

APPENDIX

Supplemental methods

Annual mortality rates

To investigate whether the mortality rate fluctuates with PM_{2.5} levels, annual mortality rates between 2010-2016 were calculated among our study population. Mortality rate was calculated by the function below:

$$\text{Annual mortality rate} = \frac{\text{Number of deaths within a year}}{\text{Total number person} - \text{year of that year}}$$

The mortality rate was calculated among the overall analytic population and among those who resided in California separately. We did not calculate the mortality for 2017 because data for PM_{2.5} level was only available through 2016.

Supplemental tables

Table S1. Associations between PM_{2.5} and mortality among older (aged≥65) patients initiating dialysis (N=384,276).

	HR (95%CI)		p for slope difference
	PM _{2.5} ≤12µg/m ³	PM _{2.5} >12µg/m ³	
All-cause mortality			
Comorbidity Model	1.00 (0.98-1.03)	1.14 (1.08-1.21)	0.001
Model for 3-month survivors	1.00 (0.97-1.02)	1.14 (1.05-1.23)	0.002
Model for 6-month survivors	0.98 (0.96-1.00)	1.11 (1.02-1.21)	0.006
Model for California only	0.97 (0.89-1.05)	1.22 (1.11-1.35)	0.001
Model for other states	1.02 (1.00-1.05)	1.16 (1.00-1.34)	0.1
Cause-specific mortality			
CVD	0.97 (0.93-1.02)	1.38 (1.21-1.58)	<0.001
Other	0.91 (0.89-0.93)	0.95 (0.89-1.01)	0.267
Unknown	1.65 (1.55-1.76)	1.33 (1.14-1.55)	0.015

HR: Hazard Ratio for mortality per 10 µg/m³ increase in PM_{2.5}; p for slope difference indicated the p effect difference of per 10 µg/m³ increase in PM_{2.5} between areas with PM_{2.5}≤12 and areas with PM_{2.5}>12

CVD: Cardiovascular disease

All the listed models were adjusted for demographics (age, sex, race), ZIP-code level characteristics (percent below 200% of the federal poverty line, mean years of education, median household income, median housing cost per month, percent Black, percent Hispanics, population density and urbanicity), and health related factors (cause of kidney failure, smoking status, BMI and nephrology care status). Comorbidity model was further adjusted for cardiovascular disease, chronic pulmonary obstructive disease and cancer.

Model for 3-month survivors included 341,655 patients who survived the first three months of dialysis, Model for 6-month survivors included 311,684 patients who survived the first six months of dialysis

Model for California only included 47,028 older patients, Model3 for other states included 337,248 older patients, other models included all 384,276 older patients. California was analyzed separately because more than 50% of the older patients with $PM_{2.5}$ exposure level higher than $12 \mu\text{g}/\text{m}^3$ came from California.

Table S2. Mortality rate and PM_{2.5} level by year among older (aged≥65) patients initiating dialysis (2010-2016) (N=384,276).

year	Overall				California			
	median PM2.5	person-year	death	mortality rate	median PM2.5	person-year	death	mortality rate
2010	9.0	23815	10080	0.423	10.5	2932	1105	0.377
2011	9.9	39800	20519	0.516	10.9	5014	2272	0.453
2012	9.0	67507	26408	0.391	10.8	8682	2869	0.330
2013	9.0	89316	31741	0.355	11.7	11624	3597	0.309
2014	9.0	108387	36188	0.334	11.7	14431	4009	0.278
2015	10.0	123745	40910	0.331	14.3	16676	4766	0.286
2016	8.7	138067	44020	0.319	14.5	18776	5084	0.271

Mortality rates were presented as death/person-year