

The effectiveness of the Air Pollution Prevention and Control Action Plan on the air quality and human health during 2013-2017 in China

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In 2013, China released the “Air Pollution Prevention and Control Action Plan”, which set the roadmap for national air pollution control actions for the period of 2013-2017. A decrease in the PM_{2.5} concentration may lead to a substantial benefit for human health. This study aims to quantify the relative contributions four factors: emission reductions, changed meteorology, population growth, and a change in baseline mortality rates to the reduced PM_{2.5}-related mortality (PM_{2.5}-mortality) during the 2013-2017 period and evaluate the importance of emission controls for human health protection in China. We used the chemical transport model (i.e., WRF-CMAQ) as well as an integrated scientific assessment system (i.e., ABaCAS) in this study. The estimated total PM_{2.5}-mortality in China was 1,389,000 (95% CI, 1,005,000-1,631,000) in 2013 but was substantially reduced to 1,102,000 (95% CI, 755,000-1,337,000) in 2017. Emission controls contributed 88.7% to this reduction in PM_{2.5}-mortality, while changed meteorology, the change in baseline mortality rates, and population growth during 2013-2017 contributed 9.6%, 3.8% and -2.2%, respectively. The implementation of the Action Plan has significantly reduced the PM_{2.5} concentration in regions of China where population density is high, dominating the decline in PM_{2.5}-mortality during 2013-2017. However, the health burden of PM_{2.5} pollution in China is still extremely high compared to that in other developed countries. An aggressive air pollution control strategy should be implemented in densely populated areas to further reduce the health burden.

Keywords: air pollution, PM_{2.5}-mortality, control action plan