Wildfire Smoke Is Poisoning California's Kids

Some Pay a Higher Price.

Somini Sengupta | Photographs by Chang W. Lee | Graphics by Nadja Popovich

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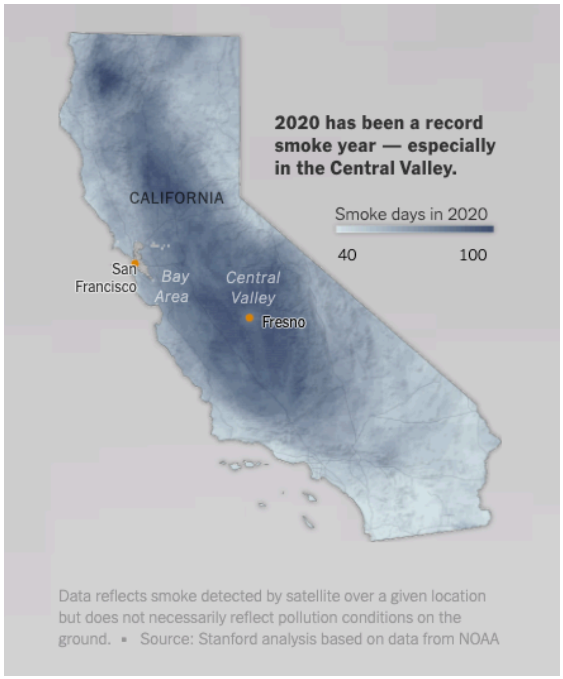
Patricio Gonzalez, 12, and his family.

FRESNO, Calif. — The fires sweeping across millions of acres in California aren't just incinerating trees and houses. They're also filling the lungs of California's children with smoke, with potentially grave effects over the course of their lives.

The effects are not evenly felt. While California as a whole has seen a steady uptick in smoke days in recent years, counties in the state's Central Valley, which is already cursed with some of the most polluted air, were particularly hard hit by wildfire smoke this year.

Data reflects smoke detected by satellite over a given location but does not necessarily reflect pollution conditions on the ground.

So for a child, it matters where you live. It matters how much foul air you breathe in on days when there are no fires at all. It matters whether your family can afford an air purifier at home or whether they can whisk you away when ash rains down from the sky.



Dr. Kari Nadeau, a professor of medicine at Stanford who specializes in pediatric allergies and asthma, said she worried that the damage to children might last a very long time. It is well-established that long-term exposure to fine particulate matter pollution, the kind that comes out of the tail pipes of cars and trucks, increases the risk of asthma in children and compromises their immune systems.

Her latest research suggests that exposure to wildfire smoke, which contains the same particulate pollution and more, is associated with genetic changes in children's immune cells. "It could," she said, "have irreversible consequences."

Already, an estimated 7.6 million children are exposed to wildfire smoke every year in the United States, and with climate change making the American West hotter and drier, many more children stand to be at risk. "This is a problem that's not going to go away," Dr. Nadeau said. "We are going to see these very extreme weather conditions and we should be prepared."

FRESNO, CENTRAL VALLEY

'An impending sense of doom'

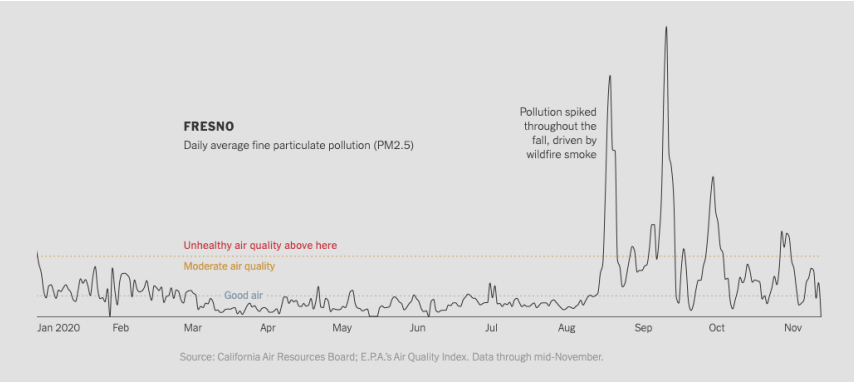
Patricio Gonzalez, 12

Patricio, a 7th grader, lives with his parents and his two younger siblings in a neighborhood flanked by several busy roads, an airport and agricultural fields that fill the air with dust.

Patricio has asthma. Even when there are no fires, there have been times when the air in California's Central Valley is so thick with pollutants that he wheezes and struggles for air or suffers from a rash of respiratory infections. The fires are an additional assault.

"Everything about this area screams bad air quality," Patricio said. "If you had a child with asthma or any person in your household with asthma and you wanted to move into this area, it's not a good idea. I don't recommend it."

It's been a rough year. First, remote schooling because of the pandemic. Then, a heat wave with temperatures peaking past 100 degrees. Then, in mid-August, fires burning to the north and east, pouring smoke into the valley.



Ash settled over every tree. The air smelled like charcoal. Patricio looked outside and told his mother, Gilda Zarate-Gonzalez, that he felt an "impending sense of doom."

Even by mid-October, when the smoke had subsided enough for Ms. Zarate-Gonzalez to propose a family bike ride, it looked as though someone had taken a giant gray crayon and smeared it across the horizon.

Fresno and its neighboring counties in the Central Valley rank first in the country for particulate matter pollution, according to the American Lung Association. Its childhood asthma rates are far higher than the statewide average. Several busy highways pass through Fresno. Dust and chemicals swirl up from the fields. Smoke gets stuck for long stretches of time until the winds can blow it westward to the Pacific.

Fresno County has had more smoke days than any other county in the state this year, the culmination of a steady rise over the past 10 years, according to data collected from the National Oceanic and Atmospheric Administration and analyzed by Stanford researchers. Through mid-November, there were 152 days when at least some part of the county was blanketed in smoke. Bay Area counties had about half the number of smoke days.

The Sierra National Forest in late October, after the Creek Fire hit the area.

Fresno is 55 percent Latino; 18 percent of its population lives below the poverty line. San Francisco, by contrast, is largely white and Asian, with 10 percent of its population living below the poverty line.

Ms. Zarate-Gonzalez's sister, Gabriela Zarate, who has had asthma since childhood, suffered much more

this year. She fell ill with a respiratory infection in October, went in and out of emergency rooms when she had trouble breathing, and got tested twice for the coronavirus. (She tested negative both times.)

Gabriela, a waitress, can't stay home. In November, she got called to work at a large banquet. "I couldn't believe it," Ms. Zarate-Gonzalez said. "Essential workers doing the only thing they can do to pay their bills, while risking their lives."

Ms. Zarate-Gonzalez, who has a masters in public health and is now earning a doctorate, wants local officials to do more to cut the risks: reduce traffic, for instance, when wildfire smoke worsens air pollution, and improve the ventilation system in public school buildings.

For now, it falls to her to adapt. She closes the windows of their two-bedroom house so outdoor air doesn't get in. She changes the air-conditioner filter often. She has an air purifier that travels from room to room with Patricio. She would like to buy two more, but that will have to wait until they go on sale.

It upsets her that, through no fault of his own, Patricio can't play outdoors when his siblings can. "We just show him we adore him and love him and that's the reason he can't go outside," she said. "When the air is that bad and we are adding the fires to it, it's not a good idea."

SAN FRANCISCO

'I got hives from nowhere. It started to get hard to breathe.'

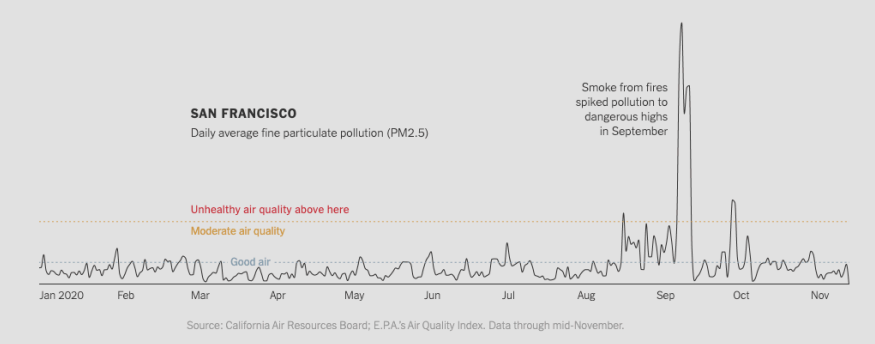
Robin Fletcher, 16

One afternoon in August, a few days after a ring of lightning fires had turned the skies around San Francisco orange, Robin Fletcher, 16, took her dog for a walk.

Within 10 minutes, her face turned red. Her arms broke out in hives, then her stomach. Her chest tightened. "It was stressful and scary, so I started crying," Robin said. "Not hyperventilating. But freaking out, kind of."

Robin has had allergies since she was little, which also makes her prone to asthma. That afternoon, her inhaler didn't help, nor her EpiPen. Only steroids, administered in an emergency room, could temper her severe anaphylactic reaction.

To this day, neither her family nor her doctors know what brought it on. Resin from a burning tree? Cars that had gone up in flames? Other chemicals? Wildfire pollution can contain toxic metals, petroleum products, plastics and carcinogens.



"That's what's so terrifying," her father, Arthur, said. "It looked beautiful. But there's stuff out there, floating."

Unlike the Central Valley, the air in the San Francisco Bay Area is gloriously clean for much of the year, and Robin can usually keep her asthma in check. She plays lacrosse and soccer. Her private school shuts down for a few days at a time when wildfire smoke is bad. She is in a clinical trial, supervised by Dr. Nadeau, to overcome her allergies.

At home, too, she is well protected. Her mother is a doctor. Her father has installed an electrostatic air filter in the ventilation system, which cleans and humidifies the air as it circulates through the house. There's a stash of N-95 masks in the basement.

And since the day of the anaphylactic attack, Robin has acquired two new tools: an air quality app on her phone, and a tube-shaped device to check her lung capacity. She uses them both to assess whether it's safe to go outside.

"I know I can keep myself safe," Robin said, "but it's something on my mind."

On Dr. Nadeau's mind is what happens next. Even after the smoke clears, she wants to know, how long might the damage last in children exposed to these sharp spikes in pollution?

There are clues in a robust body of research on the health effects of conventional particulate matter pollution. Exposure to that kind of air pollution is associated with a greater risk of preterm births among pregnant women, more severe asthma symptoms among children and, as Dr. Nadeau concluded in an earlier study, changes in children's immune system cells.

Her more recent research, with her Stanford colleague, Dr. Mary Prunicki, suggests that children like Robin, exposed to even short bursts of wildfire smoke, show changes in their immune system genes — in particular those genes that can help the body respond to allergens further down the road.

What is not yet known, and what Dr. Nadeau seeks to examine in the months ahead, is how children exposed to chronic air pollution and then to acute episodes of wildfire smoke, like Patricio in Fresno,

might be affected differently. “Most likely, the wildfires are another hammer on their systems,” Dr. Nadeau said. “That hammer is a dangerous hammer.”

IN THE FOOTHILLS OF THE SIERRA NEVADAS

‘He feels like he’s being punished being kept indoors all the time’

Natalie Blake, mother of Benjamin Tate, 8

There were so many good reasons for Natalie Blake to bring her son, Benjamin, up to the western foothills of the Sierra Nevada mountains.

Ms. Blake wanted to leave the San Francisco Bay Area. Her parents had bought a house on a large plot of land near a gateway to Yosemite National Park. Benjamin could stay with them while she worked at a supermarket in town. He could run around in the hills.

What she hadn’t quite accounted for, though, is how the hills are becoming hotter, drier and more dangerous.

A year after they moved came the first of an annual series of wildfires, and an asthma diagnosis for Benjamin. One year, they had to evacuate from their home for a few days. Another year, they bought air-conditioners so they could keep the windows shut when the air got thick and smoky. This year, just as it seemed like Benjamin’s asthma was subsiding, came the Creek Fire in the hills nearby. The air turned white with smoke. The boy had what appeared to be a mild asthma attack.

Ms. Blake struggles to explain to him why he can’t be outside exploring. She worries when he goes to school. She wonders how much longer the family will be able to insure their home if rates climb higher — and what they’ll do if insurance becomes unavailable at any price.

“It seems every year there’s some major fire,” Ms. Blake said. “We’re smoked out. It’s hard to breathe. It’s always a worry that you’re going to have to flee or you’re going to lose your home.”
Rural counties like this one, pressed against the Sierra Nevada mountains, are especially vulnerable as heat waves and droughts leave hillsides littered with dry brush and dead trees that act as kindling. High winds carry flames across vast expanses, producing monstrous clouds of smoke and uprooting ancient trees.

The Creek Fire has incinerated nearly 380,000 acres since early September. It is part of an unmistakable trend: Of the state’s 20 largest fires, 18 have come since 2000.

Marshall Burke, an economist at Stanford, has found that, across California, as the number of smoke days has risen over the past 15 years, it has begun to reverse some of the gains that the state had

Smoke from the Creek Fire hung over the Sierra National Forest in late October. Officials have said they hope the blaze will be out by the end of November.

made in cleaning up its air from conventional sources of pollution.

As the father of an 8-year-old girl with asthma, Mr. Burke has an intimate understanding of what that means. He has spent in the neighborhood of $1,000 this year to equip his suburban Bay Area home with sensors that measure air quality indoors and out, and air purifiers that hum quietly inside. When the smoke was getting really bad this summer, he took his family out of the state for three weeks.

"To protect my children of course I'm going to do that," he said. "But it's fundamentally unfair."

CLOVIS, FRESNO COUNTY

'This is insane. It smells like there's a thousand barbecues going on.'

Katie Wells, 15

The Wells family lives in a suburb between Fresno and the Sierra Nevada mountain range. Katie, 15, and Ryan, 12, both have asthma. Every year, when the fires kick up, their eyes itch and water, their chests feel congested. Ryan says he sometimes feels wiped out. Katie says she sometimes tastes smoke in her mouth.

This year, with the Creek Fire burning in the hills, smoke seeped into the house. They had to clean off the ash that coated their rooftop solar panels so they could draw energy from what little sun came through the smoke clouds. The kids' swim practice was suspended for days at a time, the air was so foul.

Courtney, their mother, said the family has discussed moving, mainly for the health of the children. Maybe to Idaho or Washington, any place where the sky is what Courtney called "true blue," at least most of the time, when there are no fires.

But moving isn't easy. Ms. Wells, a surgical assistant, grew up here. Her parents live down the road. Her husband is a math teacher, and California teachers' salaries are better than in many places. "We would love to leave but it's just not an option," she said. "We're just kind of stuck for now. We say, 'A few more years, just a few more years.'"

The other day, the children came outside briefly when their remote classes broke for lunch. They looked up at the sky and discussed going for a bike ride. The air quality index had been unhealthy that morning. Now, it was only unhealthy for those with health conditions like asthma.

REEDLEY, FRESNO COUNTY

'When it was really bad with fires, they would not even go outside'

Martha Calleres, grandmother of two asthmatic children

Martha Calleres lives in a house of inhalers. She has asthma. Her adult son has asthma. Her two grandchildren, ages 5 and 2½, have asthma. They share a rented two-bedroom house on a busy corner. When the fires burn, smoke finds its way into the house. She can smell it.

Ms. Calleres blames that smoke for the asthma attack she had one evening in September. Her inhaler offered no relief. Nor the nebulizer. Nothing helped, only a strong shot of steroids when her husband, Victor, brought her to a doctor's office the next morning.

This year, the whole family has been focused on keeping the grandchildren safe. Every week, Mr. Calleres washes the cloth filters that sit inside the window air-conditioners. They wipe the dust from the ceiling fans. They let the kids run in the backyard when the air quality is tolerable. Otherwise, for days at a time, they stay indoors. "I worry about them a lot," Ms. Calleres said.

Like many children in the valley, they've been remote-schooling at home. Several doctors in the area said that had protected them from exposure to smoky air and more severe respiratory ailments. Hospitalizations and doctor visits are lower this year than they had feared.

Ms. Calleres had been eyeing the air purifiers that she sees in her doctor's office. But they are out of financial reach. She and her husband are retired; her son has been unemployed since the pandemic. In

November, she finally found a model she could afford: one of the least expensive available, at around $80. She bought two.

“I know we need them desperately right now,” she said.

The Sierra National Forest last month.