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Future fire impact on PM2.5 pollution and attributable mortality

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Fine particulate matter with a diameter of ≤ 2.5 (PM2.5), one of the hazardous air pollutants, contributed 4.5 million to 8.9 million global mortality annually. Among the total PM2.5 related mortality, 5%–21% were attributed to fires. While anthropogenic fire has been declined by reduced land fragmentation and changed land use, climate change has increased fire activities especially in fire seasons. These fires eventually lead to high PM2.5 in many regions, leading to public health concern. However, the impact of future fires on PM2.5 and its health burden according to climate change and socioeconomic scenarios has not been studied globally. We estimated fire related PM2.5 at the end of 21st century under various future scenarios (combination of Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs)) and its attributable mortality. We used modified CLM and GEOSChem for simulating fire emissions and PM2.5 concentration, respectively. The Global Burden of Disease (GBD) method was used for estimating attributable mortality. We also evaluated how global inequality in fire-PM2.5 mortality by income (economic inequality) would change. We found that future climate change led to higher fire-PM2.5 by increasing drought and biomass carbon density, whereas future increased GDP would offset the increase in fire-PM2.5. The results of fire-PM2.5 mortality varied significantly by SSPs. Population increase under SSP3 would lead to increase in mortality and economic inequality. The total fire-PM2.5 mortality decreased under SSP1–4, but the economic inequality increased under SSP4. If the world follows SSP1-RCP2.6 scenario, fire-PM2.5 mortality would reduce about 40% and improve economic equality.

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