

Supplementary appendix

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Supplement to: Association of PM_{2.5} constituent with the predicted 10-year atherosclerotic cardiovascular disease: evidence from a large-scale rural population study

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Expand methods

Detailed information on the constituent concentration, proportion and residual analyses

The three methods could be expressed as follows:

$$\text{Logit}(P) = \beta_0 + \beta_1(\text{constituent or PM}_{2.5}) + [\gamma'X] \quad (\text{a})$$

$$\text{Logit}(P) = \beta_0 + \beta_1(\text{constituent/PM}_{2.5}) + \beta_2(\text{PM}_{2.5}) + [\gamma'X] \quad (\text{b})$$

$$\text{Logit}(P) = \beta_0 + \beta_1(\text{residual}) + [\gamma'X] \quad (\text{c})$$

Formula (a) was constituent concentration analyses, formula (b) was constituent proportion analyses, and formula (c) was constituent residual analyses. P represented the probability of a positive result occurring. β_0 was the intercept, β_1 was the coefficient of exposure to $\text{PM}_{2.5}$ or its constituent and $[\gamma'X]$ was the matrix of other covariates, residual reflected the levels of variation in the constituents, which were independent of $\text{PM}_{2.5}$ and was calculated as the residuals of linear regression models: consistent = $\beta_0 + \beta_1 (\text{PM}_{2.5})$.

Detailed information on the isochronous substitution model (ISM)

In the ISM with one of the constituents removed, total $\text{PM}_{2.5}$ concentration and other constituents were included in this model to determine the effect of replacing $1 \mu\text{g}/\text{m}^3$ of one constituent with equivalent another constituent through logistic regression models. For example, when we calculated the effect of replacing $1 \mu\text{g}/\text{m}^3$ other constituents with BC, the formula was as follows:

$$\text{logit}(P) = \beta_0 + \beta_1(\text{NH}_4^+) + \beta_2(\text{NO}_3^-) + \beta_3(\text{OM}) + \beta_4(\text{SO}_4^{2-}) + \beta_5(\text{SOIL}) + \beta_6(\text{Other}) + \beta_7(\text{PM}_{2.5}) + [\gamma'X]$$

P represented the probability of high 10-year ASCVD risk occurring. β_0 was the intercept. β_1 was the effect of replacing $1 \mu\text{g}/\text{m}^3 \text{NH}_4^+$ with $1 \mu\text{g}/\text{m}^3 \text{BC}$. By parity of reasoning, β_2 represents the effect of replacing $1 \mu\text{g}/\text{m}^3 \text{NO}_3^-$ with $1 \mu\text{g}/\text{m}^3 \text{BC}$. The concentration of other constituent was calculated by subtracting the concentration of BC, NH_4^+ , NO_3^- , OM, SO_4^{2-} and SOIL from the concentration of $\text{PM}_{2.5}$. $[\gamma'X]$ was matrix of other covariates.

Table Legend

Supplementary table S1. Distributions of 3-year averaged concentrations of PM_{2.5} and its constituents.

Figure Legends

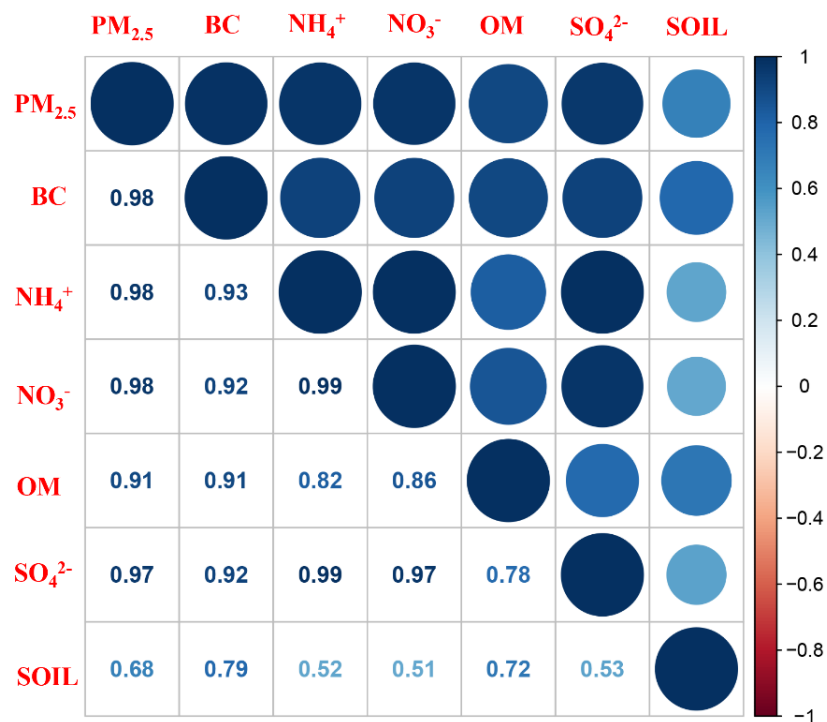
Supplementary Figure S1. Correlation between 3-year averaged concentrations of PM_{2.5} and its constituents.

Supplementary Figure S2. Sensitive analyses of the association between exposure to PM_{2.5} and its constituents and ASCVD risk at different time scales.

Supplementary table S1. Distributions of 3-year averaged concentrations of PM_{2.5} and its constituents.

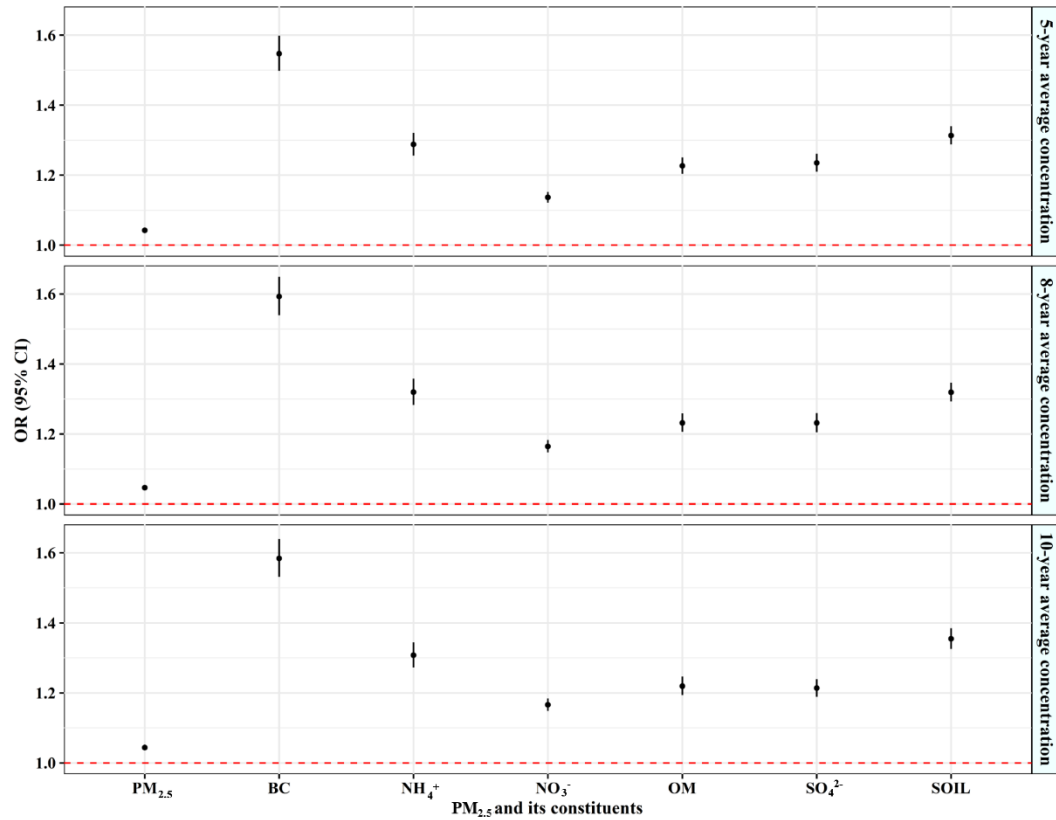
Variables	Mean \pm SD	Min	Percentiles			Max	IQR
			P ₂₅	P ₅₀	P ₇₅		
PM _{2.5} ($\mu\text{g}/\text{m}^3$)	75.24 \pm 9.600	48.970	65.960	80.160	82.810	94.090	16.850
Constituents							
BC ($\mu\text{g}/\text{m}^3$)	5.190 \pm 0.947	3.160	4.200	5.650	6.120	7.110	1.920
NH ₄ ⁺ ($\mu\text{g}/\text{m}^3$)	10.694 \pm 1.431	6.800	9.300	11.170	11.730	13.620	2.430
NO ₃ ⁻ ($\mu\text{g}/\text{m}^3$)	18.016 \pm 2.619	10.120	15.720	19.110	19.840	23.330	4.120
OM ($\mu\text{g}/\text{m}^3$)	15.659 \pm 1.746	8.840	14.330	15.710	17.210	19.730	2.880
SO ₄ ²⁻ ($\mu\text{g}/\text{m}^3$)	14.624 \pm 1.827	10.370	12.640	15.190	16.080	18.320	3.440
SOIL ($\mu\text{g}/\text{m}^3$)	9.655 \pm 1.579	6.940	8.360	9.130	11.760	14.030	3.400

Abbreviation: PM_{2.5}, fine particulate matter; BC, black carbon; NH₄⁺, ammonium; NO₃⁻, nitrate; OM, organic matter; SO₄²⁻, sulfate; SOIL, soil particles.



Supplementary Figure S1. Correlation between 3-year averaged concentrations of PM_{2.5} and its constituents.

Abbreviation: PM_{2.5}, fine particulate matter; BC, black carbon; NH₄⁺, ammonium; NO₃⁻, nitrate; OM, organic matter; SO₄²⁻, sulfate; SOIL, soil particles.



Supplementary Figure S2. Sensitive analyses of the association between exposure to PM_{2.5} and its constituents and ASCVD risk at different time scales.

Abbreviation: PM_{2.5}, fine particulate matter; BC, black carbon; NH₄⁺, ammonium; NO₃⁻, nitrate; OM, organic matter; SO₄²⁻, sulfate; SOIL, soil particles; ASCVD: atherosclerotic cardiovascular disease.

Models were adjusted for gender, marital status, average monthly income, educational level, physical activity, drinking status, high fat diet, fruit and vegetable intake.