# New Study Finds Negative Effect of Climate Change on Sleep 2023



Erica Sloan July 20, 2022

When you envision the effects of climate change, you might picture things like melting glaciers, raging wildfires, or rising sea levels—environmental impacts that are diminishing the resources we need to survive and thrive on Earth. While these events are certainly a threat to our health long-term, recent research has found that warming temperatures pose a *direct* health risk, too, contributing to a rise in cases of cardiovascular and respiratory disease, food and waterborne diseases, and mental-health issues, among other conditions. As of late, however, scientists have identified an even more immediate victim of climate change: our ability to get sufficient sleep.

> Kelton Minor, PhD, postdoctoral research scientist at Columbia University Data Science Institute

A large-scale study published in May in the journal *One Earth* analyzed billions of sleep measurements (from existing sleep-tracker data sets spanning more than 47,000 people in 68 countries) in tandem with local daily meteorological data and found that warmer-than-normal nights significantly reduced how much sleep people clocked.

To be clear, this finding was tied to ambient (aka outdoor) temperatures and not temperatures within peoples' homes—which is to say that the effect was still significant in folks with access to air conditioning and the like. Though the researchers didn't analyze *why* people categorically got less sleep on hotter days, previous research points to the fact that our body temperature must drop in order to bring on sleep, and it's possible that higher ambient temps could interfere with that process.

> People are losing about 44 hours of sleep per year, on average, due to hotter-than-optimal ambient temperatures, according to a global study.

The study found that, in terms of a world-population-weighted average, people are losing about 44 hours of sleep per year due to hotter-than-optimal ambient temperatures, which are also contributing to approximately 11 nights of "short sleep" (meaning less than seven hours) per person per year. Since not getting enough sleep can have a whole host of health consequences over time, affecting everything from your mood and ability to focus to your immune system, cognition, and blood pressure, these climate-induced sleep deficits are nothing to, well, sleep on.

While a previous study linked higher outdoor temperatures with poor subjective reports of sleep via survey results, the above is the first study to find that these temperature changes have a direct impact on objective measures of sleep from sleep trackers. This tracker data allowed the *One Earth* study to consider years' worth of *nightly* stats per person, while the survey from the previous study had just asked folks to report the number of nights of insufficient sleep they remembered getting each month over the course of a few years. As a result, the scientists working with the sleep-tracker data had billions of per-person data points to analyze for fluctuations, allowing them to uniquely measure changes in sleep from each person's individual baseline.

"We could look at, for instance, the effect of a night that is randomly warmer than normal for a given place at a given time of year, and see whether a given individual within that area sleeps more or less compared to what is normal for *them*," says Kelton Minor, PhD, lead author on the study and postdoctoral research scientist at Columbia University Data Science Institute. Basically, this ensures that data for a person who typically sleeps for just five hours a night (aka "short sleep") and then *also* slept for five hours on a warmer-than-

usual night wouldn't have been mistakenly considered evidence for the effect of climate change on sleep.

This level of specificity also meant that the researchers could rule out "stable individual characteristics that we might not normally be able to observe," says Minor. In other words, they could tell that the drops in sleep they found on hot nights weren't due to other things (like, for example, a person deciding to have caffeine that night or being particularly stressed that day) because those variables would change at random in any given individual. Separately, they also controlled for a ton of potentially confounding location-specific variables—from daylight changes to cloud cover to humidity—and the effect of climate change on sleep still stood.

Projecting their model into the future, the scientists were also able to estimate how much sleep we may lose in two different scenarios: if the climate keeps warming as it is, and if that temperature uptick is curbed by way of stabilized emissions. In the first (and scarier) scenario, people are projected to lose about 58 hours of sleep per year by 2099, and in the second, that number is 50, which is still significant. But it's also important to note that these averages mask a lot of disparity among different groups of people, says Minor.

## The effect of climate change on sleep isn't felt equally

Though the entire planet is experiencing rising temperatures, particularly at night, the negative effects of these shifts aren't distributed equally. Folks in vulnerable populations are more likely to feel the impacts, and sleep loss appears to be no exception.

"We found that the effect on sleep per degree of warming was approximately three times as large in low- to middle-income countries as it was in high-income [countries]," says Minor. "This suggests that certain socioeconomic amenities, whether it's air conditioning or something else, that people have in higher income countries... may buffer the effect of climate change on sleep." Because the study used data from sleep trackers—which require money to buy—and in turn, had fewer data points from low- and middle-income countries than high-income ones, Minor suspects the socioeconomic gap may be even larger than the one they found.

It's also the case that both elderly folks and (biological) females are likely more susceptible to the effect of climate change on sleep. In the study, the

elderly lost over twice as much sleep per degree of warming as young and middle-aged adults, and females were about 25 percent more impacted than males. Though Minor says they aren't sure exactly what was driving these relationships, one possibility is the naturally earlier sleep rhythms of both older people and females. “This may predispose them to hotter temperatures at their time of sleep onset, which could make it tougher for them to fall asleep,” he says.

> “There's evidence that even long-term exposure to warmer temperatures doesn’t guarantee any reduced impact on sleep.” — Kelton Minor, PhD candidate and social-science researcher

And it doesn’t seem like we’ll simply “get used to” the heat, either, adds Minor: “Contrary to what we anticipated, we found that the people in the warmest areas were over twice as affected per degree of warming than those in the coldest climates, providing evidence that even long-term exposure to warmer temperatures doesn’t guarantee any reduced impact on sleep.”

To test that finding in another way, the researchers also looked at sleep changes at the beginning of the summer within particular locations in comparison to changes at the end of the summer to see if people’s sleep “might be less impacted by the heat when it should be cognitively more familiar,” says Minor. And still no dice: People were actually marginally *more* impacted per degree of warming at the end of the summer, suggesting what may be a lingering, and even worsening effect of nighttime heat on sleep over time.

Because many of the warmest regions also overlap with low-income areas, that finding is a double whammy for folks who are *already* more susceptible to the heat’s sleep-reducing effects.

## How policy change can mitigate the impact of warming temperatures on sleep

We know that people are already losing several nights of good sleep a year to suboptimal nighttime temperatures, says Minor, “but we also have reason to suspect that the number of nights will only continue to grow, as temperatures rise, given low evidence of adaptation.” While this is certainly all the more reason that greenhouse gas emissions need to be curbed (in order to slow the rate of climate change overall), Minor and his team also propose more

direct policy changes to soften the blow of high nighttime temperatures on sleep.

At the top of that list is prioritizing ambient cooling techniques like heat-resilient planning (think: adding green spaces and building shade structures in urban areas). These strategies—already rolling out in places like Austin, TX—are crucial to combatting heat in cities, where the high concentration of heat-absorbing pavement and buildings make hot days even hotter. “We found that, on colder-than-normal nights, people actually slept *more*, which feeds into this notion that ambient cooling interventions may actually help to improve sleep,” he says.

Minor also stresses the necessity of expanded access to cooling technologies, like air conditioning. “If the market is allowed to do what it naturally does, these cooling technologies will continue to be unequally distributed,” he says. And this will actually worsen temperature inequality: “Because A/C basically takes heat in a given building and dumps it outside... the waste heat will further warm the surrounding environment, creating even worse conditions for sleep for those who can’t access A/C themselves,” he says.

That’s not to say that air conditioning isn’t a good solution in a warming world; in fact, it's nothing short of essential, says Minor. “But in order to avoid unintended consequences, like an increasingly unequal distribution of heat and its downstream effects on sleep, access to A/C absolutely needs to be provided in an equitable manner.” Some state and local governments, like New York, have voucher programs that help low-income residents pay for (and install) air conditioning units in their homes. But this is potentially a Band-Aid solution if said residents still can't afford to pay the higher electricity bill that comes with running the A/C.

All of that is to say, there's a *lot* of work that needs to be done to mitigate the effects of climate change on sleep (and everything else). Despite the recent discouraging news from Congress and the Supreme Court, don't let your elected officials off the hook. Call your representatives regularly to let them know that addressing climate change should be a major priority, and get in touch with local environmental activist groups to organize for action in your hometown. Because sound sleep (and a healthy planet) should be our future —not a pipe dream.