In March, scientists in India started seeing signs that a new SARS-CoV-2 variant was causing a rise in infections. The XBB.1.16 lineage has displaced others that drove case surges in India several months ago, says Rajesh Karyakarte, a microbiologist at Byramjee Jeejeebhoy Government Medical College in Pune, India. "We see that it has almost replaced all other variants in India, and we think the same thing will be followed everywhere."

In a study posted to the medRxiv preprint server, Karyakarte and his colleagues analysed more than 300 cases, from last December to early April, and found that XBB.1.16 infections tend to cause mild symptoms similar to those of earlier Omicron variants, with few hospitalizations and deaths (R. P. Karyakarte *et al*. Preprint at medRxiv https://doi.org/j8k6; 2023). "We didn't see much," Karyakarte says. The study has not yet been peer reviewed.

The World Health Organization declared XBB.1.16 a 'variant of interest' on 17 April. But whether it or another new variant will cause a spike in infections in a particular country will probably depend on the size and timing of the country's earlier waves, says Tom Wenseleers, an evolutionary biologist at the Catholic University of Leuven in Belgium.

He estimates that XBB.1.16 is spreading fairly rapidly in the United States, where it is now estimated to make up more than 11% of cases. In Europe, the variant is less prevalent and is spreading more slowly. This could be due to Europe's relatively large and recent spike in infections caused by a closely related variant, XBB.1.5, which struck earlier in the United States.

Wavelet, surge, repeat

Some countries are experiencing surges of infections three or four times each year, driven largely by the breakneck pace at which the virus continues to change, says Bedford. Currently, SARS-CoV-2's spike protein, in which most immunity-evading mutations occur, is evolving at twice the rate of a similar protein in seasonal influenza and about ten times as quickly as those of cold-causing 'seasonal' coronaviruses.

Influenza and common-cold coronaviruses cause seasonal epidemics in part because of favourable transmission conditions, such as people spending more time indoors during winter. The combination of rapid mutation and short-lived human immunity is probably preventing SARS-CoV-2 from settling into seasonal patterns of circulation, says Wenseleers.

The stubbornly high frequency of SARS-CoV-2 surges means a large number of infections. Data from the now-defunct UK survey of SARS-CoV-2 prevalence suggested that the country had as many infections as residents in the last year, which equates to a 100% annual 'attack rate', says Bedford. In the future, "we can still imagine 50% attack rates every year, half the population getting infected", compared with around 20% with influenza.

There is little doubt, however, that SARS-CoV-2's continuing ebb and flow is causing fewer problems than in the past.

In South Africa, the country's health systems would quickly send notice if COVID-19 hospitalizations and deaths were on the rise, says Waasila Jassat, a public-health specialist at the country's National Institute for Communicable Diseases in Johannesburg. "That doesn't seem to be have been the case for many, many months," she says.

In the year and half since the Omicron variant emerged, COVID-19 deaths have remained stubbornly high and the toll has been around ten times that typically caused by influenza, says Wenseleers. But, still, large infection waves are causing smaller ripples in hospitalizations and deaths. "It gives most people the hope that, in the coming years, the net toll of COVID will get comparable to influenza," he says.

AIR POLLUTION IN CHINA IS FALLING — BUT THERE IS A LONG WAY TO GO

Easy gains from upgrading power-plant smokestacks will be strengthened only by deeper policy changes.

By Dyani Lewis

Over the past decade, China's once-pollution-choked skies have steadily improved, according to more than two decades of atmospheric measurements taken by NASA satellites. But researchers say that there is still a long way to go to clean China's air and protect the health of its citizens.

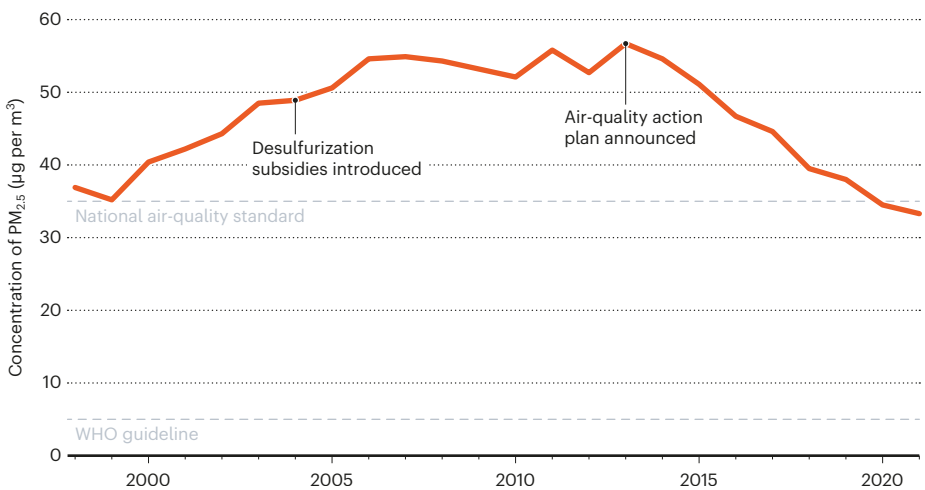
The speed at which China has reduced its air pollution has been "impressive", says Chi Li, an atmospheric scientist at Washington University in St. Louis, Missouri, and is the result of technological solutions and ambitious policies.

Each year, air pollution is responsible for more than four million premature deaths globally — including an estimated one million in China — primarily from heart disease, lung cancer and respiratory illnesses. Fine particulate matter with a diameter of 2.5 micrometres or less — referred to as $PM_{2.5}$ — is the most concerning air pollutant, says Li.

Washington University's Atmospheric Composition Analysis Group, which Li is part of, monitors various pollutants and estimates their global-health impacts. The data for China show that from the late 1990s, average annual $PM_{2.5}$ exposure in the country rose from 35 to more than 50 micrograms per cubic metre, before levelling out in around 2006 at between 50 and 60 (A. van Donkelaar *et al. Environ. Sci. Technol.* **55**, 15287–15300; 2021). Since 2013, $PM_{2.5}$ levels have steadily declined, and in 2021,

FRESH AIR

China's efforts to tackle air pollution have led to a steady decline in the concentration of airborne fine particles ($PM_{2.5}$). But levels are still far above the guideline recommended by the World Health Organization (WHO).



SOURCE: ATMOSPHERIC COMPOSITION ANALYSIS GROUP, WASHINGTON UNIV. ST. LOUIS

the average annual exposure was 33.3 micrograms per cubic metre (see 'Fresh air'). That's below the nation's air-quality standard of 35, but still much higher than the recommended level set by the World Health Organization (WHO), based in Geneva, Switzerland. In 2021, the WHO lowered its recommended annual-exposure limit for $PM_{2.5}$ from 10 to 5 micrograms per cubic metre, a level that most countries, including the United Kingdom, Germany, the United States and Canada, exceed.

Smokestack solutions

The decline in China's $PM_{2.5}$ is the result of targeted efforts over the past two decades to address poor air quality. Upgrades to coal-fired power plants have had the biggest effect so far, says Qiang Zhang, an atmospheric scientist at Tsinghua University in Beijing.

Since 2004, the Chinese government has provided subsidies to retrofit smokestacks in coal-fired power plants with filters to remove sulfur dioxide — a molecule that reacts with other compounds in the atmosphere to form $PM_{2.5}$ particles — from emissions.

In 2013, China released its air-pollution prevention and control action plan, which further tightened standards for industrial emissions, and shut down small, inefficient power generators and industrial operators.

An analysis by Zhang and his colleagues shows that these measures accounted for 81% of the reductions to $PM_{2.5}$ emissions between 2013 and 2017 (Q. Zhang *et al. Proc. Natl Acad. Sci. USA* **116**, 24463–24469; 2019).

Further reductions could lead to fewer heavy-pollution days — driven by industrial emissions and cold weather that prevents dispersal — when the daily $PM_{2.5}$ concentration can exceed 200 micrograms per cubic metre. Last year, China's government set a target to eliminate heavy-pollution days by 2025.

Energy transition

Zhang says that the air-quality improvements from end-of-pipe technologies, such as smokestack filters, will eventually be exhausted. "Energy and climate policies would definitely play more important roles in the future," he says. These include efforts to supply more households with gas or electric heating systems in parts of rural China that still rely on coal and wood-fired stoves.

Electrical grids in rural areas are being upgraded to accommodate the increased capacity required for domestic heating, says Zhang, and the renewable-energy sector is expanding. But there's "still a long way to go" before coal-fired power is replaced, he says.

China's goal to become carbon neutral by 2060 will help to achieve that transition, and will keep its air pollution trending downwards, says Li. "It will ultimately be more and more clean in the future if the electricity source gets cleaner as well," he says.

OMER ERDEM/ANADOLU AGENCY/GETTY

Smoke rises during clashes in Khartoum on 19 April.

SUDAN'S RESEARCHERS FLEE VIOLENT MILITARY CONFLICT

Clashes have left hospitals and universities without power and vulnerable to takeover by armed groups.

Sudan's academics and students have been forced to abandon universities and residential campuses because of heavy artillery and aerial bombardment in the capital, Khartoum, and other major cities, as clashes have erupted between warring military factions.

The violence, which began on 15 April, is between members of the country's army, the Sudanese Armed Forces (SAF), and a rival paramilitary group called the Rapid Support Forces (RSF). Although a temporary ceasefire is in place, street battles and explosions are still being reported in Khartoum.

The conflict has killed more than 450 people and injured more than 4,000 others, according to the United Nations. Thousands more are on the move, looking to find a safe place. Most of the injured people are unable to access medical attention. Nearly two-thirds of hospitals in Khartoum are closed, says the World Health Organization.

"This was an unexpected conflict," says Deen Sharp, an urban geographer at the London School of Economics and Political Science, who is based in Khartoum. Sharp is compiling a list of academics in Sudan who need money, food, water and medicines. "No one was really prepared."

Sudan's people have lived mostly under military rule since they gained independence from the United Kingdom and Egypt in 1956. Mass protests in 2019 overthrew a three-decade dictatorship, but the army remains the most powerful institution.

Nature spoke to three researchers in Sudan who are among the millions of people caught up in the turmoil.

HISHAM BILAL 'WE DIDN'T HAVE WATER'

I woke up on the morning of 15 April to a phone call from my sister. I was planning to go to the university that day, but she told me she had heard the sound of clashes.

The University of Khartoum is close to both the SAF headquarters and the RSF headquarters. Almost 90 students and faculty members living on the campus were stranded. They moved to the basement where they hid with some staff members for days. They were freed three days later, but one of the students died from gunfire and had to be buried in the grounds of the engineering campus.

I was living on another university campus with my wife and children, close to a military