



The area burnt by wildfires in California is projected to rise as climate change intensifies.

most recent climate-change assessment.

Lisa Miller, an immunologist at the University of California, Davis, says the Stanford study is one of the first to monitor wildfires' health effects in a diverse group of people over several years. By understanding who is most affected by wildfire and why, Miller says researchers can create evidence-based guidelines for mitigating risk. She is particularly worried that smoke exposure could damage children's developing lungs in ways that lead to chronic health problems.

"We have to be better prepared for these events," she says. "Last year was everyone's wake-up call that we need to be ready for the next big fire to happen."

The idea for the health study arose last year, as the largest and deadliest blaze in California's history – the Camp Fire – ravaged the northern part of the state. After the fire destroyed the city of Paradise in California's Central Valley and turned skies brown above the Bay Area, Nadeau and Prunicki realized their skills were needed.

The pair has long studied how air pollution in the central California city of Fresno alters immune cells and causes allergies and asthma. In April, they reported that 7- and 8-year old children living about 100 kilometres away from wildfires in 2015 were exposed to more pollutants than were those living near prescribed burns – small forest fires that are purposely set to reduce overall fire risk (M. Prunicki *et al. Allergy* 74, 1989–1991; 2019).

The researchers suspect that the difference is due to toxic chemicals released when wildfires burn synthetic materials in houses and cars. "Wildfire is like a giant slug of air pollution all at once," Prunicki says.

As the smoke from the Camp Fire hung over the Bay Area last year, she and Nadeau

scrambled to launch a small study tracking the effects of wildfire pollution on health. They collected blood and saliva from about 100 people, and asked them to return for assessments a few months later. "We didn't have time to collect tons of information, and it was sort of done in reverse," says Nadeau.

In February, they submitted a proposal for a larger study to an ethical review board. To fund the work, they set aside about US\$1 million from a grant they had received from the Parker Foundation in San Francisco.

The team is conducting the wildfire research in the Bay Area because the air quality is typically better than that of Fresno, says Nadeau. This should help her team to isolate the health effects of wildfire smoke from those caused by other environmental hazards.

The scientists also began an 80-person study last week to test whether air purifiers can limit any health effects from exposure to wildfire smoke. Half of the students in a college dormitory in Fresno have air-filter machines installed in their rooms, and the other half have a sham machine. The goal is to work out how much air filters help, and who needs them.

Michael Wara, an energy and climate policy analyst at Stanford, hopes to incorporate data from Nadeau and Prunicki's health studies into models on the costs and benefits of various policies to curb wildfire damage. "Fire is a climate-adaptation problem that California is confronting right now," he says, "and not in 2050, and not in 2100."

The researchers behind the northern California health study hope that its findings will help people around the world who are exposed to wildfire smoke. "This isn't just a problem for the [US] west," Nadeau says. "We need to know how to adapt better. Right now, people are left unaware."

Wildfires disrupt science

Power cuts have added to uncertainty for researchers.

The blazes that have torn through California since late October have prompted evacuations and power outages that have disrupted research.

The University of California, Berkeley (UCB), and the neighbouring Lawrence Berkeley National Laboratory (LBNL) were among the institutions in northern California that closed on 26 October as a result of a planned blackout that followed the Kincadee Fire, which broke out on 23 October near Santa Rosa.

This was the second outage in a month. The first, which occurred on 9–10 October when the Pacific Gas and Electric Company (PG&E) of San Francisco, California, cut power to reduce the risk of wildfires, caused the most chaos. One UCB lab moved freezers full of specimens to nearby facilities that still had power, while others stocked up on dry ice to keep their samples frozen.

But researchers say that things went more smoothly during the second blackout. That time around, university officials pre-emptively switched to a campus power plant before PG&E cut electricity to the area on 26 October. Despite the campus closure, researchers were still able to access facilities to check on their samples and experiments, but they had to scramble to relocate meetings.

A conference on the popular gene-editing technique CRISPR, scheduled for 26 October, had to be moved off campus, says Jennifer Doudna, a biochemist at UCB. Organizers streamed the meeting online for those who couldn't squeeze into the smaller space. "How can we be living in a state with the fifth-largest economy in the world and having power outages like this?" Doudna asks.

She hopes the situation will push lawmakers and PG&E to bolster the grid to avoid such disruptions in the future. "I don't think this type of climate is going away," says Doudna. "We have to plan for it."

UCB resumed normal operations on 29 October, and LBNL reopened on 30 October. In Los Angeles, another blaze, the Getty fire, prompted the University of California, Los Angeles, to cancel classes for one day on 28 October.

By Jeff Tollefson