



Research Report 238

Ambient Air Pollution and COVID-19 in California

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Appendix C. Supplemental Information for Chapter 5: Air Pollution and Meteorology as Risk Factors for COVID-19 Mortality in Southern California

Appendix C was reviewed by the HEI Review Committee and has been lightly edited for spelling, grammar, punctuation, and cross-references to the main report.

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Kaiser Permanente Southern California Cohort and Health Data

KPSC Cohort Health Data Ascertainment

We defined COVID-19 hospitalizations as those occurring within 21 days of a COVID-19 diagnosis or positive test. Hospitalizations lasting less than 24 hours were excluded, and transfers from non-KPSC hospitals to KPSC hospitals were consolidated into a single hospitalization. Data sources consist of internal data sources (including KPSC hospital, clinic, and emergency department data), California state death master files, and the Social Security Administration Death Master File. Data are cleaned and scored for accuracy using a proprietary algorithm.

Elixhauser Disease Categories

Five broad comorbidity categories were created to identify comorbidities that may increase a person’s risk of severe COVID-19 outcomes.^{1,2} We use Elixhauser disease categories to create COVID-19–related disease categories. The Elixhauser comorbidity index, which is based on aggregating diagnoses into 23 disease categories, measures the burden of multiple morbidities by summing the number of disease categories in which a patient has a diagnosis. The index was originally developed to predict mortality among hospitalized patients by aggregating the following Elixhauser comorbidity categories: “Cardiovascular diseases” includes the Elixhauser comorbidities Congestive Heart Failure, Cardiac Arrhythmia, Valvular Disease, Pulmonary Circulation Disorders, and Peripheral Vascular Disorders; “Pulmonary disease” includes the Elixhauser comorbidity Chronic Pulmonary Disease; “Hypertension ” includes Elixhauser comorbidities Hypertension uncomplicated and Hypertension complicated; “Diabetes” includes the Elixhauser comorbidities Diabetes with and without chronic complications; the remainder of the Elixhauser comorbidities were grouped into a residual category

named “other.” We further combined the four specific categories into a count of COVID-19–related disease categories that would allow us to stratify our analysis by chronic disease burden.

Confounder Analysis

Table C1, on the next page, shows the confounders selected for each pollutant, based on the 10% criterion.

Table C1. Confounders Selected^a for Each Pollutant Exposure, Based on a 10% Change in the Pollution Coefficient

	NO ₂	O ₃ (max)	NO ₂ (CTM) and O ₃	PM _{2.5} (mass)	PM _{2.5} (mass) and O ₃	PM _{2.5} (ni- trates)	PM _{2.5} (organic com- pounds)	PM _{0.1} (mass)	PM _{2.5} (elem- ental carbon)	On-road diesel PM _{2.5}	On-road gasoline PM _{2.5}	Biomass com- bustion PM _{2.5}	Relative humidity (%)	Temp (C)
Smoking status	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
BMI (linear and squared terms)	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Medicaid	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Exercise Vital Sign	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE
Percentage of housing units with >1 occupants per room (Census)	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE
Neighborhood Deprivation Index	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE
Percentage of workers age 16+ commuting by public transportation (Census)	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Relative humidity (%)	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE
Temperature (°C)	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE

^aFALSE indicates not selected, and TRUE indicates selected.

Unadjusted Hazard Ratios

Table C2. Unadjusted Hazard Ratios

Characteristic	Completely unadjusted				Stratified by age, sex, race/ethnicity		
	<i>N</i>	HR	95% CI	<i>P</i> value	HR	95% CI	<i>P</i> value
NO ₂	21,415	1.013	0.97, 1.061	0.59	1.04	0.99, 1.09	0.2
O ₃ (maximum)	21,415	1.106	1.058, 1.156	<0.001	1.15	1.10, 1.21	<0.001
PM _{2.5} (mass)	21,415	1.050	1.008, 1.094	0.019	1.08	1.03, 1.13	<0.001
PM _{2.5} (nitrates)	21,415	1.059	1.018, 1.102	0.005	1.08	1.03, 1.13	<0.001
PM _{2.5} (organic compounds)	21,415	0.99	0.947, 1.031	0.58	1.00	0.95, 1.05	>0.9
PM _{0.1} (mass)	21,415	1.034	1.002, 1.068	0.038	1.05	1.02, 1.09	0.005
PM _{2.5} (elemental carbon)	21,415	1.008	0.97, 1.048	0.71	1.04	0.99, 1.09	0.094
On-road diesel PM _{2.5}	21,415	1.022	0.99, 1.056	0.21	1.05	1.01, 1.09	0.008
On-road gasoline PM _{2.5}	21,415	0.99	0.950, 1.028	0.56	1.01	0.97, 1.06	0.5
Biomass combustion PM _{2.5}	21,415	0.99	0.96, 1.021	0.50	0.98	0.95, 1.02	0.3
Relative humidity (%)	21,409	0.806	0.771, 0.843	<0.001	0.79	0.75, 0.83	<0.001
Temperature (°C)	21,409	0.877	0.852, 0.903	<0.001	0.89	0.86, 0.92	<0.001

CI = Confidence Interval; HR = Hazard Ratio. Bold font indicates *P* values < 0.05.

Table C3. Main Results for Fully Adjusted Models by Exposure

Pollutant or Source Tracer	HR ¹	95% CI	p-value
PM _{2.5} (mass)	1.12	1.06, 1.17	<0.001
PM _{2.5} (mass) and Ozone	1.10	1.05, 1.15	<0.001
	1.02	0.96, 1.09	0.5
PM _{2.5} (mass) and NO ₂	1.07	1.00, 1.15	0.035
	1.03	0.95, 1.12	0.5
PM _{2.5} (nitrates)	1.12	1.07, 1.17	<0.001
PM _{2.5} (organic compounds)	1.04	0.99, 1.10	0.13
PM _{2.5} (elemental carbon)	1.07	1.03, 1.13	0.002
On-road diesel PM _{2.5}	1.06	1.03, 1.10	<0.001
On-road gasoline PM _{2.5}	1.07	1.02, 1.13	0.004
Biomass combustion PM _{2.5}	0.99	0.96, 1.03	0.7
PM _{0.1} (mass)	1.06	1.02, 1.10	0.007
NO ₂	1.10	1.04, 1.16	0.001
Ozone (maximum)	1.02	0.96, 1.08	0.6
NO ₂ and Ozone	1.11	1.05, 1.18	<0.001
	0.97	0.89, 1.05	0.4
Relative humidity (%)	0.82	0.78, 0.86	<0.001
Temperature (°C)	0.92	0.89, 0.95	<0.001

¹Hazard ratios reported for the interquartile range exposure increment. Based on interquartile exposure contrast for each pollutant or pollutant source tracer. **Bolded** font indicates significant *P* values less than 0.05.

Stratification Analyses

We ran the stratified models and tested for significant interactions with the pollutant models, as shown in Tables C4–C6. The majority of the subgroup analyses were highly nonsignificant based on the Q statistic shown at the bottom of each table, meaning that we did not find significant interactions between the air pollutants and the subgroups.

Stratification by Sex

Table C4. Stratification by Sex

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
NO ₂ /IQR	1.09	1.00, 1.19	0.056	1.10	1.03, 1.19	0.009
BMI/IQR	0.66	0.51, 0.87	0.003	0.76	0.59, 0.98	0.035
BMI*BMI/IQR	1.54	1.23, 1.94	<0.001	1.39	1.11, 1.75	0.005
Exercise Vital Sign (median)/IQR	0.95	0.88, 1.01	0.11	0.97	0.94, 1.01	0.15
NDI ACS2013	1.06	1.00, 1.12	0.034	1.02	0.98, 1.07	0.4
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.012	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for NO2_stdqr is: 0.04, df is: 2, and P value is: 0.98"

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
O ₃ (maximum)/IQR	1.00	0.91, 1.11	>0.9	1.02	0.95, 1.10	0.5
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for O3max_stdqr is: 0.08, df is: 2, and P value is: 0.961"

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
NO ₂ /IQR	1.10	1.00, 1.20	0.044	1.11	1.03, 1.20	0.005
O ₃ (maximum)/IQR	1.06	0.96, 1.18	0.2	1.10	1.01, 1.19	0.023
BMI/IQR	0.66	0.51, 0.87	0.003	0.76	0.59, 0.98	0.037
BMI*BMI/IQR	1.54	1.23, 1.94	<0.001	1.39	1.10, 1.75	0.005
Exercise Vital Sign (median)/IQR	0.95	0.89, 1.01	0.12	0.97	0.94, 1.01	0.2
NDI ACS2013	1.06	1.01, 1.12	0.027	1.02	0.98, 1.07	0.3
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	0.004
Temperature (°C)	0.98	0.97, 1.00	0.008	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for NO2_stdqr is: 0.054, df is: 2, and P value is: 0.974"

Continued next page

	F			M		
Characteristic	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (mass)/IQR	1.14	1.06, 1.23	<0.001	1.10	1.04, 1.17	0.001
Temperature (°C)	0.98	0.97, 0.99	<0.001	0.97	0.96, 0.98	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5mass_stdqr is: 0.476, df is: 2, and P value is: 0.788"

	F			M		
Characteristic	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (mass)/IQR	1.12	1.04, 1.21	0.004	1.08	1.02, 1.15	0.011
O ₃ (maximum)/IQR	0.99	0.89, 1.11	0.9	1.04	0.96, 1.13	0.3
Temperature (°C)	0.98	0.97, 0.99	0.005	0.98	0.97, 0.99	<0.001
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5mass_stdqr is: 0.436, df is: 2, and P value is: 0.804"

	F			M		
Characteristic	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (nitrates)/IQR	1.12	1.04, 1.22	0.004	1.12	1.05, 1.19	<0.001
Temperature (°C)	0.98	0.97, 0.99	<0.001	0.97	0.96, 0.98	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5n_v_stdqr is: 0.011, df is: 2, and P value is: 0.995"

	F			M		
Characteristic	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (organic compounds)/IQR	1.07	0.98, 1.16	0.11	1.02	0.96, 1.09	0.5
BMI/IQR	0.66	0.51, 0.87	0.003	0.76	0.58, 0.98	0.033
BMI*BMI/IQR	1.54	1.23, 1.94	<0.001	1.40	1.11, 1.76	0.004
Exercise Vital Sign (median)/IQR	0.94	0.88, 1.01	0.10	0.97	0.94, 1.01	0.2
Percentage of housing units with >1 occupants per room	0.96	0.53, 1.72	0.9	1.12	0.72, 1.73	0.6
NDI ACS2013	1.06	1.00, 1.14	0.062	1.02	0.97, 1.08	0.4
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.011	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5oc_stdqr is: 0.602, df is: 2, and P value is: 0.74"

	F			M		
Characteristic	HR	95% CI	P value	HR	95% CI	P value
PM _{0.1} (mass)/IQR	1.11	1.04, 1.18	0.001	1.03	0.98, 1.09	0.2
BMI/IQR	0.69	0.53, 0.91	0.009	0.79	0.61, 1.02	0.070
BMI*BMI/IQR	1.50	1.19, 1.89	<0.001	1.37	1.09, 1.73	0.007
NDI_ACS2013	1.04	0.99, 1.10	0.12	1.03	0.98, 1.07	0.2
Temperature (°C)	0.98	0.97, 0.99	<0.001	0.97	0.97, 0.98	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm0_1mass_stdqr is: 2.948, df is: 2, and P value is: 0.229"

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Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (elemental carbon)/IQR	1.07	0.99, 1.15	0.070	1.08	1.02, 1.15	0.014
BMI/IQR	0.66	0.50, 0.87	0.003	0.76	0.59, 0.98	0.035
BMI*BMI/IQR	1.55	1.23, 1.94	<0.001	1.39	1.11, 1.75	0.005
Exercise Vital Sign (median)/IQR	0.95	0.88, 1.01	0.11	0.97	0.94, 1.01	0.2
NDI ACS2013	1.07	1.01, 1.12	0.018	1.03	0.98, 1.07	0.2
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.010	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5ec_stdqr is: 0.034, df is: 2, and P value is: 0.983"

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
On-road diesel PM _{2.5} /IQR	1.06	1.01, 1.13	0.032	1.06	1.01, 1.11	0.012
BMI/IQR	0.67	0.51, 0.88	0.004	0.78	0.61, 1.02	0.066
BMI*BMI/IQR	1.54	1.22, 1.93	<0.001	1.37	1.09, 1.72	0.008
Relative humidity (%)	0.99	0.99, 0.99	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.009	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5tracer3_stdqr is: 0.002, df is: 2, and P value is: 0.999"

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
On-road gasoline PM _{2.5} /IQR	1.06	0.98, 1.14	0.14	1.08	1.02, 1.15	0.014
BMI/IQR	0.66	0.50, 0.87	0.003	0.76	0.58, 0.98	0.034
BMI*BMI/IQR	1.55	1.23, 1.94	<0.001	1.40	1.11, 1.76	0.004
Exercise Vital Sign (median)/IQR	0.94	0.88, 1.01	0.10	0.97	0.94, 1.01	0.14
Percentage of housing units with >1 occupants per room	0.95	0.53, 1.70	0.9	1.05	0.68, 1.63	0.8
NDI ACS2013	1.07	1.00, 1.14	0.042	1.02	0.97, 1.08	0.4
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.012	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5tracer1_stdqr is: 0.149, df is: 2, and P value is: 0.928"

Characteristic	F			M		
	HR	95% CI	P value	HR	95% CI	P value
Biomass combustion PM _{2.5} /IQR	1.02	0.97, 1.08	0.5	0.98	0.94, 1.02	0.3
BMI/IQR	0.67	0.51, 0.88	0.004	0.78	0.60, 1.00	0.052
BMI*BMI/IQR	1.54	1.23, 1.93	<0.001	1.38	1.11, 1.73	0.004
Percentage of housing units with >1 occupants per room	0.99	0.55, 1.78	>0.9	1.19	0.77, 1.83	0.4
NDI ACS2013	1.07	1.00, 1.14	0.051	1.03	0.98, 1.09	0.3
Relative humidity (%)	0.99	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for pm2_5tracer6_stdqr is: 1.169, df is: 2, and P value is: 0.557"

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	F			M		
Characteristic	HR ¹	95% CI	P value	HR	95% CI	P value
Relative humidity (%) / IQR	0.78	0.72, 0.85	<0.001	0.85	0.80, 0.90	<0.001
Temperature (°C)	0.99	0.98, 1.00	0.007	0.98	0.97, 0.99	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for rmax_k_stdiqr is: 2.062, df is: 2, and P value is: 0.357"

	F			M		
Characteristic	HR	95% CI	P value	HR ¹	95% CI	P value
Temperature (°C) / IQR	0.93	0.88, 0.98	0.007	0.91	0.87, 0.95	<0.001
Relative humidity (%)	0.99	0.99, 0.99	<0.001	0.99	0.99, 1.00	<0.001

CI = confidence interval; F = female; HR = hazard ratio; M = male.

[1] "Q for tmmx_c_stdiqr is: 0.321, df is: 2, and P value is: 0.852"

Stratification by Number of Disease Categories

Table C5. Stratification by Number of Disease Categories

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
NO ₂ /IQR	4,429	405	1.00	0.80, 1.25	>0.9	4,664	761	1.24	1.04, 1.46	0.014	11,245	3,475	1.10	1.03, 1.17	0.004
BMI/IQR	4,429	405	0.56	0.29, 1.07	0.078	4,664	761	0.80	0.44, 1.44	0.5	11,245	3,475	0.68	0.55, 0.84	<0.001
BMI*BMI/IQR	4,429	405	1.91	1.17, 3.11	0.010	4,664	761	1.38	0.84, 2.26	0.2	11,245	3,475	1.49	1.24, 1.79	<0.001
Exercise Vital Sign (median)/IQR	4,429	405	0.92	0.83, 1.02	0.10	4,664	761	0.93	0.85, 1.01	0.077	11,245	3,475	0.98	0.94, 1.02	0.3
NDI ACS2013	4,429	405	1.20	1.05, 1.37	0.009	4,664	761	1.03	0.94, 1.13	0.5	11,245	3,475	1.02	0.98, 1.06	0.3
Relative humidity (%)	4,429	405	0.98	0.97, 0.99	<0.001	4,664	761	0.98	0.97, 0.99	<0.001	11,245	3,475	0.99	0.99, 1.00	<0.001
Temperature (°C)	4,429	405	0.98	0.96, 1.01	0.2	4,664	761	0.99	0.97, 1.01	0.2	11,245	3,475	0.98	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for NO₂_stdiqr is: 2.033, df is: 3, and P value is: 0.566"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
O ₃ (maximum)/IQR	4,841	445	1.14	0.91, 1.44	0.3	4,786	786	1.08	0.91, 1.27	0.4	11,372	3,523	1.03	0.96, 1.10	0.4
Relative humidity (%)	4,841	445	0.98	0.97, 0.99	<0.001	4,786	786	0.98	0.98, 0.99	<0.001	11,372	3,523	0.99	0.99, 1.00	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for O₃max_stdqr is: 0.72, df is: 3, and P value is: 0.869"

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Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
NO ₂ /IQR	4,429	405	1.05	0.82, 1.33	0.7	4,664	761	1.27	1.07, 1.51	0.007	11,245	3,475	1.11	1.04, 1.18	0.002
O ₃ (maximum)/IQR	4,429	405	1.23	0.92, 1.65	0.2	4,664	761	1.19	0.98, 1.44	0.072	11,245	3,475	1.08	1.01, 1.16	0.030
BMI/IQR	4,429	405	0.57	0.30, 1.08	0.083	4,664	761	0.81	0.45, 1.46	0.5	11,245	3,475	0.68	0.55, 0.84	<0.001
BMI*BMI/IQR	4,429	405	1.88	1.16, 3.07	0.011	4,664	761	1.36	0.83, 2.22	0.2	11,245	3,475	1.49	1.24, 1.79	<0.001
Exercise Vital Sign (median)/IQR	4,429	405	0.92	0.83, 1.02	0.10	4,664	761	0.93	0.85, 1.02	0.11	11,245	3,475	0.98	0.94, 1.02	0.3
NDI_ACS2013	4,429	405	1.21	1.06, 1.39	0.006	4,664	761	1.05	0.96, 1.15	0.3	11,245	3,475	1.02	0.99, 1.07	0.2
Relative humidity (%)	4,429	405	0.98	0.97, 1.00	0.007	4,664	761	0.98	0.98, 0.99	<0.001	11,245	3,475	0.99	0.99, 1.00	0.001
Temperature (°C)	4,429	405	0.98	0.95, 1.00	0.091	4,664	761	0.98	0.96, 1.00	0.086	11,245	3,475	0.98	0.97, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for NO₂_stdiqr is: 2.103, df is: 3, and P value is: 0.551"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{2.5} (mass)/IQR	4,841	445	1.30	1.09, 1.55	0.003	4,786	786	1.27	1.12, 1.44	<0.001	11,372	3,523	1.10	1.04, 1.16	<0.001
Temperature (°C)	4,841	445	0.96	0.94, 0.98	<0.001	4,786	786	0.97	0.95, 0.99	0.002	11,372	3,523	0.98	0.97, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5mass_stdqr is: 6.165, df is: 3, and P value is: 0.104"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{2.5} (mass)/IQR	4,841	445	1.21	1.01, 1.44	0.041	4,786	786	1.24	1.08, 1.41	0.002	11,372	3,523	1.08	1.02, 1.14	0.007
O ₃ (maximum)/IQR	4,841	445	1.14	0.88, 1.47	0.3	4,786	786	1.02	0.85, 1.23	0.8	11,372	3,523	1.03	0.96, 1.11	0.4
Temperature (°C)	4,841	445	0.98	0.95, 1.00	0.089	4,786	786	0.98	0.97, 1.00	0.11	11,372	3,523	0.98	0.98, 0.99	<0.001
Relative humidity (%)	4,841	445	0.99	0.97, 1.00	0.018	4,786	786	0.98	0.98, 0.99	<0.001	11,372	3,523	0.99	0.99, 1.00	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5mass_stdqr is: 3.651, df is: 3, and P value is: 0.302"

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Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{2.5} (nitrates)/IQR	4,841	445	1.47	1.22, 1.77	<0.001	4,786	786	1.16	1.01, 1.33	0.036	11,372	3,523	1.11	1.05, 1.17	<0.001
Temperature (°C)	4,841	445	0.96	0.94, 0.98	<0.001	4,786	786	0.97	0.95, 0.99	0.003	11,372	3,523	0.98	0.97, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5n_v_stdiqr is: 7.251, df is: 3, and P value is: 0.064"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{2.5} (organic compounds)/IQR	4,322	396	0.94	0.78, 1.14	0.5	4,533	745	1.20	1.03, 1.40	0.021	10,942	3,377	1.03	0.97, 1.09	0.3
BMI/IQR	4,322	396	0.56	0.29, 1.07	0.078	4,533	745	0.79	0.44, 1.43	0.4	10,942	3,377	0.68	0.55, 0.84	<0.001
BMI*BMI/IQR	4,322	396	1.92	1.17, 3.13	0.009	4,533	745	1.39	0.85, 2.27	0.2	10,942	3,377	1.50	1.24, 1.80	<0.001
Exercise Vital Sign (median)/IQR	4,322	396	0.92	0.83, 1.02	0.11	4,533	745	0.93	0.85, 1.01	0.090	10,942	3,377	0.98	0.94, 1.02	0.3
Percent housing units with >1 occupants per room	4,322	396	0.73	0.19, 2.89	0.7	4,533	745	0.77	0.27, 2.18	0.6	10,942	3,377	1.26	0.83, 1.91	0.3
NDI ACS2013	4,322	396	1.23	1.04, 1.44	0.013	4,533	745	1.05	0.94, 1.18	0.4	10,942	3,377	1.01	0.97, 1.06	0.5
Relative humidity (%)	4,322	396	0.98	0.97, 0.99	<0.001	4,533	745	0.98	0.97, 0.99	<0.001	10,942	3,377	0.99	0.99, 1.00	<0.001
Temperature (C°)	4,322	396	0.99	0.96, 1.01	0.2	4,533	745	0.99	0.97, 1.01	0.3	10,942	3,377	0.98	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5oc_stdiqr is: 3.622, df is: 3, and P value is: 0.305"

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Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{0.1} (mass)/IQR	4,528	412	1.20	1.02, 1.40	0.025	4,700	766	1.15	1.05, 1.26	0.004	11,296	3,492	1.04	0.99, 1.09	0.10
BMI/IQR	4,528	412	0.50	0.27, 0.93	0.029	4,700	766	0.91	0.50, 1.64	0.7	11,296	3,492	0.71	0.57, 0.87	0.001
BMI*BMI/IQR	4,528	412	2.11	1.32, 3.39	0.002	4,700	766	1.24	0.76, 2.04	0.4	11,296	3,492	1.46	1.21, 1.76	<0.001
NDI ACS2013	4,528	412	1.14	1.00, 1.29	0.055	4,700	766	1.03	0.94, 1.12	0.5	11,296	3,492	1.02	0.99, 1.06	0.2
Temperature (°C)	4,528	412	0.96	0.94, 0.98	<0.001	4,700	766	0.97	0.96, 0.99	0.003	11,296	3,492	0.98	0.97, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm0_1mass_stdiqr is: 4.96, df is: 3, and P value is: 0.175"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
PM _{2.5} (elemental carbon)/IQR	4,429	405	1.12	0.94, 1.32	0.2	4,664	761	1.20	1.05, 1.37	0.007	11,245	3,475	1.07	1.01, 1.13	0.013
BMI/IQR	4,429	405	0.56	0.30, 1.06	0.075	4,664	761	0.79	0.44, 1.43	0.4	11,245	3,475	0.68	0.55, 0.84	<0.001
BMI*BMI/IQR	4,429	405	1.89	1.17, 3.08	0.010	4,664	761	1.39	0.85, 2.27	0.2	11,245	3,475	1.49	1.24, 1.80	<0.001
Exercise Vital Sign (median)/IQR	4,429	405	0.92	0.83, 1.01	0.092	4,664	761	0.93	0.85, 1.01	0.089	11,245	3,475	0.98	0.94, 1.02	0.3
NDI ACS2013	4,429	405	1.19	1.04, 1.37	0.010	4,664	761	1.05	0.96, 1.14	0.3	11,245	3,475	1.03	0.99, 1.07	0.2
Relative humidity (%)	4,429	405	0.98	0.97, 0.99	<0.001	4,664	761	0.98	0.97, 0.99	<0.001	11,245	3,475	0.99	0.99, 1.00	<0.001
Temperature (°C)	4,429	405	0.98	0.96, 1.01	0.2	4,664	761	0.99	0.97, 1.01	0.2	11,245	3,475	0.98	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5ec_stdiqr is: 2.148, df is: 3, and P value is: 0.542"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
On-road diesel PM _{2.5} /IQR	4,529	412	1.07	0.93, 1.23	0.3	4,700	766	1.18	1.06, 1.30	0.001	11,296	3,492	1.06	1.02, 1.11	0.008
BMI/IQR	4,529	412	0.56	0.30, 1.07	0.081	4,700	766	0.79	0.44, 1.42	0.4	11,296	3,492	0.70	0.56, 0.86	<0.001
BMI*BMI/IQR	4,529	412	1.93	1.18, 3.15	0.009	4,700	766	1.40	0.86, 2.27	0.2	11,296	3,492	1.47	1.22, 1.77	<0.001
Relative humidity (%)	4,529	412	0.98	0.97, 0.99	<0.001	4,700	766	0.98	0.98, 0.99	<0.001	11,296	3,492	0.99	0.99, 1.00	<0.001
Temperature (C°)	4,529	412	0.98	0.96, 1.00	0.10	4,700	766	0.99	0.97, 1.01	0.2	11,296	3,492	0.98	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5tracer3_stdiqr is: 3.017, df is: 3, and P value is: 0.389"

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Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
On-road gasoline PM _{2.5} /IQR	4,322	396	1.12	0.93, 1.35	0.2	4,533	745	1.23	1.07, 1.42	0.003	10,942	3,377	1.07	1.01, 1.13	0.017
BMI/IQR	4,322	396	0.57	0.30, 1.07	0.081	4,533	745	0.79	0.44, 1.42	0.4	10,942	3,377	0.68	0.55, 0.84	<0.001
BMI*BMI/IQR	4,322	396	1.88	1.16, 3.06	0.011	4,533	745	1.39	0.85, 2.26	0.2	10,942	3,377	1.50	1.25, 1.80	<0.001
Exercise Vital Sign (median)/IQR	4,322	396	0.92	0.83, 1.02	0.10	4,533	745	0.93	0.85, 1.01	0.081	10,942	3,377	0.98	0.94, 1.02	0.3
Percent housing units with >1 occupants per room	4,322	396	0.66	0.16, 2.68	0.6	4,533	745	0.75	0.27, 2.09	0.6	10,942	3,377	1.20	0.79, 1.82	0.4
NDI ACS2013	4,322	396	1.23	1.04, 1.45	0.013	4,533	745	1.07	0.95, 1.20	0.2	10,942	3,377	1.02	0.97, 1.07	0.5
Relative humidity (%)	4,322	396	0.98	0.97, 0.99	<0.001	4,533	745	0.98	0.97, 0.99	<0.001	10,942	3,377	0.99	0.99, 0.99	<0.001
Temperature (°C)	4,322	396	0.98	0.96, 1.01	0.2	4,533	745	0.99	0.97, 1.01	0.2	10,942	3,377	0.98	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5tracer1_stdqr is: 3.079, df is: 3, and P value is: 0.38"

Characteristic	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value	N	Event N	HR	95% CI	P value
Biomass combustion PM _{2.5} /IQR	4,418	403	0.80	0.71, 0.92	0.001	4,568	750	1.09	0.98, 1.22	0.11	10,989	3,392	0.99	0.95, 1.03	0.7
BMI/IQR	4,418	403	0.57	0.30, 1.09	0.089	4,568	750	0.80	0.44, 1.46	0.5	10,989	3,392	0.70	0.57, 0.86	<0.001
BMI*BMI/IQR	4,418	403	1.93	1.18, 3.15	0.009	4,568	750	1.39	0.85, 2.28	0.2	10,989	3,392	1.48	1.23, 1.77	<0.001
Percent housing units with >1 occupants per room	4,418	403	0.76	0.20, 2.86	0.7	4,568	750	0.79	0.29, 2.14	0.6	10,989	3,392	1.32	0.88, 1.99	0.2
NDI ACS2013	4,418	403	1.28	1.10, 1.50	0.002	4,568	750	1.07	0.96, 1.20	0.2	10,989	3,392	1.02	0.97, 1.07	0.4
Relative humidity (%)	4,418	403	0.98	0.97, 0.99	<0.001	4,568	750	0.98	0.97, 0.99	<0.001	10,989	3,392	0.99	0.99, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for pm2_5tracer6_stdqr is: 8.424, df is: 3, and P value is: 0.038"

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	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
Characteristic	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value
Relative humidity (%) / IQR	4,841	445	0.63	0.52, 0.76	<0.001	4,786	786	0.68	0.59, 0.78	<0.001	11,372	3,523	0.86	0.81, 0.91	<0.001
Temperature (°C)	4,841	445	0.99	0.97, 1.01	0.3	4,786	786	0.99	0.97, 1.01	0.2	11,372	3,523	0.99	0.98, 0.99	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for rmax_k_stdiqr is: 12.99, df is: 3, and *P* value is: 0.005"

	Number of COPD, CVD, HTN, DM: 0					Number of COPD, CVD, HTN, DM: 1					Number of COPD, CVD, HTN, DM: 2+				
Characteristic	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value	<i>N</i>	Event <i>N</i>	HR	95% CI	<i>P</i> value
Temperature (°C) / IQR	4,841	445	0.94	0.84, 1.05	0.3	4,786	786	0.95	0.87, 1.04	0.2	11,372	3,523	0.93	0.90, 0.97	<0.001
Relative humidity (%)	4,841	445	0.98	0.97, 0.99	<0.001	4,786	786	0.98	0.98, 0.99	<0.001	11,372	3,523	0.99	0.99, 1.00	<0.001

CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; HTN = hypertension.

[1] "Q for tmmx_c_stdiqr is: 0.13, df is: 3, and *P* value is: 0.988"

Stratification by Age

Table C6. Stratification by Age (yr)

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
NO ₂ /IQR	0.99	0.80, 1.22	>0.9	1.19	1.05, 1.35	0.007	1.16	1.05, 1.28	0.004	1.05	0.97, 1.13	0.2
BMI/IQR	1.25	0.69, 2.27	0.5	1.11	0.65, 1.90	0.7	1.12	0.73, 1.71	0.6	0.47	0.34, 0.67	<0.001
BMI*BMI/IQR	1.04	0.67, 1.61	0.9	1.01	0.64, 1.57	>0.9	0.97	0.67, 1.42	0.9	1.99	1.41, 2.82	<0.001
Exercise Vital Sign (median)/IQR	0.90	0.81, 1.01	0.078	0.92	0.85, 0.99	0.023	0.96	0.90, 1.02	0.2	0.99	0.94, 1.04	0.7
NDI_ACS2013	1.04	0.92, 1.17	0.5	1.05	0.97, 1.13	0.2	1.11	1.04, 1.17	<0.001	1.00	0.95, 1.05	0.9
Relative humidity (%)	1.00	0.99, 1.00	0.3	0.98	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.006	0.98	0.97, 1.00	0.013	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.044

CI = confidence interval; HR = hazard ratio.

[1] "Q for NO2_stdqr is: 4.896, df is: 4, and P value is: 0.298"

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
O ₃ (maximum)/IQR	0.99	0.82, 1.20	>0.9	1.05	0.92, 1.20	0.5	0.91	0.83, 1.01	0.084	1.08	1.00, 1.17	0.063
Relative humidity (%)	0.99	0.98, 1.00	0.011	0.99	0.98, 0.99	<0.001	0.99	0.98, 0.99	<0.001	1.00	0.99, 1.00	0.018

CI = confidence interval; HR = hazard ratio.

[1] "Q for O3max_stdqr is: 6.175, df is: 4, and P value is: 0.186"

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Characteristic	HR	[18, 53]		HR	[53, 65]		HR	[65, 76]		HR	[76,105]	
		95% CI	P value		95% CI	P value		95% CI	P value		95% CI	P value
NO ₂ /IQR	1.00	0.80, 1.25	>0.9	1.22	1.07, 1.39	0.003	1.16	1.05, 1.28	0.004	1.06	0.98, 1.14	0.2
O ₃ (maximum)/IQR	1.04	0.83, 1.32	0.7	1.17	1.00, 1.38	0.051	1.00	0.90, 1.13	>0.9	1.12	1.03, 1.22	0.009
BMI/IQR	1.24	0.68, 2.26	0.5	1.12	0.65, 1.91	0.7	1.12	0.73, 1.71	0.6	0.47	0.34, 0.67	<0.001
BMI*BMI/IQR	1.04	0.67, 1.61	0.9	1.00	0.64, 1.56	>0.9	0.97	0.67, 1.42	0.9	1.98	1.41, 2.80	<0.001
Exercise Vital Sign (median)/IQR	0.90	0.81, 1.01	0.080	0.91	0.85, 0.99	0.023	0.96	0.90, 1.02	0.2	0.99	0.94, 1.05	0.8
NDI_ACS2013	1.04	0.92, 1.18	0.5	1.06	0.98, 1.14	0.2	1.11	1.04, 1.17	0.001	1.00	0.95, 1.05	>0.9
Relative humidity (%)	1.00	0.99, 1.01	0.5	0.99	0.98, 1.00	0.003	0.99	0.99, 1.00	<0.001	1.00	0.99, 1.00	0.080
Temperature (°C)	0.97	0.94, 0.99	0.007	0.98	0.96, 0.99	0.004	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.010

CI = confidence interval; HR = hazard ratio.

[1] "Q for NO₂_stdiqr is: 5.03, df is: 4, and P value is: 0.284"

Characteristic	HR	[18, 53]		HR	[53, 65]		HR	[65, 76]		HR	[76,105]	
		95% CI	P value		95% CI	P value		95% CI	P value		95% CI	P value
PM _{2.5} (mass)/IQR	1.20	1.01, 1.43	0.039	1.22	1.10, 1.36	<0.001	1.10	1.02, 1.19	0.014	1.07	1.01, 1.14	0.030
Temperature (°C)	0.96	0.94, 0.98	<0.001	0.97	0.95, 0.98	<0.001	0.97	0.96, 0.98	<0.001	0.99	0.98, 1.00	0.004

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5mass_stdqr is: 5.739, df is: 4, and P value is: 0.22"

Characteristic	HR	[18, 53]		HR	[53, 65]		HR	[65, 76]		HR	[76,105]	
		95% CI	P value		95% CI	P value		95% CI	P value		95% CI	P value
PM _{2.5} (mass)/IQR	1.19	0.99, 1.43	0.059	1.18	1.07, 1.32	0.002	1.11	1.03, 1.20	0.009	1.05	0.98, 1.12	0.2
O ₃ (maximum)/IQR	0.98	0.79, 1.22	0.9	1.03	0.88, 1.20	0.7	0.92	0.81, 1.03	0.14	1.09	0.99, 1.19	0.073
Temperature (°C)	0.97	0.95, 0.99	0.005	0.98	0.96, 0.99	0.006	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.016
Relative humidity (%)	0.99	0.98, 1.00	0.11	0.99	0.98, 1.00	0.001	0.99	0.99, 1.00	<0.001	1.00	0.99, 1.00	0.094

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5mass_stdqr is: 5.131, df is: 4, and P value is: 0.274"

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Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (nitrates)/IQR	1.17	0.98, 1.40	0.075	1.26	1.13, 1.41	<0.001	1.10	1.01, 1.19	0.022	1.07	1.00, 1.14	0.048
Temperature (°C)	0.96	0.94, 0.98	<0.001	0.96	0.95, 0.98	<0.001	0.97	0.96, 0.98	<0.001	0.99	0.98, 1.00	0.003

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5n_v_stdiqr is: 8.318, df is: 4, and P value is: 0.081"

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (organic compounds)/IQR	1.09	0.88, 1.36	0.4	1.08	0.96, 1.22	0.2	1.07	0.99, 1.17	0.11	1.01	0.94, 1.08	0.9
BMI/IQR	1.26	0.69, 2.29	0.5	1.13	0.66, 1.94	0.7	1.11	0.73, 1.69	0.6	0.47	0.33, 0.67	<0.001
BMI*BMI/IQR	1.03	0.66, 1.60	0.9	1.00	0.64, 1.57	>0.9	0.98	0.68, 1.42	>0.9	2.00	1.41, 2.83	<0.001
Exercise Vital Sign (median)/IQR	0.91	0.81, 1.01	0.088	0.92	0.85, 0.99	0.026	0.96	0.91, 1.02	0.2	0.99	0.94, 1.04	0.7
Percentage of housing units with >1 occupants per room	0.79	0.21, 2.91	0.7	1.75	0.86, 3.55	0.12	0.87	0.46, 1.62	0.7	0.89	0.51, 1.56	0.7
NDI_ACS2013	1.04	0.90, 1.21	0.6	1.01	0.93, 1.11	0.8	1.13	1.05, 1.21	0.001	1.01	0.95, 1.07	0.7
Relative humidity (%)	0.99	0.99, 1.00	0.2	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.007	0.98	0.97, 1.00	0.015	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.047

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5oc_stdiqr is: 1.985, df is: 4, and P value is: 0.738"

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
PM _{0.1} (mass)/IQR	1.07	0.91, 1.26	0.4	1.09	1.01, 1.19	0.032	1.05	0.99, 1.12	0.10	1.03	0.97, 1.09	0.3
BMI/IQR	1.27	0.71, 2.26	0.4	1.18	0.69, 2.03	0.5	1.15	0.76, 1.74	0.5	0.50	0.35, 0.70	<0.001
BMI*BMI/IQR	1.04	0.68, 1.59	0.9	0.97	0.62, 1.52	>0.9	0.96	0.67, 1.39	0.8	1.92	1.35, 2.74	<0.001
NDI_ACS2013	1.03	0.92, 1.16	0.6	1.04	0.96, 1.12	0.3	1.10	1.04, 1.16	0.002	1.00	0.95, 1.04	0.9
Temperature (°C)	0.96	0.94, 0.99	0.002	0.97	0.96, 0.98	<0.001	0.97	0.96, 0.98	<0.001	0.99	0.98, 1.00	0.005

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm0_1mass_stdiqr is: 1.887, df is: 4, and P value is: 0.756"

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Characteristic	[18, 53]			[53, 65]			[65, 76]			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
PM _{2.5} (elemental carbon)/IQR	1.08	0.90, 1.29	0.4	1.17	1.05, 1.29	0.003	1.08	1.00, 1.16	0.038	1.03	0.96, 1.10	0.4
BMI/IQR	1.25	0.68, 2.28	0.5	1.12	0.65, 1.92	0.7	1.12	0.73, 1.70	0.6	0.47	0.34, 0.67	<0.001
BMI*BMI/IQR	1.03	0.67, 1.60	0.9	1.00	0.64, 1.57	>0.9	0.97	0.67, 1.42	0.9	1.99	1.41, 2.82	<0.001
Exercise Vital Sign (median)/IQR	0.90	0.81, 1.01	0.084	0.92	0.85, 0.99	0.025	0.96	0.91, 1.02	0.2	0.99	0.94, 1.04	0.7
NDI_ACS2013	1.03	0.91, 1.16	0.6	1.06	0.98, 1.14	0.2	1.12	1.06, 1.19	<0.001	1.00	0.95, 1.05	>0.9
Relative humidity (%)	0.99	0.99, 1.00	0.2	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.005	0.98	0.97, 0.99	0.008	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.043

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5ec_stdqr is: 4.505, df is: 4, and P value is: 0.342"

Characteristic	[18, 53]			[53, 65]			[65, 76]			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
On-road diesel PM _{2.5} /IQR	1.06	0.92, 1.21	0.4	1.10	1.01, 1.19	0.029	1.06	1.00, 1.12	0.039	1.05	1.00, 1.11	0.062
BMI/IQR	1.30	0.73, 2.34	0.4	1.19	0.69, 2.04	0.5	1.14	0.75, 1.73	0.5	0.49	0.35, 0.69	<0.001
BMI*BMI/IQR	1.02	0.66, 1.56	>0.9	0.97	0.62, 1.51	0.9	0.96	0.67, 1.39	0.8	1.94	1.37, 2.75	<0.001
Relative humidity (%)	0.99	0.99, 1.00	0.2	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.006	0.98	0.97, 1.00	0.011	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.047

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5tracer3_stdqr is: 0.865, df is: 4, and P value is: 0.93"

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Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
On-road gasoline PM _{2.5} /IQR	1.02	0.85, 1.21	0.9	1.13	1.01, 1.25	0.031	1.10	1.01, 1.19	0.023	1.04	0.98, 1.12	0.2
BMI/IQR	1.25	0.69, 2.27	0.5	1.13	0.66, 1.94	0.7	1.11	0.72, 1.69	0.6	0.47	0.33, 0.67	<0.001
BMI*BMI/IQR	1.04	0.67, 1.61	0.9	1.00	0.64, 1.57	>0.9	0.98	0.68, 1.43	>0.9	2.00	1.41, 2.83	<0.001
Exercise Vital Sign (median)/IQR	0.90	0.81, 1.01	0.081	0.92	0.85, 0.99	0.023	0.96	0.90, 1.02	0.2	0.99	0.94, 1.04	0.7
Percentage of housing units with >1 occupants per room	0.81	0.22, 2.96	0.7	1.66	0.82, 3.36	0.2	0.82	0.43, 1.56	0.5	0.86	0.49, 1.52	0.6
NDI_ACS2013	1.05	0.91, 1.22	0.5	1.02	0.93, 1.12	0.7	1.13	1.05, 1.22	<0.001	1.01	0.95, 1.07	0.7
Relative humidity (%)	1.00	0.99, 1.00	0.3	0.98	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001	0.99	0.99, 1.00	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.006	0.98	0.97, 1.00	0.012	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.043

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5tracer1_stdqir is: 2.172, df is: 4, and P value is: 0.704"

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Biomass combustion PM _{2.5} /IQR	1.07	0.92, 1.25	0.4	0.95	0.88, 1.04	0.3	1.00	0.95, 1.06	0.9	1.00	0.96, 1.05	0.8
BMI/IQR	1.25	0.71, 2.19	0.4	1.21	0.71, 2.05	0.5	1.15	0.75, 1.76	0.5	0.49	0.35, 0.69	<0.001
BMI*BMI/IQR	1.06	0.70, 1.58	0.8	0.97	0.63, 1.50	0.9	0.96	0.66, 1.40	0.8	1.92	1.37, 2.70	<0.001
Percentage of housing units with >1 occupants per room	0.70	0.19, 2.63	0.6	1.95	0.96, 3.95	0.063	0.95	0.51, 1.77	0.9	0.95	0.55, 1.65	0.9
NDI_ACS2013	1.06	0.91, 1.22	0.5	1.02	0.94, 1.12	0.6	1.13	1.05, 1.22	<0.001	1.01	0.95, 1.07	0.8
Relative humidity (%)	0.99	0.98, 1.00	0.031	0.99	0.98, 0.99	<0.001	0.99	0.99, 0.99	<0.001	0.99	0.99, 1.00	<0.001

CI = confidence interval; HR = hazard ratio.

[1] "Q for pm2_5tracer6_stdqir is: 2.234, df is: 4, and P value is: 0.693"

Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Relative humidity (%) /IQR	0.84	0.70, 0.99	0.043	0.74	0.66, 0.83	<0.001	0.84	0.77, 0.92	<0.001	0.88	0.82, 0.94	<0.001
Temperature (°C)	0.97	0.95, 0.99	0.006	0.98	0.97, 1.00	0.022	0.98	0.97, 0.99	<0.001	0.99	0.98, 1.00	0.065

CI = confidence interval; HR = hazard ratio.

[1] "Q for rmax_k_stdqir is: 6.136, df is: 4, and P value is: 0.189"

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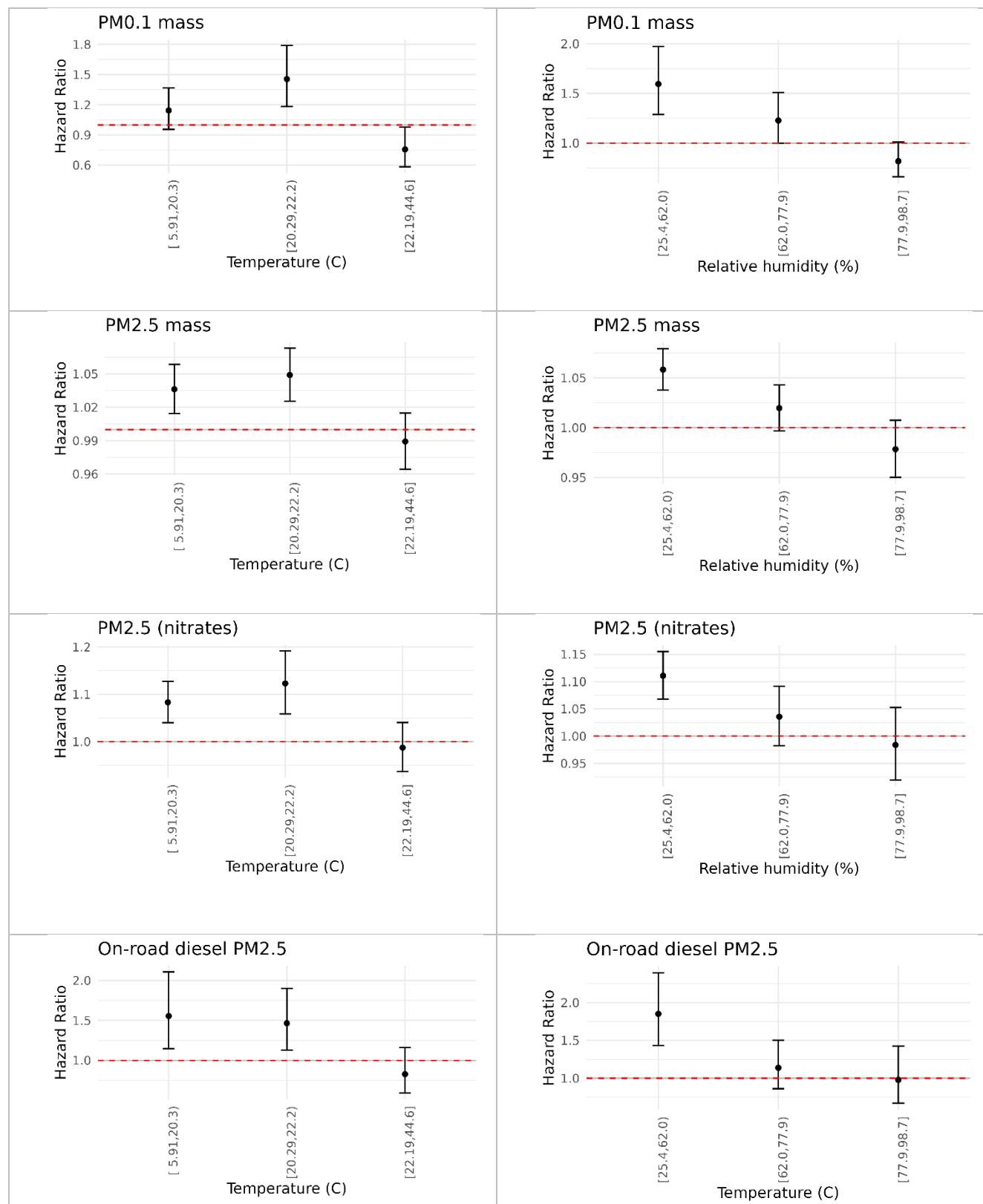
Characteristic	[18, 53)			[53, 65)			[65, 76)			[76,105]		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Temperature (°C)/IQR	0.86	0.77, 0.96	0.006	0.92	0.86, 0.99	0.022	0.90	0.85, 0.95	<0.001	0.96	0.92, 1.00	0.065
Relative humidity (%)	0.99	0.98, 1.00	0.043	0.99	0.98, 0.99	<0.001	0.99	0.99, 1.00	<0.001	0.99	0.99, 1.00	<0.001

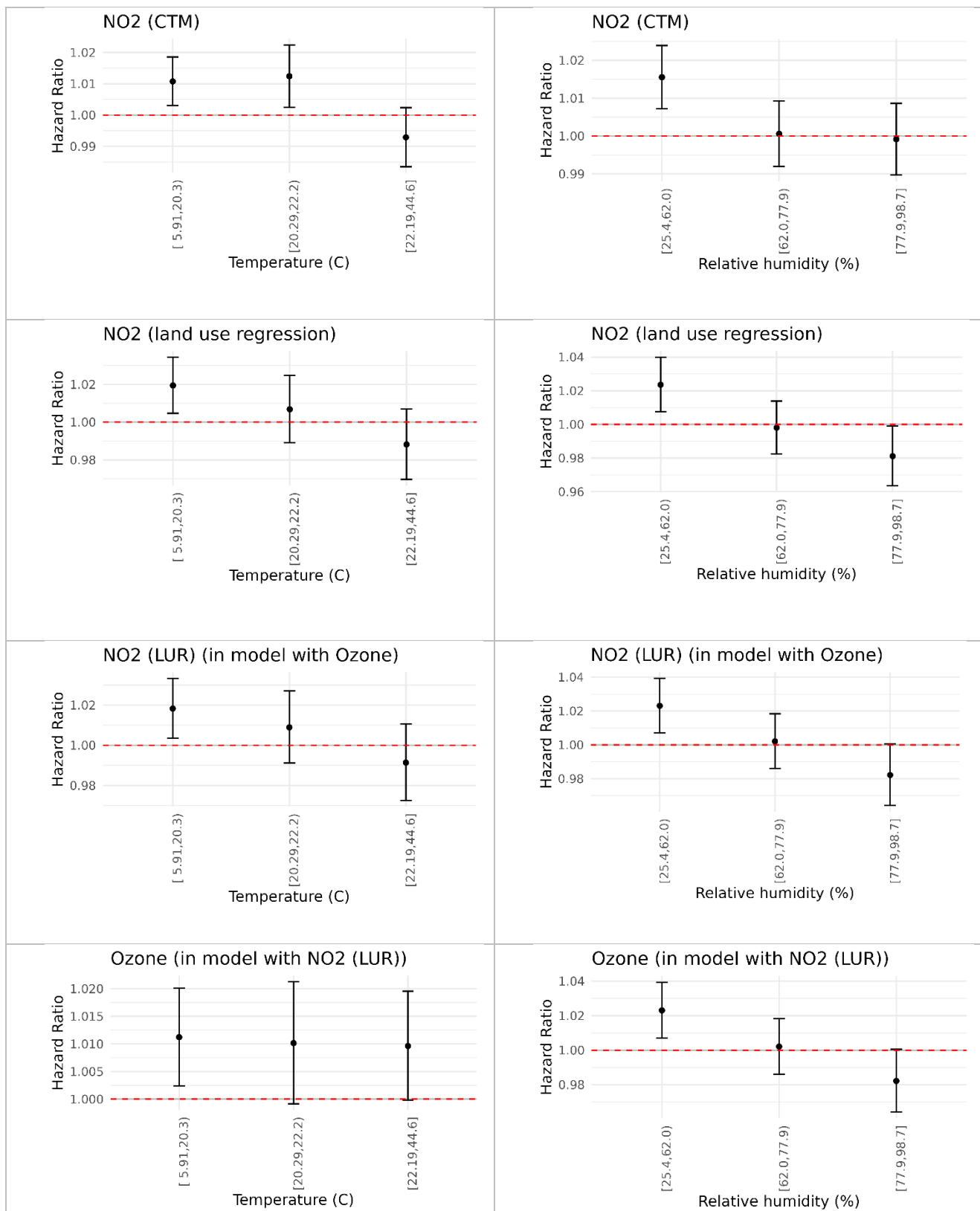
CI = confidence interval; HR = hazard ratio.

[1] "Q for tmmx_c_stdqr is: 4.9, df is: 4, and P value is: 0.298"

Stratification by Tertile

See next page for Figure C1. Stratification of significant pollutants by tertile, controlled for temperature and humidity.





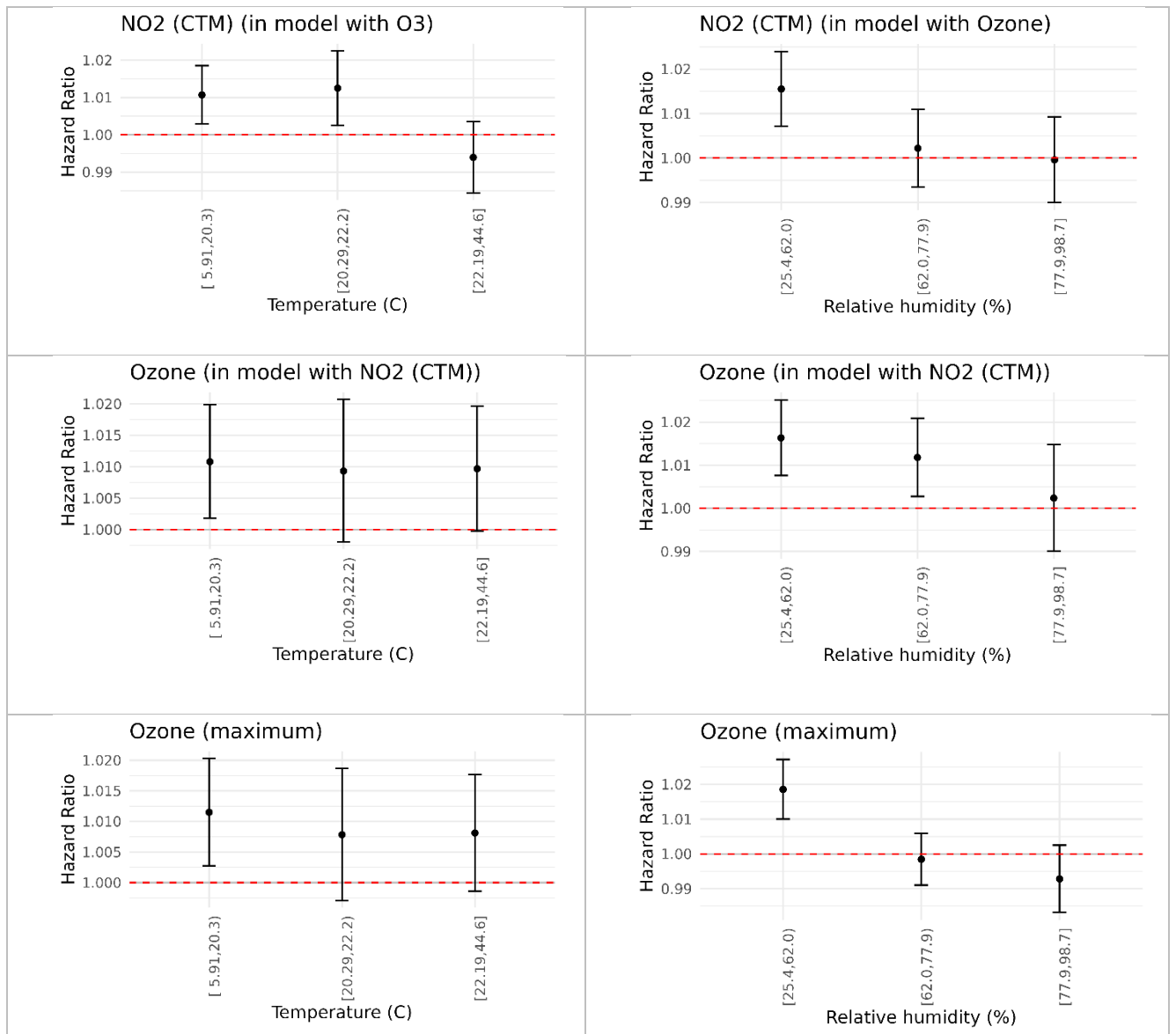


Figure C2. Stratification of significant pollutants by tertile, controlled for temperature and humidity.

References

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2. Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical care*. 2005;43(11):1130-1139. doi:10.1097/01.mlr.0000182534.19832.83