

India's rising temperatures are already deadly, study shows

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Indians cool off themselves at a fountain near the India Gate monument on a hot day in New Delhi, India, Tuesday, June 6, 2017. (AP Photo/Altaf Qadri)

India is now two and a half times more likely to experience a deadly heat wave than a half century ago, and all it took was an increase in the average temperature of just 0.5 degrees Celsius (less than 1 degree Fahrenheit), a new study shows.

The findings are sobering considering that the world is on track for far more warming. For the last two weeks much of Asia has been gripped by

a heat wave, with a record high of 53.5 degrees C (128.3 degrees F) set in the southwest Pakistani city of Turbat on May 28—the world's hottest-ever temperature recorded for the month of May. Temperatures in the Indian capital of New Delhi have soared beyond 44 degrees C (111 degrees F).

Even if countries are able to meet the Paris Agreement goals in curbing climate-warming carbon emissions, that would still only limit the global temperature rise to an estimated 2 degrees C (3.6 degrees F). U.S. President Donald Trump's recent pledge to exit the Paris treaty won't help.

"It's getting hotter, and of course more heat waves are going to kill more people," said climatologist Omid Mazdiyasni of the University of California, Irvine, who led an international team of scientists in analyzing a half century of data from the Indian Meteorological Department on temperature, heat waves and heat-related mortality.

"We knew there was going to be an impact, but we didn't expect it to be this big," he said.

Their study, published Wednesday in the journal *Science Advances*, shows that, while India's average temperatures rose by more than 0.5 degrees C (0.9 degrees F) between 1960 and 2009, the probability of India experiencing a massive heat-related mortality event—defined by more than 100 deaths—shot up by 146 percent.

The study also found that the number of heat wave days increased by 25 percent across most of India. Areas in the south and west experienced 50 percent more heat wave events, or periods of extreme heat lasting more than three or four days, in 1985-2009 compared with the previous 25-year period.



Indian snack vendors take an afternoon nap under the shade of a tree on a hot day in New Delhi, India, Tuesday, June 6, 2017. (AP Photo/Altaf Qadri)

It's harder to estimate how deadly future warming might be. There is no historical data for heat wave mortality at those peak temperatures, and death tolls could increase sharply as it gets even hotter.

"The general public may think that a 1 or 2 degree temperature rise is not that significant, but our results show that even small changes can result in more heat waves and more death," said Amir AghaKouchak, another climatologist at UC Irvine and a co-author of the report.

Scientists have warned for years that climate change will make heat waves more intense, more frequent and longer lasting.

"It stands to reason there would be more dire health impacts with more

severe heat waves, and this paper provides a key quantification of those impacts for one region of the world," said climate scientist Gerald Meehl of the National Center for Atmospheric Research in Boulder, Colorado, who was not involved in the study.

The same methodology can be applied in any region to get a sense of how vulnerable a country or population might be, the authors said.

They accounted for India's fast-rising population and income levels in the analysis, to make sure neither affected the results. In the case of income, they found an even stronger correlation between heat waves and deaths among those who are poor.

That's bad news as India is already seeing new deadly highs. Last year in May, India recorded a record 52.4 degrees C (126.3 degrees F) in the western city of Jaisalmer.



An Indian woman offers an ice-cream to her son as he cools off in a pond near the India Gate monument on a hot day in New Delhi, India, Tuesday, June 6, 2017. (AP Photo/Altaf Qadri)

The vast majority of India's 1.25 billion people are poor and have few options as temperatures hit sweltering levels, drying forests and riverbeds and wiping out farm animals. They are unlikely to have air conditioners—up to 25 percent still have no access to electricity.

Most in India rely on agriculture for their livelihoods, and climate change is likely to hurt their crops.

Many who work as farmers or in construction will have to shorten their work days by 2-3 hours within four decades, simply because it will be too hot outdoors, according to a report last year by the U.N. Environment Program.

Most Indian cities and states are not prepared to handle more heat, even if they understand the devastation it can wreak. In 2010, some 1,200 people died in a heat wave in the western city of Ahmedabad, prompting city officials to introduce seven-day weather forecasts, extra water supplies and cool-air summer shelters.

After more than 2,500 were killed in heat-ravaged areas across India in 2015, nine other cities rolled out a plan to educate children about heat risk, stock hospitals with ice packs and extra water, and train medical workers to identify heat stress, dehydration and heat stroke.

But the nine cities cover only about 11 million people, not even 1 percent of the country's population.

"Heat wave stress is a relatively new aspect that hasn't been recognized" as a climate change threat in the region, said scientist Saleemul Huq, director of the International Centre for Climate Change and Development in Dhaka. In Bangladesh, "we are seeing more heat waves, there's no doubt about it. And there is strong anecdotal evidence that we are seeing a similar trend in mortality. I would recommend a similar study here."

More information: O. Mazdiyasi et al., "Increasing probability of mass mortality during Indian heat waves," *Science Advances* (2017). advances.sciencemag.org/content/3/6/e1700066

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