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Global, regional, and national mortality burden attributable to air pollution from landscape fires: a health impact assessment study

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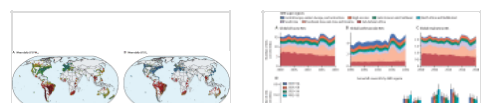
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Figures (5)

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Summary

Background

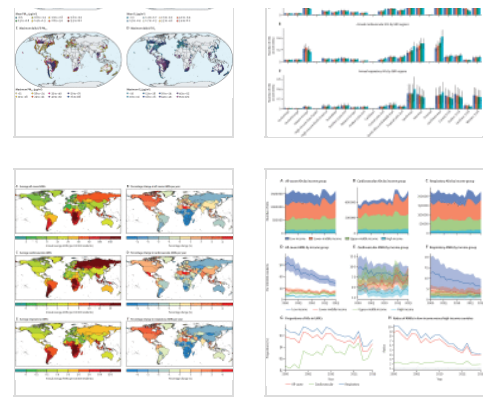
Landscape fire-sourced (LFS) air pollution is an increasing public health concern in the context of climate change. However, little is known about the attributable global, regional, and national mortality burden related to LFS air pollution.

Methods

We calculated country-specific population-weighted average daily and annual LFS fine particulate matter ($PM_{2.5}$) and surface ozone (O_3) during 2000–19 from a validated dataset. We obtained the relative risks (RRs) for both short-term and long-term impact of LFS $PM_{2.5}$ and O_3 on all-cause, cardiovascular, and respiratory mortality. The short-term RRs were pooled from community-specific standard time-series regressions in 2267 communities across 59 countries or territories. The long-term RRs were obtained from published meta-analyses of cohort studies on all-source $PM_{2.5}$ and O_3 . Annual mortality, population, and socio-demographic data for each country or territory were extracted from the Global Burden of Diseases Study 2019. These data were used to estimate country-specific annual deaths attributable to LFS air pollution using standard algorithms.

Findings

Globally, 1·53 million all-cause deaths per year (95% empirical confidence interval [eCI] 1·24–1·82) were attributable to LFS air pollution during 2000–19, including 0·45 million (0·32–0·57) cardiovascular deaths and 0·22 million respiratory deaths (0·08–0·35). LFS $PM_{2.5}$ and O_3 contributed to 77·6% and 22·4% of the total attributable deaths, respectively. Over 90% of all attributable deaths were in low-income and middle-income countries, particularly in sub-Saharan Africa (606 769 deaths per



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year), southeast Asia (206 817 deaths), south Asia (170 762 deaths), and east Asia (147 291 deaths). The global cardiovascular attributable deaths saw an average 1·67% increase per year ($p_{\text{trend}} < 0\cdot001$), although the trends for all-cause and respiratory attributable deaths were not statistically significant. The five countries with the largest all-cause attributable deaths were China, the Democratic Republic of the Congo, India, Indonesia, and Nigeria, although the order changed in the second decade. The leading countries with the greatest attributable mortality rates (AMRs) were all in sub-Saharan Africa, despite decreasing trends from 2000 to 2019. North and central America, and countries surrounding the Mediterranean, showed increasing trends of all-cause, cardiovascular, and respiratory AMRs. Increasing cardiovascular AMR was also observed in southeast Asia, south Asia, and east Asia. In 2019, the AMRs in low-income countries remained four times those in high-income countries, though this had reduced from nine times in 2000. AMRs negatively correlated with a country-specific socio-demographic index (Spearman correlation coefficients r around $-0\cdot60$).

Interpretation

LFS air pollution induced a substantial global mortality burden, with notable geographical and socioeconomic disparities. Urgent actions are required to address such substantial health impact and the associated environmental injustice in a warming climate.

Funding

Australian Research Council, Australian National Health and Medical Research Council.

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