

Ozone worsens other deadly health effects of globally generated wildfires

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One of the very dangerous consequences of global warming is the growing incidence of wildfires. Not only do they cause extensive physical destruction, but they put huge quantities of smoke into the atmosphere, severely impacting human health. This pollution can travel long distances from the direct effects of such fires, as witnessed earlier this year in the northeastern US due to wildfire smoke originating in western Canada and the US.

This smoke includes a witches' brew of gases and particles that can have deleterious consequences for human health. Among these are small particles called PM2.5, which can penetrate lung tissue and cause respiratory and cardiovascular harm, including aggravated asthma, decreased lung function, heart attacks, strokes and increased premature mortality. This has been known for some time. A less well-known but also dangerous component of wildfire smoke is ozone, which is a highly reactive molecule composed of three oxygen atoms (O₃), as opposed to naturally occurring two-atom oxygen—O₂.

Ground-level ozone is a secondary pollutant that is formed by chemical reactions of primary pollutants, such as nitrogen oxide, and volatile organic compounds, carbon-based chemicals that easily turn into gas from the liquid phase. Consequently, ground-level ozone concentration, which is distinct from the ozone layer in the stratosphere, is sensitive to meteorological factors, such as solar radiation, temperature, humidity and wind speed, as well as local land use.

In the upper atmosphere, ozone provides protection against excessive solar radiation reaching the earth's surface. It will be recalled that a number of years ago there was concern regarding the formation of "hole" in the ozone layer due to the emission of

chlorofluorocarbons (CFCs) used, among other things, as refrigerants. These chemicals were then banned.

At ground level, however, ozone gas has serious negative consequences. It is toxic to the lining of human airways, not to mention other animals. It is known to cause asthma among children and heart disease and respiratory problems in adults. It has been linked to premature death.

Concentrations of ground-level ozone are monitored at approximately 1,200 locations in the US, mostly in urban areas.

A recent study by a team headquartered at the University of Iowa, published in the journal *Science* ("Fires reverse progress toward ozone air quality standards in the United States," 4 June 2026), used data from a variety of sources, including satellites, surface measurements and atmospheric models, processed using artificial intelligence, to generate a detailed map of ozone levels across the country.

The study revealed that both PM2.5 and ozone levels were declining during the early 2000s, due at least in part to the consequences of the Clean Air Act's implementation. However, beginning in 2015, both began to rise, though this trend went undetected at the time. This reversal is attributed to air pollution resulting from the increase in wildfires due to global warming. The researchers estimated that between 2022 and 2024, 43 million people were exposed to potentially hazardous levels of ozone.

In a separately published review in *ScienceAdvances*, the authors observe:

After correcting for meteorological variability, smoke contribution to daily ground-level O₃

[ozone] can reach up to 6.9 parts per billion (16% increase relative to nonsmoke days) at certain US monitoring locations, averaged over all smoke days from 2006 to 2023. Smoke O3 patterns are poorly correlated with smoke PM2.5 patterns, demonstrating that their health impacts do not necessarily coincide in space and time. We estimate that smoke O3 can lead to 2045 annual excess deaths (95% confidence interval: 1325 to 2755) averaged across 2006 to 2023 using established exposure-response functions of all-source O3 exposure.

Among the most concerning findings is that the spread of elevated levels of ozone and the spread of particulate materials don't necessarily coincide, meaning that the ill effects of elevated ozone can occur in areas not experiencing visible smoke, making them invisible and unnoticed without specific, intensive monitoring.

It warns that:

Increasing fire activity and the smoke they generate pose a substantial threat to the environment and public health globally. In the US, fire-burned area has more than quadrupled over the past three decades, largely driven by increased fuel aridity and fire weather conditions under climate change, historical fire suppression especially in the western US, and the expansion of human activities into forested areas.

The illness and death caused by increases of ground-level ozone due the elevated frequency and extent of wildfires is in addition compounded by other wildfire-generated pollutants, such as PM2.5 particulates. In a separate study published last year in *Nature*, the authors conclude that in the US alone:

We project that smoke PM2.5 could result in 71,420 excess deaths (95% confidence interval: 34,930–98,430) per year by 2050 under a high-warming scenario (shared socioeconomic pathway scenario 3-7.0, SSP3-7.0)—a 73% increase relative to

the estimated 2011–2020 average annual excess deaths from smoke. Cumulative excess deaths from smoke PM2.5 could reach 1.9 million between 2026 and 2055.

With climate change accelerating due to the uncontrolled emissions of greenhouse gases from human activities resulting in continuing global warming, the frequency and extent of wildfires caused by the resulting hot/dry conditions means that the impact of increased ground-level ozone will rise along with the other negative effects of wildfires in the US. This is compounded by the projected number of deaths due to particulate pollution from wildfires. The catastrophic global impact will be greatly increased by similar conditions around the world. The knock-on effects, including physical and human, will be immense.

The deadly impact of a capitalist system intent upon maximization of profit, by any means necessary, including war and dictatorship, regardless of the consequences, including its unwillingness and indeed inability to effectively address global warming, can only be averted through the combined effort of a united global working class replacing this putrefying system with socialism.



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