Extreme Heat in Connecticut: A Yale Center on Climate Change and Health Issue Brief

YALE CENTER ON CLIMATE CHANGE AND HEALTH

Introduction

In Summer 2020, the Hartford area broke a 37-year-old record for the most days in a year reaching temperatures of 90 °F or above.[1] In the last 125 years, six of the hottest years in Connecticut have been since 2005.[2] It is clear that climate change is no longer a distant threat; its impacts are visible now, here in Connecticut, and its adverse impacts on human health are of increasing concern.

Many people do not realize how deadly heat can be; for this reason, heat is often called a 'silent killer.' Importantly, however, heat-related illness and death is preventable. The Connecticut General Assembly, the Connecticut Department of Public Health, municipalities, and other decision-makers have an important role to play in preventing heat-related illness in Connecticut. The Governor's Council on Climate Change (GC3) *Phase 1 Report*[3] identifies recommendations to address these risks. The Yale Center on Climate Change and Health underscores and amplifies those proposed actions by recommending the following:

- **Expand the Connecticut Energy Assistance Program to include cooling assistance**
- **Implement strategies to overcome the health, safety, and legal issues in homes that are barriers to efficiency upgrades, so that homes are better insulated to keep cool air inside**
- **Support urban tree planting and maintenance in Connecticut's cities to help counteract the urban heat island effect**
- **Protect against heat-related illnesses at outdoor and indoor worksites**
- **Protect children's health by enacting policies to address exposure to extreme heat events while at school and playing outdoor sports**
- **Develop and maintain local heat response plans at the municipal level**

In *Climate Change and Health in Connecticut: 2020 Report*, the Yale Center on Climate Change and Health evaluated how climate change affects human health in Connecticut by tracking 19 indicators related to changes to the environment and to our health.[4] We summarize below our findings to explain what we know about how temperatures have changed—and are expected to change—in Connecticut and how this impacts our health.

How has the environment changed?

Average annual temperature in Connecticut has increased by 3.2 °F since 1895.[2] This impacts our health because of a number of environmental changes, including:

- **HOTTER NIGHTS**
  Warmer nighttime temperatures can be especially dangerous, particularly for people living in urban areas and for those without access to air conditioning. This is because cool nights are typically an opportunity for the body to cool down; without this cooling-off time, heat waves can be even more perilous.
- **MORE HEAT WAVES**
  While there has not been an observed change in the number of extreme heat days (days with maximum temperature over 90 °F) since the mid-1900's,[5] under climate change extreme heat days are expected to increase significantly.
- **BAD GROUND-LEVEL OZONE DAYS**
  The hottest days often are associated with the highest concentrations of air pollutants, particularly ground-level ozone, or smog. Ground-level ozone pollution is a problem across all of Connecticut.[4] In fact, the American Lung Association gave all eight Connecticut counties "F" grades for ozone pollution in its 2020 *State of the Air Report*.[6] Looking to the future, higher temperatures caused by climate change are expected to bring about higher ground-level ozone concentrations, especially in already polluted areas.[7] Ozone is dangerous to health, worsening conditions including chronic obstructive pulmonary disease and asthma.[8] Children are at higher risk from ozone exposure, especially for asthma exacerbations, since their lungs are still developing and they are likely to be active outdoors when ozone levels are high.

What does this mean for our health?

Heat-related illnesses, such as heat exhaustion or heat stroke, happen when the body is not able to properly cool itself. While the body normally cools itself by increasing blood flow to the skin (which then transfers heat from the skin to the surrounding air) and by sweating, during extreme heat, this might not be enough, especially during physical activity. In these cases, a person's body temperature rises faster than it can cool itself down. In heat stroke, this can cause damage to the brain and other vital organs, or even death. **From 2007 to 2016 in Connecticut, there were on average 422 emergency department visits and 45 hospitalizations per year for heat stress**.[9] This is surely an underestimate of heat-related illness, however. One reason is that in addition to causing heat exhaustion and heat stroke, heat also can worsen kidney, heart, lung, and other chronic diseases, resulting in emergency department visits and hospitalizations. Physicians rarely document these as heat-related admissions.

Who is most at risk?

Extreme heat can affect everyone; however, some people are more vulnerable than others. Population groups most at risk include:

- **Outdoor workers:** Even when it's very hot, outdoor workers must exert themselves physically outside, putting them at risk for heat-related illness. Outdoor workers also often lack control over their work environment and important behavioral adaptation decisions like taking breaks or seeking shade.[10]
- **Older adults:** In Connecticut, individuals aged 75 and older are most at risk for hospitalization due to heat-related illness.[11] Older adults are more sensitive to heat, are less likely to perceive being overheated and to respond accordingly, and are more likely to have a chronic medical condition that can be exacerbated by heat stress or take medication that may affect their body's ability to regulate its temperature.[12] Finally, social isolation is another factor that can greatly increase vulnerability among the elderly.[13]
- **Urban residents:** Cities can be much warmer than the surrounding areas due to the "urban heat island effect," in which a city's infrastructure—largely made up of dark-colored asphalt, concrete, and metal—traps and absorbs the sun's energy and re-emits it as heat, increasing the air temperature. Connecticut's urban heat islands coincide with low-income communities and communities of color where housing more frequently lacks insulation, good ventilation, and air conditioning.[14]
- **People experiencing homelessness** are likely to be exposed to outdoor temperatures and to live in urban areas, where their exposure is amplified through the urban heat island effect. They are likely to have high sensitivity to extreme heat effects due to risk factors such as psychiatric illness, heart or lung disease, substance use, and social isolation.[15] Finally, people experiencing homelessness have less access to important adaptive capacity measures, including shade from trees, air conditioning, and medical services.
- **Low-income populations** have limited resources to adapt during heat events. In particular, people with low wealth are more likely to live in inadequately insulated housing and to not be able to afford or use air conditioning.[16] They may be more exposed to high temperatures at their workplaces or while using public transportation. They may also have inadequate access to cooling centers and to routine and emergency health care.
- **Pregnant women** are more vulnerable to heat-related illness. In addition, preterm birth, low birth weight, and infant mortality have been associated with extreme heat. Importantly, factors affecting vulnerability and adaptive capacity are cumulative. For instance, black mothers are three times more likely to die from pregnancy-related problems than white women[17] and are at greater risk for preterm birth and for having a low-birth-weight baby.[18]
- **Young children** are vulnerable because they must rely on others to help keep them safe and cool, because of their immature physiology and metabolism, and because they are often physically active outside. Outdoor youth athletes, particularly foot-

ball players, are vulnerable to heat-related illness when not properly acclimatized.

What can we expect in the future?

There is high confidence in the temperature projections that scientists have developed through mid-century (or about 2050). Under these projections, in Connecticut we can expect to experience an approximately 5 °F increase in average temperature by 2050, compared to the 1970–1999 reference period.[19] **This means that we can expect extreme heat events to become more common and severe, and to last longer**. In particular, researchers project that the number of warm spell days (similar to a measure of the number of heat wave days per year) are expected to increase from less than three per year in the 1950s to approximately 44 per year by 2050.[19]

The projected changes after 2050, however, are critically dependent on how quickly we stop emitting greenhouse gases. As the *GC3 Phase 1 Report* states, **"Coordinated mitigation now means it is more likely that the temperature will stabilize after 2050. If not, warming is likely to accelerate."**[3]

Recommendations

1 Expand the Connecticut Energy Assistance Program to include cooling assistance. (Aligns with GC3 Recommendation 51.d)

During a heatwave, indoor temperatures can become dangerously hot. Air conditioning provides substantial protection against heat-related illness and death for at-risk groups,[20] though it can be prohibitively expensive for low-income households,[21] particularly in Connecticut where energy costs are among the highest in the country. To avoid contributing to greater greenhouse gas emissions, actions to increase air conditioning should be combined with improved home energy efficiency and weatherization (see **Recommendation 2**), as well as a rapid transition to renewable energy. Additionally, the air conditioners should be the most energy efficient models, including ENERGY STAR certified window units and heat pumps.

The Low-Income Home Energy Assistance Program (LIHEAP) is a federally-funded program that provides financial assistance to low-income households to help them pay energy bills. While the program allows coverage of both heating and cooling, Connecticut currently only covers heating. For the 2022 program plan, we recommend that the Low-Income Energy Advisory Board (LIEAB) elect to expand the program to include cooling assistance, and that the state legislature approve this program change. Since Connecticut in recent years has not fully utilized its federal program funds—for instance, from FY 2014 to FY 2018, the program carried over, on average, $6.7 million each year from the prior year[22]—there is room to expand the program's reach to address the growing health risks from climate change. Other states in the region, including New York and New Jersey, offer cooling assistance through utility bill support or by providing new air conditioner units.[23] We also recommend that LIEAB and its state partners consider creative, multi-solving solutions. For instance, the Maine State Housing Authority uses LIHEAP funds to pay for heat pumps and their installation for eligible homeowners;[24] these heat pumps provide state-of-the-art energy efficient heating and cooling.

2 Implement strategies to overcome the health, safety, and legal issues in homes that are barriers to efficiency upgrades, so that homes are better insulated to keep cool air inside. (Aligns with GC3 Recommendation 7)

Households receiving energy assistance should be priority recipients of weatherization and energy efficiency measures. Doing so would reduce household energy costs, including summertime electricity costs from running air conditioning. By making the homes more energy efficient, weatherization also lowers greenhouse gas emissions, aligning with the state's climate goals. In addition, weatherization produces health benefits: in a national study of weatherized households, researchers found that residents experienced fewer bad physical or mental health days; suffered fewer persistent colds; experienced fewer doctor and emergency room visits and hospitalizations, including for heat stress and asthma; and were better able to pay their energy, medical, and food costs.[25]

However, health, safety, and legal barriers—such as asbestos, lead, mold, and knob-and-tube wiring—prevent homeowners from being allowed to complete home energy audits and pursue weatherization.[26] For example, a home with asbestos insulation is required to perform expensive asbestos abatement before being permitted to have an energy audit. We recommend that the Department of Energy and Environmental Protection (DEEP) and the Department of Social Services (DSS) find ways to apply federal funds from the Weatherization Assistance Program and LIHEAP toward addressing these barriers. We also urge DEEP and DSS to continue working together to create a more comprehensive approach to energy efficiency, weatherization, and utility assistance programs in order to maximize their reach and impact.

3 **Support urban tree planting and maintenance in Connecticut's cities to help counteract the urban heat island effect. (Aligns with GC3 Recommendations 29 & 35.c)**

Greenspace, including parks and street trees, provides a cooling effect in urban areas. Urban trees can provide other benefits, as well, including neighborhood beautification, air purification, absorption of carbon dioxide, and wildlife habitat. Planting new trees is important, particularly to introduce trees to neighborhoods with few existing ones. For new trees to meet community goals, tree plantings should be done in partnership with neighborhood residents and community organizations. In New Haven, the Urban Resources Initiative provides a nationally respected example of urban forestry and ecosystem restoration through community participation.[27] In addition to planting new trees, preventive maintenance and protection of existing larger and older trees is a key component of a municipal tree program, particularly since larger trees provide more cooling effect. Policies to consider include shade tree ordinances, which set standards for the protection and management of public (and sometimes private) trees in a munipality,[28] and dedicated funds for urban tree maintenance.

4 **Protect against heat-related illnesses at outdoor and indoor worksites. (Aligns with GC3 Recommendation 51.b)**

Currently, there is no federal heat stress standard to protect workers against hazardous heat.[29] In Connecticut, private sector employers must comply with federal OSHA standards, which are enforced by the US Department of Labor. Public sector employers must comply with the Connecticut State Plan, enforced by the Connecticut Department of Labor's Division of Occupational Safety and Health (CONNOSHA); Connecticut adopts the federal standards as its state plan. Therefore, to protect workers in Connecticut and across the country, federal OSHA needs to adopt a federal standard that specifically protects outdoor and indoor US workers from occupational exposure to excessive heat. A comprehensive federal standard should include a heat acclimatization plan for new and returning employees; temperature and humidity exposure limits that trigger protective measures, including rest and shade; hydration; and protection for workers from punitive action for exercising their rights under the standard.[30]

Additionally, each Connecticut occupational health and safety entity—CONNOSHA, Connecticut offices of the Department of Labor, and the Connecticut OSHA Consultation Program—should continue to provide education and training about preventing heat health risks. Finally, we recommend that in circumstances of excessive heat, the entities with enforcement responsibilities fully enforce the Occupational Safety and Health Act's General Duty Clause (requiring employers to provide a workplace "free from recognizable hazards that are causing or are likely to cause death or serious harm to employees").

5 **Protect children's health by enacting policies to address exposure to extreme heat events while at school and playing outdoor sports. (Aligns with GC3 Recommendation 51.a)**

In past years, Connecticut school districts have been forced to cancel school or declare early dismissals be-

cause of the dangerous combination of high heat days and school buildings that lack air conditioning. Elevated temperatures, as well as high humidity, in the classroom have been found to negatively impact both test-taking and long-term learning outcomes.[31] Currently, however, Connecticut lacks laws or public health codes to protect students and staff from excessive indoor heat in school buildings, including mandating indoor temperature limits. To address these health concerns, we recommend that the Connecticut legislature set a standard for air temperature in school buildings, which includes an acceptable temperature range. We also recommend that Connecticut pursue school campus design standards, such as those in the *Northeast Collaborative for High Performance Schools Criteria*,[32] that keep schools cool in an energy efficient and sustainable manner.

Students also are exposed to health-threatening heat while playing scholastic outdoor sports. Importantly, the Connecticut Interscholastic Athletic Conference has already instituted heat acclimatization policies and provides guidance on practices and precautions to reduce athletes' risk of heat-related illness. However, more can be done. Coaches, parents, and athletes would benefit from greater education around preventing, recognizing, and properly treating heat-related illness. Additionally, Connecticut lacks heat modification policies for youth sports, which would specify when to make practice and game modifications, based on the combination of heat and humidity.[33]

6 **Develop and maintain local heat response plans at the municipal level. (Aligns with GC3 Recommendation 51.c)**

A heat response plan establishes and coordinates activities to protect against heat-related illness and death within a jurisdiction; it can be a stand-alone plan or included with a municipality's all-hazards plan.[20] We recommend that all Connecticut municipalities develop and maintain a heat response plan. Importantly, the planning process should actively involve representation from the jurisdiction's vulnerable populations.

The Connecticut Department of Public Health and the Connecticut Division of Emergency Management and Homeland Security can support municipalities by developing evidence-based standards for heat response plans. Important plan components may include: identification of vulnerable populations and geographies; thresholds for activation; delineation of roles and identification of partnerships; preparedness and response actions, including heat health messaging, communications tools, and operation of cooling centers; and longer-term adaptation measures, such as changes to the built environment.[20]

About this series:

YCCCH released *Climate Change and Health in Connecticut: 2020 Report* in September 2020. The comprehensive report tracks 19 indicators on climate change and health in Connecticut across four domains: temperature, extreme events, infectious diseases, and air quality. The issue brief series mirrors the four domains, summarizing key findings from the Report and extending it to include policy recommendations. To read the full report, visit:

https://publichealth.yale.edu/climate/policy_practice/connecticut/

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The Yale Center on Climate Change and Health is supported by a generous grant from the High Tide Foundation. We also gratefully acknowledge a generous gift from The Patrick and Catherine Weldon Donaghue Medical Research Foundation to support the design of this report.

ENDNOTES: NEXT PAGE

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