

Health and Population Impacts Associated with Extreme Temperature Events

Massachusetts Region 4AB Regional Profile

Extremely hot or cold weather can be a health hazard, especially without proper planning. Communities can keep residents safe and healthy during extreme temperature events by tailoring strategies to each community's needs. The Massachusetts (MA) Region 4AB Public Health Emergency Preparedness Coalition prioritizes whole community planning and applies health equity principle when preparing for these events.

Since an individual's exposure, sensitivity, and adaptability to extreme temperatures differ, mitigation strategies to reduce the negative health impacts of extreme heat and cold must consider demographics and social determinants of health and be responsive to the needs of those most at risk and disproportionately impacted.

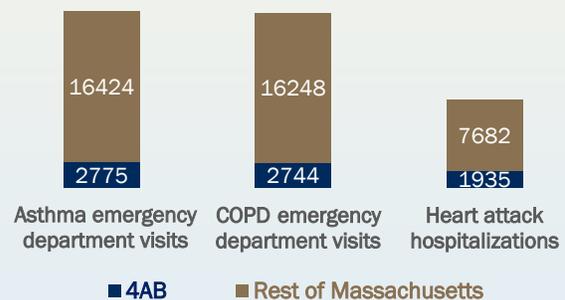
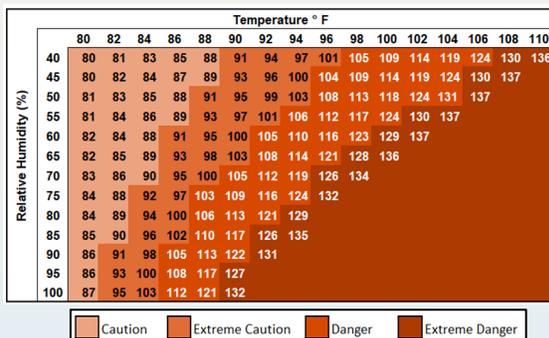
Health Impacts of Extreme Temperatures



Extreme heat events are projected to increase over the next decades. Massachusetts can expect an average of [10-28 days](#) per year with temperatures over 90°F by 2050. Region 4AB communities can see 19-31 days over 90°F. [Heat waves](#), or three days over 90°F in a row, are among the world's most dangerous natural hazards. In 2020, 101 or 18% of the overall 565 heat stress-related emergency department visits in MA were in Region 4AB. Extreme heat stresses the body's ability to regulate temperature, leading to heat exhaustion, heat stroke, and worsening of chronic medical conditions such as asthma, COPD, heart disease, kidney disease, and diabetes. Extreme heat has been shown to [increase risk of death from all-causes](#). When combined with high humidity, it is even more difficult for the body to cool off and heat-related illnesses can be more severe.



Extreme cold can lower the body's temperature to dangerous levels, and prolonged exposure leads to hypothermia and frostbite. Cold air affects the lungs making it difficult for people with respiratory conditions to breathe. It also restricts blood flow which can worsen heart conditions. Other risks include non-fire related carbon monoxide poisoning from gas furnaces, heaters, and generators and falls or injuries on ice.



Populations At Risk of Extreme Temperature Health Effects

Understanding who is at higher risk of negative health effects and disproportionately impacted by extreme temperature events can help inform more effective and equitable action planning. People with the greatest health risks tend to have multiple vulnerabilities. For example, older adults tend to have more chronic medical conditions and take certain medications that can increase risk. Individuals with limited resources or capacity to adapt also tend to live in housing or neighborhoods where there are greater exposure factors, from inadequate heating or cooling to urban heat islands. Mitigation strategies must consider these overlapping risk factors.

While Region 4AB's 818 square miles represent about 10% of Massachusetts' total land area, more than 1.7 million or 25% of MA residents live in Region 4AB. It is more densely populated than the rest of the state. Residents are diverse in demographics, socioeconomic status, and health outcomes. The places and environments where they live, work, and play vary and can influence exposure and vulnerability to the health risks of extreme temperatures.

Sociodemographic Factors

A person's age, income, language, household composition, housing situation, and other factors can affect their ability to adapt and respond to extreme temperatures.



Older adults age 65+ have more chronic medical conditions, tend to live alone, and be socially isolated. More than [80% of the estimated 12,000 heat-related deaths](#) in the U.S. annually are among those over age 60. Since older age affects body temperature regulation, the [risk of hypothermia](#) is higher. Poor circulation also increases risk of frostbite, and falls and injuries on ice are more likely.

Older adults will outnumber children by 2035, with [1 in 4 \(23%\) being 65+](#) by 2060. Mitigation strategies must consider multiple risk factors and [planning](#) should involve older adults, caregivers, and other service providers and partners, such as the 119 long term care (LTC) facilities in Region 4AB. In MA, [all LTC facilities must maintain](#) at least 75°F during the winter and a max of 75°F in the summer.



People living alone or who are [socially isolated](#) may be harder to reach and have less support from family or friends in times of need. They are more likely to have a chronic disease or disability, experience depression, substance use or addiction, and dementia, which increase risks.



Infants and children [feel heat faster](#) and take more time to cool down. Playing outside without rest or rehydration increases heat exhaustion and heat stroke risk. Due to having a smaller body size and less fat, they are at more risk of [accidental hypothermia](#) in extreme cold. Also, about 40 children die a year in the U.S. due to [being left in a hot car](#). Region 4AB has 829 childcare centers that can help disseminate health alerts.



Air conditioning and heating can help people adapt to extreme temperatures. But low-income households and those with fewer resources or unstable housing may not have access. One in five (22%) MA households are energy insecure and had trouble paying an energy bill, or had their electricity, oil or gas delivery cut. While [87% in MA have AC](#), [people living in housing](#) built before 1950, apartments, buildings with 5+ units, and renters are less likely to have AC.



Low-income households are 11% more likely to live in areas with the [highest projected increases in extreme temperature-related deaths](#). Unsafe practices such as use of gas stoves for heating can also lead to accidental carbon monoxide poisoning. In Region 4AB, 7% of households have no or slow internet and may not get emergency alerts; 11% do not have a car and may not have transportation to warming or cooling centers (compared to 9% and 12% in MA, respectively). When experiencing heat- or cold-related illnesses, they may avoid medical care due to cost.



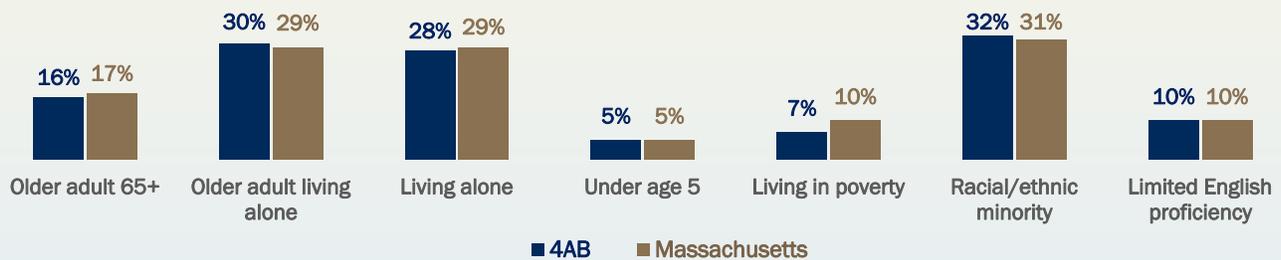
Communities of color experience higher [illness](#) and [mortality from extreme temperatures](#). Inequitable conditions lead to the disparities in income, health, and housing and neighborhood risks these populations face. In Region 4AB, 10% of residents are Hispanic, 12% Asian, 4% Black and 5% other. Poverty is more than two times higher for Blacks and Hispanic (15%) compared to White (6%), and 71% of Black residents rent (34% White).



People experiencing homelessness have higher risk for frostbite and the odds of hypothermia increase 64% with each 9°F drop in temperature. In hot weather, the risks of heat stroke, heat exhaustion, and dehydration are high. There are [10,082 homeless](#) households in MA.



Non-English speakers may not receive or understand extreme temperature alerts or information on resources available to cope with heat or cold-related hazards. Additionally, **people who are undocumented** face unique challenges and may avoid needed medical care or services due to fear of immigration consequences.

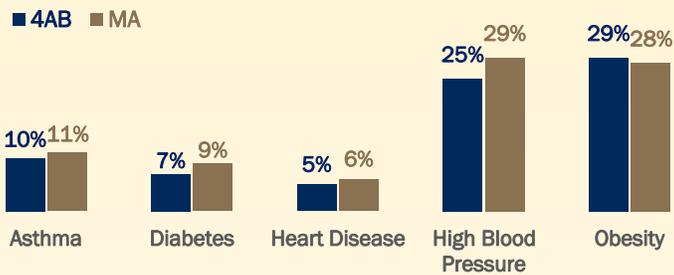


Pre-Existing Health and Medical Conditions

People with pre-existing health conditions are more sensitive to extreme temperatures and some medications can affect body temperature regulation, which increases risk for heat and cold-related illnesses.



People with [pre-existing health conditions](#), such as asthma, COPD, heart disease, high blood pressure, diabetes, obesity, seasonal allergies, cerebrovascular disease, and renal disease, have higher health risks in extreme temperatures. Extreme heat can also affect [mental health](#) conditions and increase irritability and substance use.



Some [prescription medications](#) affect sweating and body temperature regulation:

- high blood pressure medications
- antidepressants and antipsychotics
- central nervous system stimulants
- anticholinergics
- antihistamines
- decongestants

Extreme heat and cold can [change medications and how well they work](#), so proper storage is needed.



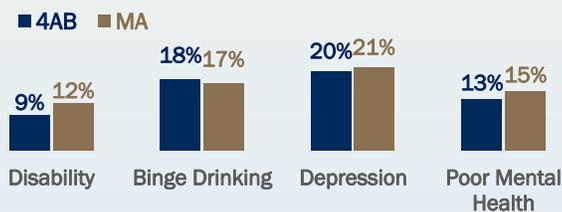
[People with disabilities](#) or who are neurodiverse may be less able to adapt and may have difficulty accessing services or understanding extreme weather alerts. Those with service and support animals may not use warming or cooling centers if they are unaware that they can bring their animal or are unable to transport them.



[People with power-dependent medical devices](#) who do not have a backup generator or someone to check on them during power outages can lose the ability to function and be at risk of a life-threatening event. In Region 4AB, all 60 communities have an emergency notification system and 21 (35%) maintain or promote an access and functional needs registry, which can be used to ensure that residents who need support receive assistance, transportation, or other services in emergencies.



[People who use substances](#) tend to have other co-occurring conditions such as homelessness, poverty, and mental illness, which increase health risks. [Hospital visits for alcohol and drug use](#) increase during extreme heat and [heat stroke can be more severe](#). Those who use substances or are in recovery may need daily medications and emergency naloxone (Narcan); a challenge if shelters do not have provisions or if transportation is disrupted. Alcohol and substance use also increase risk of hypothermia. Opioids reduce breathing, affect temperature regulation and interfere with the body's ability to warm up. In extreme cold, the [risk of fatal overdoses increases](#) by 25%.



- In Region 4AB, 25 people per 100,000 died of a drug overdose, compared to 33 statewide.
- From 2016-2020, 20% (2,197) of the 11,148 drug overdose deaths in the state were in 4AB.



[Pregnant people](#) are more likely to get heat-related illnesses because their bodies have to work harder to cool down. Extreme heat or cold exposure can also [increase risk of preterm birth](#). In 2021, there were 17,257 births in Region 4AB, 8% of which were preterm (compared to 9% statewide).



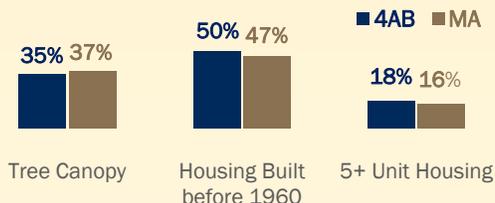
Environment

Some people have higher exposure to extreme temperatures where they live, work, and play. Taking measures to limit exposure can lessen the impact and reduce health risks.



Urban Heat Islands, High Rise Buildings, Low Income Neighborhoods. People living in urban areas or coastal communities with less green space

and tree canopy, and more buildings and roads that absorb and retain heat have higher exposure. Region 4AB has more roads per square mile (10.7 road miles compared to 4.7 statewide). Those living in high-rise buildings, older or poorly ventilated or insulated housing have greater risk. Also, Region 4AB has about 35,000 HUD-assisted units, including housing for the elderly and people with disabilities, where more [disproportionately impacted populations](#) live.



Occupational Settings. People who work outdoors such as in buildings and grounds maintenance, construction, emergency response, installation and repair, and transportation have high exposure to extreme temperatures. The physical demand, use of personal protective equipment, and limited access to water, shade, or cooling increase risk of heat stress. Extreme cold, and windy and wet conditions can lead to frostbite and hypothermia. People who work in hot and humid indoor environments such as kitchens, bakeries, laundries, manufacturing plants and factories, and electrical utilities are at risk of heat-related illnesses.

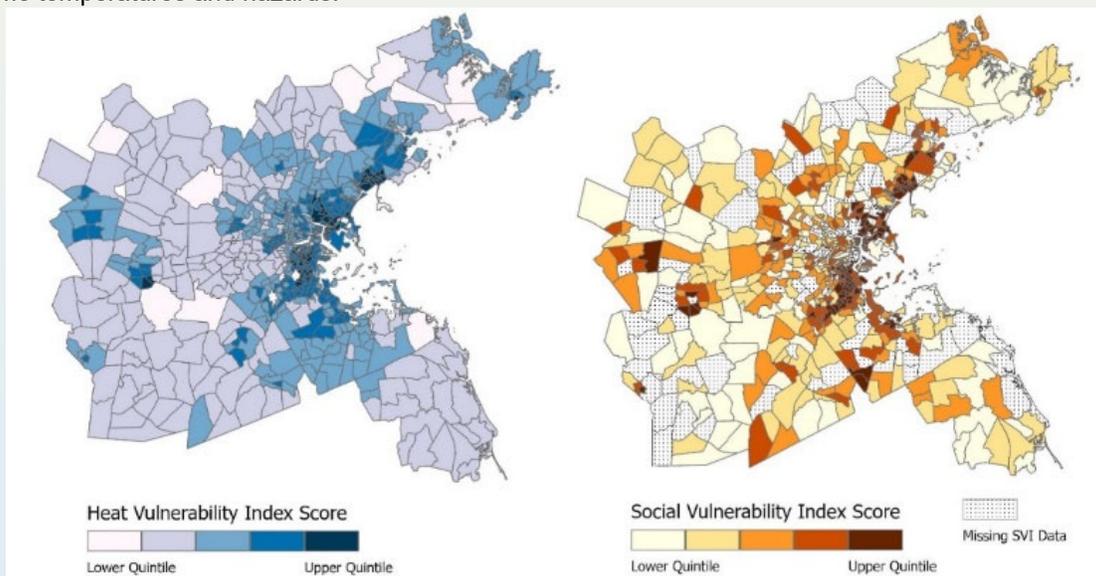
[1 in 3](#) in the U.S. are outdoor workers. Outdoor workers have [35 times the risk of dying from heat exposure](#), and 40% of outdoor workers are Black or Hispanic.



Athletics, Recreation & Tourism. [Athletes](#), participants of outdoor activities or sports, and tourists are more prone to heat stress. [Winter](#) recreation, such as skiing, hiking, hunting, and fishing can also increase risk of dehydration, frostbite, and hypothermia. Massachusetts has [guidelines](#) to reduce heat exposure for student athletes.

Areas Most Impacted by Extreme Temperatures

The maps below show heat and social vulnerability across Region 4AB. Darker blue indicates higher heat vulnerability and darker orange indicates more socioeconomic and demographic factors affecting response to extreme temperatures and hazards.



Best Practices to Reduce Extreme Temperature Health Effects

Addressing extreme temperatures and their impact on higher risk and disproportionately impacted populations needs a multifaceted approach that includes community engagement, public health strategies, and built environment considerations. Communities will need to assess existing interventions, identify gaps and opportunities, and ensure mitigation strategies are inclusive and equitable. Examples of best practices to reduce health effects on impacted populations are below.



Partner with pediatricians, childcare centers, and schools to distribute educational materials to parents and caregivers on keeping infants and children safe during extreme temperature events.

Encourage schools to implement heat-smart policies, such as providing access to shaded areas, water stations, and indoor recess options during extreme temperature days.



Develop culturally-tailored extreme temperature safety materials and messaging that resonate with diverse communities and take into account cultural beliefs, practices, and norms.

Use social media platforms and local media outlets, such as radio, television, and newspapers, to disseminate heat and cold safety messages to reach disproportionately impacted populations.



Collaborate with healthcare providers, pharmacies, and patient advocacy groups to develop targeted messaging about managing chronic conditions and medications during extreme temperatures.

Offer educational sessions or support groups that provide guidance on medication management, hydration, and symptom recognition for people with chronic diseases.



Translate extreme temperature safety materials and resources into multiple languages commonly spoken within the community, ensuring accessibility for individuals with limited English proficiency.

Utilize bilingual community health workers or interpreters to facilitate outreach efforts and communicate important heat and cold safety information effectively.



Ensure outreach materials and communications are accessible to individuals with disabilities, including providing information in alternative formats such as braille, large print, or audio.

Partner with disability advocacy organizations and other agencies to host inclusive workshops or trainings on heat and cold safety and emergency preparedness.



Engage with labor unions, employers, and occupational health organizations to disseminate and reinforce heat and cold safety guidelines and resources to indoor and outdoor workers.

Offer workplace training or safety briefings to address heat stress prevention measures, hydration strategies, and recognizing early signs of heat-related illness.



Data Sources

- Massachusetts Department of Public Health [Community Health Data Tool](#), [Environmental Public Health Tracking Tool](#), and [Emergency Preparedness Planning Tool](#)
- Massachusetts Births [2021 Report](#)
- Maps: CDC/ATSDR [Social Vulnerability Index](#) & MAPC [Climate Vulnerability Data](#)
- Heat Index: [NWS](#)

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