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### **CPS Position Statement on Global Climate Change and Health**

Developed by Leina Kingdom and Dr. Signe Richer for PedsCases.com.

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#### **Introduction:**

Hello, I'm Leina Kingdom and I am a 3<sup>rd</sup> year medical student at McGill University working with Dr. Signe Richer, an intensive and emergency medicine physician at Verdun Hospital in Montreal. Today, we will discuss climate change and how this affects Canadian youth. We will cover examples from recent climate events, and cover the content included in the [Canadian Pediatric Society Position statement on global climate change and health in Canadian children written by Dr. Irena Buka, Dr. Katherine Shea](#). The objectives of this podcast are to:

- 1) Describe Canada's changing climate.
- 2) Review why children are particularly vulnerable to the effects of climate change.
- 3) Identify specific health threats of climate change to the pediatric population.
- 4) Review how the climate crisis exacerbates health disparities in children.
- 5) Identify methods and resources for medical students and physicians to address these climate-related health challenges.

#### **Part I: Climate Change in Canada**

In the summer of 2023, Canada experienced the most destructive wildfire season ever recorded. Within the month of June alone, more land burned in Southern Quebec than in the previous 20 years combined ([Statistics Canada, 2023](#)). The forest fires forced thousands of people to evacuate their homes as their communities were turned into ash. Individuals in cities witnessed skies cloaked in smoke and they were restricted from the outdoors given the dangerous air quality. The forest fires were fueled by record high temperatures and by

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significantly intense and prolonged drought conditions. But forest fires are not the only challenge that Canada must deal with in the face of climate change.

Over the last 50 years, Canada has experienced a considerable increase in average temperatures. Indeed, the annual average temperature in Canada has increased at roughly twice the global average rate ([Statistics Canada, 2023](#)). Canada has seen a rise in the number and the intensity of heat waves, which are expected to increase in frequency, length and severity in the upcoming years. Particularly, rising temperatures have been highest in Northern regions of Canada leading to rapid sea ice melting. As temperature rises, the capacity of the atmosphere to store moisture increases as well, leading to more frequent and intense rainfall ([Fan, 2023](#)). Extreme precipitation combined with rising sea levels ultimately has increased the number of floods in areas such as Calgary, Montreal, Thunder Bay and Toronto.

The Canadian environment is rapidly changing, at terrifying rates. All Canadians are affected by changing climate, but not all to the same degree (no pun intended). Adverse climate-related health events are highest among vulnerable groups, particularly children. But why?

Children are disproportionately affected by climate-related changes because they metabolize more water, air, and food per kilogram of body weight compared to adults. Thus, air pollutants, waste and toxins have greater effects on children's bodies. Children also have immature immune and temperature regulation systems and spend more time outdoors which also increases their vulnerability to environmental hazards. Now that we understand why children are vulnerable to the effects of climate change, let us discuss which specific health threats children are facing in our changing environment.

## **Part II: Specific health threats of climate change to the pediatric population**

Although the idea of longer and warmer hot sunny days may sound appealing to many, **extreme heat** poses multiple health threats to children. In fact, children represent almost 50% of individuals affected by heat-related illness ([Mangus, 2019](#)). Children have a larger body-surface area to mass ratio compared to adults. This means that when exposed to heat, they lose water more quickly, leading to rapid dehydration and electrolyte imbalances. Children also have a reduced ability to regulate core body temperature, thereby increasing their risk of

heat exhaustion and heat stroke ([Uibel et al, 2022](#)). Children love to play outside - but infants and young children often lack the awareness to remain under the shade, remove clothing layers and drink water, which also increases the risk of heat related-morbidity and mortality. In fact, studies have shown that extreme heat is associated with a 22% increase in pediatric emergency department visits in Southwestern Ontario ([Wilk et. al. 2021](#)).

Natural hazards and extreme weather events including storms, droughts, floods and forest fires cause many direct and indirect health-effects. Increasingly frequent forest fires and flooding destroy infrastructure, forcing families to be displaced from their homes. It is estimated that between the years 2016 and 2021, approximately 47,000 children have been displaced from their homes in Canada due to forest fires alone ([Unicef, 2023](#)). When families are forced to seek accommodation elsewhere, they frequently end up in shelters that are overcrowded, thereby increasing the risk of infection transmission. Climate hazards can also lead to the destruction of critical infrastructures thereby preventing children from attending school and acquiring the health services they need. It is also worth mentioning that due to the an increasing number of smoky summer days, outside activities are often cancelled and children miss out on exercise and being immersed in nature which may lead to greater risk of obesity and loss of wellbeing.

Witnessing extreme weather events and the subsequent loss of possessions and loved ones is terrifying, frightening, and traumatic for children leading to profound and severe psychological effects. These include post-traumatic stress disorder, anxiety and depression. Chronic mental health symptoms have been reported in children even four years after natural disasters ([Lakhani, 2023](#)).

During every minute of every day, we fill our lungs with surrounding air. Air pollution is another major environmental health threat that affects children in uniquely damaging ways. Fossil fuels, industrial and agricultural processes, wildfires, and dust storms, all contribute to something called particulate matter. When particulate matter is inhaled, it deposits into our alveoli, causing pulmonary inflammation, oxidative stress and direct toxic injury ([Kyung et al, 2020](#)). Infants and children are particularly vulnerable to air pollution because they have higher minute ventilation compared to adults, spend more time playing and engaging in

outdoor sports, and therefore have longer exposure times to particulate matter ([Buka et al, 2006](#)).

Air pollution has negative effects on respiratory health, even before we take our first breaths. Exposure to air pollution during pregnancy is strongly associated with premature birth and low birth weight ([American Lung Association, 2023](#)). Noxious aerosols have been associated with impaired lung development and decreased lung function in childhood, thereby increasing the risk of developing chronic lung diseases later in life. There is also evidence that air pollution is linked to childhood obesity ([Zheng et al., 2024](#)), sudden infant death syndrome ([Hwang et al., 2019](#)), ear infections ([Park et al., 2024](#)), lung infections, asthma exacerbations, and even childhood cancers such as retinoblastoma ([Heck et al., 2015](#)) and leukemia ([Khorrami et al., 2016](#)).

The climate crisis has not only affected the air that we breathe, but also the water that we drink. **Floods** create the optimal place for mixing pollutants including agricultural waste, chemicals, and sewage. This cocktail of hazards can contaminate local water supplies and drinking water. Consuming contaminated water during pregnancy is associated with infant mortality and increased incidence of birth defects ([Mallet & Etzel, 2018](#)).

Within 24 hours of a flood, affected housing and infrastructure can start to grow mold. Mold poses serious health-threats, especially to children. Mold is a fungus that reproduces via spores - the inhalation of these spores has been associated with hemorrhagic pneumonia, asthma exacerbations and increases the risk of cognitive deficits if exposed in early infancy ([Jedrychowski et al, 2011](#)).

The changing Canadian climate is also fueling the spread of infectious disease. Long summers and shorter winters facilitate the reproduction and survival of insects that serve as vectors for disease spread. Canada has seen an increase in the number and in the geographic distribution of tick-borne disease such as Lyme, and mosquito-borne disease such as West Nile Virus. Changes in wind patterns and extreme weather events further facilitates the introduction and transmission of tropical mosquito-borne diseases such as dengue, chikungunya and Zika ([Ogden et al. 2022](#)). Not to mention that increased rainfall provides the optimal habitat for their reproduction. Higher temperatures are also associated with greater risk of Hand, Foot and Mouth, a common childhood infectious condition. Finally, flood-contaminated water provides the optimal environment for the transmission of water-

borne diseases. In Canada, children under 4 years old are more likely than adults to acquire an infection from *Campylobacter*, *Giardia*, *Salmonella* or *Shigella* species.

The ozone is a layer of the earth's stratosphere that functions to absorb ultraviolet, or UV, radiation emitted from the sun. Importantly, the ozone layer absorbs a specific type of UV light called UV-B, which is the most harmful type of UV light ([Environment Canada, 2023](#)). Unfortunately, a large number of ozone-depleting substances (ODS) derived from human-made gasses have slowly contributed to the depletion of the ozone layer. Although the ozone layer is slowly recovering due to multiple efforts to diminish the production of these ozone-depleting substances, this layer of the atmosphere is much thinner in Canada's North. When the ozone layer is thin, UV light easily penetrates the earth's atmosphere. You know that familiar red and tender skin that occurs when you spend too much time in the sun? Well that is your skin reacting to UV- B causing the all-too familiar sunburn. UV- B increases the risk of developing cataracts and multiple skin cancers including basal cell carcinoma, squamous cell carcinoma and malignant melanoma. An estimated 50-80% of sun damage occurs in childhood and adolescence ([Robinson et al. 2000](#)). It is therefore imperative that we protect our youth from the damaging effects of UV radiation.

### **Part III: Climate change exacerbates health disparities**

Although climate change affects all children, it does not affect all children equally. Climate change can be understood as the great divider – it exacerbates pre-existing health disparities. Children who are socio-economically disadvantaged, Indigenous, or living with a chronic disease are particularly at risk.

So much of our ability to cope with the changing climate is facilitated by our access to social and economic resources. It is much easier to survive a heat wave when you have access to fresh water and air-conditioning. Storms are far less dangerous when you live in a house with good infrastructure. Floods are less likely to cause mold growth when you can afford the restoration costs from water damage. It could not be more evident that socio-economically disadvantaged children are far more affected by the effects of climate change.

Furthermore, Indigenous people are particularly affected by climate change due to their connection to and reliance on land, their remoteness to essential services, infrastructure deficits, and exposure to climate risks ([CIER, 2006](#)). Unfortunately, compared to people living-

off reserve, First Nation communities are 18 times more likely to be evacuated due to natural disasters ([Government of Canada, 2019](#)). They are also 10 times more likely to experience forest-fire related death ([Government of Canada, 2024](#)). Furthermore, as we discussed earlier, the ozone layer is thinnest in the Northern areas of Canada, thereby increasing UV light exposure to children residing in such areas. Moreover, rising temperatures leads to permafrost instability in Northern regions. Permafrost is the layer of soil that is permanently frozen. When this layer of soil thaws in response to warmer temperatures, it becomes incredibly unstable, causing the ground to literally “cave” into itself, thereby destroying housing and essential infrastructure including schools and health-care services. But it is not just damage to housing and infrastructure that’s of concern. Melting permafrost can even cause the revival of long-frozen bacteria and viruses, thereby contributing to infectious disease spread amongst children and families.

#### **Part IV: What can we do as medical students, trainees and as health-care professionals?**

Thinking about the climate crisis can be overwhelming, discouraging, all-encompassing and even paralyzing at times. These feelings of frustration and lack of hope are valid, but nevertheless, they do not move us forward. The prospect of building a better world for all children is what moves us forward. So, what can we do, as medical students and future health-care professionals, to mitigate the effects of the climate crisis?

As individuals working in the health sector, we are incredibly fortunate to have a clinical practice – a practice where we can educate and counsel children and their families on preventing climate-related health issues. For instance, it is imperative that we:

- Communicate the risk for water contamination during periods of heavy rain and flooding.
- Emphasize the importance of sun protection, especially in regions where ozone layers are thinning.
- Promote the use of protective clothing and repellents to prevent tick and mosquito bites.
- Counsel families to track air quality by monitoring their local air quality index and to minimize exposures to air pollutants.

We are also very fortunate to be surrounded by colleagues who are perpetual learners. It is our duty to continue to educate ourselves about Canada's changing climate and its related health effects in children. Incorporating planetary health into medical education is also essential to ensure that clinical practices continue to adapt to our changing environment.

Outside of the clinical setting, there are a multitude of individual choices that promote environmental sustainability. I am certain that many of you are aware of the importance of taking public transport, recycling, and composting. Sustainable choices are not only beneficial for your patients but many of these lifestyle changes such as eating a plant-rich diet and partaking in active transport, have many personal co-benefits as well. Individual consumer choices each have a small impact on the planet, but when combined, can collectively have a major impact in driving systemic change.

Although personal lifestyle changes are imperative in mitigating the climate crisis, changes at the systemic level must occur in order to create powerful sustainable change. As physicians and as future physicians, we have the privilege of having the respect and authority to create systemic change. We must seize this opportunity to create healthy and sustainable environments for children by advocating for:

- Policies to reduce reliance on automotive transport and improve walkability and bike paths in urban and suburban neighborhoods
- Policies that facilitate transfer of outdoor sports to indoor facilities on poor air quality days
- Local infrastructure that reduces fossil fuel energy use

We believe that it also is essential to highlight that healthcare itself is a major contributor to climate change. In Canada, healthcare accounts for approximately 5% of our national carbon footprint ([Canadian Medical Association, 2024](#)). Eco-responsibility and sustainability need to be integrated into healthcare delivery. As health-care professionals it is our duty to:

- Advocate for greener building practices, efficient water use, better waste management, use of safe chemicals and environmentally preferable purchasing within healthcare institutions.
- Ensure that environmental stewardship is at the forefront of decision making.

To finish off this podcast episode, I want to remind all listeners that children are society's future, but they are also its most vulnerable members. It is our duty to protect them against

the harmful effects of climate change. Thousands of children are threatened by the climate crisis every single day. There is little time to waste, but there is so much to be gained if we put our efforts together to address the climate crisis.

Thank you for listening to this PedsCases podcast and stay tuned for more great podcasts!



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