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Characterization of ambient air pollution and health burden of fine particulate matter in Nanjing

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With the rapid industrialization and urbanization, Nanjing faced with exceptionally serious air problem, and the adverse health effects due to air pollution has become a matter of public concern. In this study, the hourly and daily concentrations of air pollutants and meteorological data in Nanjing from March, 2014 to February, 2017 were used to analyse the temporal characterization and the relationship between them. Then the integrated exposure-response (IER) model was applied to assess the mortality and years of life lost (YLL) due to PM2.5. The mortality benefits were estimated in the scenarios when meeting the World Health Organization (WHO) Air Quality Guidelines (AQG) and three interim targets (ITs). The results showed that the pollutants decreased during the study period, expect for CO and O_3. The concentrations of pollutants varied in years and seasons can be explained by the emissions, chemical reactions and meteorological conditions. The attributable fractions (AF) of PM2.5 for chronic obstructive pulmonary disease (COPD), lung cancer (LC), ischemic heart disease (IHD), and Stroke are 23% (CI95 12-32%), 29% (CI95 11-40%), 30% (CI95 21-48%), 46% (CI95 17-57%) and 20% (CI9510-29%), 24% (CI95 8-35%), 28% (CI95 19-44%), 43% (CI95 15-55%),in 2014 and 2015, respectively. The total deaths in Nanjing due to PM2.5 are 12055 and 10771 in 2014 and 2015, respectively. Long-term exposure to PM2.5 contributed to 98802.2 and 90399.4 years lost in 2014, 2015, respectively. The males and older people are under the high health risk. When the PM2.5 concentrations meeting the AQG (10 μg/m3), about 80% of the premature deaths will be avoided, indicating much higher health benefits could be achieved if Nanjing adopted more stringent guidelines.