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英文題目：A national cohort study of long-term particulate air pollution exposure and dementia in
Taiwan: Cox model and machine learning approaches

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Background: Air pollution exposure has been linked to various diseases, including dementia. However, a novel method for investigating the associations between air pollution exposure and disease is lacking. The objective of this study was to investigate whether long-term exposure to ambient particulate air pollution increases dementia risk using both the traditional Cox model approach and a novel machine learning (ML) with random forest (RF) method.

Method: We used health data from a national population-based cohort in Taiwan from 2000 to 2017. We collected the following ambient air pollution data from the Taiwan Environmental Protection Administration (EPA): fine particulate matter (PM_{2.5}) and gaseous pollutants, including sulfur dioxide (SO₂), carbon monoxide (CO), ozone (O₃), nitrogen oxide (NO_x), nitric oxide (NO), and nitrogen dioxide (NO₂). Spatiotemporal-estimated air quality data calculated based on a geostatistical approach, namely, the Bayesian maximum entropy method, were collected. Each subject's residential county and township were reviewed monthly and linked to air quality data based on the corresponding township and month of the year for each subject. The Cox model approach and the ML with RF method were used.

Results: Increasing the concentration of PM_{2.5} by one interquartile range (IQR) increased the risk of dementia by approximately 5% (HR=1.05 with 95% CI=1.04-1.05). The comparison of the performance of the extended Cox model approach with the RF method showed that the prediction accuracy was approximately 0.7 by the RF method, but the AUC was lower than that of the Cox model approach.

Conclusion: This national cohort study over an 18-year period provides supporting evidence that long-term particulate air pollution exposure is associated with increased dementia risk in Taiwan. The ML with RF method appears to be an acceptable approach for exploring associations between air pollutant exposure and disease.