



Estimates, Trends, and Potential Drivers of the Global Burden of Chronic Obstructive Pulmonary Disease Attributable to Ozone Pollution, 1990-2019: an Analysis for the Global Burden of Disease Study 2019

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Introduction

- Ozone has been increasingly reported to play an important role in the progression of chronic obstructive pulmonary disease (COPD).
- Urbanization, industrialization, and global warming may aggravate the impacts of ozone pollution on health.
- Variations in climate, environment, demographic characteristics, and socioeconomic level in different regions may result in the heterogeneity of the health impact of ozone.

Aims

- To investigate the mortality and disability-adjusted life year (DALY) burden of COPD attributable to ambient ozone and its trend at the regional and national levels using data from the global burden of disease study (GBD) 2019.
- To assess whether country-specific environment, demographic characteristics, and socioeconomic variables modified the observed ozone-related burden of COPD.

Methods

- The GBD data: the annual numbers, age-standardized rates (ASRs), and the proportions of death and DALY from COPD attributable to ozone pollution by sex, country, and region for the period 1990 to 2019
- The following country- and year-specific factors that might modify ozone-related COPD burden were included:

Methods

- Age-standardized prevalence of smoking tobacco use
- Demographic and socioeconomic factors (average years of schooling, proportion of population aged 65 years or older, gross domestic product (GDP) per capital etc.)
- Environmental factors (temperature, rainfall, Normalized Derived Vegetation Index (NDVI))
- Three-step statistical methods:
 - We used maps to show the spatial distribution of disease burden due to COPD attributable to ozone.
 - We fitted the natural logarithms of ASR of ozone-related COPD death and DALY with calendar year by linear regression. Annual percentage change (APC) was calculated to examine the trends of ozone-related COPD death rate and DALY rate.
 - We applied panel regression model to assess the modification effect of country-level factors on ozone-related COPD burden.

Results

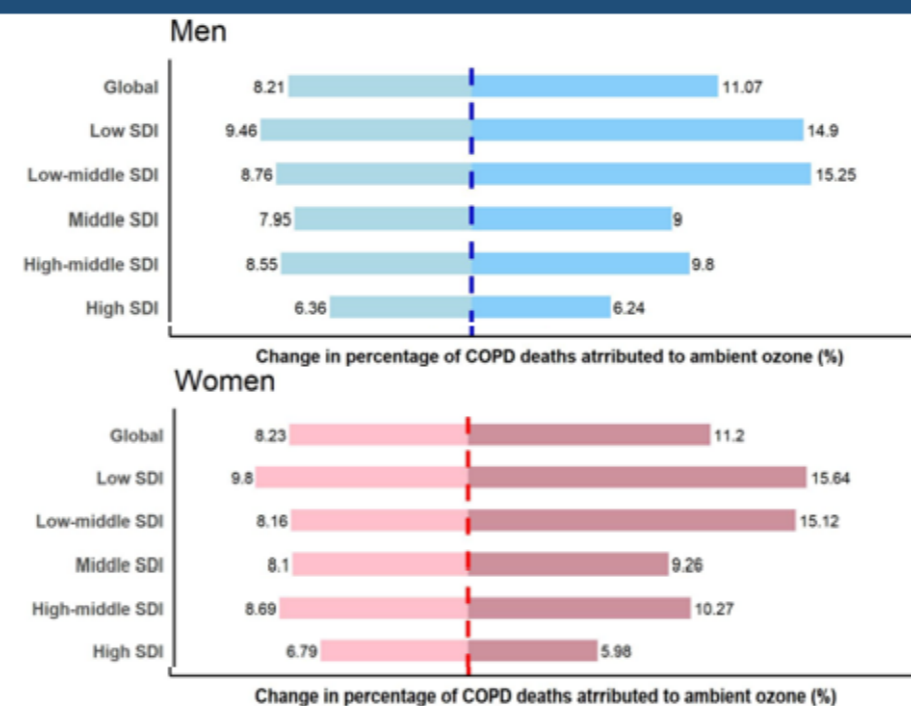


Fig. 1. Change in percentage of COPD deaths attributable to ambient ozone (%)

Results

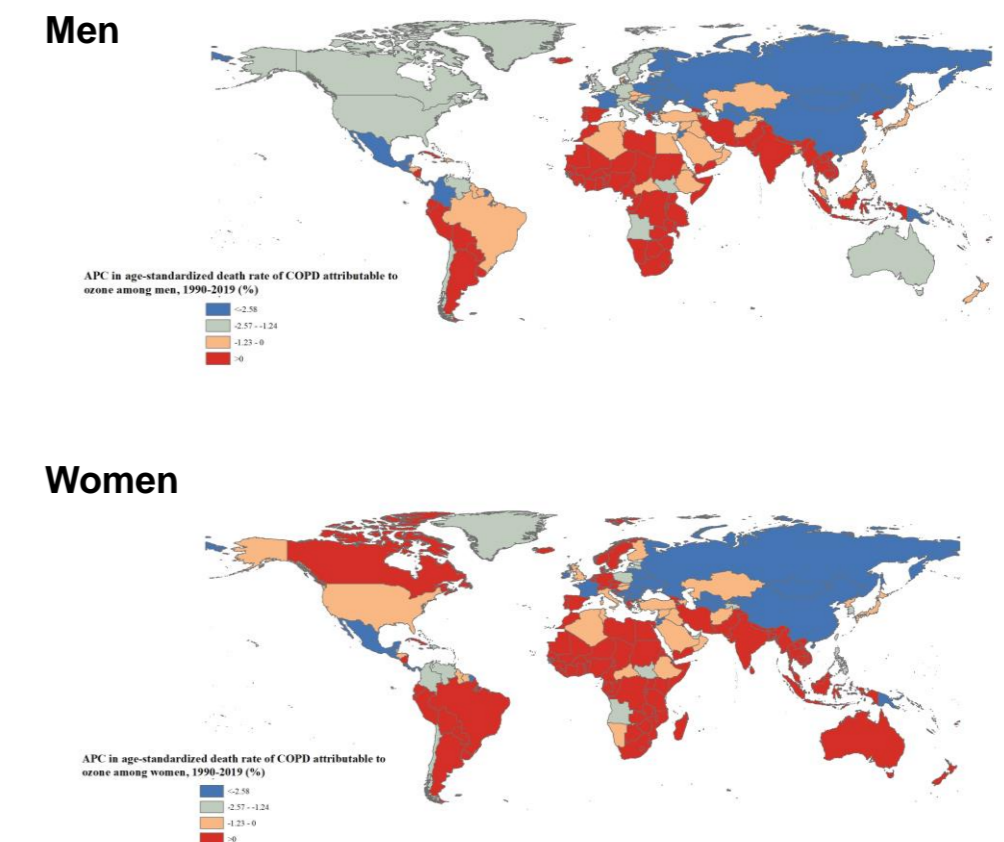


Fig. 2. Annual percentage change in age-standardized mortality rate of COPD attributable to ambient ozone by country, 1990-2019



Fig. 3. Country-level modifiers that were associated with age-standardized mortality rate of COPD attributable to ambient ozone by country, 1990-2019

Conclusions

- More efforts are needed in low and low-middle SDI regions to diminish inter-country inequality in ozone-related COPD.
- Global warming may exacerbate ozone-related COPD burden.
- Expanding green space may help reduce the burden.