



## Wildfire Smoke and Your Health

By Dr. Delia Roberts

With BC bracing for another record setting wildfire season, it is very likely that summer will be filled with smoke filled skies over much of the province. Wildfire smoke contains several components that are harmful to health including the poisonous gases ozone and nitrogen oxide, but it is the fine particulates that are the most worrisome. Known as PM2.5, these particulates are so small that they can remain airborne for a long time. Because of this they can travel very long distances and may even be present in high enough concentrations to cause health problems when smoke is not visible.

The health consequences of short and long-term wildfire smoke exposure are not yet fully understood. Much of the information is based on monitoring the effects of general air pollution, but there have also been a few studies

that specifically looked at smoke exposure in wildland firefighters. We do know that due to their small size, PM2.5 are easily carried into the lungs during breathing. There they can cause inflammation of the cells lining the respiratory tract and even pass through the delicate tissues of the lung into the bloodstream. In this way the particulates can be carried throughout the body where they may also irritate the lining of the blood vessels, including those that supply the heart with blood. There is even some evidence that PM2.5 can pass into the brain and nervous system. One interesting study that looked at data from the popular puzzle game *Lumosity* found that players experienced a drop in performance with short-term wildfire smoke exposure (Cleland et al 2022).

People can be more or less sensitive to wildfire smoke. Conditions like asthma and other respiratory diseases make lung tissue more reactive and thus more susceptible to problems from smoke inhalation. Children and infants, pregnant people, seniors and smokers may also experience problems at lower levels of PM2.5 due to the way their lungs function. Similarly, those with other health issues such as heart disease, cancer, diabetes, and Alzheimer's may have a higher level of risk for health complications when exposed to wildfire smoke. Reports of increased rates of heart attack and stroke and worsening of other existing health conditions with wildfire smoke are widespread. One recent study examined data on fires, weather, and land use in Mexico, USA and Canada from 2001 to 2021. This information was georeferenced along with reports of wildfire smoke particulates and the number of deaths in the USA. The findings indicate that there is a direct relationship between mortality rate and increased levels of PM2.5. The study predicts that climate-induced smoke PM2.5 could lead to an increase in the range of 50-75% increase in excess deaths per year in the USA (Qiu et al 2024).

The composition of wildfire smoke can vary somewhat depending on the type of fuel being burned. For example, if the fire crosses into urban areas, levels of toxic gases may increase. This factor, combined with varying sensitivities to smoke make it important to monitor the appearance of symptoms in order to assess the health risk. The first signs of health problems with wildfire smoke are the relatively mild symptoms of



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irritated eyes, nose and throat. There may be increased mucous production and or a mild cough. As exposure progresses, symptoms may include headaches and a temporary decrease in lung function including the ability to exchange oxygen and carbon dioxide, or clear viruses and bacteria from the respiratory tract. This may cause breathing difficulties and an increase in susceptibility to infections including flus, colds and bronchitis. More severe symptoms that require immediate medical attention include dizziness, a severe cough, chest pains, shortness of breath or wheezing (including asthma attacks) and heart palpitations (irregular heartbeat) which may signal a heart attack. If you have a pre-existing medical condition that places you at high risk with wildfire smoke exposure, it's a good idea to discuss a plan with your primary health care provider. You may need additional medications and they can help you determine what other assistance you may need.

In spite of the pervasiveness of smoke you can do some things to protect your health during wildfire season. The Air Quality and Health Index is a measure of how much of a health risk is caused by the pollutants in the air including PM2.5 and some of the gases that affect health. Reported as the AQHI, the scale ranges from 1-10 where levels 1-3 represent healthy air quality that we normally experience in British Columbia. At levels 4-6 the air quality is diminished but most people will not experience any symptoms. However, those with more sensitive lungs or other health issues may need to restrict outdoor activities. When the scale reaches 7-10 even those with healthy lung function will experience symptoms and outdoor activity should be kept to a minimum. The highest level is AQHI10+ which poses a serious health risk. At this maximum level on the scale, the air quality may continue to get worse but is not reflected in the AQHI score as the scale doesn't go any higher. You can get an idea of

the health risk from wildfire smoke by checking the [current AQHI rating for your area](#). But because the monitoring stations are very widespread, and the PM2.5 can travel long distances, the closest AQHI may not reflect the actual level of health risk at your location. As a result it's very important to be aware of the symptoms of exposure to wildfire smoke and to modify behaviour accordingly.

Ways to reduce your risk of health complications with when the AQHI is high are to stay indoors and restrict fresh air flow into the building by closing the windows and doors. Using a good quality air filter like a HEPA filter in your furnace or fan can also help. Although many air filtering devices are expensive, simple plans to build a very effective home-made filtering fan are widely available. Using a mask may also help, but for a mask or respirator to be effective they must be properly fitted with no air leaks and a NIOSH certified N95 or equivalent filter. Keep in mind that masks and respirators help to filter out the PM2.5 but they do not filter out the poisonous gases in wildfire smoke. Although it's very important to limit smoke exposure, don't forgo your daily exercise as being active can help provide protection against many diseases including reducing anxiety. Instead of going outside, move your walking route to places like indoor malls or ice-skating arenas, or use an indoor bike or rowing machine. Limiting yourself to indoor exercise might even provide an opportunity to begin a strength program if you have access to a gym, or even a calisthenics routine in your living room. Use elastic banding, a backpack loaded with rocks, or 4 litre jugs filled with water to increase the resistance and work up a sweat.

Wildfire has become an expected part of summers in much of North America. With the severe drought conditions and warmer weather experienced here in British Columbia we know that it is

very likely that the fires this year will be devastating. Protect yourself and your family by preparing at home and in the workplace as much as possible.

### For more information about wildfire smoke and your health:

Government of Canada Weather: [Weather Wildfire Smoke and Air Quality Information](#)

BC Centre for Disease Control: [Wildfire Smoke and Air Quality Fact Sheets](#)

BC Centre for Disease Control: [Home-made Air Filter Instructions](#)

### Sources:

Cleland SE, Wyatt LH, Wei L, Paul N, Serre ML, West JJ, Henderson SB, Rappold AG. Short-Term Exposure to Wildfire Smoke and PM2.5 and Cognitive Performance in a Brain-Training Game: A Longitudinal Study of U.S. Adults. *Environ Health Perspect.* 2022 Jun;130(6):67005. doi: 10.1289/EHP10498. Epub 2022 Jun 14

Qiu M, Li J, Gould CF, et al. Mortality Burden from Wildfire Smoke Under Climate Change. [Working Paper 32307](#) National Bureau of Economic Research. Cambridge, MA. April 2024. 🌱