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VCHIP
VERMONT CHILD HEALTH IMPROVEMENT PROGRAM

GUND INSTITUTE FOR ENVIRONMENT

# Climate Change and the Health of Vermont's Children

## Acting Now to Protect Our Future


Authors:
**Rachel Garfield**, Executive Director, Vermont Child Health Improvement Program Professor, Department of Pediatrics, Larner College of Medicine
**Robert Inglis**, Assistant Professor of Emergency Medicine, Larner College of Medicine
**Anna Maassel**, PhD student, Rubenstein School of Environment and Natural Resources, Graduate Fellow, Gund Institute for Environment
**Taylor H. Ricketts**, Director, Gund Institute for Environment, Professor, Rubenstien School of Environment and Natural Resources
**Amanda Sardonis,** Director of Policy and Partnerships, Gund Institute for Environment
**Stephen Teach,** Professor of Emergency Medicine and Pediatrics, Larner College of Medicine

# EXECUTIVE SUMMARY

Optimal human health depends on a healthy planet. While humans of all ages are affected by environmentally driven health hazards, children are uniquely vulnerable to extreme heat, poor water quality, poor air quality, and infectious diseases. Stressful climate events put children at risk for long-term negative physical and mental health outcomes. Climate change is exacerbating these threats in Vermont despite our state's reputation as a climate refuge.

The most effective way to avoid the worst impacts of climate change is to reduce greenhouse gas emissions, which is the goal of Vermont's Global Warming Solutions Act. The law also tasks state agencies with developing strategies for adapting to the impacts of climate change. This report provides an overview of how heat, air quality, vector-borne diseases, water quality and flooding, and climate anxiety are negatively shaping the health of Vermont's children and their families and how the University of Vermont and the State of Vermont can work together to mitigate those harms.

***Why focus on children?*** Environmental health hazards affect everyone, but children are more vulnerable to these health effects than adults. They are more susceptible to heat-related illness and many vector-borne diseases. Because their organ systems are still developing, they are physiologically more at risk from airborne particulates and toxins in flood sediments. Because of their long future lifespans, they suffer more from exposure to carcinogens. Their social/emotional development is also deeply shaped by the stress of climate change. Finally, concern for our children unites Vermonters across the political spectrum. They are our future, and our commitment to them reflects on all of us. Because children generally use health care services at a less intense level than adults, they can get lost in discussions of broad population health and health care services policy.

***Why now?*** The impacts of climate change are increasing rapidly, and it is cheaper and more effective to anticipate these threats than to react to them. However, our responses are constrained by research gaps and a lack of real-time, location-specific information. Public, private, and university partners need to collaborate and invest in research, information-gathering tools, and platforms for information sharing.

Recent reports from the Vermont Department of Health and the Vermont Climate Assessment effectively summarize the overall health risks from climate change in Vermont. We complement and extend these reports by:

- Specifically **focusing on children**
- Identifying **cross-cutting policy initiatives** that can protect them
- Assessing **what we still don't know** about climate's impact on Vermont's youth and identifying **opportunities for collaborative research**
- Highlighting how **UVM can partner with the state** to protect children's health

# KEY POLICY RECOMMENDATIONS AND POTENTIAL PARTNERSHIPS

There are multiple actions that Vermont's state government and its public and university partners can take to protect children and their families from the impacts of climate change. We generated policy-related recommendations for each topic area in Appendix A. We identified several promising initiatives that reflect the synergies across climate hazards. For example, heat exacerbates air pollution, degrades water quality, and impedes learning; and flooding events have negative air quality and mental health impacts.

***Monitoring, Reporting, and Modeling***

Because gathering and disseminating accurate, location-specific, and real-time data about these health threats is critical, we recommend expanding existing monitoring efforts at the Vermont Department of Health, Agency of Natural Resources, and Vermont Emergency Management and developing a consolidated environmental health dashboard, with real-time access to data on:

- Heat risk and locations of cooling centers
- Air quality – both outdoor and indoor - for public spaces, including schools
- Surface water quality, including coliform and cyanobacteria monitoring in lakes and rivers
- Drinking water quality
- Wildfire risk
- Disease incidence and vector distribution

Activities in this space could extend to collection of new population survey data to gauge Vermonters' experiences related to child and family climate health. Monitoring and population-health data could be used to model future exposures and develop anticipatory public messaging.

- *Examples of how the state and UVM can collaborate:* UVM's Forest Ecosystem Monitoring Cooperative (FEMC) long-term monitoring can be combined with Vermont Child Health Improvement Program's (VCHIP's) long-term evaluation of children's health in Vermont to uncover and quantify relationships between the environment and children's health. By building on Vermont's excellent vector monitoring program, state agencies and UVM can produce real time distribution maps and alerts for infected vectors and human cases and can model future range shifts in vectors and predict outbreaks. Modelers can collaborate to predict elevations in the Air Quality Index and its effect on asthma-related emergency department visits, hospitalizations, and school attendance.

***Education and Outreach***

Getting actionable information to groups responsible for children's health and welfare – schools, caregivers, pediatric and family medicine offices, afterschool programs, community organizations – is critical for mitigating harm. We recommend expanding the Department of Health's educational outreach efforts around the health risks identified in the dashboard, and providing guidance and standards based on up-to-date science.

- *Examples of how the state and UVM can collaborate:* The Department of Health and UVM could co-develop a program to gather qualitative feedback from citizens on their educational needs around climate hazards and to conduct behavioral research on relative effectiveness of different educational and behavioral campaigns. UVM and VDH can leverage longstanding collaborative efforts through the Vermont Child Health Improvement Program (VCHIP) and other programs to disseminate best practices and guidance to child-serving professionals.

# KEY POLICY RECOMMENDATIONS AND POTENTIAL PARTNERSHIPS- CONT

I***nfrastructure and Community Resilience***

As climate-related disasters increase, both hard and soft infrastructure will need to be strengthened, and communities will be tasked with more communication, response, and recovery duties. We recommend standing up "climate safety centers" that will protect children and families from dangerous heat, air pollution, and flooding events. The state should focus on "healthy buildings," investing in updated HVAC systems and air and water quality monitoring for schools and daycares.

- *Examples of how the state and UVM can collaborate:* UVM and the Climate Action Office could create a civilian climate corps and recruit volunteers for cooling centers and community greening projects, and the state agencies could sponsor interdisciplinary community projects for undergraduate courses.

***Emergency Management and Hazard Mitigation***

As the state, municipalities, and communities develop new climate action and hazard mitigation plans, we recommend including actions to protect children's health and equal attention to mental health needs during climate events. The Vermont Division of Emergency Management could include mental health professionals in crisis teams, promulgate lists of available mental health resources in communities affected, and prepare a workforce for increased demand for services.[1]

- *Examples of how the state and UVM can collaborate:* Through VCHIP, the state has worked for decades to leverage UVM faculty's clinical and public health expertise to connect clinicians and public health priorities. Ongoing activities include provider training, quality improvement, systems design, and evaluation.

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

**1. Heat:** Rising temperatures have clear implications for children's health. This facet of climate change has its foundation in higher average temperatures, more frequent periods of extreme heat, increased amounts of harmful ground-level ozone, and changing seasonal ecological patterns.

***Climate Change and Temperature:*** Increased bouts of extreme heat cause more and more deaths annually nationwide.[2] Over the past 50 years, Vermont's average temperature has increased by $2^0$F in summers and $4^0$F in winters.[3] In the next 30 years, Vermonters can expect an annual average of 15-20 extreme heat days (days hotter than $90^0$F), more than double the number of the early 2000s,[4] To complicate matters, only 67% of housing units in Vermont are equipped with some type of air conditioning, and only 7% have central air conditioning.[5]

Exposure to extreme heat puts people of all ages at risk for heat-related illnesses marked by headache, dizziness, nausea, vomiting, dehydration, confusion, loss of consciousness, and even death. A hot environment also exacerbates chronic conditions such as heart and lung diseases, diabetes, kidney disease, mental illness, and multiple sclerosis. Higher ambient temperatures can synergize with other negative effects of climate change. These health effects impact children as well as adults. New evidence suggests, for example, that rising temperatures will episodically increase ground level ozone with negative implications for children's respiratory health, especially asthma.[6] Rising temperatures also increase the risk of wildfires and vector-borne diseases while exacerbating risks from flooding and higher humidity.

- ***Health Risks to Children:*** Children are particularly vulnerable to the negative health implications of an increasing temperature. Most notably, their smaller size yields higher surface area to volume ratios, meaning greater vulnerability to heat relative to their immature temperature regulating functions. Young children are also less able to communicate their temperature needs to an adult. Older children and adolescents are at increased risk if they participate in outdoor sports. Among U.S. high school athletes, heat illness from practice or competition is already a leading cause of death and disability.[7] On top of direct heat-induced morbidity, there is mounting risk to students' education from increasing temperatures. For the first time ever, in June 2024, the St. Johnsbury School District closed schools due to an ongoing heat wave.[8]

Rising temperatures also can increase ground-level (tropospheric) ozone. Composed of 3 oxygen molecules bonded together, ozone is formed from chemical reactions between volatile organic compounds (VOCs) and nitrogen oxides (NOx). These come from emissions and volatiles from chemical plants, gasoline pumps, paint, power plants, and gas-powered vehicles.

Rising temperatures directly increase formation of ozone by accelerating the chemical reactions between VOC and NOx pollutants.

Ozone is toxic when breathed, and children are particularly vulnerable as it can uniquely damage their developing respiratory and cardiovascular systems. The 2021 Vermont Climate Assessment quotes the American Lung Association noting that ozone exposure is "like getting sunburn on your lungs."[9] Short term impacts include lung and throat irritation, airway swelling and difficulty breathing, decreased lung functioning, increased risk of respiratory infections, exacerbation of existing conditions (asthma, emphysema), and even death. Longer term, there is a link between childhood ozone exposure and the development of asthma and other lung conditions.

There will be not only more intense heat, but also longer growing seasons.[10] As Vermont's abundant flora produces more pollens earlier and longer, seasonal allergic symptoms (itchy red eyes and scratchy throats) and asthma exacerbations will become more intense and last longer. Aside from the direct allergic symptoms, affected children experience learning disruptions and difficulty concentrating from lack of sleep, increased risk of ear infections, sinus infections, uncontrolled asthma, and lowered self-esteem.[11]

**Priority Knowledge Gaps:**

- What are the specific and unique strains that different outdoor activities and sports place on children, and can guidance be more tailored based on activity?
- How does the specific context of activities affect the impact of heat on children?
- What are the age-specific vulnerabilities within the pediatric population, and how can the negative health impacts be mitigated by age group?
- What are the optimal ways to predict, monitor, report, and mitigate elevated ozone and allergen levels?

**2. Air quality:** Climate change has caused longer periods of hot and dry weather across much of Canada and the western United States. Such conditions increase the frequency, size, and severity of seasonal wildfires.[12] These drive poor outdoor air quality across growing portions of the contiguous United States for more days each year.[13] While Vermont itself has not experienced a major wildfire season since 1908 when over 100 fires destroyed more than16,000 acres, over 75% of the state is forested,[14] and with increasing temperatures and periods of drought, wildfires may increase within Vermont itself.

Among its many constituents, wildfire smoke contains abundant small particulate matter measuring ≤2.5 micrometers in diameter (PM2.5). When wildfire smoke drives sustained elevations in ambient PM2.5 concentrations, the EPA's Air Quality Index (AQI) becomes

unhealthy and eventually hazardous. Nationwide, increased wildfire activity has increased annual PM2.5 concentrations in nearly 75% of US states.[15] Wildfires can also increase ground level ozone levels[16] which can also negatively impact respiratory health.

- ***Health Risks to Children:*** Similar to sustained poor indoor air quality from secondhand cigarette smoke, wood stoves, and other sources,[17] episodic poor outdoor air quality from wildfires negatively affects youth with chronic respiratory conditions, most notably asthma.[18] When inhaled, PM2.5 and ozone cause inflammation, swelling, and increased mucus production in the small-to-medium sized airways in the lungs. These obstructive changes drive significant asthma morbidity (shortness of breath, cough, wheezing, activity limitations, and difficulty sleeping). Data from the Centers for Disease Control and Prevention document greater than expected asthma-associated emergency department visits nationwide among youth with asthma during the severe spring and summer wildfire season of 2023.[19] These visits were correlated to those days and geographic regions with the most elevated particulate concentrations.

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

Vermont tracks annual average PM2.5 and ground-level ozone concentrations with results publicly accessible on-line.[23] Similar to national data, these levels steadily dropped from 2001-2020, and in 2020, no Vermont county experienced a day over the national ambient air quality standard for PM2.5. Most recently, however, wildfire-induced surges have become routine.[24]

As a result of these surges, Vermont can expect increasing asthma morbidity among its youngest citizens marked by more missed schooldays, parental missed workdays, limited physical activity, sleepless nights, medication usage, emergency department visits, and hospitalizations. Learning, academic performance, and ultimate employability will suffer.

***Priority Knowledge Gaps:***

- What are the best approaches to predicting periods of poor air quality in Vermont?
- What do Vermonters want to know about the effects of episodic poor air quality and how are they using existing resources such as the State's posted Air Quality Index?
- How do they want to receive information about periods of poor air quality, and how do they want to put that information to personal and public use?
- What are the relative benefits to pediatric respiratory health from investments in the air quality in homes vs. public spaces like schools? Where should Vermont focus its resources?
- What is the best approach to longitudinal Monitoring, Reporting, and Modeling of the contribution of episodic poor air quality to pediatric asthma-related quality of life (emergency department visits, hospitalizations, school absenteeism, school performance, and limitations on physical activity)?

***3. Water Quality and Flooding:*** Tragic and historic flooding struck Vermont in July 2023 and July 2024, devastating homes and communities across the state. Unfortunately, the risks from flooding in Vermont are rising. Recent research found that the frequency of extreme precipitation events has increased about 50% over the pre-industrial baseline and will increase another 52% by 2100.[25]

- ***Health Risks to Children:*** Flooding creates multiple threats to child and family health. Floodwaters are often contaminated with sewage and pose an acute risk of viral and bacterial illnesses. After the waters recede, they leave behind contaminated sediments which can contain elevated levels of heavy metals, pesticides, petrochemical products, volatile organic compounds, and other toxins.[26] The exact content of sediments is determined by what lies upstream; location-specific information is therefore critical. Wind, traffic, and other activities can "resuspend" flood sediments in the air in the form of PM2.5 which can affect respiratory health and expose children to lead and other toxins. Flood-damaged homes are also susceptible to mold growth, which exacerbates allergies and asthma in those susceptible.[27]

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

Even in the absence of extreme flooding, climate change worsens water quality in ways that can impact children and families. Heavy-rainfall events lead to increased runoff, which degrades water quality in streams and rivers through multiple pathways, including microbiological contamination from overflowing septic and sewer systems. These events also wash pesticides and other persistent toxins, including per- and polyfluoroalkyl substances (PFAS) and polychlorinated biphenyls (PCBs), into streams.

Runoff also leads to increased nutrient loading through runoff of fertilizer and topsoil erosion. Increased nutrient loading, combined with increased air and water temperatures, leads to an increased frequency of toxic cyanobacteria blooms. While these blooms have prominently impacted our largest lakes (including Lake Champlain and Lake Memphremagog,) they affect bodies of water across the state. Cyanobacteria produce compounds that are toxic to the human liver and may lead to an increased risk of neurodegenerative diseases.

Children are disproportionately vulnerable to water pollution. They are more likely to engage in water-based recreation and to ingest water-borne sediments and microbes. They are more harmed by neurodevelopmental toxins such as lead or mercury. Finally, because the development of cancer occurs due to the gradual accumulation of toxins and genetic modifications over time, children are most likely to be harmed by carcinogenic water pollutants, including PFAS and certain pesticides.

***Priority Knowledge Gaps:***

- What are the most significant point and nonpoint sources of toxic substances that could enter floodwaters in Vermont?
- Are there affordable strategies for remediating these sites to reduce their risk of contributing to downstream pollution during flood events?
- What are the risks posed by the land application of biosolids, municipal compost, and biogas digestate,[28] particularly the risks posed by migration of toxic substances within these materials into surface water or flood sediments?[29] [30]
- Can the state and researchers align with EPA and satellite data to better monitor cyanobacteria blooms and have earlier warnings instead of being dependent upon volunteer monitoring data?
- What are the most cost-effective strategies for reducing phosphorus loading in Vermont's rivers and lakes, and what role can nature-based solutions such as wetland restoration play in these efforts?

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

***4. Vector-borne Diseases:*** Vermont's children are at risk from several environmentally sensitive vector-borne diseases. Prominent examples include Lyme Disease, Eastern Equine Encephalitis, and West Nile Virus. Climate change is already increasing the range and prevalence of these diseases, through warmer temperatures, longer frost-free seasons, and heavier and more frequent rains. These same changes may also bring new vector-borne diseases to Vermont (dengue, Zika, Rocky Mountain spotted fever, and even malaria) as vectors and pathogens move northward.

- ***Health Risks to Children:*** Lyme Disease is the most common vector-borne disease in Vermont. It is caused by a bacterium that resides in mice, deer, and other mammals and is transmitted to people by the black-legged tick (i.e., deer tick). Acutely, Lyme disease can cause flu-like symptoms and a rash, and if undiagnosed and untreated, it can cause serious heart and brain infections, joint pain, fatigue, and memory problems. Cases of Lyme Disease are rising and spreading in Vermont. From 2007 to 2017, cases increased 10-fold and spread from mainly southern counties to all counties of the state.[31]

West Nile Virus (WNV) is a fever-producing disease caused by an arbovirus and is the most common mosquito-borne illness in the US. It resides naturally in birds and is transmitted to people in Vermont by two mosquitos in the genus Culex. Roughly 1 in 5 people infected develop symptoms, which include fever, headache, rash, and swollen lymph glands. In rare cases, infections can progress to severe neurologic disease including encephalitis.  West Nile Virus is found in mosquitoes in every country of Vermont, but only a handful of human cases are reported each year state-wide.[32]

Eastern Equine Encephalitis (EEE) is a rare but serious neurological infection caused by a virus. It resides naturally in birds and is transmitted to people by the mosquito Culiseta melanura. Symptoms include fever, chills, and joint and muscle pain. Cases rarely can develop into swelling of the brain and its lining, causing seizures, behavioral change, and coma. Roughly one-third of serious cases result in death.[33] EEE is currently rare in Vermont. Only two human cases were reported in 2024, and counties of highest risk are Addison, Rutland, Chittenden, Franklin, and Grand Isle.[34]

Ticks and mosquitoes transmit several additional diseases that, while less serious, still present risks to children. Anaplasmosis and babesiosis are also transmitted by black-legged ticks. Cases of both diseases have increased many-fold in the last decade.[35] Zika and dengue fever are caused by viruses transmitted by Aedes albopictus, a mosquito that has recently become established in Windham County, Vermont.

For all the diseases noted here, children face higher risks of acquisition. Those aged 5-14 years are especially at risk because they play outside more often, may be in closer contact with pets, and are less vigilant with protective clothing, insect repellants, and checking their bodies for ticks.[36] If infected, children's symptoms also differ from other age groups For Lyme disease, children may suffer long term effects including ongoing muscle and joint pain, fatigue, and memory issues that interfere with education and activities.[37] For EEE, children have a higher chance of developing serious cases of encephalitis if infected with a higher fatality rate.[38]

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

Some of Vermont's children are more at risk than others. Those living in more southern or lower areas of Vermont, those in homes without adequate window screens, and those who are frequently outside (e.g., in farming families) are all more likely to be bitten by mosquitoes or ticks.

Climate change increases the risk of all these diseases. Warmer temperatures accelerate development and reproduction cycles in both ticks and mosquitoes, leading to higher vector abundances. Warmer temperatures also allow tick and mosquito populations to expand northward and upward, increasing the areas in which children are at risk. Longer frost-free periods provide more days per year in which ticks and mosquitos are active. For mosquitoes, heavier rains leave standing water throughout the landscape, providing plenty of suitable breeding habitat.

Taken together, these climate drivers are likely to lead to more abundant and widespread vectors that feed more actively for a longer period each year.

***Priority Knowledge Gaps:***

- How will ranges of important disease vectors continue to shift in future, based on climate projections and range shifts to date?
- How effective are various intervention options? Are efforts to change the self-protective behaviors of parents and children more or less effective than vector control methods?
- How effective is landscape management for vector control (e.g., maintaining diversity for a dilution effect[39] and removing water to reduce breeding habitat)?

**5. Climate Anxiety:** The negative mental health consequences of climate change may be felt among those directly affected by climatic events such as flooding and among those experiencing the indirect effects of stress, anxiety, or depression engendered by the substantial threat to the planet and their health.

- ***Health Risks to Children:*** Like adults, children may feel either direct or indirect mental health effects of climate change. Direct effects are related to exposure to wildfires, flood, or extreme heat or the direct consequence of such exposure (e.g., displacement from one's home) that lead to worry, distress, anxiety, psychological distress, or exacerbation of mental illness or substance use among young people.[40] [41] [42] [43] There is some evidence that these mental health effects can in turn lead to subsequent physical health effects such as headaches, abdominal pain, vomiting, rashes, or cold/flu symptoms. [44]

# SPECIFIC THREATS TO THE CHILDREN OF VERMONT

The indirect mental health effects of climate change may be felt by those who are not directly affected by climate events. Evidence indicates that awareness of climate change, feelings of hopelessness, and frustration at lack of progress on environmental issues may lead to the vicarious effect of "eco-anxiety" (or "climate anxiety") among the general population, including youth. While this effect could be a productive response that leads to activism and engagement, there also are measurable negative mental health effects including clinical depression and generalized anxiety disorder.[45] The issue of eco-anxiety among children and young adults is a relatively new area of study,[46] and research is still investigating which children are most at risk of this consequence of climate change. However, there are some findings that climate-related anxiety is more prevalent among girls[47] or youth with ties to the land (e.g., indigenous communities, agricultural communities).[48] Research is also examining whether there are any effects of chronic climate worry on brain development among young people.[49]

Most evidence on eco-anxiety among children and youth is recent, and there is a lack of consensus on how best to measure it.[50] As a result, its scope is largely unknown both nationally and locally. The primary data collection systems to monitor health among children in Vermont (the Youth Risk Behavior Survey and the School Health Profiles) include questions on mental health but not on concerns about climate change.

The state has recognized the mental health consequences of climate change and generated resources on this topic. A public-facing website provides an overview of this topic for people looking for more information and referrals to additional resources in mental health.[51] In partnership with the Vermont Collaborative for Practice Improvement and Innovation, the Vermont Department of Health has supported training for professionals in how to address conversations about climate anxiety.[52] The State also expanded access to mental health resources through its Starting Over Strong-VT program following climate events such as the flooding in 2023 and 2024.

**Priority Knowledge Gaps**

- To what extent are Vermont's youth experiencing anxiety related to climate change? Which groups are most at risk for mental health effects of climate change? How severe are the symptoms or effects on well-being?
- What instruments or tools are best suited to capturing the mental health effects of climate change among youth?
- What is the impact of involuntary displacement of populations or families and of climate migration?
- How much do child-serving professionals in Vermont (e.g., pediatricians, school counselors) know about climate anxiety and the tools they can use to support children?

# CONCLUSION AND NEXT STEPS

The serious threats facing Vermont's children from the rapidly accelerating pace of climate change are real and immediate. They are more frequently exposed to its many manifestations, and they are uniquely susceptible to its effects. Increased collaborations among experts from the state, the University of Vermont, and other public and private partners are essential. Our focus should be on addressing the knowledge gaps that will inform effective public policies designed to mitigate the wide range of growing health risks. The University of Vermont is a key resource for the state with a deep bench of experts in epidemiology, climate science, medicine, ecology, and hydrology eager to see their research lead to action. UVM and Vermont state agencies could enter into a research collaboration agreement to share resources and data and make it easier to work together.

## FURTHER READING


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# APPENDIX

**Appendix A: Thread-Specific Policy Recommendations**

**Heat**

*Education and Outreach:*

- Continue to provide guidance for schools around heat-safe sports practices, ensuring school sports practices are held during cooler times of day, and provide adequate water and cooling mechanisms.
- Set clear standards for heat-related school closures and ensure school children have access to cool spaces when school is cancelled.
- Communicate the importance of whole health measures for managing heat-related illness risks, such as good nutritional and hydration practices, and meditation or stress-reducing activities to reduce heart rate.

*Monitoring, Reporting, and Modeling:*

- Create a specific child-health related live weather dashboard for the caregivers to check the safety of temperature on a given day or at a given time, to plan activities and necessary precautions. This dashboard could be combined with air quality information and other weather-related risk monitoring.

*Infrastructure and Community Resilience:*

- Add green space, rooftop gardens, and trees to urban areas to mitigate the urban heat island effect.
- Ensure schools and daycares are equipped with air conditioning, high-quality air filtration systems, and air quality monitors.
- Expand and promote the existing system of cooling centers statewide.[53]
- Improve access to swimming pools and natural water bodies that can be a valuable resource for cooling off on hot days. Invest in measures to prevent algal blooms in Lake Champlain and other accessible lakes (see Flooding and Water Quality).

*Healthcare Advocacy:*

- Ensure essential medications (for example, allergy medications, asthma inhalers, etc.) are accessible and affordable, especially to the most vulnerable populations.

**Air Quality**

*Education and Outreach:*

- Expand the state's existing educational outreach efforts[54] [55] around the health risks of poor outdoor air quality due to wildfire smoke and poor indoor air quality due to secondhand smoke, wood stoves and other sources with a focus on the families of high-risk youth and pregnant women.

*Monitoring, Reporting, and Modeling:*

- Sustain and expand existing longitudinal monitoring[56] of outdoor air quality and indoor quality of public spaces like schools with expanded public dissemination of results.

*Infrastructure and Community Resilience:*

- Equip new and existing public buildings with high efficiency air filtration systems to remove particulates.
- Identify public safe spaces for vulnerable children, families, and pregnant women for use during periods of extremely poor outdoor air quality.

*Emergency Management and Hazard Mitigation:*

- Increase efforts to prevent and control wildfires within Vermont.

**Vector-borne Diseases**

*Education and Outreach:*

- Expand existing efforts to educate caregivers about the risks of local vector borne diseases.[57] [58]
- Communicate actions to reduce human encounters with vectors.[59]
    - Encourage children to wear long clothing and insect repellents when outside between dusk and dawn, and to check themselves for ticks each time they bathe.
    - Avoid scheduling outdoor kids' activities between dusk and dawn, when mosquitoes are active. Adjust sports schedules or school activities as needed.

*Monitoring, Reporting, and Modeling:*

- Continue real time monitoring of the distribution, abundance, and infection rates of vector species. Vermont's Vector Surveillance Program monitors mosquito and tick populations, as well as vector and human infections throughout the state.[60]

*Emergency Management and Hazard Mitigation:*

- Develop ecologically sensitive vector control measures, selecting and applying pesticides in ways that minimize collateral effects on other insects.

*Infrastructure and Community Resilience:*

- Establish programs to reduce vector habitats in the landscape, especially where children sleep, learn, and play. For example, schools, playgrounds, and homes can reduce/remove standing water.
- Route trails and walkways in parks and playgrounds to avoid mosquito and tick habitats such as swamps or tall grasses.

# APPENDIX

**Water Quality and Flooding**

*Education and Outreach:*

- Expand current efforts to educate the public about the health risks from flooding and contaminated drinking[61] and recreational[62] waters.
- Allow residents to opt in to a public database of water-testing results, which can help neighbors understand threats to their own wells.

*Monitoring, Reporting, and Modeling:*

- Develop program to test flood sediments for contamination, and to make this data public, so that schools, parents, and health professionals can make informed decisions about next steps.
- Expand the state's monitoring of drinking water,[63] especially after major flooding.
- Increase monitoring for coliform bacteria in streams and lakes, with public communication of this data via online maps and other tools.
- Increase monitoring of Lake Champlain and other bodies of water for cyanobacteria blooms, expand and communicate the existing efforts of Vermont's volunteer cyanobacteria monitoring program.

*Infrastructure and Community Resilience:*

- Offer free well- and spring-water testing for families with children under 10, build on existing programs that offer free testing in the aftermath of floods.

**Climate Anxiety**

*Education and Outreach:*

- Increase number of resources and broader outreach to connect young people to resources related to climate anxiety through schools, parent groups, and "third spaces" where youth spend time outside home and school (e.g., after school programs).
- Convene youth council to add youth voice to state climate priorities to empower youth and ensure programs meet youth priorities.
- Building on evidence that action can alleviate eco-anxiety, support environmental action activities for children and young people through resources, programming, and training.
- Train child-serving providers to screen for and respond to eco-anxiety among patients by providing patients coping skills; train parents supporting children's adaptive coping skills.

*Monitoring, Reporting, and Modeling:*

- Support efforts to measure the scope of the problem more fully, including adding relevant questions to data collection tools such as YRBS.

*Emergency Management and Hazard Mitigation:*

- Ensure equal attention to mental health needs during climate events to support access to counseling or other resources for people directly affected. For example, include mental health professionals in crisis teams sent to areas following climate events, promulgate lists of available mental health resources in communities affected, and prepare workforce for increased demand for services.

# ENDNOTES


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