Catastrophic wildfires, corporate air pollution, and COVID-19: A collision of crises

By Henry Hakamaki
21 September 2020

The author is a guest contributor working as a graduate immunobiology researcher in Germany.

Devastating wildfires that have broken out across the western United States, particularly in California, Washington, Oregon, and Idaho, which at latest count have claimed 33 lives and 4.6 million acres of land, are increasingly creating the potential for three major crises to collide: wildfires, air pollution and the coronavirus pandemic.

Air quality indexes, measures of the amount of particulate present in the air, in Portland and Seattle are currently being recorded as the worst in the world due to particulates emitted from the ongoing wildfires nearby. The scientific data suggest that residents of these cities (and much of the Pacific coast of the United States as well as British Columbia, which all currently are experiencing incredibly poor air quality) will simultaneously be facing an increased risk of developing COVID-19 as well as an increased risk of severe disease if infected.

Meanwhile, corporations nationwide have been given the green light by the current administration to emit as many air pollutants as they see fit, only further escalating the assault on the environment and the blatant disregard for the health and safety of working people across the country.

While seemingly disparate crises, the wildfires driven by climate change, the corporate attack on American citizens for the sake of profit, and the COVID-19 pandemic all have effects that intertwine with one another.

The effect of corporate practices that shirk environmental regulations, along with politicians from both major parties passing regulations that are far too lax in the first place, is well documented in regard to climate change. Climate change in turn has exacerbated the wildfires across the West Coast.

What is less well documented in the media is the effect of air pollutants, due to both corporate emissions and particulate matter released by the massive wildfires, on the risk of infection and the risk of death due to COVID-19.

Air pollution caused by the wildfires will exacerbate the COVID-19 crisis due to both immunological and sociological factors. Research has suggested that particulate matter in the air, due to industrial pollution, the burning of fossil fuels, and now the fires on the West Coast, increases the likelihood of infection by COVID-19 and the likelihood for severe disease. Meanwhile, the fires themselves are forcing mass evacuations of individuals, creating *de facto* climate crisis refugees, putting them into close contact with other individuals and creating a veritable breeding ground for COVID-19 transmission.

From an immunological standpoint, two factors are at play in regard to the effects of the air pollution and COVID-19: increases in likelihood for infection and increases in severity among individuals who are infected.

In April, data from a large cross-sectional study was released as a preprint by researchers at Harvard using county-level data of nearly every county in the US. This study accounted for more than 20 other variables, and then compared COVID-19 deaths and long-term air quality data in each county. The results were striking. It was determined that just 1 microgram per cubic meter of PM2.5 (particulate matter smaller than 2.5 microns in size, small enough to be inhaled deeply into the lung) was associated with an 8 percent increase in COVID-19 fatalities.

Since then, a similar analysis was conducted using data from the Netherlands, which found that the same increase in PM2.5 levels, 1 microgram per cubic meter, increased the number of cases of COVID-19 by 7.2 percent, and an increase in COVID-19 fatalities of between 9.4 percent and 15.1 percent.

For comparison sake, Portland's PM2.5 level at the time of writing is over 400 micrograms per cubic meter, whereas on Thursday, September 3, the PM2.5 level during the day in the city was 5 micrograms per cubic meter. The higher figure represents an increase of 395 times the difference cited in the studies above.

It has been known for quite some time that air pollution, particularly airborne particulate matter, is a significant risk factor for cardiovascular pathology, being responsible for 5 million deaths in 2017 alone, and being linked to death in individuals with heart or lung disease, heart attacks, aggravated asthma, decreased lung function, and respiratory inflammation.

These pathologies have been linked directly to increased severity of COVID-19 infections, and increased risk of death due to COVID-19. Other studies have since found increases in COVID-19 infections and deaths in areas with higher airborne particulate levels in the UK and an increase in deaths in some

regions in Italy.

The immunological reason why airborne particulate matter increases the likelihood of infection and death due to COVID-19 is increasingly becoming understood. The ACE2 receptor on the surface of human cells acts as the main entry point for SARS-CoV-2, the virus responsible for COVID-19, to enter the cell by binding with the spike protein of the virus.

It is currently hypothesized by scientists that increased expression of ACE2 on the cell surface will increase the severity of COVID-19 infections by allowing for more points of viral entry, though the data on this front is not quite clear, as ACE2 also has anti-inflammatory effects that may be beneficial in late-stage infection.

A study published in 2018 showed that exposing mice to PM2.5 particles for both two days and five days significantly increased the expression of ACE2 on the lung cells of the mice. If this finding in mice also holds true in humans, it could provide some evidence as to why regions with more air pollution, even when controlling for all other confounding factors, record more cases and more deaths due to COVID-19 than areas with lower air pollution levels.

Essentially, higher air pollution would increase the ACE2 expression on the lung cells of individuals living in those areas, allowing for increased viral entry to the cells, and more infections and more severe disease among infected individuals.

In addition to potentially allowing more viral entry to cells via increased ACE2 expression, airborne particulate matter, when in the lungs, induces inflammation of the lung cells. The most severe damage in COVID-19 infections is actually caused by an overreaction by the innate immune cells, and this overreaction is driven by proinflammatory cytokines, the same signalling markers that are present at increased quantity in lungs exposed to high levels of airborne particulate matter.

The chronic inflammatory state of individuals in areas with very poor air quality would increase the likelihood for what is known as a cytokine storm, where massive amounts of pro-inflammatory cytokines are released by the innate immune system, and which is likely responsible for the severity of the most severe cases of COVID-19.

Furthermore, data suggest that exposure to higher levels of airborne particulate matter is associated with changes in blood coagulation, tending towards hypercoagulability. This may also play some role in the severity of COVID-19 infections of individuals in areas with poor air quality, as coagulopathy has been noted as one of the more severe outcomes associated with COVID-19 infection. These immunological effects of airborne particulate matter all could play major roles in the risk of infection and severity of infection by COVID-19.

The wildfires on the West Coast are not simply increasing the likelihood for infection from an immunological standpoint, however. The wildfires are currently forcing hundreds of thousands of individuals to evacuate, oftentimes to high schools where social distancing would be much more difficult to achieve than at their own homes.

In Oregon alone, over 500,000 residents are under varying levels of evacuation orders, many of whom will soon be forced to live in close proximity to others. This intermingling of individuals dramatically increases the likelihood of transmission of COVID-19, as the closer the contact between individuals, the higher the probability of infection occurring if any individuals being forced together are infected.

To compound problems nationwide, the EPA drastically relaxed environmental regulations on March 26, including emissions regulations, due to the pandemic. This relaxing of regulations will allow corporations to emit as much air pollutants as they want, as long as they claim they are “acting responsibly.”

The inevitable increase in air pollutants due to this decision by the EPA will only exacerbate the COVID-19 crisis in communities where the majority of the emissions are taking place. Through this action, air quality levels will be expected to deteriorate wherever major corporations operate.

This means that not only are individuals suffering through air quality issues due to the wildfires on the West Coast at risk for the immunological impacts of airborne particulate matter for COVID-19, but individuals nationwide will be forced to suffer more severely due to the never-ending search for more profits by the corporations, irrespective of any impacts on public health.

The disregard for the working class by the government and big business interests over the course of decades has laid the groundwork for the convergence of these crises, and until the working class stands up and demands that their health take priority over profits, it should be expected that these crises will continue unabated.