Air Pollution, Smoking and Protecting Gains for Public Health in a Pandemic Driven by Viral Pneumonia[1]

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Key Messages

- Air pollutants and the SARS-CoV-2 virus target our respiratory system
- Pollutants from outdoor air pollution, wildfire smoke, household air pollution, and vaping or smoking contribute to respiratory infections and can worsen the severity of COVID-19
- Existing science can be used to mitigate climate change and address health disparities and shift away from fossil fuels, while lowering air pollutants and reducing respiratory infections

Introduction

Breathing clean, fresh air is a luxury which not everyone has. Contributions to outdoor air pollution through cars, transportation, and industries results in the release of harmful substances as fine particles and toxic gases. The quality of the air we breathe, and the short term and long term affects of these pollutants on our lungs is always concerning but even more so during this pandemic. The SARS-CoV-2 virus enters the body usually through the respiratory system. There is evidence that exposure to air pollutants can lead to a more severe COVID-19 infection and worse health outcomes. During the lockdown-induced pause driven by the public health measures enacted worldwide, researchers have been able to show the positive effects from the reduction of air pollution and its role as a potential risk factor for respiratory infection. Reflecting on this evidence and updating it with ongoing research can help us better control COVID-19 and future respiratory pandemics. This will be essential as we bounce forward and develop strategies for the climate change emergency as we make policy to prevent the next pandemic (Rice, 2020; Balmes, 2020).

In the seventh session of the webinar series “Learning and Relearning for Planetary Health: Early Lessons from a Pandemic”, presenters focused on risk factors for COVID-19 including air pollution and smoking, and spoke on protecting gains for public health in a pandemic driven by the devastating disease that begins as SARS CoV2 caused viral pneumonia.

Outdoor & Household Air Pollution with COVID-19

[1] On May 27th, 2020, a webinar with the above title, was presented as a contribution to a series on *“Learning and Relearning for Planetary Health”,* which spoke on air pollution in the context of a pandemic driven by a respiratory disease. The presenters were Dr. Mary Rice, an Assistant Professor of Medicine at Harvard and Chair of ATS Environmental Health Policy Committee, and Dr. John Balmes, a Professor of Medicine at the University of California San Francisco and Professor of Environmental Health Sciences at UC Berkeley.
All the recordings of this webinar series can be accessed here:
https://learningforplaneta.wixsite.com/website/past-webinars.

Outdoor air pollution consists of emissions of fuel combustion from motor vehicles, power plants, and transportation which contain pollutants such as fine particulate matter ($PM_{2.5}$) and NO_2; ozone (O_3) is also generated in the atmosphere from emissions of NO_2. These three pollutants all have demonstrated negative impacts on our health. There is strong evidence linking long-term exposure of these pollutants to increased risk of chronic cardiovascular and pulmonary diseases. These diseases are also risk factors for COVID-19, and when combined can lead to more deadly COVID-19. Long term pollution leads to increased risk of developing Acute Respiratory Distress Syndrome (ARDS) which is a severe form of respiratory failure often fatal for patients with severe COVID-19. One study found that the risk of ARDS increases if you live in close proximity to polluted areas. In another, hospitalized patients at risk for ARDS had the highest ozone exposure for 3 years prior were more likely to develop ARDS (Rice,2020). As we consider public health policies for the recovery period and in preparation for the next pandemic, reducing air pollution should be a priority and can bring the dual benefit of reducing GHGs. The following four types of air pollution are of concern in this regard:

Outdoor air pollution: The short-term effects of outdoor air pollution also increase the risk for COVID-19 infection, hospitalization, and death (Kapitsinis, 2020). Such short-term exposures to air pollutants worsens the severity of infections such as influenza and outcomes such as pneumonia. In China, higher COVID-19 infection rates were seen during periods of higher pollution. Suspended particles of air pollution appear to help the SARS-CoV-2 virus travel longer distances and spend more time in the air. This was also found in other polluted areas which had high infection rates. Confirmatory studies are needed, but preliminary findings suggest another benefit to reducing air pollution (Hoang & Tran, 2020; Rice, 2020).

Household air pollution: In lower-middle income countries such as Sub-Saharan Africa and parts of Central and South America, there is high exposure to household air pollution from fuels used for indoor cooking such as wood, crop waste, dried dung, coal and kerosene. The smoke released into these homes, which families constantly breathe, contains toxic pollutants which contribute to cardiovascular disease, chronic obstructive pulmonary disease and lung cancer and has lead to 1.6 million premature deaths in 2017, with almost half of those being due to pneumonia in children under 5 years of age. In these countries, household air pollution is likely to be a risk factor for COVID-19 infection and serious outcomes (Jackson et al, 2013; Smith et al, 2013)

Wildfire Smoke: In the West Coast of Canada and the USA, as well as in Australia, there has been an increase in the number and extent of wildfires in recent years, and this has negatively impacted air quality and visibility for weeks at a time. The duration of the wildfire season has become longer due to climate change. Wildfires also produce emissions of pollutants such as fine particulate matter ($PM_{2.5}$), carbon monoxide, NO_2, and toxic gases; O_3 is generated in the atmosphere from NO_2 and volatile organic compounds (VOCs) emitted from the fires. In cases where buildings, homes, or cars are consumed by these wildfires, toxic chemicals and metals will also be released. Currently, there is clear evidence that wildfire smoke significantly worsens respiratory illnesses like asthma and chronic obstructive pulmonary disease (COPD) and there is also growing evidence for the link of wildfire smoke to respiratory infections such as pneumonia (Kondo et al., 2019). This suggests that wildfire smoke is also likely a risk factor for COVID-19 (Henderson, 2020).

Smoking: Active smoking increases the risk for lung cancer and also likely the risk for COVID-19 (Reddy et al., 2020). Smoke from both tobacco and cannabis can damage lungs and regular use can lead to chronic bronchitis, increased chances for lung infections and negative cardiovascular outcomes. Vaping has become a very common smoking method, and so has the risk for e-cigarette or vaping acute lung injury (EVALI) with 2807 hospitalizations and 68 deaths as of February 2020. Second-hand smoke can also lead to multiple negative health impacts and probably also increases the risk for severe COVID-19 outcomes (Abrams et al., 2020; Balmes, 2020).

Bouncing forward to an Equitable and Sustainable Recovery

Globally, we previously saw outdoor air quality improvements with the pause of economic activities and the decrease of transportation, which dramatically lowered the levels of major air pollutants. In some studies, more pollution-related deaths were avoided than COVID-19 deaths accumulated during this time (Kapitsinis, 2020; Rice, 2020). We must try to hold on to as many of these improvements as possible including reducing the existing inequities in air pollution exposure everywhere. Currently, there is a higher prevalence and mortality of COVID-19 in racialized communities and neighbourhoods due to proximity to environmental pollutants, crowded households, the need to work outside the home, and poor access to health care (Rice, 2020). In planning for an equitable and sustainable post-COVID future, it is necessary to use existing research to create strong policies and economic stimulus plans to address health disparities, mitigate climate change, improve our air quality, and keep the positive health gains from the lowering of pollutants by shifting away from fossil fuels and investing in cleaner power (Balmes,2020).

Stay tuned for our next OpEd on an Action Agenda Workshop featuring ideas on mobilizing for the bounce forward to a post-COVID future.

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