Supplemental Material

Table S1. **Cases and person-year for arrhythmias during follow-up visits.**

	Outcomes								
	Bradycardia	Atrial fibrillation	Premature Ventricular Contraction	Premature Atrial Contraction	Tachycardia	RBBB	LBBB	Atrioventricular block	Others
PM_{10}	6,373/1,031,827	180/1,049,008	1,705/1,042,506	670/1,047,251	669/1,046,556	4,760 /1,032,103	42/1,043,399	26/1,043,417	1,792 /1,042,900
$PM_{2.5}$	5,499/590,311	116/602,578	1,186/600,144	488/601,674	450/601,803	3,732/585,312	22/598,223	5/598,251	1,298/599,501

Table S2. ORs (95% CI) for each 10 μg/m^3 increase in particulate matter exposure associated with risk of any arrhythmias in Kangbuk Samsung Health Study (KSHS) cohort from 2002 to 2016. (use longer exposure datasets)

Exposures	Models	12-month	36-month	60-month
PM_{10}	model 1	1.10 (1.04, 1.16)	1.08 (1.03, 1.14)	1.12 (1.06, 1.18)
	model 2	1.11 (1.05, 1.18)	1.09 (1.03, 1.15)	1.12 (1.06, 1.19)
$PM_{2.5}$	model 1	1.20 (1.08, 1.33)	1.13 (1.01, 1.25)	
	model 2	1.19 (1.07, 1.32)	1.11 (1.00, 1.23)	

Model 1. Adjusted for age (continuous), sex (men or women), study center (Seoul or Suwon), year of visit (continuous), and education level (no education, elementary school, middle school, high school, technical college, and university or more). Model 2. Additionally, systolic blood pressure (continuous), smoking status (never, current, former), height (continuous), weight (continuous), alcohol consumption (none, moderate, or excessive), physical activity (none, <3 times per week, or ⩾3 times per week), and history of diabetes (yes or no) and history of hypertension (yes or no). PM_{10}, particulate matter of less than 10 μm in aerodynamic diameter; $PM_{2.5}$, particulate matter of less than 2.5 μm in aerodynamic diameter.

Table S3. ORs (95% CI) for secondary outcomes associated with particulate matter exposures (use longer exposure datasets)

Arrhythmias	Exposure	Models	Exposure Duration		
			12-month	36-month	60-month
Atrial Fibrillation	PM_{10}	Model 1	1.24 (0.61, 2.55)	1.28 (0.62, 2.66)	1.33 (0.66, 2.67)
		Model 2	1.25 (0.61, 2.56)	1.29 (0.62, 2.69)	1.34 (0.67, 2.70)
	$PM_{2.5}$	Model 1	1.02 (0.50, 2.07)	0.93 (0.48, 1.84)	
		Model 2	0.93 (0.47, 1.84)	0.94 (0.48, 1.84)	
Bradycardia	PM_{10}	Model 1	1.19 (1.10, 1.28)	1.19 (1.10, 1.29)	1.19 (1.10, 1.29)
		Model 2	1.21 (1.12, 1.31)	1.21 (1.11, 1.31)	1.21 (1.12, 1.31)
	$PM_{2.5}$	Model 1	1.14 (0.99, 1.31)	1.22 (1.05, 1.41)	
		Model 2	1.12 (0.97, 1.29)	1.19 (1.03, 1.38)	
Premature Ventricular Contraction	PM_{10}	Model 1	1.07 (0.90, 1.28)	1.03 (0.85, 1.24)	1.04 (0.86, 1.25)
		Model 2	1.07 (0.90, 1.28)	1.03 (0.85, 1.24)	1.04 (0.86, 1.25)
	$PM_{2.5}$	Model 1	0.85 (0.61, 1.20)	0.83 (0.59, 1.16)	
		Model 2	0.86 (0.61, 1.21)	0.84 (0.60, 1.16)	
Premature Atrial Contraction	PM_{10}	Model 1	1.28 (0.98, 1.68)	1.35 (1.03, 1.75)	1.38 (1.06, 1.79)
		Model 2	1.28 (0.98, 1.68)	1.35 (1.04, 1.76)	1.39 (1.07, 1.80)
	$PM_{2.5}$	Model 1	0.99 (0.55, 1.80)	0.96 (0.53, 1.74)	
		Model 2	0.99 (0.55, 1.80)	0.96 (0.53, 1.74)	
Conduction Disorder	PM_{10}	Model 1	0.99 (0.90, 1.09)	0.94 (0.85, 1.04)	1.02 (0.93, 1.13)
		Model 2	1.01 (0.92, 1.11)	0.96 (0.86, 1.06)	1.04 (0.94, 1.15)
	$PM_{2.5}$	Model 1	1.55 (1.27, 1.89)	1.19 (0.99, 1.44)	
		Model 2	1.52 (1.24, 1.85)	1.17 (0.97, 1.41)	
Tachycardia	PM_{10}	Model 1	1.03 (0.75, 1.41)	1.08 (0.79, 1.47)	1.06 (0.78, 1.43)
		Model 2	0.98 (0.72, 1.34)	1.04 (0.77, 1.42)	1.03 (0.76, 1.39)
	$PM_{2.5}$	Model 1	0.92 (0.60, 1.41)	0.97 (0.63, 1.50)	
		Model 2	0.93 (0.61, 1.43)	1.00 (0.65, 1.55)	
Other	PM_{10}	Model 1	1.11 (0.95, 1.30)	1.10 (0.94, 1.30)	1.22 (1.04, 1.42)
		Model 2	1.11 (0.95, 1.31)	1.11 (0.94, 1.31)	1.22 (1.05, 1.43)
	$PM_{2.5}$	Model 1	0.97 (0.70, 1.34)	0.87 (0.64, 1.18)	
		Model 2	0.96 (0.69, 1.33)	0.86 (0.64, 1.16)	

Model 1. Adjusted for age (continuous), sex (men or women), study center (Seoul or Suwon), year of visit (continuous), and education level (no education, elementary school, middle school, high school, technical college, and university or more). Model 2. Additionally, systolic blood pressure (continuous), smoking status (never, current, former), height (continuous), weight (continuous), alcohol consumption (none, moderate, or excessive), physical activity (none, <3 times per week, or ⩾3 times per week), and history of diabetes (yes or no) and history of hypertension (yes or no). PM_{10}, particulate matter of less than 10 μm in aerodynamic diameter; $PM_{2.5}$, particulate matter of less than 2.5 μm in aerodynamic diameter.