoples. We further note the relevant Calls to Action in the report of the Truth and Reconciliation Commission of Canada, including the responsibility of the federal government to eliminate the discrepancy in education funding for First Nations children being educated on reserves and those being educated off reserves.

Signatories

In solidarity and with determination for the health and well-being of our nation's children and future generations, this Call for Action is advanced collectively by:

Canadian Partnership for Children's Health and Environment (CPCHE)
Canadian Environmental Law Association (CELA)*
Canadian Association of Physicians for the Environment (CAPE)*
Canadian Association of Nurses for the Environment (CANE)*
Canadian Child Care Federation (CCCF)*
Center for Environmental Health Equity (CEHE)*
Environmental Health Clinic at Women's College Hospital*
Little Things Matter**
Ontario Public Health Association (OPHA)*
Pollution Probe*
Prenatal Environmental Health Education (PEHE) Collaboration**
Andrew Fleck Children's Services
Association of Early Childhood Educators of Newfoundland and Labrador (AECENL)
Association of Early Childhood Educators of Nova Scotia (AECENS)
BC Society of Transition Houses (BCSTH)
Canadian Health Association for Sustainability and Equity (CHASE)
Canadian Institute of Public Health Inspectors
- Ontario Branch (CIPHI-O)
Canadian Public Health Association (CPHA)
Citizens' Climate Lobby - Toronto (CCL-T)
Clean Air Partnership
Climate Action for Lifelong Learners (CALL)
Climate Emergency Unit
Climate Legacy
EcoSchools
Efficiency Canada
Environmental Defence
Environmental Education Ontario
First Call Child and Youth Advocacy Society
For Our Kids
Green Communities Canada
Health Providers Against Poverty (HPAP)
Just Futures Kingston
Low-Income Energy Network (LIEN)
New Brunswick Lung
Outdoor Play Canada
Prevent Cancer Now
Seniors for Climate Action Now!
Take Me Outside
The CHANGE Research Lab
The Climate Reality Project Canada
Windfall Ecology Centre

*CPCHE Partner organization
**CPCHE Affiliate organization

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