Extreme heat may hasten cognitive decline in vulnerable populations

August 15 2023

Credit: Pixabay/CC0 Public Domain

July 2023 was the hottest month on record, with cities like Phoenix

experiencing record-breaking heat waves for weeks on end. A new study finds that ongoing extreme heat can worsen cognitive decline among vulnerable groups—particularly Black older adults and those living in poor neighborhoods.

"Our research finds that cumulative exposure to extreme heat can undermine cognitive health, but it does so unequally across the population," said Eunyoung Choi, a postdoctoral associate at the NYU School of Global Public Health and the first author of the study, published in the *Journal of Epidemiology and Community Health*.

Extreme heat is the leading cause of weather-related deaths in the U.S., claiming more lives each year than hurricanes, tornadoes, and lightning combined. Young children and older adults are particularly vulnerable to heat-related illnesses such as heat exhaustion and heat stroke.

Recent studies suggest that high temperatures may hurt cognitive function, but these studies tend to look at a snapshot of someone's cognition at a single time point following brief exposure to heat. Less is known about the long-term consequences of heat on cognitive health.

"Cognitive decline may not manifest right after a single heat event, but repeated or prolonged exposures to extreme heat may be detrimental," explained Virginia Chang, associate professor of social and behavioral sciences at the NYU School of Global Public Health and the study's senior author. "Cumulative exposure to extreme heat can trigger a cascade of events in the brain, including cellular damage, inflammation, and oxidative stress, all of which can exhaust one's cognitive reserve."

As heat waves have become more frequent and intense due to climate change and urban heat islands, the researchers sought to understand the connection between extreme heat exposure and cognitive decline. They analyzed data from nearly 9,500 U.S. adults ages 52 and older surveyed

over a 12-year period (2006-2018) as part of the Health and Retirement Study conducted by the University of Michigan Institute for Social Research, which measures participants' cognitive function over time.

The researchers also looked at socioeconomic measures of the neighborhoods where participants lived. In addition, they calculated participants' cumulative exposure to extreme heat (the number of days in which the heat index reached or exceeded a location-specific threshold) during this 12-year period based on historical temperature data from the CDC's National Environmental Public Health Tracking Network.

They found that high exposure to extreme heat was associated with faster cognitive decline among residents of poor neighborhoods, but not for those in wealthier neighborhoods.

"Affluent neighborhoods tend to have resources that can help in a heat wave—things like well-maintained green spaces, air conditioning, and cooling centers. In disadvantaged neighborhoods, these resources may not exist," said Haena Lee, assistant professor of sociology at Sungkyunkwan University, South Korea and the study's co-first author. "Other factors associated with disadvantaged neighborhoods—residents experiencing chronic stress, greater social isolation, and fewer specialized services for cognitive health—could also be contributing to this disparity."

Moreover, cumulative exposure to extreme heat was associated with faster cognitive decline among Black older adults, but not white or Hispanic older adults. (The study did not have enough participants of other races and ethnicities to include them in the analysis.)

"One possible explanation for this pattern of findings is that Black older adults may have disproportionately experienced systemic disadvantages throughout their lives due to structural racism, segregation, and other

discriminatory policies, all of which may affect cognitive reserve," said Chang.

The researchers urge local governments and health officials to develop policies and tools that identify residents who are susceptible to extreme heat, empower at-risk communities, map their specific needs, and develop targeted support and increased communication with these populations.

"When faced with high temperatures, our study reveals that vulnerable populations are experiencing compounding disadvantages," said Choi. "Extreme heat is a serious public health threat, and in the context of climate change, we need to focus on supporting at-risk groups in order to build resilient communities."

More information: Eun Young Choi et al, Cumulative exposure to extreme heat and trajectories of cognitive decline among older adults in the USA, *Journal of Epidemiology and Community Health* (2023). DOI: 10.1136/jech-2023-220675

Provided by New York University