

THE HEALTH COSTS OF CLIMATE CHANGE

How Canada can adapt, prepare, and save lives

Climate change is not just an environmental and economic threat, it is also a threat to public health. Climate change will make existing health inequities worse and increase costs to Canada's health system and economy—unless governments work together to invest in preparation and prevention.

The impacts of climate change are already causing illness, death, and economic damage in Canada. Wildfires and floods destroy homes and disrupt lives and livelihoods. Heat waves can be deadly, especially to the elderly, and to people working outdoors. These are the most dramatic and visible examples. But the changing climate is also altering the places and landscapes that people call home—sometimes slowly and sometimes rapidly, introducing new risks, such as new diseases or different ice or snow conditions.

Humans are adaptable. But climate change is shifting the nature of these threats at an unprecedented pace.

As with the COVID-19 pandemic, no one in Canada will be immune to the health effects of climate change. And as with the pandemic, the impacts of climate change will be worse for those who are already at risk of poor health and face barriers to affordable housing, food security, and healthcare.

Our report shows that climate change will make existing health inequities worse and concludes that addressing climate change requires recognizing the systemic issues that place some people at greater risk. Failing to do so will lead to higher costs, more illness, and additional deaths from climate change impacts.

The risks to people across Canada are twofold. First, the impacts of climate change on health are increasing rapidly. Second, health and social systems—which are necessary to weather illnesses and loss—are often unable to meet the needs of those most vulnerable to climate-related health hazards. Yet despite these growing risks, preparation for the health impacts of climate change remains inadequate.

In this report, we outline future threats by projecting climate impacts to health in the coming decades and discuss opportunities to protect the health of people in Canada.

Our research finds that protecting the health of people in Canada in the face of climate change is not just about preparing for specific risks like heat waves or Lyme disease. It is also about addressing factors like poverty and racism that make people more vulnerable and ensuring access to housing, healthcare, employment, and education. Health

and climate change policy objectives can't be viewed in isolation—they are fundamentally interconnected with the broader social and economic policy landscape. Addressing the root causes of climate-related health impacts as well as their symptoms, therefore, requires coordination and collaboration across and within governments.

METHODS

This report combines new analysis and evidence from the existing literature to highlight key health risks and costs across Canada from a changing climate.

Projections of health costs

We estimated how climate-related health costs could change between now and the year 2100 for three key health impacts:

- A. The impact of declining air quality associated with increasing ground-level ozone concentrations
- B. Increasing incidence of Lyme disease
- C. The health effects of hotter temperatures

For each of these climate-related health risks, we analyzed the impacts under both low and high global greenhouse gas emissions scenarios.

To illustrate the benefits of proactive health adaptation, we also examined the potential cost savings from two potential adaptations to heat waves.

Losses and damages that cannot be quantified

Air quality, Lyme disease, and heat are only a few of the many possible threats that climate change poses to health. Many other impacts require attention even if it is not currently possible or appropriate to quantify them.

To paint a broader picture of the effects of climate change on health in Canada, we summarize current understanding of climate-related mental health effects, impacts on Indigenous People's cultures and food security, and risks to Canada's healthcare facilities.

FINDINGS

► **Ground-level ozone and other impacts to air quality are a clear threat to health.**

As temperatures rise, concentrations of ground-level ozone (a major component of smog) will increase across Canada. Our modelling shows that, with the temperatures projected for the end of the century, average summer ozone concentrations could increase by 22 per cent.

As ground-level ozone increases, so do deaths and healthcare costs. Unless action is taken, future healthcare costs of ozone exposure could increase to one quarter of current healthcare costs linked to cancer. The costs of death and lost quality of life are even greater—we estimate these costs will be \$86 billion per year by mid-century and \$250 billion per year by the end of the century.

Over a ten-year period at the end of the century, ozone-linked respiratory illnesses could be associated with 270,000 hospitalizations and premature deaths—more than the population of Gatineau, Quebec.

► **Lyme disease impacts are uncertain, but they are likely smaller than many other climate change impacts on health.**

Warming temperatures from climate change are creating ideal conditions for the spread of the ticks that carry Lyme disease into many parts of Canada where they have never been seen. We project that, under a low-emissions future, additional cases of Lyme disease due to demographic change and climate change will rise to about 8,500 annually by mid-century and 9,900 by the end of the century, up from an average of about 600 cases per year.

Our analysis projects Lyme disease to be the least costly of the health impacts we modelled. Our modelling estimates that healthcare costs of Lyme disease will be on the order of \$3 million annually by mid-century.

Lyme disease is challenging to model and future risk is uncertain, but our results provide an important starting point for discussion of potential future impacts and costs.

► **Heat waves will continue to become more frequent and severe.**

The number of days with heat-related deaths is increasing.

Between 1971 and 2000, Ontario and Manitoba had an average of about 50 days per year with temperatures above thresholds where heat-related deaths begin to occur. In the 2050s—when children born today are about 30 years old—the number of days above that threshold will increase by 1.5 times in Ontario and Manitoba.

Our analysis suggests that even under the low-emissions scenario, heat-related hospitalization rates will increase by 21 per cent by mid-century compared to the current average and double by

the end of the century. Further, the costs of death and reduced quality of life from heat-related deaths are substantial. By mid-century, we project these costs will range from \$3.0 billion to \$3.9 billion per year.

Rising temperatures are projected to have a large negative impact on productivity, especially in economic sectors where work takes place outdoors or in poorly cooled spaces. Our modelling estimates that under a high-emissions scenario climate change could lead to a projected loss of 128 million work hours annually by end of century—the equivalent of 62,000 full-time equivalent workers, at a cost of almost \$15 billion.

► **Impacts to mental health could be among the costliest climate-related health impacts for Canada.**

In the years ahead, climate change will increase the frequency of weather-related disasters and accelerate permanent changes to landscapes and ecosystems. The psychological impacts of these changes will increase the risk of mental illness for many people across Canada, affecting mental health, eroding well-being, and imposing substantial costs on individuals and governments.

Mental illness in Canada is already a critical issue with major social and economic implications. Productivity losses associated with depression currently cost about \$34 billion per year in Canada; anxiety is estimated to cost \$17 billion per year. An increase in rates of mental illness caused by climate change could therefore have major costs.

► **It is not possible or appropriate to assign every loss a dollar value—but that does not mean they are not important.**

Many people and communities are highly exposed to climate change impacts that threaten health, safety, culture, and ways of life. For example, in the North thawing permafrost and changing ice and snow conditions make homes uninhabitable, threaten drinking water supplies, make hunting and harvesting activities more challenging, and cut off community access to emergency medical care and services. Loss of traditional food sources also has a profound impact on the cultural and spiritual well-being of Indigenous Peoples, in addition to increasing food insecurity, which they already experience at a rate of three to five times the national average. These losses may not be on balance sheets or in government budgets, but to overlook them risks ignoring some of the most critical impacts of climate change on health and well-being.

► **In addition to a growing burden of climate-related impacts, health systems in Canada are also faced with physical risks to health infrastructure.**

The growing risk of weather-related disasters from climate change is not only a threat to the health of people in Canada, but a threat to the country's hospitals, clinics, and emergency response facilities. Despite the importance of these facilities, less than 20 per cent of health authorities have assessed the vulnerability of their facilities to climate change risks, and about eight per cent of health centres in Canada are located in flood risk zones.



SOCIAL DETERMINANTS OF HEALTH

In this country, health is defined more by a person's postal code than their genetic code.

While the COVID-19 pandemic has affected everyone in Canada, it has hit the most vulnerable hardest. And like COVID-19, the impacts of climate change will not be experienced equally.

From asthma complications to high blood pressure, the likelihood that a person experiences poor health throughout life is largely determined by their social context. Income, access to quality housing, food and water security, and education shape the health of each and every person across Canada. These factors are influenced by where they live, their race, and their gender.

Indicators of health inequity have been trending in the wrong direction in Canada. For example, between 1991 and 2016, the difference in premature death risk between a poor woman and wealthy woman widened by about 40 per cent (Shahidi et al., 2020). Similarly, between 1996 and 2011, the gap in life expectancy between men who did not graduate from secondary school and men with university degrees increased by over 20 per cent (Marshall-Catlin et al., 2019).

Climate change is likely to increase these gaps in the coming decades.

Racism, poverty, and geographic remoteness have already put many people in Canada at a disadvantage by increasing their exposure to health hazards and causing poor baseline health. Without adaptation, the climate change impacts on Canada's horizon will worsen the health divide.

Those who are not personally at high risk can still be affected. Most people across Canada have family members and friends who will be more vulnerable to climate change health impacts. Healthcare costs may increase, potentially affecting quality of service and costing both taxpayers and patients. And as with the COVID-19 pandemic, impacts to labour productivity will affect the broader economy.

Adapting to climate change means addressing both the symptoms of climate change health impacts and the root causes of health inequity and vulnerability. Addressing symptoms includes measures like improving emergency response systems for high heat and poor air quality events, retrofitting homes and buildings to improve cooling and ventilation, and developing vaccines for new climate-driven diseases. Addressing the root causes will require investing proactively in measures that improve health and well-being for all, such as increasing access to health services and ensuring everyone has healthy air, water, and food.



HEALTH ADAPTATION POLICY NEEDS TO CATCH UP

As the world discovered in 2020, countries that were prepared and proactive when faced with COVID-19 fared far better than those that were not.

The COVID-19 pandemic tested the capacity of Canada's health systems. The economic costs were profound, and the human impact will be felt for years to come. We have seen how difficult it is for governments to catch up to a risk when it outpaced existing safeguards.

There are, of course, many differences between climate change and the sudden emergence of a novel pathogen. In particular, we are well aware of the threats from climate change and can reasonably predict what will happen next. Yet, as with COVID-19, if Canada does not prepare for the impacts of climate change, the crises ahead may overwhelm public health and healthcare systems.

The challenge ahead is profound. Our analysis shows that the impacts of climate change could cost Canada's healthcare system billions of dollars and reduce economic activity by tens of billions of dollars by later this century. Adding the value of lost quality of life and premature death, the

societal costs of climate change impacts on health could amount to hundreds of billions of dollars.

Over the past decade, adaptation policies and actions have not kept pace with the scale of emerging climate change risks to health and well-being. Only \$71 million has been earmarked specifically for health adaptation programs in federal budgets since 2017—about three per cent of all climate change adaptation funding, or about 0.3 per cent of total federal climate change program funding.

Canada is behind when it comes to adaptation policy, and now is the time to catch up. Policy makers will have to expand their arsenal to prepare for the risks ahead. Because of the broad scope of policies that affect health outcomes, intra- and inter-governmental collaboration and coordination is essential. National adaptation funding and coordination should reflect the importance of climate change health impacts and the imperative of treating the symptoms of climate-related diseases and vulnerability, while also addressing the root causes.

RECOMMENDATIONS

As Canada moves beyond the COVID-19 crisis, governments have an opportunity to safeguard against future health threats. This is a critical juncture to redefine how public policy advances health and climate change adaptation.

The following recommendations provide a starting point based on our analysis of climate-related health risks on Canada's horizon:

1 All orders of government should implement health adaptation policies to address both the symptoms and root causes of climate-related health threats.

Policies that tackle the symptoms of health impacts can play a clear role in reducing risks. For example, governments can enhance warnings about heat and poor air quality and ensure emergency response systems are primed for more extreme weather. Despite their benefits, however, health adaptation efforts that are limited to symptoms and proximate effects will ultimately be unable to keep up with growing and unpredictable climate change impacts. That means that governments should also implement policies that address the root causes of vulnerability and exposure to climate health hazards.

2 Canada's emerging national adaptation strategy should map all key adaptation policy levers across government departments and orders of government against top climate health impact areas.

When developing the forthcoming national adaptation strategy, the Government of Canada should explicitly recognize the decentralized nature of health adaptation and resilience building. It should work with provincial, territorial, Indigenous, and local government partners to identify bodies that make policy decisions to improve health resilience. Mapping these accountabilities can help start the discussion about how to coordinate policy decisions that advance health adaptation across orders of government.

3 Central agencies in federal, provincial, and territorial governments should explicitly incorporate health resilience into climate lenses to inform cost-benefit analyses and policy decisions.

All government departments should be directed to identify their role in climate change health adaptation and resilience and to take responsibility for those roles in departmental goals, projects and decisions. Departments should consider not just overall quantitative costs and benefits of alternative actions with respect to climate change health impacts but also the distribution of costs and benefits—recognizing that improving the circumstances of disadvantaged groups builds overall resilience.

4 Governments should invest in research on emerging, unknown, and local climate change health impacts.

Successful health adaptation policy must address health risks broadly, not only the narrower set of impacts of climate change that are most studied. Broad risks include mental health impacts, the effects of changes in wildfire regimes on air quality and respiratory health, the vulnerability of health systems themselves to climate change and extreme weather, and the direct and indirect effects of ecosystem change on health and well-being. Provincial, territorial, Indigenous, and local governments should also invest in better understanding the regional and local health implications of climate change, including the exposure and sensitivity of disadvantaged groups.

This report is the second in the Costs of Climate Change series. Our first report, *Tip of the Iceberg*, provides an introduction to the known and unknown costs of climate change for Canada. Forthcoming reports will analyze the cost of climate change to Canada's infrastructure and the national economy.

For more information: climatechoices.ca

The health costs of climate change in Canada

Climate change is not just an environmental and economic threat. It is also a threat to public health.

Changes in climate are already affecting the health of people in Canada. In the decades to come, these health impacts will intensify, and costs will increase. Climate change will affect everyone living in Canada—but it won't affect everyone equally.



Three factors influence people's vulnerability to climate-related health impacts:

Exposure: How much a person comes in contact with climate-related hazards—for example, exposure to heat is reduced if a person has access to a home with air conditioning.

Sensitivity: Factors such as age, pre-existing health conditions, and social and economic conditions—for example, unmanaged diabetes—can increase sensitivity to heat waves and infectious diseases.

Capacity to adapt: The ability to avoid, prepare for, and cope with exposure and sensitivity—for example, someone who earns a high income likely has more access to prescription medications and health services than those who earn less.

Social Determinants

Income Education Race
Age Literacy Working conditions



Social determinants reduce protection

Some people are more vulnerable because of age or genetics. Others are put at greater risk by economic disadvantage and discrimination.

Health is determined more by a person's postal code than their genetic code. From asthma complications to high blood pressure, the likelihood that a person experiences poor health—which also increases their vulnerability to climate change—is largely determined by their social context.

Unless governments work together to invest in preparation and prevention, climate change will worsen these existing health inequities and increase costs to Canada's health system and economy.

Climate Impact

Ecosystem changes Heat waves Wildfire smoke
Permafrost thaw Air pollution Severe weather Floods



Climate impacts reduce protection

Many people in Canada have already experienced health effects related to climate change.

Some effects and costs are easy to quantify, such as heat-related hospitalizations, but the full scope and scale of potential climate change health impacts in Canada are uncertain. While some emerging threats, like mental health impacts, are difficult to estimate and model, they are nonetheless important and deeply felt across the country.

Social determinants will dictate the severity of health outcomes that people experience from climate change impacts.

Adaptation

Cooling centres Primary healthcare Medications
Disaster response Food and water Flood protection
Heat warning systems Housing Education and outreach



Adapting to climate change requires supporting the health of people in Canada over the coming decades.

It's essential to **treat the symptoms** of climate-related health impacts. This involves preventing or reducing the negative impacts of specific health hazards related to climate change as they occur—for example, by increasing emergency response capacity, and developing early warning systems.

Addressing root causes is equally important. This requires tackling the factors that make people vulnerable to climate health hazards—for example, by reducing food and water insecurity, increasing access to preventive healthcare, and reducing economic inequities.

PROJECTED HEALTH COSTS

Billions of \$ per year by end of century

Canada does not need to be locked into a future of mounting costs, illness, and death resulting from climate change health impacts.

If governments accelerate action to strengthen health systems and address the root causes of vulnerability, the health risks and costs related to climate change can be substantially reduced.

