

Heat Exposure and Health Impacts in North Carolina

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There is increasing concern over the adverse health effects associated with hot weather. In the United States, heat kills more people annually than any other weather-related disaster, resulting in hundreds of fatalities each year [1]. Prolonged exposure to high temperatures can result in heat-related illnesses, such as heat syncope, heat exhaustion, head edema, heat cramps, and in the most severe cases, heat stroke, which has a very high mortality rate. The health effects from heat are likely to increase as temperatures are projected to rise due to climate change [2].

Proper ways to treat heat-related illnesses include basic hydration or relocating to a cooler location [3]. Although public health education and targeted heat-health interventions to prevent heat exposure can help mitigate adverse health effects, many North Carolina residents experience heat-related illnesses. There are nearly 2,000 annual emergency department visits related to heat-related illnesses, and likely many more cases that are undiagnosed [4].

North Carolina is an ideal location to study heat health, as it is located in a subtropical climate with hot and humid conditions. Moreover, North Carolina has a unique system called NC DETECT (North Carolina Disease Event Tracking and Epidemiologic Collection Tool), a syndromic surveillance tool that collects information on emergency department visits, allowing for statewide analysis of heat-related illnesses, which are often acute and require immediate medical care.

Research using NC DETECT has found that most heat-related illness occurs during climatologically normal summer conditions, rather than extreme heat events. In fact,

when examining emergency department visits, declines of heat-related illness are noted at the highest temperatures [4]. These findings suggest that North Carolinians are mitigating their heat exposure during the highest temperatures, reducing heat-health effects. Public health preparedness plans should not be limited to extreme heat events. Warnings to avoid over-exertion are equally if not more important throughout the warm season from May to September, when heat-related illnesses are at their highest in North Carolina [4, 5].

Temperatures in urban locations are higher than in surrounding locations due to urban heat islands (UHIs), which are created by heat-absorbing impervious surfaces that absorb heat during the day and slowly re-radiate high temperatures at night [6]. Because of this phenomenon, urban populations are traditionally considered the most susceptible to adverse heat-related health outcomes. Vulnerable populations, including infants and children, elderly individuals, overweight individuals, and those with existing medical conditions, are particularly at risk of experiencing a heat-related illness due to impaired or less-efficient thermoregulation systems [7].

Surprisingly, in North Carolina, heat-related illnesses are most common in rural locations. Several hypotheses may explain this pattern. First, rural populations engage in more outdoor occupational labor with higher concentrations of workers engaging in agriculture and construction than in urban locations. Second, many rural residents in North Carolina, particularly the Eastern part of the state, are “energy poor,” or are unable to afford to use their air conditioning despite high temperatures. Lastly, rural locations of North Carolina experience overall greater social

vulnerability (ie, lower educational attainment, high poverty rates, etc.) putting them at greater risk for natural hazards, such as extreme heat [8, 9].

Extreme heat events, or heat waves, can also trigger other illnesses outside of heat-related illnesses. An analysis of extreme heat in North Carolina found significant increases in all-cause emergency department visits, as well as different disease categories (eg, cardiovascular and cerebrovascular diseases) [10]. Across the summer season, there are notable changes in demographics seeking care for heat, with the young (younger than 14) and elderly people (65 and older) experiencing higher rates in June with the onset of summer temperatures. The demographic most vulnerable to late-season extreme heat are adolescents (aged 15 to 17), which may relate to the onset of organized school sports [10]. These findings suggest that public health interventions for heat health should target different demographics and locations throughout the warm season.

In sum, heat-related illnesses are surprisingly common despite easy adaptation techniques. To mitigate health impacts, targeted health interventions, basic education, and community outreach are needed. In particular, more efforts are needed to target at-risk demographics, including rural outdoor occupational workers, young people who engage in organized school sports, residents living in poverty, and older individuals who are not acclimated and have impaired thermoregulation systems. **NCMJ**

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