

The Health Impacts of Air Pollution and Climate Change

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Human activities have changed the atmospheric composition greatly comparing to pre-industry aera, resulted in global air pollution and climate change. Both air pollution and climate change pose harmful impacts on human beings and ecosystem.

The Global Burden of Disease estimated that each year indoor/outdoor air pollution contributed to about 8 million premature deaths globally. Air pollution, mostly PM_{2.5} (particles with aerodynamic diameter smaller than 2.5 micron), contributes 40% of COPD deaths, 26% of stroke deaths, 20% of ischemic hear disease deaths, 19% of lung cancer deaths, 30% of lower respiratory infection deaths, 20% of neonatal deaths, and 20% of diabetes deaths. In fact, the health of whole human life span as well as human reproduction are impacted by air pollution. With the National Action Plan on Air Pollution Prevention and Control 2013-2017, and the Winning Blue Sky action 2018-2020, air pollution has been drastically reduced in China from its level in 2013. Evidences of significant health benefit from this reduction have been observed, including the reduction in the lost of life expectance caused by PM_{2.5}.

In the meantime, evidences about the health effects of climate change are quickly accumulating. 2023 was the warmest year in the 174-year observational record. Global warming is leading to more impact weathers (wildfires, heatwaves, storms, droughts and dust-storms). Unsuitable temperature (hot or cold) is associated with multiple diseases and mortalities, such as CVD, respiratory, metabolic, mental, and reproduction diseases. Moreover, we found temperature anomaly is associated with stroke, while the daily mean and range of temperature are association with mortalities in China. The globally increasing wildfire contributes to significantly to large scale air pollution in the downwind, increasing exposure to PM_{2.5} and ozone, and causes harm to human health. We found PM_{2.5} from wildfire has higher effect on acute respiratory effects than that from other sources, and during 2000 - 2014 global exposure to fire- sourced PM_{2.5} contributed 0.86 million child deaths per year. It is also found that air pollution and high temperature have synergistic effects on human health.

Global air pollution and climate change are caused by the changing atmospheric composition, mainly fossil fuel consumption. While carbon neutrality policies provide a great opportunity to reduce air pollution, international actions are needed to coordinate scientific research and policies on air pollution control and climate change mitigation/adaptation to maximize the co-benefits of health. Therefore, an international big science plan ARCH (AiR Pollution - Climate Change - Health Effects Nexus) is therefore proposed.