

Heat, humidity, and heart disease

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It's no secret that high temperatures or extreme humidity can negatively impact one's physical health, particularly those afflicted with cardiovascular disease. Previous literature has even suggested that cardiovascular disease is one most sensitive to weather extremes. Climate-health studies often examine the specific role of extreme temperatures or humidity but, until now, little has been known about the joint effect that the two conditions play together and whether or not demographics play a role in the way bodies react to such weather conditions.

Shao Lin, Professor of Environmental Health Sciences, and Wayne Lawrence, doctoral student of Epidemiology and Biostatistics, both in the School of Public Health, collaborated with lead investigator Professor Cunrui Huang of Sun Yat-sen University and other researchers in China and Australia to examine the role [humidity](#) and heat played on [cardiovascular disease](#) deaths.

As the researchers explain in their paper, [high humidity](#) is thought to reduce the body's efficiency at transporting away metabolic heat, while low humidity can lead to dehydration. Sweating is the primary way our bodies work to maintain a healthy core temperature under heat stress, but humid conditions can interfere and prevent us from effectively maintaining our temperature. For those suffering with cardiovascular disease, these conditions can have catastrophic effects and in some cases can lead to the formation of deadly blood clots (called thrombosis). Though these dangers of high heat and humidity separately were already known, questions remained about their joint effects and whether

particular populations were more susceptible than others.

Led by Huang and graduate student Jie Zeng of Sun Yat-sen University in China, the group set out to fill the gaps left in current knowledge and better understand the combined correlation between heat and humidity as they pertain to cardiovascular related deaths. The team collected data on daily meteorological and cardiovascular disease mortality from seven coastal cities and four inland cities in Zhejiang Province, China, using the China Meteorological Data Sharing Service System. Zhejiang Province, in the southern part of the Yangtze River Delta on the east coast of China, had 120,544 recorded deaths from cardiovascular disease during the study period of 2010-2013. The province is characterized by four distinct seasons and an overall moderate climate.

Once the datasets were obtained, the team applied a two-stage analysis strategy. First, they estimated the city-specific effects of temperature on mortality by using time-series regression models. They then conducted a stratified analyses of temperature effects by low and high humidity levels. Next, a multivariate meta-regression strategy was used to calculate the overall cardiovascular mortality burden in different demographics.

The researchers found:

- Low temperature combined with high humidity accounted for a majority of the cardiovascular disease death burden; this effect was particularly significant for males, youth, those with low education, and those who live in coastal areas.
- Temperature had a greater impact on cardiovascular disease death when combined with high humidity, exacerbating the temperature effects on those with existing cardiac [health](#) problems.
- Low education level was found to be significantly associated with

cold-but-humid related deaths, suggesting that certain populations require extra protection.

- High temperature and high humidity were associated with more significant risks in coastal areas than in inland areas.
- There was a positive correlation between the number of cardiovascular disease deaths and [relative humidity](#).

"While a lot of prior research paid attention to heat's effect, this study shows that cold [temperature](#)'s effect with high humidity on cardiovascular [disease](#) should not be ignored," said Lin. "We also found that this type of international collaboration with colleagues near and far allows us to share expertise and resources with other universities doing innovative and important research," she continued.

Lawrence, who was a Visiting Scholar at Sun Yat-sen University this summer through the School of Public Health's Center for Global Health, also notes the value of international collaboration. "What I enjoyed most about this project was that it brought together researchers from the United States, Australia, and China to collaborate on examining an environmental health issue," said Lawrence.

"Because of the strong connection UAlbany's School of Public Health has with numerous international institutions, such as Sun Yat-sen University, I have had the opportunity to not only collaborate with large global research teams on publications, but also to travel outside of the country to obtain a firsthand experience on various [public health](#) problems, and how policies influences population health."

More information: Jie Zeng et al. Humidity May Modify the Relationship between Temperature and Cardiovascular Mortality in Zhejiang Province, China, *International Journal of Environmental Research and Public Health* (2017). [DOI: 10.3390/ijerph14111383](https://doi.org/10.3390/ijerph14111383)

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