Supplemental Material

Long-Term Exposure to Ambient Fine Particulate Matter and Chronic Kidney Disease: A Cohort Study

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Table S1 Characteristics of participants in the study cohort of Taiwanese adults

Characteristics	Participants with eGFR [a]	Participants with Multiple visits [b]	Eligible participants [c]	Eligible participants with follow-up ≥ 3 years [d]
Number of participants	429,058	159,944	147,658	100,629
Age (year)	39.3 ± 13.4	39.0 ± 12.7	39.1 ± 11.5	38.9 ± 11.3
Male	206,626 (48.2)	79,492 (49.7)	78,075 (52.9)	52,837 (52.5)
Body mass index (kg/m^2)	23.0 ± 3.8	22.9 ± 3.6	23.0 ± 3.5	22.9 ± 3.5
Systolic blood pressure (mmHg)	117.9 ± 17.7	117.4 ± 17.1	117.3 ± 16.6	117.0 ± 16.4
Fasting glucose (mg/dL)	99.6 ± 21.4	98.7 ± 19.3	98.5 ± 18.4	98.1 ± 17.7
Total cholesterol (mg/dL)	191.0 ± 34.1	190.5 ± 35.4	190.8 ± 34.9	190.1 ± 34.6
eGFR (mL/min/1.73m^2)	86.4 ± 17.6	86.5 ± 14.7	86.8 ± 15.0	87.0 ± 14.9
Self-reported cardiovascular disease	12,177 (2.8)	3999 (2.5)	3295 (2.2)	2122 (2.1)

Data are presented as mean ±SD for continuous variables and number (percentage) for categorical variables. Data are complete for all variables.

[a] Participants with eGFR: participants having serum creatinine measurement for the calculation of eGFR in the period of 2001 to 2014. Those with eGFR ≥ 200 mL/min/1.73 m^2 or < 2 mL/min/1.73 m^2 were excluded because the values suggested the measurements were probably incorrect due to occasional technical errors;

[b] Participants with multiple visits: participants having at least two medical visits;

[c] Eligible participants: participants meeting the inclusion criteria: (1) aged 20 years or above; (2) having eGFR ≥ 60 mL/min/1.73 m^2 and having no self-reported kidney disease at baseline; (3) having no missing information on key variables (socio-economic status, lifestyle, blood tests and PM$_{2.5}$ exposure);

[d] Eligible participants with follow-up ≥ 3 years: participants with follow-up period ≥ 3 years.

Abbreviations: eGFR, estimated glomerular filtration rate; PM$_{2.5}$, particulate matter with an aerodynamic equivalent diameter less than 2.5 μm.

Table S2 Associations between incident chronic kidney disease and long-term PM2.5 exposure in Taiwanese adults (eGFR calculated using CKD-Epi equation, N=103,353)

Exposure	Crude Model [a]		Adjusted Model 1 [b]		Adjusted Model 2 [c]		Adjusted Model 3 [d]		Adjusted Model 4 [e]	
	HR (95%CI)	P	HR (95%CI)	P	HR (95%CI)	P	HR (95%CI)	P	HR (95%CI)	P
1st quintile (5.8–21.2 μg/m^3)	Ref	—	Ref	—	Ref	—	Ref	—	Ref	—
2nd quintile (>21.2–23.3 μg/m^3)	0.96 (0.86,1.08)	0.51	1.09 (0.97,1.23)	0.14	1.08 (0.96,1.21)	0.20	1.12 (1.00,1.26)	0.05	1.12 (1.00,1.27)	0.05
3rd quintile (>23.3–25.3 μg/m^3)	0.92 (0.82,1.04)	0.19	1.12 (0.99,1.26)	0.07	1.11 (0.98,1.25)	0.10	1.22 (1.08,1.37)	0.001	1.20 (1.06,1.36)	0.003
4th quintile (>25.3–35.7 μg/m^3)	1.08 (0.96,1.21)	0.22	1.17 (1.04,1.31)	0.01	1.12 (1.00,1.27)	0.05	1.24 (1.10,1.40)	<0.001	1.23 (1.10,1.39)	0.001
5th quintile (>35.7–49.6 μg/m^3)	1.09 (0.97,1.22)	0.14	1.21 (1.08,1.35)	0.001	1.20 (1.07,1.34)	0.002	1.23 (1.01,1.38)	<0.001	1.19 (1.06,1.34)	0.002
Trend test	—	0.04	—	0.001	—	0.002	—	<0.001	—	0.001
10 μg/m^3 increment	1.06 (1.01,1.11)	0.02	1.08 (1.03,1.13)	0.002	1.07 (1.02,1.12)	0.003	1.08 (1.03,1.13)	0.001	1.07 (1.02,1.12)	0.008

CKD defined as eGFR < 60 mL/min/1.73 m^2; only participants with follow-up ≥ 3 years are included in data analysis. Covariates were from baseline visits. Data are complete for all variables.

[a] Crude model: $PM_{2.5}$;

[b] Model 1: Crude model + age, sex, educational level, smoking, drinking;

[c] Model 2: Model 1 + BMI, systolic blood pressure, fasting glucose, total cholesterol, self-reported heart disease or stroke;

[d] Model 3: Model 2 + baseline eGFR.

[e] Model 4: Model 3 + urine protein.

Abbreviations: CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; $PM_{2.5}$, particulate matter with an aerodynamic equivalent diameter less than 2.5 μm.
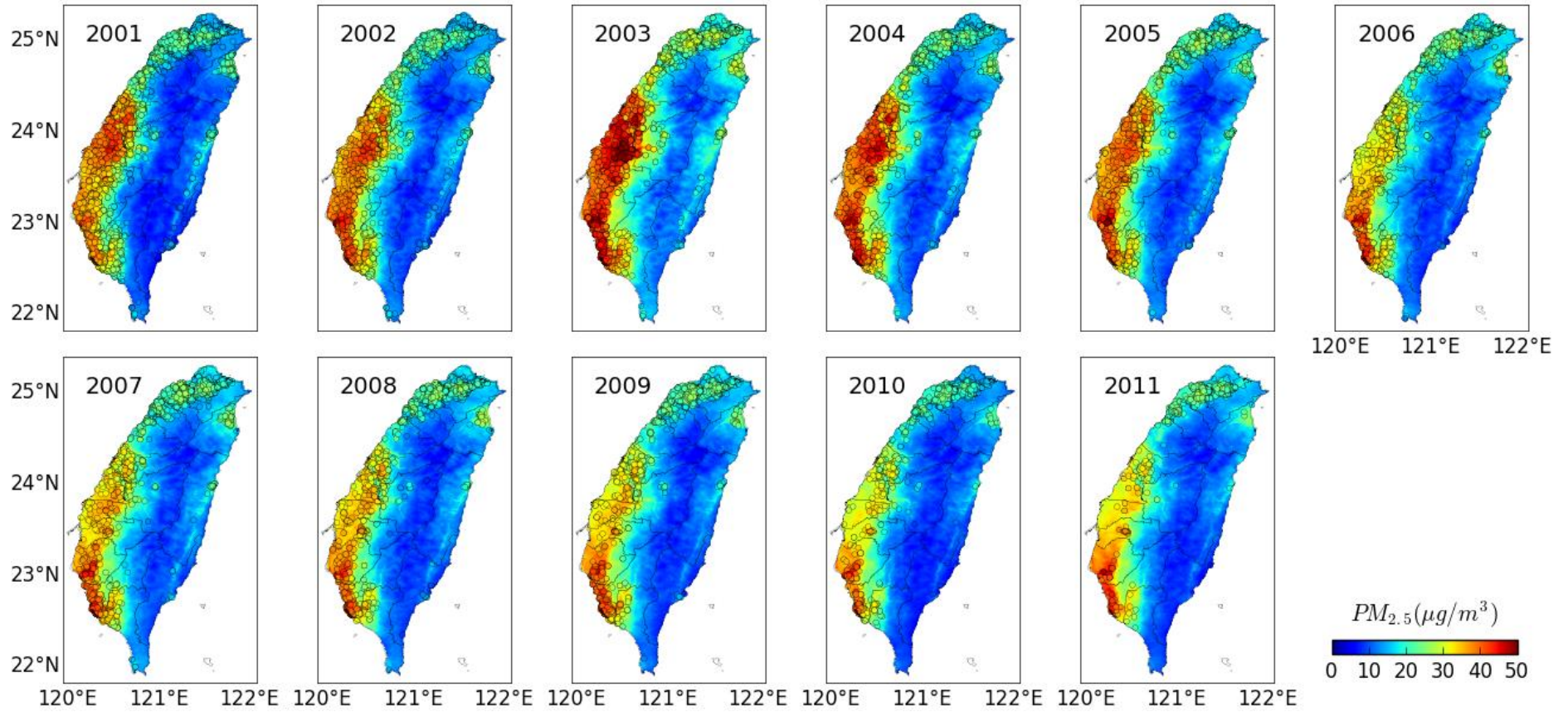
Figure S1

Figure S1. Maps of Taiwan showing the residential or business locations of study participants (circles) and spatial distributions of baseline PM$_{2.5}$ exposure by year of the study (2001–2011)