

Supplemental Online Content

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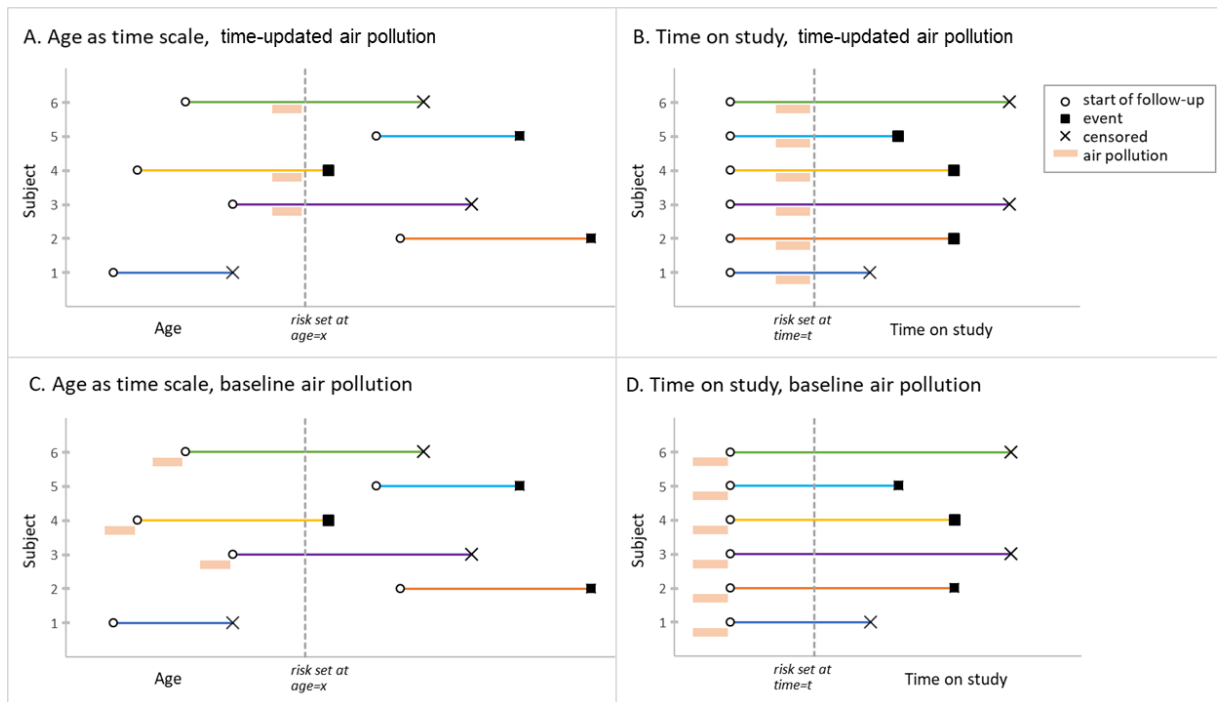
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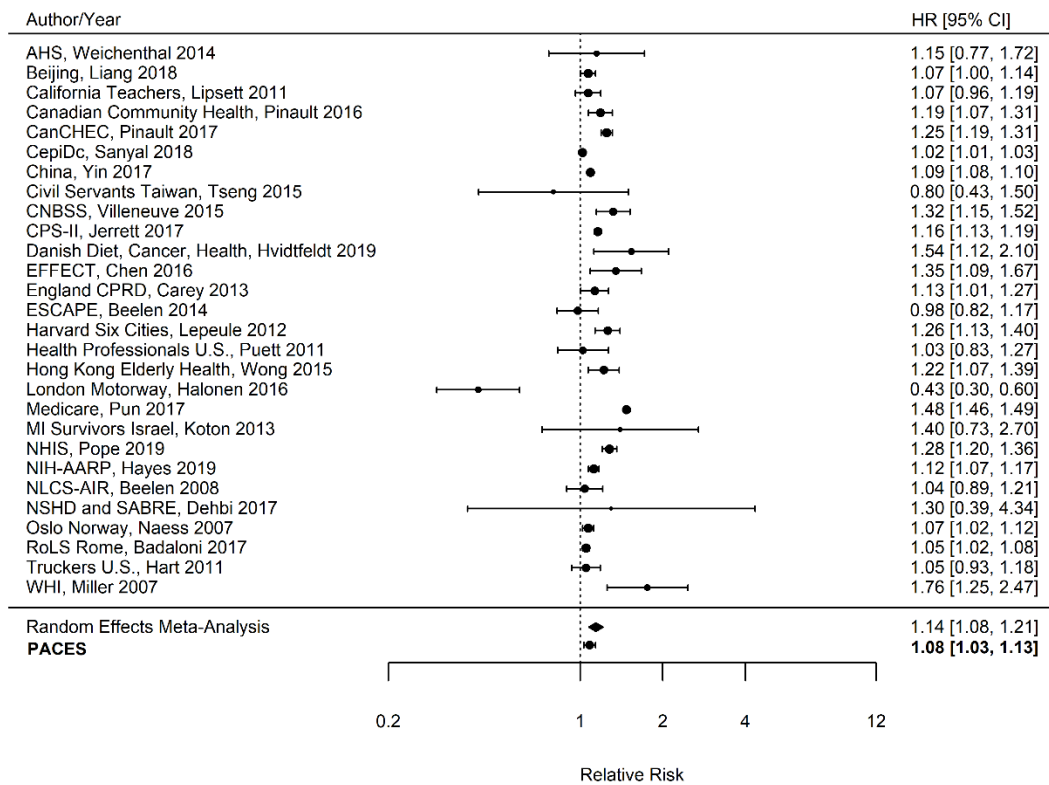
This supplemental material has been provided by the authors to give readers additional information about their work.

eFigure 1. Survival analysis study designs illustrating age as time scale, time on study, baseline air pollution exposure, and time-updated air pollution exposure.

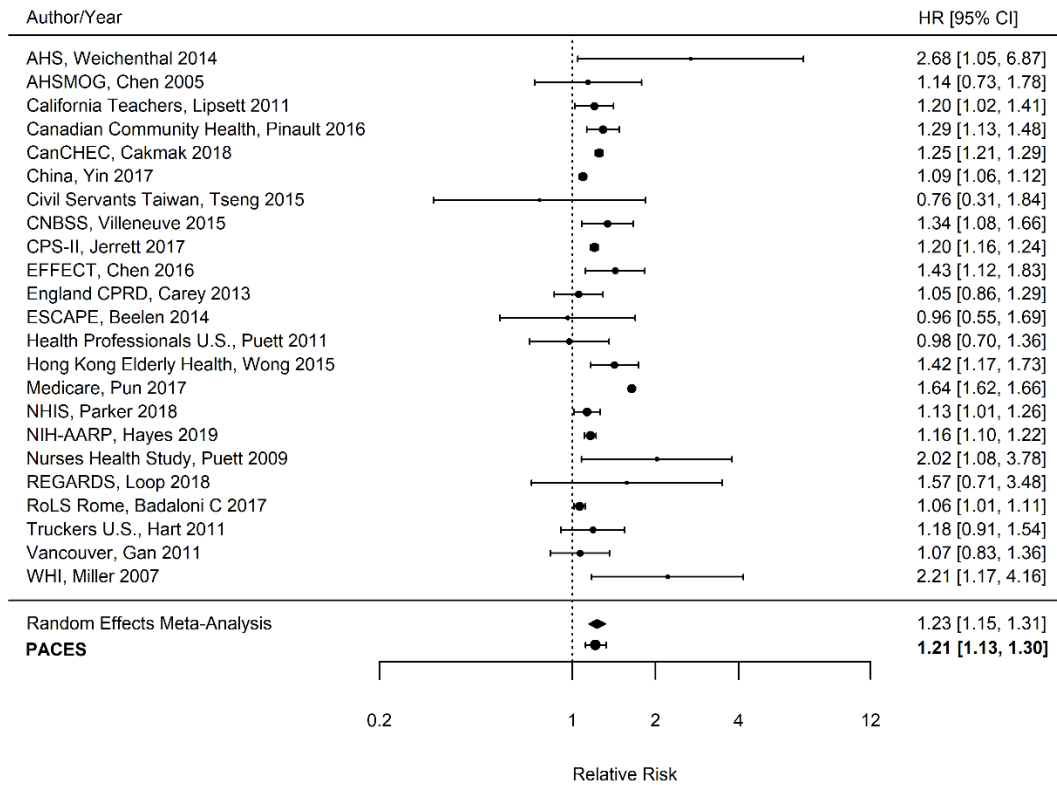


Our study used age as time scale and time-updated air pollution (A), which aligns subjects by age and appropriately computes risk estimates using the most recent 1-year mean air pollution. In this example, the risk set at age= x includes three subjects, and the estimated risk of the event at that instance is computed based on each subjects' mean air pollution during the preceding year. Panel (B) illustrates time on study and time-varying air pollution. In this example, the risk set at time= t includes all six subjects, and the estimated risk of the event at that instance is computed based on each subjects' mean air pollution during the preceding year. Panel (C) illustrates age as time scale and baseline air pollution. In this example, the risk set at age= x includes three subjects, and the estimated risk of the event at that instance is computed based on each subjects' mean air pollution during the year preceding the start of follow-up. Panel (D) illustrates time on study and baseline air pollution. In this example, the risk set at time= t includes all six subjects, and the estimated risk of the event at that instance is computed based on each subjects' mean air pollution during the year preceding the start of follow-up.

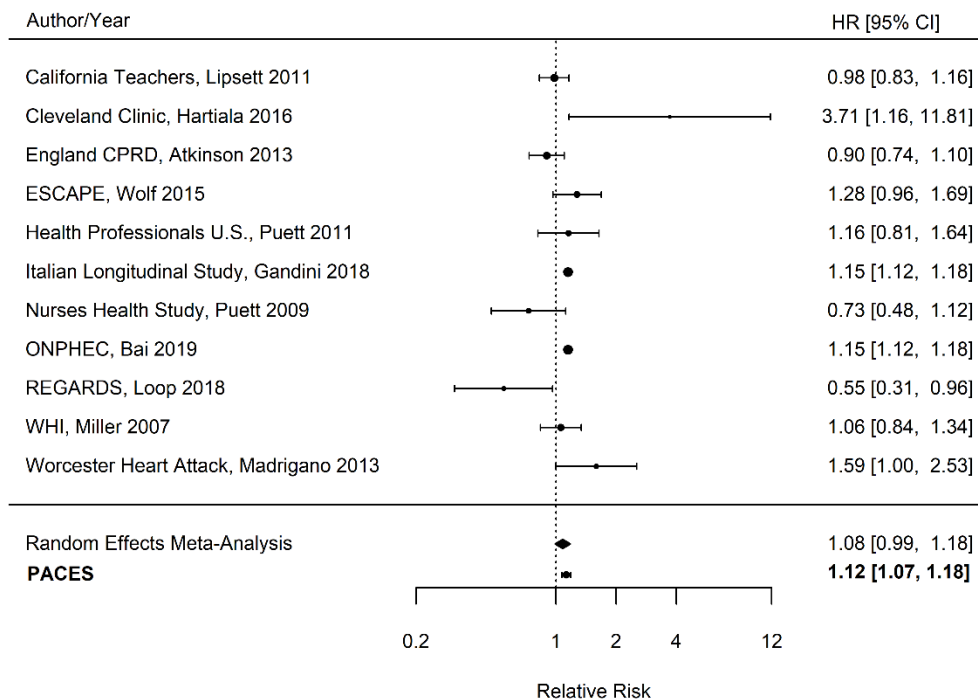
eFigure 2. PACES estimated CVD mortality effect compared to previous studies in a recently published meta-analysis.



eFigure 3. PACES estimated IHD mortality effect compared to previous studies in a recently published meta-analysis.



eFigure 4. PACES estimated incident AMI effect compared to previous studies in a recently published meta-analysis.



eTable 1. Sensitivity analyses showing the relative risk of each outcome associated with a 10 µg/m³ increase in time-varying 1-year mean PM_{2.5} exposure for different models.

Model	Covariates	Incident AMI (30,165 events) HR (95% CI)	IHD Mortality (14,278 events) HR (95% CI)	CVD Mortality (31,284 events) HR (95% CI)
Model 1	Age, sex, race/ethnicity	1.38 (1.32, 1.45)	1.50 (1.40, 1.60)	1.30 (1.24, 1.36)
Model 2	Age, sex, race/ethnicity, SES	1.27 (1.21, 1.33)	1.34 (1.25, 1.43)	1.18 (1.13, 1.24)
Model 2.1	Age, sex, race/ethnicity, SES, smoking	1.26 (1.20, 1.32)	1.34 (1.25, 1.44)	1.18 (1.13, 1.24)
Model 2.2	Age, sex, race/ethnicity, SES, smoking, BMI	1.24 (1.18, 1.30)	1.33 (1.24, 1.42)	1.17 (1.12, 1.23)
Model 2.3	Age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities	1.12 (1.07, 1.18)	1.22 (1.14, 1.30)	1.08 (1.03, 1.13)
Model 3 (fully adjusted)	Age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, and baseline medication use	1.12 (1.07, 1.18)	1.21 (1.13, 1.30)	1.08 (1.03, 1.13)
Model 3.1	Age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, baseline medication use, calendar year	1.12 (1.07, 1.18)	1.21 (1.13, 1.30)	1.08 (1.03, 1.13)
Model 3.2	Age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, baseline medication use; uses inverse probability of censoring weighting	1.12 (1.06, 1.18)	1.23 (1.14, 1.32)	1.09 (1.03, 1.15)
Model 3.3	Age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, baseline medication use; adjusts for neighborhood income instead of neighborhood education	1.11 (1.06, 1.16)	1.19 (1.11, 1.27)	1.07 (1.02, 1.12)

eTable 2. Follow-up time in years, overall and by age and SES.

Subgroup	Median	25%	75%
Overall	4.2	1.7	9.8
Age			
18-39	2.9	1.2	6.5
40-64	6.2	2.2	10.0
≥65	8.1	3.2	10.0
Neighborhood Education			
Q1 (High SES)	4.9	1.8	10.0
Q2	4.6	1.8	10.0
Q3	4.2	1.6	9.7
Q4 (Low SES)	3.5	1.3	8.4

eTable 3. Relative risk of each outcome associated with 1-year mean PM_{2.5} exposure, overall and by subgroups for age, sex, race, neighborhood education, and smoking status.

Subgroup	N	<u>Incident AMI</u>			<u>IHD Mortality</u>			<u>CVD Mortality</u>		
		HR	(95% CI)	P Value	HR	(95% CI)	P Value	HR	(95% CI)	P-Value
Overall	3,798,078	1.12	(1.07, 1.18)		1.21	(1.13, 1.30)		1.08	(1.03, 1.13)	
Age				0.266			0.207			0.009
18-64	3,118,050	1.16	(1.08, 1.25)		1.34	(1.13, 1.59)		1.25	(1.11, 1.41)	
≥65	680,028	1.10	(1.03, 1.17)		1.19	(1.11, 1.28)		1.05	(1.00, 1.11)	
Sex				0.668			0.008			0.108
Male	1,806,020	1.13	(1.06, 1.20)		1.12	(1.02, 1.23)		1.12	(1.05, 1.19)	
Female	1,992,058	1.11	(1.02, 1.20)		1.34	(1.21, 1.48)		1.04	(0.97, 1.11)	
Race				0.654			0.170			0.021
White	1,904,793	1.12	(1.06, 1.19)		1.26	(1.17, 1.37)		1.11	(1.06, 1.18)	
Hispanic	696,796	1.08	(0.94, 1.25)		0.98	(0.77, 1.24)		0.94	(0.80, 1.11)	
Black	287,980	1.09	(0.88, 1.35)		1.30	(0.97, 1.75)		1.13	(0.93, 1.38)	
Asian/Pacific Islander	714,043	1.24	(1.06, 1.46)		1.19	(0.89, 1.60)		1.13	(0.93, 1.38)	
AIAN	20,205	1.54	(0.87, 2.74)		1.28	(0.52, 3.14)		0.83	(0.41, 1.68)	
Multiple Races	174,261	1.07	(0.89, 1.29)		0.96	(0.74, 1.24)		0.84	(0.70, 1.00)	
Neighborhood Education				<0.001			<0.001			<0.001
Q1 (High SES)	949,562	1.03	(0.97, 1.09)		1.08	(0.99, 1.18)		0.99	(0.93, 1.05)	
Q2	949,434	1.10	(1.05, 1.17)		1.16	(1.08, 1.26)		1.06	(1.01, 1.20)	
Q3	949,569	1.16	(1.10, 1.22)		1.26	(1.17, 1.35)		1.10	(1.05, 1.16)	
Q4 (Low SES)	949,513	1.17	(1.10, 1.24)		1.31	(1.20, 1.43)		1.14	(1.07, 1.21)	
Smoking				0.051			0.199			0.396
Never	2,497,571	1.06	(0.99, 1.14)		1.28	(1.16, 1.41)		1.06	(0.99,1.13)	
Current	611,156	1.24	(1.12, 1.37)		1.26	(1.06, 1.49)		1.16	(1.03,1.32)	
Former	689,351	1.14	(1.05, 1.23)		1.12	(1.00, 1.25)		1.07	(0.99,1.16)	

eTable 4. Sensitivity analysis of the relative risk of incident AMI, IHD mortality, cardiovascular mortality, and associated with time-varying 1-year mean PM_{2.5} exposure, in quartiles of neighborhood median income, among 3.7 million subjects in the PACES cohort.

Outcome	Neighborhood Median Income	N	N events	HR	(95% CI)	P Value
Incident AMI						0.649
	Q1 (low SES)	948,628	7,650	1.11	(1.05, 1.18)	
	Q2	950,217	7,666	1.12	(1.06, 1.18)	
	Q3	950,242	7,427	1.10	(1.04, 1.16)	
	Q4 (high SES)	948,991	7,422	1.10	(1.03, 1.18)	
IHD Mortality						0.001
	Q1 (low SES)	948,628	4,214	1.25	(1.16, 1.35)	
	Q2	950,217	3,735	1.21	(1.13, 1.31)	
	Q3	950,242	3,172	1.10	(1.02, 1.19)	
	Q4 (high SES)	948,991	3,157	1.11	(1.01, 1.23)	
CVD Mortality						0.007
	Q1 (low SES)	948,628	8,966	1.11	(1.05, 1.17)	
	Q2	950,217	7,985	1.07	(1.02, 1.13)	
	Q3	950,242	7,142	1.02	(0.97, 1.08)	
	Q4 (high SES)	948,991	7,191	1.02	(0.95, 1.09)	

eTable 5. Relative risk of cardiovascular mortality, IHD mortality, and incident AMI associated with time-varying 1-year mean PM_{2.5} exposure, in categories above and below the regulation limit, among 3.7 million subjects in the PACES cohort.

PM2.5 exposure category	Incident AMI HR (95% CI)	IHD Mortality HR (95% CI)	Cardiovascular Mortality HR (95% CI)
<8.0	1.00 (ref)	1.00 (ref)	1.00 (ref)
8.0- 9.9	1.06 (1.03,1.09)	1.02 (0.98, 1.07)	0.99 (0.96, 1.02)
10.0-11.9	1.06 (1.03,1.10)	1.07 (1.02, 1.12)	0.98 (0.95, 1.02)
12.0-13.9	1.10 (1.05,1.16)	1.16 (1.08, 1.25)	1.08 (1.03, 1.14)
≥14.0	1.09 (1.02,1.15)	1.19 (1.09, 1.29)	1.11 (1.05, 1.17)

Adjusted for age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, baseline medication use.

eTable 6. Assessment of linearity of associations by adding a quadratic term for 1-year mean PM_{2.5} exposure to the linear associations in the fully adjusted models (Model 3), among 3.7 million subjects in the PACES cohort.

PM2.5 exposure, test for non-linearity	Incident AMI p-value	IHD Mortality p-value	Cardiovascular Mortality p-value
quadratic term for 1-year mean PM _{2.5} exposure	0.0011	0.3318	0.0019

Adjusted for age, sex, race/ethnicity, SES, smoking, BMI, baseline comorbidities, baseline medication use.

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eMethods. Supplementary Methods

Imputation of missing covariates. Missing data was imputed for the covariates sex (<0.1%), race/ethnicity (8.6%), smoking (5.2%), and BMI (4.7%) using the fully conditional specification (FSC) method. The FSC method accommodates both continuous and categorical variables and does not require assuming a joint distribution for all missing variables. Instead, it uses a separate conditional distribution for each imputed variable, making the approach more flexible. The variables were imputed sequentially in the order of least to most missingness. Age, sex, neighborhood education, BMI, race/ethnicity, and smoking, were used for imputation. Continuous variables used the regression method and categorical variables used the generalized logit distribution, appropriate for variables with multiple non-ordered categories.