

**Cardiopulmonary hospitalization risks from wildfire and non-wildfire PM_{2.5} in
20 US states**

Supplementary Information

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Supplementary Methods

In this study, we used conditional logistic regression models to estimate the effects of long-term wildfire-specific and non-wildfire PM_{2.5} on the hospitalization risk, adjusting for measured time-varying confounders, including calendar year, temperature values, and neighborhood-level covariates.

In the conditional logistic regression model, the 2-year average wildfire-specific and non-wildfire PM_{2.5} concentrations were simultaneously included as continuous variables to mutually adjust for each other's effects. Calendar year was included as a categorical variable to control for potential unmeasured confounders varying over time. Surface temperature variables—including mean summer temperature, standard deviation of summer temperature, mean winter temperature, and standard deviation of winter temperature—were modeled using penalized cubic splines with 5 degrees of freedom to account for potential nonlinear relationships. Other covariates included neighborhood-level statistics, such as percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, and Townsend Deprivation Index, all adjusted as continuous variables. The model was provided below.

Let $l(\mu_1(\beta), \dots, \mu_n(\beta))$ denotes the log likelihood for a conditional logistic regression for observations $i = 1, \dots, n$, where

$$\mu_i(\beta) = \beta_1 W_i + \beta_2 X_i + \beta_T T_i + \beta_Y Y_i + \beta_N N_i$$

$W_{i,1}$ and $X_{i,1}$ are the exposure of interest, respectively (2-year average wildfire-specific and non-wildfire PM_{2.5} concentrations, respective), and T_i are the vectors of cubic spline expansions of air temperature. The cubic spline expansion has five degrees of freedom. Y_i and N_i represents calendar year and neighborhood-level statistics, respectively.

Supplementary Table 1. Characteristics for hospitalized patients.

Characteristics	Cardiovascular diseases (CVD)						Respiratory diseases (RD)				
	Ischemic heart disease	Cerebrovascular disease	Heart failure	Arrhythmia	Hypertension	Other cardiovascular diseases	Acute respiratory infections	Pneumonia	COPD	Asthma	Other respiratory diseases
Number of individuals, n (%)	8300356	5171077	9867248	7632375	15754362	10539548	1404055	7976711	6048248	3416258	13846122
Age, y, mean (SD)	68.5 (13.6)	69.6 (15.2)	72.8 (14.6)	71.4 (15.8)	65.2 (15.5)	64.9 (18.0)	26.3 (31.5)	64.5 (23.2)	68.8 (12.7)	40.9 (25.2)	63.8 (21.5)
Sex, n (%)											
Female	3278182 (39.5)	2650863 (51.3)	5004769 (50.7)	3660338 (48.0)	8229910 (52.2)	5225091 (49.6)	706010 (50.3)	4108802 (51.5)	3268094 (54.0)	2200754 (64.4)	7105455 (51.3)
Male	5021667 (60.5)	2519843 (48.7)	4861715 (49.3)	3971418 (52.0)	7522757 (47.8)	5313291 (50.4)	697943 (49.7)	3867166 (48.5)	2779638 (46.0)	1215106 (35.6)	6739172 (48.7)
Missing	507 (0.01)	371 (0.01)	764 (0.01)	619 (0.01)	1695 (0.01)	1166 (0.01)	102 (0.01)	743 (0.01)	516 (0.01)	398 (0.01)	1495 (0.01)
Race/ethnicity, n (%)											
White	5726781 (69.0)	3318759 (64.2)	6505047 (65.9)	5559589 (72.8)	9465162 (60.1)	6880790 (65.3)	692307 (49.3)	5403834 (67.7)	4525708 (74.8)	1620777 (47.4)	9414885 (68.0)
Black	848768 (10.2)	799576 (15.5)	1580404 (16.0)	697758 (9.1)	3024803 (19.2)	1578797 (15.0)	226230 (16.1)	958272 (12.0)	604069 (10.0)	803557 (23.5)	1693453 (12.2)
Hispanic	457647 (5.5)	296785 (5.7)	503589 (5.1)	325244 (4.3)	1154959 (7.3)	606597 (5.8)	211843 (15.1)	501809 (6.3)	192384 (3.2)	442716 (13.0)	833581 (6.0)
Other	499943 (6.0)	303494 (5.9)	448917 (4.5)	330025 (4.3)	938269 (6.0)	524991 (5.0)	121507 (8.7)	412588 (5.2)	189628 (3.1)	242964 (7.1)	732452 (5.3)
Missing	767217 (9.2)	452463 (8.7)	829291 (8.4)	719759 (9.4)	1171169 (7.4)	948373 (9.0)	152168 (10.8)	700208 (8.8)	536459 (8.9)	306244 (9.0)	1171751 (8.5)
Patient location, n (%)											
Metropolitan areas	6612443 (79.7)	4269116 (82.6)	7998579 (81.1)	6223616 (81.5)	13109443 (83.2)	8761543 (83.1)	1171856 (83.5)	6203349 (77.8)	4548566 (75.2)	2980905 (87.3)	11345511 (81.9)
Micropolitan areas	973852 (11.7)	530530 (10.3)	1086703 (11.0)	819194 (10.7)	1554821 (9.9)	1051594 (10.0)	132460 (9.4)	987304 (12.4)	814618 (13.5)	265354 (7.8)	1495092 (10.8)

Non-CBSA	710461 (8.6)	369970 (7.2)	779060 (7.9)	586538 (7.7)	1085088 (6.9)	723156 (6.9)	99417 (7.1)	784077 (9.8)	682621 (11.3)	168903 (4.9)	1002881 (7.2)
Missing	3600 (0.04)	1461 (0.03)	2906 (0.03)	3027 (0.04)	5010 (0.03)	3255 (0.03)	322 (0.02)	1981 (0.02)	2443 (0.04)	1096 (0.03)	2638 (0.02)
Died during hospitalization, n (%)	293836 (3.5)	258276 (5.0)	287764 (2.9)	179291 (2.3)	112885 (0.7)	273830 (2.6)	1423 (0.1)	409586 (5.1)	89868 (1.5)	8201 (0.2)	1317231 (9.5)
Comorbidity with obesity, n (%)	774415 (9.3)	306140 (5.9)	939909 (9.5)	655384 (8.6)	1740327 (11.0)	953261 (9.0)	66801 (4.8)	474999 (6.0)	569813 (9.4)	410053 (12.0)	1078374 (7.8)
Comorbidity with diabetes, n (%)	2560949 (30.9)	1422334 (27.5)	3233121 (32.8)	1722448 (22.6)	4323743 (27.4)	2337610 (22.2)	130744 (9.3)	1671658 (21.0)	1478897 (24.5)	470441 (13.8)	2622252 (18.9)
Neighborhood-level statistics, mean (SD)											
Percentage of White, %	71.2 (24.5)	68.3 (25.6)	68.3 (26.0)	72.5 (23.3)	65.5 (27.0)	68.8 (25.3)	63.9 (27.2)	70.4 (24.8)	72.9 (23.8)	60.8 (28.7)	69.2 (24.4)
Percentage of Black, %	12.7 (19.1)	14.7 (21.0)	15.3 (21.7)	11.8 (18.1)	16.7 (22.5)	14.4 (20.8)	16.1 (21.5)	13.2 (19.4)	13.0 (19.1)	19.8 (24.2)	13.2 (19.3)
Percentage of the population who graduated high school, %	85.6 (8.4)	85.9 (8.3)	85.5 (8.4)	86.7 (8.05)	85.2 (8.7)	86.1 (8.3)	83.8 (9.7)	85.2 (8.5)	84.8 (8.3)	83.5 (9.6)	86.0 (8.3)
Median household income, \$	56726.8 (23379.9)	57187.2 (23627.4)	55516.5 (22987.9)	58990.5 (24311.3)	56687.8 (23728.4)	57508.0 (23889.9)	54716.8 (23244.8)	54949.8 (22452.5)	52519.0 (20819.6)	53429.9 (22936.5)	57081.7 (23316.3)
Townsend deprivation index	1.25 (3.15)	1.32 (3.12)	1.47 (3.25)	1.04 (2.98)	1.68 (3.52)	1.31 (3.16)	2.03 (3.76)	1.28 (3.05)	1.15 (2.80)	2.63 (4.24)	1.18 (2.88)
Environmental data, median (ranges)											
Wildfire-specific PM _{2.5} , µg/m ³	0.30 (0.00, 11.15)	0.29 (0.00, 11.15)	0.31 (0.00, 11.15)	0.30 (0.00, 11.15)	0.29 (0.00, 11.15)	0.30 (0.00, 11.15)	0.29 (0.00, 10.26)	0.30 (0.00, 11.15)	0.30 (0.00, 11.15)	0.29 (0.00, 10.26)	0.29 (0.00, 11.15)
Non-wildfire PM _{2.5} , µg/m ³	8.06 (0.02, 22.78)	7.96 (0.02, 20.06)	8.04 (0.02, 20.85)	7.94 (0.02, 20.67)	7.99 (0.005, 21.30)	7.95 (0.02, 20.67)	8.05 (0.006, 19.24)	7.96 (0.02, 20.85)	8.03 (0.005, 20.85)	8.32 (0.005, 20.85)	7.78 (0.005, 20.85)
Mean summer temperature, °C	22.89 (11.80, 35.53)	22.97 (11.44, 35.53)	22.93 (11.44, 35.53)	22.82 (11.44, 35.53)	23.14 (11.47, 35.53)	22.96 (11.44, 35.53)	23.07 (11.60, 35.53)	23.01 (11.44, 35.53)	22.90 (11.80, 35.53)	23.11 (11.60, 35.53)	22.96 (11.44, 35.53)
SD of summer temperature, °C	1.51 (0.001, 4.41)	1.49 (0.001, 4.35)	1.51 (0.001, 4.41)	1.50 (0.001, 4.46)	1.51 (0.001, 4.46)	1.50 (0.001, 4.33)	1.55 (0.001, 4.35)	1.47 (0.001, 4.46)	1.44 (0.001, 4.46)	1.58 (0.001, 4.35)	1.47 (0.001, 4.41)
Mean winter temperature, °C	1.46 (-19.26, 35.53)	1.84 (-19.26, 35.53)	1.49 (-19.22, 35.53)	1.46 (-19.26, 35.53)	1.84 (-19.26, 35.53)	1.63 (-19.26, 35.53)	1.69 (-19.22, 35.53)	1.69 (-19.26, 35.53)	1.43 (-19.26, 35.53)	1.45 (-19.26, 35.53)	1.98 (-19.26, 35.53)

	23.71)	23.23)	23.71)	23.28)	23.71)	23.71)	23.19)	23.22)	23.22)	23.71)	23.71)
SD of summer temperature, °C	2.07 (0.005, 9.44)	2.08 (0.005, 9.50)	2.21 (0.005, 9.46)	2.13 (0.005, 9.60)	2.13 (0.005, 9.64)	2.13 (0.005, 9.61)	2.05 (0.005, 9.37)	2.13 (0.005, 9.44)	2.22 (0.005, 9.54)	2.06 (0.005, 9.42)	2.14 (0.005, 9.60)
Abbreviations: SD, standard deviation; non-CBSA, non-Core Based Statistical Areas.											

Supplementary Table 2. The distribution of 2-year averages of wildfire-specific PM_{2.5} and non-wildfire PM_{2.5} (µg/m³).

Variables	Mean (SD)	Median (IQR)	Percentiles				
			P5	P25	P75	P95	Min-Max
Ischemic heart disease							
Wildfire-specific PM _{2.5}	0.376 (0.336)	0.322 (0.261)	0.085	0.200	0.461	0.721	0.004-7.787
Non-wildfire PM _{2.5}	8.292 (2.124)	8.271 (2.568)	4.604	6.998	9.567	11.92	0.290-21.566
Cerebrovascular disease							
Wildfire-specific PM _{2.5}	0.383 (0.360)	0.318 (0.266)	0.086	0.196	0.462	0.773	0.004-7.787
Non-wildfire PM _{2.5}	8.156 (2.061)	8.154 (2.409)	4.570	6.936	9.345	11.723	0.290-20.687
Heart failure							
Wildfire-specific PM _{2.5}	0.386 (0.346)	0.328 (0.264)	0.095	0.205	0.469	0.750	0.004-7.787
Non-wildfire PM _{2.5}	8.250 (2.049)	8.242 (2.412)	4.739	7.013	9.425	11.819	0.290-20.195
Arrhythmia							
Wildfire-specific PM _{2.5}	0.378 (0.340)	0.322 (0.263)	0.082	0.199	0.462	0.733	0.004-7.787
Non-wildfire PM _{2.5}	8.134 (2.084)	8.124 (2.463)	4.509	6.889	9.352	11.754	0.290-20.687
Hypertension							
Wildfire-specific PM _{2.5}	0.375 (0.342)	0.315 (0.255)	0.094	0.199	0.454	0.734	0.004-7.787
Non-wildfire PM _{2.5}	8.266 (2.059)	8.210 (2.454)	4.782	7.013	9.467	11.854	0.290-19.797
Other cardiovascular diseases							
Wildfire-specific PM _{2.5}	0.379 (0.349)	0.318 (0.265)	0.084	0.196	0.461	0.747	0.004-7.787
Non-wildfire PM _{2.5}	8.148 (2.055)	8.142 (2.401)	4.576	6.934	9.335	11.710	0.290-20.195
Acute respiratory infections							
Wildfire-specific PM _{2.5}	0.371 (0.333)	0.315 (0.266)	0.080	0.194	0.459	0.723	0.004-7.787
Non-wildfire PM _{2.5}	8.300 (2.061)	8.259 (2.446)	4.794	7.054	9.500	11.870	0.290-19.414
Pneumonia							
Wildfire-specific PM _{2.5}	0.379 (0.351)	0.319 (0.270)	0.084	0.194	0.465	0.759	0.004-7.787
Non-wildfire PM _{2.5}	8.162 (2.087)	8.159 (2.454)	4.527	6.922	9.376	11.766	0.290-20.175
COPD							
Wildfire-specific PM _{2.5}	0.370 (0.330)	0.319 (0.261)	0.086	0.198	0.459	0.710	0.004-7.787
Non-wildfire PM _{2.5}	8.276 (2.124)	8.248 (2.532)	4.612	6.989	9.521	11.947	0.290-20.195
Asthma							
Wildfire-specific PM _{2.5}	0.364 (0.297)	0.319 (0.258)	0.084	0.199	0.457	0.682	0.004-7.787
Non-wildfire PM _{2.5}	8.527 (2.022)	8.501 (2.399)	5.015	7.325	9.725	11.929	0.290-19.586
Other respiratory diseases							
Wildfire-specific PM _{2.5}	0.392 (0.396)	0.317 (0.272)	0.084	0.194	0.465	0.817	0.004-7.787
Non-wildfire PM _{2.5}	7.981 (2.044)	7.952 (2.356)	4.478	6.783	9.139	11.614	0.290-19.797
Abbreviations: SD, standard deviation; IQR, interquartile Range; COPD, chronic obstructive pulmonary disease.							

Supplementary Table 3. The hospitalization risks of cardiopulmonary diseases associated with a SD increase in 2-year average of wildfire-specific PM_{2.5} and non-wildfire PM_{2.5} concentrations.

Outcomes	Wildfire-specific PM _{2.5}		Non-wildfire PM _{2.5}	
	SD, µg/m ³	Relative risk (95% CI)	SD, µg/m ³	Relative risk (95% CI)
Ischemic heart disease	0.336	1.042 (1.039, 1.045)	2.124	1.143 (1.135, 1.151)
Cerebrovascular disease	0.360	1.045 (1.041, 1.049)	2.061	1.152 (1.142, 1.162)
Heart failure	0.346	1.033 (1.031, 1.036)	2.049	1.115 (1.108, 1.122)
Arrhythmia	0.340	1.038 (1.035, 1.042)	2.084	1.111 (1.103, 1.119)
Hypertension	0.342	1.040 (1.038, 1.042)	2.059	1.183 (1.177, 1.189)
Other cardiovascular diseases	0.349	1.040 (1.037, 1.042)	2.055	1.133 (1.126, 1.139)
Acute respiratory infections	0.333	1.036 (1.028, 1.043)	2.061	1.114 (1.095, 1.133)
Pneumonia	0.351	1.037 (1.034, 1.040)	2.087	1.121 (1.113, 1.128)
COPD	0.330	1.036 (1.032, 1.039)	2.124	1.101 (1.092, 1.111)
Asthma	0.297	1.045 (1.040, 1.050)	2.022	1.125 (1.113, 1.137)
Other respiratory diseases	0.396	1.044 (1.041, 1.046)	2.044	1.139 (1.133, 1.145)
Ischemic heart disease	0.336	1.042 (1.039, 1.045)	2.124	1.143 (1.135, 1.151)

Abbreviations: SD, standard deviation; COPD, chronic obstructive pulmonary disease.

Note: The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature, annual NO₂ concentration, and annual O₃ concentration. All statistical tests were two-sided.

Supplementary Table 4. Sensitivity analysis results adjusting degrees of freedom for temperature to nine.

Outcome	Relative risk (95% CI) per 1 $\mu\text{g}/\text{m}^3$ increase		Relative risk (95% CI) per SD $\mu\text{g}/\text{m}^3$ increase	
	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
CVD				
Ischemic heart disease	1.110 (1.100, 1.120)	1.061 (1.057, 1.064)	1.036 (1.033, 1.039)	1.133 (1.125, 1.142)
Cerebrovascular disease	1.117 (1.105, 1.129)	1.067 (1.062, 1.071)	1.041 (1.037, 1.045)	1.142 (1.132, 1.152)
Heart failure	1.091 (1.082, 1.099)	1.053 (1.050, 1.056)	1.030 (1.028, 1.033)	1.112 (1.104, 1.119)
Arrhythmia	1.102 (1.092, 1.112)	1.049 (1.045, 1.052)	1.034 (1.031, 1.037)	1.104 (1.096, 1.112)
Hypertension	1.111 (1.105, 1.118)	1.077 (1.075, 1.080)	1.037 (1.035, 1.039)	1.166 (1.160, 1.172)
Other cardiovascular diseases	1.103 (1.095, 1.111)	1.059 (1.055, 1.062)	1.035 (1.032, 1.038)	1.124 (1.117, 1.131)
RD				
Acute respiratory infections	1.098 (1.074, 1.123)	1.050 (1.041, 1.059)	1.032 (1.024, 1.039)	1.106 (1.087, 1.124)
Pneumonia	1.100 (1.091, 1.109)	1.054 (1.050, 1.058)	1.034 (1.031, 1.037)	1.116 (1.108, 1.124)
COPD	1.100 (1.089, 1.112)	1.046 (1.042, 1.050)	1.032 (1.029, 1.036)	1.100 (1.090, 1.109)
Asthma	1.135 (1.118, 1.153)	1.055 (1.050, 1.061)	1.038 (1.034, 1.043)	1.115 (1.103, 1.127)
Other respiratory diseases	1.108 (1.102, 1.115)	1.063 (1.060, 1.066)	1.041 (1.039, 1.044)	1.133 (1.127, 1.139)

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. All statistical tests were two-sided.

Supplementary Table 5. Sensitivity analysis results adjusting for annual precipitation and vapor pressure.

Outcome	Relative risk (95% CI) per 1 $\mu\text{g}/\text{m}^3$ increase		Relative risk (95% CI) per SD $\mu\text{g}/\text{m}^3$ increase	
CVD	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
Ischemic heart disease	1.105 (1.095, 1.115)	1.062 (1.058, 1.066)	1.034 (1.031, 1.037)	1.136 (1.128, 1.144)
Cerebrovascular disease	1.112 (1.100, 1.124)	1.069 (1.065, 1.074)	1.039 (1.035, 1.043)	1.148 (1.138, 1.158)
Heart failure	1.083 (1.074, 1.092)	1.054 (1.051, 1.057)	1.028 (1.025, 1.031)	1.114 (1.107, 1.121)
Arrhythmia	1.100 (1.090, 1.110)	1.050 (1.047, 1.054)	1.033 (1.030, 1.036)	1.107 (1.099, 1.115)
Hypertension	1.096 (1.090, 1.103)	1.082 (1.079, 1.085)	1.032 (1.030, 1.034)	1.176 (1.171, 1.183)
Other cardiovascular diseases	1.102 (1.094, 1.111)	1.061 (1.058, 1.064)	1.035 (1.032, 1.037)	1.130 (1.123, 1.137)
RD				
Acute respiratory infections	1.103 (1.078, 1.128)	1.052 (1.044, 1.061)	1.033 (1.025, 1.041)	1.111 (1.092, 1.129)
Pneumonia	1.096 (1.087, 1.106)	1.055 (1.052, 1.059)	1.033 (1.030, 1.036)	1.119 (1.111, 1.127)
COPD	1.093 (1.081, 1.104)	1.045 (1.040, 1.049)	1.030 (1.026, 1.033)	1.097 (1.088, 1.107)
Asthma	1.134 (1.116, 1.152)	1.056 (1.051, 1.062)	1.038 (1.033, 1.043)	1.117 (1.105, 1.129)
Other respiratory diseases	1.101 (1.094, 1.108)	1.066 (1.063, 1.069)	1.039 (1.036, 1.041)	1.139 (1.133, 1.145)

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter temperature, annual precipitation, and annual vapor pressure. Daily precipitation vapor pressure (Pa) were derived from Daymet V4. All statistical tests were two-sided.

Supplementary Table 6. Sensitivity analysis results under case definition based on the principal diagnosis code at discharge.

Outcome	Relative risk (95% CI) per 1 $\mu\text{g}/\text{m}^3$ increase		Relative risk (95% CI) per SD $\mu\text{g}/\text{m}^3$ increase	
	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
CVD				
Ischemic heart disease	1.150 (1.136, 1.164)	1.071 (1.066, 1.076)	1.048 (1.044, 1.052)	1.157 (1.146, 1.168)
Cerebrovascular disease	1.137 (1.124, 1.151)	1.079 (1.073, 1.084)	1.047 (1.043, 1.052)	1.169 (1.157, 1.181)
Heart failure	1.092 (1.072, 1.113)	1.020 (1.014, 1.027)	1.031 (1.024, 1.038)	1.042 (1.030, 1.055)
Arrhythmia	1.118 (1.102, 1.135)	1.057 (1.051, 1.062)	1.039 (1.034, 1.044)	1.121 (1.109, 1.134)
Hypertension	1.278 (1.259, 1.297)	1.148 (1.140, 1.156)	1.088 (1.082, 1.093)	1.329 (1.310, 1.348)
Other cardiovascular diseases	1.144 (1.130, 1.157)	1.069 (1.064, 1.074)	1.048 (1.044, 1.052)	1.147 (1.135, 1.158)
RD				
Acute respiratory infections	1.125 (1.094, 1.158)	1.052 (1.041, 1.063)	1.040 (1.030, 1.050)	1.111 (1.087, 1.135)
Pneumonia	1.086 (1.070, 1.101)	1.049 (1.044, 1.055)	1.029 (1.024, 1.034)	1.105 (1.093, 1.117)
COPD	1.141 (1.122, 1.160)	1.060 (1.053, 1.067)	1.044 (1.039, 1.050)	1.132 (1.117, 1.148)
Asthma	1.158 (1.126, 1.191)	1.056 (1.046, 1.065)	1.045 (1.036, 1.053)	1.116 (1.095, 1.137)
Other respiratory diseases	1.117 (1.104, 1.130)	1.071 (1.066, 1.076)	1.045 (1.040, 1.049)	1.150 (1.139, 1.161)

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. All statistical tests were two-sided.

Supplementary Table 7. Sensitivity analysis results using alternative approaches to handle negative values of non-wildfire PM_{2.5}.

Outcomes ^a	Relative risk (95% CI) per 1 µg/m ³ increase		Relative risk (95% CI) per SD µg/m ³ increase	
	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
CVD				
Ischemic heart disease	1.128 (1.118, 1.138)	1.065 (1.062, 1.069)	1.041 (1.038, 1.044)	1.143 (1.135, 1.151)
Cerebrovascular disease	1.130 (1.118, 1.141)	1.071 (1.067, 1.076)	1.045 (1.041, 1.049)	1.153 (1.143, 1.163)
Heart failure	1.099 (1.091, 1.108)	1.055 (1.051, 1.058)	1.033 (1.030, 1.036)	1.115 (1.108, 1.123)
Arrhythmia	1.116 (1.107, 1.126)	1.052 (1.048, 1.055)	1.038 (1.035, 1.041)	1.111 (1.103, 1.119)
Hypertension	1.122 (1.115, 1.129)	1.085 (1.082, 1.088)	1.040 (1.038, 1.042)	1.183 (1.177, 1.189)
Other cardiovascular diseases	1.116 (1.108, 1.125)	1.063 (1.059, 1.066)	1.039 (1.037, 1.042)	1.133 (1.126, 1.140)
RD				
Acute respiratory infections	1.111 (1.087, 1.136)	1.054 (1.045, 1.062)	1.036 (1.028, 1.043)	1.114 (1.095, 1.133)
Pneumonia	1.108 (1.099, 1.118)	1.056 (1.053, 1.060)	1.037 (1.034, 1.040)	1.121 (1.113, 1.129)
COPD	1.112 (1.101, 1.123)	1.047 (1.042, 1.051)	1.036 (1.032, 1.039)	1.102 (1.092, 1.111)
Asthma	1.159 (1.141, 1.177)	1.060 (1.054, 1.066)	1.045 (1.040, 1.050)	1.125 (1.113, 1.137)
Other respiratory diseases	1.114 (1.108, 1.120)	1.066 (1.063, 1.069)	1.044 (1.041, 1.046)	1.139 (1.134, 1.145)
Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.				
Note: The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. All statistical tests were two-sided.				
^a The negative values of non-wildfire PM _{2.5} resulting from the subtraction were treated as zero.				

Supplementary Table 8. Sensitivity analysis results using 3- or 4-year moving averages as alternative exposure windows.

Outcomes	Relative risk (95% CI) per 1 µg/m ³ increase		Relative risk (95% CI) per SD µg/m ³ increase	
	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
Lag02 (3-year averages)				
Ischemic heart disease	1.372 (1.352, 1.393)	1.036 (1.031, 1.040)	1.112 (1.107, 1.118)	1.080 (1.070, 1.091)
Cerebrovascular disease	1.425 (1.400, 1.450)	1.032 (1.026, 1.037)	1.136 (1.129, 1.143)	1.070 (1.058, 1.082)
Heart failure	1.319 (1.301, 1.337)	1.030 (1.025, 1.034)	1.101 (1.096, 1.106)	1.065 (1.056, 1.074)
Arrhythmia	1.367 (1.346, 1.387)	1.024 (1.019, 1.028)	1.112 (1.106, 1.118)	1.053 (1.043, 1.063)
Hypertension	1.409 (1.394, 1.424)	1.037 (1.034, 1.041)	1.125 (1.121, 1.129)	1.083 (1.076, 1.091)
Other cardiovascular diseases	1.369 (1.352, 1.386)	1.027 (1.023, 1.031)	1.116 (1.111, 1.121)	1.060 (1.052, 1.069)
Acute respiratory infections	1.442 (1.389, 1.497)	1.038 (1.027, 1.049)	1.130 (1.116, 1.144)	1.084 (1.06, 1.1090)
Pneumonia	1.334 (1.314, 1.353)	1.020 (1.015, 1.024)	1.106 (1.101, 1.112)	1.045 (1.035, 1.055)
COPD	1.267 (1.245, 1.288)	1.013 (1.008, 1.019)	1.081 (1.075, 1.087)	1.031 (1.020, 1.043)
Asthma	1.472 (1.434, 1.511)	1.042 (1.035, 1.050)	1.122 (1.113, 1.130)	1.090 (1.075, 1.106)
Other respiratory diseases	1.408 (1.393, 1.422)	1.029 (1.025, 1.032)	1.145 (1.141, 1.150)	1.064 (1.056, 1.071)
Ischemic heart disease	1.372 (1.352, 1.393)	1.036 (1.031, 1.040)	1.112 (1.107, 1.118)	1.080 (1.070, 1.091)
Lag03 (4-year averages)				
Ischemic heart disease	1.560 (1.531, 1.590)	1.066 (1.060, 1.072)	1.161 (1.154, 1.169)	1.150 (1.136, 1.164)
Cerebrovascular disease	1.590 (1.555, 1.625)	0.991 (0.987, 0.996)	1.175 (1.166, 1.184)	1.149 (1.133, 1.166)
Heart failure	1.550 (1.524, 1.575)	1.053 (1.048, 1.059)	1.164 (1.157, 1.170)	1.117 (1.105, 1.129)
Arrhythmia	1.526 (1.498, 1.554)	1.055 (1.049, 1.061)	1.154 (1.147, 1.162)	1.122 (1.108, 1.136)
Hypertension	1.676 (1.655, 1.698)	1.082 (1.078, 1.087)	1.193 (1.188, 1.199)	1.183 (1.172, 1.193)
Other cardiovascular diseases	1.540 (1.517, 1.564)	1.062 (1.056, 1.067)	1.163 (1.156, 1.169)	1.135 (1.124, 1.147)
Acute respiratory infections	1.634 (1.560, 1.711)	1.068 (1.053, 1.082)	1.178 (1.160, 1.196)	1.149 (1.117, 1.182)
Pneumonia	1.591 (1.563, 1.620)	1.042 (1.036, 1.048)	1.177 (1.170, 1.184)	1.093 (1.081, 1.106)
COPD	1.497 (1.466, 1.529)	1.025 (1.018, 1.032)	1.143 (1.135, 1.150)	1.057 (1.042, 1.072)
Asthma	1.688 (1.633, 1.745)	1.069 (1.059, 1.079)	1.168 (1.157, 1.180)	1.147 (1.126, 1.169)
Other respiratory diseases	1.583 (1.564, 1.602)	1.055 (1.051, 1.060)	1.200 (1.194, 1.205)	1.122 (1.113, 1.132)
Ischemic heart disease	1.560 (1.531, 1.590)	1.066 (1.060, 1.072)	1.161 (1.154, 1.169)	1.150 (1.136, 1.164)
Abbreviations: COPD, chronic obstructive pulmonary disease.				
Note: The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. All statistical tests were two-sided.				

Supplementary Table 9. Sensitivity analysis results using alternative control-year specifications.

Outcomes	Relative risk (95% CI) per 1 µg/m ³ increase		Relative risk (95% CI) per SD µg/m ³ increase	
	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}	Wildfire-specific PM _{2.5}	Non-wildfire PM _{2.5}
Two years before and after the year of hospitalization (case year)				
Ischemic heart disease	1.200 (1.192, 1.208)	1.071 (1.069, 1.074)	1.063 (1.061, 1.066)	1.157 (1.152, 1.163)
Cerebrovascular disease	1.189 (1.180, 1.198)	1.078 (1.075, 1.081)	1.064 (1.061, 1.067)	1.167 (1.160, 1.174)
Heart failure	1.082 (1.076, 1.088)	1.062 (1.060, 1.064)	1.028 (1.026, 1.030)	1.131 (1.126, 1.137)
Arrhythmia	1.152 (1.144, 1.159)	1.047 (1.044, 1.049)	1.049 (1.047, 1.052)	1.100 (1.094, 1.105)
Hypertension	1.254 (1.248, 1.260)	1.082 (1.080, 1.084)	1.080 (1.079, 1.082)	1.175 (1.171, 1.180)
Other cardiovascular diseases	1.160 (1.154, 1.167)	1.064 (1.062, 1.066)	1.053 (1.051, 1.055)	1.137 (1.132, 1.141)
Acute respiratory infections	1.229 (1.209, 1.249)	1.069 (1.063, 1.075)	1.071 (1.065, 1.077)	1.148 (1.135, 1.162)
Pneumonia	1.170 (1.162, 1.177)	1.062 (1.060, 1.065)	1.057 (1.054, 1.059)	1.135 (1.129, 1.140)
COPD	1.161 (1.152, 1.170)	1.037 (1.034, 1.040)	1.050 (1.048, 1.053)	1.080 (1.073, 1.086)
Asthma	1.241 (1.227, 1.255)	1.068 (1.065, 1.072)	1.066 (1.063, 1.070)	1.143 (1.135, 1.152)
Other respiratory diseases	1.183 (1.178, 1.189)	1.079 (1.077, 1.081)	1.069 (1.067, 1.071)	1.168 (1.164, 1.172)
Ischemic heart disease	1.200 (1.192, 1.208)	1.071 (1.069, 1.074)	1.063 (1.061, 1.066)	1.157 (1.152, 1.163)
Three years before and after the year of hospitalization (case year)				
Ischemic heart disease	1.264 (1.256, 1.271)	1.080 (1.078, 1.082)	1.082 (1.080, 1.084)	1.177 (1.172, 1.182)
Cerebrovascular disease	1.295 (1.286, 1.304)	1.064 (1.061, 1.066)	1.098 (1.095, 1.100)	1.136 (1.130, 1.141)
Heart failure	1.312 (1.305, 1.319)	1.076 (1.074, 1.078)	1.099 (1.097, 1.101)	1.163 (1.158, 1.167)
Arrhythmia	1.292 (1.284, 1.299)	1.064 (1.062, 1.066)	1.091 (1.089, 1.093)	1.138 (1.133, 1.142)
Hypertension	1.256 (1.250, 1.261)	1.096 (1.095, 1.098)	1.081 (1.079, 1.083)	1.209 (1.205, 1.212)
Other cardiovascular diseases	1.241 (1.234, 1.247)	1.057 (1.055, 1.059)	1.078 (1.076, 1.080)	1.121 (1.117, 1.125)
Acute respiratory infections	1.215 (1.197, 1.233)	1.077 (1.072, 1.082)	1.067 (1.062, 1.072)	1.165 (1.154, 1.177)
Pneumonia	1.264 (1.257, 1.271)	1.048 (1.046, 1.050)	1.086 (1.084, 1.088)	1.103 (1.098, 1.107)
COPD	1.253 (1.245, 1.262)	1.055 (1.053, 1.058)	1.077 (1.075, 1.080)	1.121 (1.116, 1.127)
Asthma	1.274 (1.261, 1.287)	1.056 (1.053, 1.060)	1.075 (1.071, 1.078)	1.118 (1.110, 1.125)
Other respiratory diseases	1.308 (1.302, 1.313)	1.070 (1.068, 1.071)	1.112 (1.110, 1.114)	1.148 (1.144, 1.151)
Ischemic heart disease	1.264 (1.256, 1.271)	1.080 (1.078, 1.082)	1.082 (1.080, 1.084)	1.177 (1.172, 1.182)
Four years before and after the year of hospitalization (case year)				
Ischemic heart disease	1.222 (1.215, 1.229)	1.085 (1.083, 1.087)	1.070 (1.068, 1.072)	1.190 (1.185, 1.195)
Cerebrovascular disease	1.257 (1.249, 1.266)	1.062 (1.059, 1.064)	1.086 (1.083, 1.088)	1.131 (1.126, 1.137)
Heart failure	1.340 (1.334, 1.347)	1.065 (1.063, 1.067)	1.107 (1.105, 1.109)	1.138 (1.134, 1.142)
Arrhythmia	1.273 (1.266, 1.281)	1.049 (1.047, 1.051)	1.086 (1.084, 1.088)	1.104 (1.100, 1.109)
Hypertension	1.181 (1.176, 1.186)	1.123 (1.121, 1.125)	1.059 (1.057, 1.060)	1.270 (1.266, 1.273)
Other cardiovascular diseases	1.220 (1.215, 1.226)	1.058 (1.056, 1.060)	1.072 (1.070, 1.074)	1.122 (1.118, 1.126)
Acute respiratory infections	1.160 (1.144, 1.176)	1.094 (1.089, 1.099)	1.051 (1.046, 1.056)	1.202 (1.191, 1.214)
Pneumonia	1.248 (1.242, 1.255)	1.040 (1.038, 1.042)	1.081 (1.079, 1.083)	1.086 (1.082, 1.090)

COPD	1.163 (1.156, 1.171)	1.041 (1.039, 1.044)	1.051 (1.049, 1.053)	1.090 (1.085, 1.095)
Asthma	1.230 (1.218, 1.241)	1.064 (1.061, 1.067)	1.063 (1.060, 1.066)	1.134 (1.127, 1.141)
Other respiratory diseases	1.303 (1.297, 1.308)	1.073 (1.071, 1.074)	1.110 (1.109, 1.112)	1.155 (1.151, 1.158)
Ischemic heart disease	1.222 (1.215, 1.229)	1.085 (1.083, 1.087)	1.070 (1.068, 1.072)	1.190 (1.185, 1.195)

Abbreviations: COPD, chronic obstructive pulmonary disease.

Note: The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. All statistical tests were two-sided.

Supplementary Table 10. Sensitivity analysis results stratifying the model by US state.

States	Cardiovascular diseases (CVD)						Respiratory diseases (RD)				
	Ischemic heart disease	Cerebrovascular disease	Heart failure	Arrhythmia	Hypertension	Other cardiovascular diseases	Acute respiratory infections	Pneumonia	COPD	Asthma	Other respiratory diseases
Wildfire-specific PM _{2.5}											
AZ	1.052 (0.953, 1.162)	1.051 (0.936, 1.18)	0.997 (0.894, 1.112)	1.059 (0.963, 1.164)	1.007 (0.929, 1.091)	1.033 (0.946, 1.128)	1.299 (0.987, 1.708)	0.996 (0.904, 1.098)	1.022 (0.901, 1.159)	1.122 (0.917, 1.373)	1.026 (0.955, 1.101)
CA	1.084 (1.034, 1.137)	1.354 (1.29, 1.422)	1.101 (1.057, 1.147)	1.058 (1.01, 1.108)	1.062 (1.029, 1.096)	1.049 (1.01, 1.089)	1.034 (0.927, 1.153)	1.238 (1.188, 1.289)	1.154 (1.088, 1.224)	1.022 (0.935, 1.116)	1.234 (1.202, 1.266)
CO	0.541 (0.471, 0.622)	0.936 (0.746, 1.175)	0.277 (0.237, 0.324)	0.288 (0.249, 0.334)	1.016 (0.869, 1.186)	1.022 (0.876, 1.193)	0.852 (0.56, 1.297)	0.961 (0.787, 1.174)	0.888 (0.674, 1.169)	0.997 (0.715, 1.391)	1.048 (0.929, 1.183)
DE	1.056 (0.232, 4.812)	0.606 (0.041, 9.006)	2.133 (0.256, 17.795)	0.645 (0.064, 6.48)	1.292 (0.256, 6.515)	0.268 (0.034, 2.129)	0.728 (0.011, 46.844)	2.089 (0.365, 11.944)	1.178 (0.044, 31.891)	1.897 (0.055, 64.926)	1.621 (0.352, 7.471)
GA	1.066 (0.997, 1.14)	1.006 (0.929, 1.089)	1.027 (0.968, 1.089)	1.058 (0.985, 1.135)	0.879 (0.848, 0.911)	1.034 (0.977, 1.094)	1.22 (1.041, 1.431)	0.974 (0.917, 1.035)	0.871 (0.825, 0.919)	0.912 (0.816, 1.019)	0.989 (0.942, 1.039)
IA	0.798 (0.627, 1.016)	0.781 (0.567, 1.077)	0.763 (0.603, 0.964)	0.762 (0.589, 0.985)	0.935 (0.761, 1.15)	0.957 (0.757, 1.211)	1.077 (0.55, 2.112)	0.831 (0.667, 1.037)	0.865 (0.656, 1.14)	1.07 (0.649, 1.764)	0.945 (0.776, 1.15)
IN	0.974 (0.521, 1.821)	1.242 (0.637, 2.421)	1.191 (0.676, 2.1)	0.843 (0.454, 1.565)	0.927 (0.599, 1.433)	0.847 (0.495, 1.45)	0.61 (0.106, 3.507)	1.029 (0.593, 1.785)	0.529 (0.249, 1.125)	1.003 (0.261, 3.847)	1.023 (0.709, 1.477)
KY	1.044 (0.901, 1.21)	0.915 (0.744, 1.126)	1.077 (0.938, 1.237)	0.882 (0.745, 1.045)	0.967 (0.855, 1.092)	0.924 (0.797, 1.07)	0.777 (0.537, 1.125)	0.985 (0.861, 1.127)	0.978 (0.853, 1.122)	0.755 (0.566, 1.008)	1.018 (0.907, 1.143)
MD	0.874 (0.234, 3.27)	1.746 (0.476, 6.4)	0.533 (0.087, 3.248)	3.35 (0.945, 11.871)	1.318 (0.495, 3.512)	1.471 (0.66, 3.282)	9.272 (0.04, 2159.764)	2.056 (0.494, 8.56)	2.185 (0.233, 20.523)	0.652 (0.063, 6.716)	0.853 (0.397, 1.829)
MI	0.874 (0.754, 1.014)	1.08 (0.889, 1.312)	1.033 (0.892, 1.184)	1.012 (0.858, 1.166)	0.678 (0.601, 0.755)	0.937 (0.813, 1.061)	1.126 (0.759, 1.493)	1.062 (0.905, 1.219)	0.91 (0.757, 1.063)	0.961 (0.74, 1.182)	1.01 (0.888, 1.132)

			1.196)	1.192)	0.765)	1.08)	1.672)	1.247)	1.094)	1.249)	1.148)
MN	1.087 (0.918, 1.288)	0.935 (0.763, 1.145)	1.029 (0.899, 1.179)	1.015 (0.878, 1.174)	1.052 (0.928, 1.192)	1.086 (0.971, 1.214)	1.34 (0.868, 2.068)	0.954 (0.812, 1.121)	0.953 (0.759, 1.196)	1.175 (0.861, 1.604)	1.017 (0.907, 1.14)
NC	1.01 (0.941, 1.085)	0.999 (0.914, 1.091)	0.972 (0.91, 1.038)	0.988 (0.918, 1.063)	0.977 (0.927, 1.03)	0.881 (0.827, 0.938)	1.099 (0.907, 1.331)	0.984 (0.917, 1.055)	0.925 (0.854, 1.002)	1.048 (0.924, 1.187)	0.981 (0.93, 1.034)
NE	0.913 (0.606, 1.376)	0.872 (0.561, 1.355)	0.742 (0.513, 1.075)	0.798 (0.54, 1.18)	0.771 (0.572, 1.038)	0.612 (0.44, 0.851)	1.588 (0.612, 4.119)	0.786 (0.551, 1.121)	0.796 (0.497, 1.274)	0.302 (0.116, 0.783)	0.732 (0.581, 0.923)
NJ	0.856 (0.7, 1.046)	0.784 (0.592, 1.038)	0.857 (0.685, 1.073)	0.978 (0.784, 1.219)	0.758 (0.649, 0.886)	0.838 (0.688, 1.021)	0.781 (0.462, 1.32)	0.759 (0.598, 0.963)	0.845 (0.64, 1.116)	0.764 (0.557, 1.047)	0.785 (0.645, 0.956)
NY	0.991 (0.922, 1.065)	0.995 (0.901, 1.099)	1.184 (1.101, 1.274)	1.093 (1.012, 1.181)	1.057 (1.002, 1.116)	1.032 (0.964, 1.105)	1.127 (0.932, 1.364)	0.935 (0.859, 1.017)	1.128 (1.025, 1.241)	1.107 (0.993, 1.233)	0.92 (0.858, 0.987)
OR	1.034 (1.01, 1.059)	0.998 (0.969, 1.029)	0.997 (0.976, 1.018)	0.984 (0.961, 1.007)	0.982 (0.965, 0.999)	0.998 (0.978, 1.018)	1.031 (0.963, 1.104)	1.013 (0.989, 1.038)	1.02 (0.992, 1.048)	1.011 (0.965, 1.06)	1.018 (1.001, 1.034)
RI	1.152 (0.571, 2.324)	1.226 (0.438, 3.432)	0.52 (0.219, 1.234)	0.965 (0.447, 2.083)	1.021 (0.602, 1.731)	0.89 (0.404, 1.964)	0.605 (0.139, 2.629)	1.037 (0.417, 2.581)	0.751 (0.276, 2.046)	0.747 (0.237, 2.356)	0.631 (0.296, 1.346)
VT	0.683 (0.056, 8.385)	0.507 (0.026, 9.934)	1.491 (0.151, 14.776)	1.015 (0.142, 7.255)	0.111 (0.007, 1.676)	0.65 (0.087, 4.882)	6.131 (0, 18198027.834)	0.49 (0.052, 4.645)	0.279 (0.005, 15.597)	0.001 (0, 89.913)	0.999 (0.125, 8.001)
WA	1.007 (0.975, 1.039)	1.015 (0.979, 1.053)	0.99 (0.96, 1.02)	0.98 (0.95, 1.012)	1.009 (0.984, 1.034)	0.993 (0.966, 1.02)	0.955 (0.875, 1.042)	0.994 (0.963, 1.026)	0.987 (0.949, 1.027)	0.964 (0.908, 1.023)	0.994 (0.972, 1.017)
WI	1.21 (0.848, 1.727)	1.077 (0.702, 1.651)	0.912 (0.679, 1.223)	0.931 (0.661, 1.311)	1.028 (0.797, 1.325)	0.864 (0.644, 1.16)	1.26 (0.529, 3.002)	1.017 (0.736, 1.406)	0.934 (0.626, 1.394)	1.045 (0.597, 1.831)	1.277 (0.995, 1.639)
Non-wildfire PM _{2.5}											
AZ	0.997 (0.982, 1.011)	0.994 (0.976, 1.011)	0.996 (0.981, 1.012)	0.998 (0.983, 1.012)	0.993 (0.982, 1.005)	0.992 (0.98, 1.005)	0.981 (0.949, 1.014)	0.987 (0.974, 1.001)	0.994 (0.976, 1.012)	1.002 (0.979, 1.025)	0.994 (0.983, 1.004)
CA	1.037 (1.005, 1.071)	1.176 (1.136, 1.217)	1.015 (0.986, 1.043)	1.042 (1.008, 1.078)	1.036 (1.014, 1.059)	1.047 (1.019, 1.076)	0.989 (0.92, 1.062)	1.097 (1.066, 1.129)	1.08 (1.036, 1.126)	0.983 (0.93, 1.04)	1.094 (1.074, 1.115)

CO	0.966 (0.932, 1.001)	1.006 (0.967, 1.047)	0.918 (0.888, 0.95)	0.959 (0.926, 0.993)	0.983 (0.96, 1.006)	0.991 (0.965, 1.017)	0.985 (0.929, 1.044)	0.979 (0.947, 1.012)	0.978 (0.936, 1.021)	0.985 (0.938, 1.033)	0.983 (0.964, 1.002)
DE	0.923 (0.768, 1.111)	1.05 (0.875, 1.261)	0.881 (0.749, 1.038)	1.013 (0.854, 1.202)	0.958 (0.849, 1.081)	0.966 (0.841, 1.11)	1.089 (0.859, 1.38)	0.979 (0.838, 1.143)	1.001 (0.816, 1.229)	1.058 (0.814, 1.375)	0.983 (0.888, 1.088)
GA	1.004 (0.983, 1.025)	1.003 (0.979, 1.028)	1.013 (0.996, 1.031)	1.007 (0.985, 1.029)	1.07 (1.056, 1.083)	1.002 (0.985, 1.019)	1.002 (0.953, 1.053)	0.997 (0.978, 1.017)	1.027 (1.005, 1.049)	1.003 (0.97, 1.038)	0.996 (0.982, 1.011)
IA	1 (0.967, 1.034)	0.996 (0.953, 1.042)	0.986 (0.956, 1.016)	0.987 (0.954, 1.022)	1.034 (1.006, 1.062)	0.965 (0.936, 0.995)	0.993 (0.914, 1.079)	0.998 (0.968, 1.029)	0.982 (0.948, 1.018)	0.994 (0.929, 1.063)	0.989 (0.963, 1.016)
IN	0.952 (0.896, 1.012)	1.002 (0.931, 1.077)	0.996 (0.945, 1.05)	0.991 (0.928, 1.057)	1.079 (1.037, 1.123)	1.01 (0.959, 1.062)	1.016 (0.856, 1.205)	0.994 (0.941, 1.049)	1.021 (0.959, 1.088)	1.003 (0.88, 1.142)	0.969 (0.935, 1.005)
KY	0.99 (0.971, 1.01)	0.986 (0.96, 1.013)	1.016 (0.998, 1.034)	0.981 (0.959, 1.003)	0.991 (0.975, 1.006)	1.005 (0.986, 1.024)	0.947 (0.902, 0.995)	0.984 (0.967, 1.002)	0.982 (0.964, 1)	0.953 (0.919, 0.988)	0.986 (0.971, 1)
MD	0.979 (0.816, 1.174)	0.965 (0.805, 1.156)	0.91 (0.749, 1.105)	1.058 (0.887, 1.263)	1.011 (0.902, 1.134)	1.067 (0.945, 1.206)	0.899 (0.571, 1.416)	0.854 (0.727, 1.002)	1.051 (0.849, 1.302)	1.084 (0.785, 1.497)	0.947 (0.851, 1.053)
MI	0.992 (0.978, 1.006)	0.999 (0.981, 1.018)	0.999 (0.986, 1.013)	0.985 (0.97, 1.001)	0.972 (0.961, 0.982)	0.982 (0.97, 0.995)	1.004 (0.966, 1.044)	0.986 (0.971, 1.001)	0.986 (0.97, 1.002)	0.997 (0.973, 1.022)	1 (0.988, 1.011)
MN	1.016 (0.991, 1.043)	0.998 (0.968, 1.03)	1.008 (0.987, 1.03)	0.987 (0.964, 1.01)	1.007 (0.988, 1.027)	0.995 (0.976, 1.015)	0.992 (0.935, 1.053)	0.999 (0.975, 1.023)	1.002 (0.97, 1.034)	1.003 (0.963, 1.045)	0.996 (0.979, 1.014)
NC	1.007 (0.99, 1.024)	1 (0.98, 1.02)	1.011 (0.996, 1.027)	0.997 (0.98, 1.014)	1.008 (0.996, 1.02)	0.998 (0.983, 1.012)	1.008 (0.963, 1.055)	0.993 (0.976, 1.009)	0.999 (0.981, 1.018)	1.03 (1.001, 1.06)	0.992 (0.98, 1.004)
NE	1.037 (0.964, 1.115)	1.021 (0.938, 1.113)	1.033 (0.97, 1.1)	0.957 (0.893, 1.024)	0.962 (0.913, 1.013)	0.997 (0.941, 1.057)	1 (0.84, 1.19)	1.018 (0.954, 1.087)	0.984 (0.906, 1.068)	1.058 (0.903, 1.238)	0.995 (0.949, 1.043)
NJ	1.013 (0.994, 1.032)	1.001 (0.976, 1.027)	1.003 (0.983, 1.022)	0.998 (0.978, 1.018)	1.011 (0.998, 1.025)	1 (0.983, 1.017)	0.986 (0.941, 1.033)	0.999 (0.978, 1.021)	1.012 (0.987, 1.036)	0.996 (0.969, 1.024)	1.014 (0.997, 1.032)
NY	1.018 (1.009, 1.028)	1.013 (1, 1.026)	1.013 (1.004, 1.022)	1.002 (0.992, 1.012)	1.013 (1.006, 1.02)	1.013 (1.005, 1.022)	0.987 (0.964, 1.011)	1.013 (1.002, 1.024)	1.013 (1.001, 1.025)	1 (0.987, 1.014)	1.013 (1.004, 1.021)

OR	1.017 (0.996, 1.038)	0.997 (0.972, 1.023)	1.006 (0.987, 1.025)	0.991 (0.971, 1.012)	1.006 (0.989, 1.023)	0.992 (0.975, 1.011)	1.002 (0.947, 1.061)	1.016 (0.995, 1.039)	1.019 (0.992, 1.046)	1.001 (0.965, 1.039)	0.998 (0.982, 1.013)
RI	1.023 (0.966, 1.084)	1.001 (0.924, 1.083)	1.078 (1.014, 1.145)	1.003 (0.941, 1.068)	0.996 (0.954, 1.039)	0.987 (0.932, 1.046)	1.022 (0.885, 1.181)	1.024 (0.956, 1.097)	1.052 (0.977, 1.132)	0.983 (0.897, 1.079)	1.039 (0.984, 1.096)
VT	0.976 (0.737, 1.291)	1.045 (0.737, 1.482)	1.006 (0.77, 1.316)	0.987 (0.746, 1.305)	1.04 (0.829, 1.305)	0.937 (0.725, 1.212)	1.112 (0.47, 2.633)	1.042 (0.78, 1.393)	1.147 (0.797, 1.652)	0.782 (0.411, 1.488)	0.975 (0.796, 1.194)
WA	1.005 (0.989, 1.021)	1.001 (0.982, 1.02)	1.001 (0.987, 1.015)	1.009 (0.993, 1.025)	0.995 (0.982, 1.007)	1.008 (0.995, 1.022)	1.001 (0.962, 1.042)	0.997 (0.981, 1.013)	0.994 (0.975, 1.014)	0.99 (0.964, 1.017)	1 (0.989, 1.012)
WI	0.998 (0.967, 1.03)	1.006 (0.968, 1.046)	1 (0.973, 1.029)	0.976 (0.945, 1.007)	1.006 (0.983, 1.03)	0.976 (0.95, 1.003)	0.979 (0.902, 1.061)	1.003 (0.972, 1.035)	1.003 (0.965, 1.043)	0.997 (0.946, 1.051)	0.995 (0.972, 1.019)

Abbreviations: AZ, Arizona; CA, California; CO, Colorado; DE, Delaware; GA, Georgia; IA, Iowa; IN, Indiana; KY, Kentucky; MD, Maryland; MI, Michigan; MN, Minnesota; NC, North Carolina; NE, Nebraska; NJ, New Jersey; NY, New York; OR, Oregon; RI, Rhode Island; VT, Vermont; WA, Washington; WI, Wisconsin.

Note: The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, and standard deviation of summer and winter temperature. Relative risks were reported per 1 $\mu\text{g}/\text{m}^3$ increase in 2-year average $\text{PM}_{2.5}$ concentrations. All statistical tests were two-sided.

Supplementary Table 11. Subgroup analysis by age.

Outcome	Wildfire-specific PM _{2.5}			Non-wildfire PM _{2.5}		
	Under 65 years old	65 years old and above	<i>P</i> -value ^a	Under 65 years old	65 years old and above	<i>P</i> -value ^b
CVD						
Ischemic heart disease	1.129 (1.112, 1.146)	1.130 (1.118, 1.142)	0.876	1.067 (1.061, 1.072)	1.064 (1.059, 1.068)	0.247
Cerebrovascular disease	1.141 (1.120, 1.162)	1.127 (1.113, 1.142)	0.142	1.081 (1.073, 1.089)	1.067 (1.061, 1.072)	3.23E-05
Heart failure	1.144 (1.127, 1.162)	1.086 (1.076, 1.096)	1.08E-16	1.079 (1.072, 1.085)	1.046 (1.042, 1.050)	8.14E-34
Arrhythmia	1.141 (1.121, 1.162)	1.110 (1.099, 1.121)	0.000143	1.061 (1.054, 1.068)	1.049 (1.044, 1.053)	2.34E-05
Hypertension	1.121 (1.110, 1.131)	1.130 (1.121, 1.139)	0.054	1.084 (1.081, 1.088)	1.085 (1.081, 1.088)	0.907
Other cardiovascular diseases	1.127 (1.115, 1.140)	1.111 (1.100, 1.122)	0.005	1.072 (1.067, 1.076)	1.056 (1.052, 1.060)	6.48E-13
RD						
Acute respiratory infections ^c	1.123 (1.092, 1.156)	1.089 (1.052, 1.126)	0.045	1.050 (1.039, 1.061)	1.062 (1.049, 1.075)	0.053
Pneumonia	1.105 (1.090, 1.120)	1.111 (1.099, 1.123)	0.356	1.056 (1.051, 1.062)	1.056 (1.052, 1.061)	0.980
COPD	1.103 (1.083, 1.122)	1.119 (1.105, 1.132)	0.057	1.047 (1.040, 1.054)	1.047 (1.042, 1.052)	0.948
Asthma ^c	1.165 (1.127, 1.205)	1.158 (1.138, 1.178)	0.645	1.067 (1.055, 1.079)	1.058 (1.051, 1.064)	0.052
Other respiratory diseases	1.116 (1.106, 1.126)	1.113 (1.104, 1.121)	0.474	1.071 (1.067, 1.075)	1.062 (1.059, 1.066)	1.19E-05

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^c The group was divided into under 18 years old vs. 18 years old and above.

Supplementary Table 12. Subgroup analysis by sex.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}		
	Female	Male	<i>P</i> -value ^a		Female	Male	<i>P</i> -value ^b
CVD							
Ischemic heart disease	1.132 (1.116, 1.148)	1.127 (1.114, 1.139)	0.441		1.067 (1.062, 1.073)	1.063 (1.059, 1.068)	0.134
Cerebrovascular disease	1.131 (1.115, 1.148)	1.130 (1.114, 1.147)	0.868		1.070 (1.064, 1.076)	1.072 (1.066, 1.079)	0.422
Heart failure	1.093 (1.080, 1.105)	1.106 (1.094, 1.118)	0.032		1.052 (1.047, 1.057)	1.057 (1.053, 1.062)	0.024
Arrhythmia	1.122 (1.108, 1.137)	1.114 (1.100, 1.127)	0.223		1.053 (1.047, 1.058)	1.051 (1.046, 1.056)	0.453
Hypertension	1.121 (1.111, 1.131)	1.124 (1.114, 1.134)	0.510		1.082 (1.078, 1.086)	1.088 (1.084, 1.092)	0.002
Other cardiovascular diseases	1.116 (1.105, 1.128)	1.119 (1.107, 1.130)	0.727		1.062 (1.057, 1.066)	1.063 (1.059, 1.067)	0.530
RD							
Acute respiratory infections	1.101 (1.068, 1.136)	1.119 (1.085, 1.154)	0.305		1.053 (1.041, 1.066)	1.054 (1.042, 1.066)	0.914
Pneumonia	1.108 (1.095, 1.121)	1.109 (1.096, 1.123)	0.822		1.054 (1.049, 1.059)	1.058 (1.053, 1.063)	0.138
COPD	1.117 (1.101, 1.132)	1.107 (1.091, 1.124)	0.235		1.046 (1.041, 1.052)	1.047 (1.041, 1.053)	0.811
Asthma	1.156 (1.134, 1.178)	1.165 (1.135, 1.197)	0.479		1.060 (1.053, 1.067)	1.059 (1.049, 1.068)	0.748
Other respiratory diseases	1.115 (1.106, 1.125)	1.113 (1.104, 1.122)	0.579		1.064 (1.061, 1.068)	1.068 (1.064, 1.071)	0.101

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 13. Subgroup analysis by race/ethnicity.

Outcome	Wildfire-specific PM _{2.5}					Non-wildfire PM _{2.5}				
	White	Black	Hispanic	Other	<i>P</i> -value	White	Black	Hispanic	Other	<i>P</i> -value
CVD										
Ischemic heart disease	1.095 (1.084, 1.106)	1.061 (1.017, 1.106)	1.199 (1.150, 1.249)	1.309 (1.258, 1.363)	9.16E-41	1.070 (1.066, 1.075)	1.112 (1.098, 1.126)	1.107 (1.091, 1.124)	1.137 (1.122, 1.153)	2.41E-46
Cerebrovascular disease	1.106 (1.093, 1.120)	1.077 (1.034, 1.123)	1.138 (1.089, 1.190)	1.289 (1.232, 1.349)	4.10E-20	1.073 (1.067, 1.079)	1.117 (1.102, 1.132)	1.105 (1.085, 1.125)	1.165 (1.145, 1.185)	3.60E-46
Heart failure	1.073 (1.063, 1.082)	1.065 (1.033, 1.097)	1.123 (1.080, 1.167)	1.169 (1.125, 1.216)	2.47E-10	1.053 (1.049, 1.057)	1.100 (1.089, 1.110)	1.063 (1.048, 1.079)	1.128 (1.112, 1.145)	6.32E-61
Arrhythmia	1.098 (1.087, 1.109)	1.090 (1.040, 1.143)	1.156 (1.101, 1.213)	1.212 (1.156, 1.272)	6.97E-09	1.063 (1.059, 1.068)	1.092 (1.077, 1.108)	1.079 (1.060, 1.098)	1.119 (1.101, 1.138)	9.06E-21
Hypertension	1.076 (1.068, 1.084)	1.059 (1.036, 1.083)	1.195 (1.165, 1.227)	1.308 (1.271, 1.346)	1.14E-10 0	1.079 (1.076, 1.083)	1.119 (1.112, 1.127)	1.102 (1.091, 1.112)	1.153 (1.141, 1.165)	5.49E-96
Other cardiovascular diseases	1.093 (1.084, 1.103)	1.075 (1.043, 1.107)	1.160 (1.123, 1.199)	1.238 (1.195, 1.283)	1.11E-25	1.064 (1.061, 1.068)	1.102 (1.092, 1.112)	1.105 (1.091, 1.119)	1.136 (1.121, 1.151)	6.59E-64
RD										
Acute respiratory infections	1.061 (1.031, 1.092)	1.100 (1.014, 1.193)	1.173 (1.108, 1.241)	1.253 (1.157, 1.356)	1.35E-09	1.046 (1.034, 1.058)	1.109 (1.083, 1.137)	1.086 (1.064, 1.110)	1.109 (1.078, 1.140)	2.91E-14
Pneumonia	1.088 (1.077, 1.098)	1.062 (1.022, 1.103)	1.149 (1.108, 1.191)	1.237 (1.191, 1.285)	2.22E-22	1.054 (1.049, 1.058)	1.106 (1.093, 1.119)	1.094 (1.079, 1.109)	1.133 (1.117, 1.150)	2.58E-66
COPD	1.087 (1.075, 1.099)	1.102 (1.050, 1.157)	1.190 (1.115, 1.270)	1.240 (1.171, 1.314)	1.00E-11	1.042 (1.037, 1.047)	1.125 (1.108, 1.142)	1.066 (1.042, 1.091)	1.121 (1.098, 1.146)	2.69E-57
Asthma	1.120 (1.098, 1.143)	1.143 (1.091, 1.199)	1.243 (1.184, 1.304)	1.280 (1.204, 1.361)	6.23E-13	1.059 (1.051, 1.067)	1.088 (1.074, 1.102)	1.084 (1.067, 1.101)	1.108 (1.086, 1.130)	2.54E-12
Other respiratory diseases	1.089 (1.082, 1.096)	1.089 (1.061, 1.118)	1.143 (1.115, 1.173)	1.264 (1.230, 1.298)	4.68E-55	1.066 (1.062, 1.069)	1.119 (1.109, 1.129)	1.108 (1.096, 1.119)	1.154 (1.141, 1.166)	4.28E-13 3

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Wald test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Wald test.

Supplementary Table 14. Subgroup analysis by patient location.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}			
	Metropolitan	Micropolitan	Non-CBSA	<i>P</i> -value ^a	Metropolitan	Micropolitan	Non-CBSA	<i>P</i> -value ^b
CVD								
Ischemic heart disease	1.144 (1.133, 1.156)	1.034 (1.008, 1.060)	1.017 (0.986, 1.050)	8.84E-44	1.069 (1.065, 1.073)	1.014 (1.004, 1.024)	0.994 (0.981, 1.007)	8.11E-85
Cerebrovascular disease	1.146 (1.133, 1.160)	1.046 (1.014, 1.079)	1.017 (0.978, 1.057)	6.72E-27	1.074 (1.069, 1.079)	1.006 (0.992, 1.020)	1.015 (0.996, 1.033)	4.37E-48
Heart failure	1.106 (1.097, 1.116)	1.029 (1.006, 1.052)	0.993 (0.963, 1.023)	3.99E-34	1.054 (1.050, 1.057)	1.010 (1.000, 1.020)	1.007 (0.994, 1.020)	4.95E-45
Arrhythmia	1.129 (1.118, 1.140)	1.032 (1.006, 1.059)	1.033 (1.000, 1.067)	3.13E-28	1.054 (1.050, 1.058)	1.001 (0.990, 1.012)	1.005 (0.991, 1.019)	1.47E-48
Hypertension	1.131 (1.123, 1.138)	1.034 (1.016, 1.053)	1.031 (1.007, 1.056)	6.50E-56	1.089 (1.086, 1.092)	1.002 (0.994, 1.011)	1.002 (0.991, 1.013)	3.92E-235
Other cardiovascular diseases	1.128 (1.119, 1.138)	1.043 (1.021, 1.066)	1.026 (0.998, 1.055)	1.63E-35	1.064 (1.061, 1.067)	1.006 (0.996, 1.016)	1.007 (0.995, 1.021)	1.33E-75
RD								
Acute respiratory infections	1.121 (1.094, 1.149)	1.061 (0.992, 1.134)	1.040 (0.954, 1.133)	0.008	1.056 (1.047, 1.065)	0.988 (0.961, 1.016)	0.976 (0.942, 1.012)	1.61E-16
Pneumonia	1.118 (1.108, 1.129)	1.052 (1.027, 1.077)	1.015 (0.985, 1.045)	4.19E-25	1.059 (1.055, 1.063)	0.995 (0.985, 1.005)	0.991 (0.978, 1.004)	1.24E-93
COPD	1.123 (1.110, 1.137)	1.047 (1.019, 1.075)	1.050 (1.015, 1.086)	2.72E-15	1.054 (1.049, 1.058)	1.005 (0.993, 1.016)	0.996 (0.982, 1.010)	2.06E-47
Asthma	1.175 (1.155, 1.195)	1.041 (0.992, 1.092)	1.026 (0.959, 1.098)	5.84E-16	1.060 (1.054, 1.066)	1.023 (1.003, 1.043)	1.010 (0.983, 1.037)	4.66E-11
Other respiratory diseases	1.120 (1.113, 1.127)	1.074 (1.056, 1.092)	1.040 (1.016, 1.065)	3.93E-24	1.069 (1.066, 1.072)	0.996 (0.988, 1.005)	0.999 (0.988, 1.010)	1.70E-160

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Wald test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Wald test.

Supplementary Table 15. Subgroup analysis by ICD-9-CM diagnoses of obesity.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}		
	Obesity	Non-obesity	<i>P</i> -value ^a		Obesity	Non-obesity	<i>P</i> -value ^b
CVD							
Ischemic heart disease	1.184 (1.152, 1.216)	1.123 (1.112, 1.133)	1.92E-07		1.081 (1.069, 1.093)	1.063 (1.059, 1.067)	5.31E-05
Cerebrovascular disease	1.196 (1.148, 1.247)	1.127 (1.115, 1.139)	7.27E-05		1.101 (1.082, 1.120)	1.069 (1.065, 1.074)	4.71E-06
Heart failure	1.121 (1.095, 1.148)	1.097 (1.088, 1.106)	0.013		1.074 (1.063, 1.085)	1.053 (1.049, 1.056)	2.31E-07
Arrhythmia	1.161 (1.129, 1.195)	1.113 (1.102, 1.123)	4.51E-05		1.061 (1.049, 1.074)	1.051 (1.047, 1.055)	0.026
Hypertension	1.102 (1.082, 1.121)	1.125 (1.117, 1.132)	0.0015		1.090 (1.082, 1.098)	1.084 (1.081, 1.087)	0.046
Other cardiovascular diseases	1.150 (1.123, 1.177)	1.114 (1.105, 1.123)	0.000316		1.073 (1.062, 1.084)	1.061 (1.058, 1.065)	0.003
RD							
Acute respiratory infections	1.125 (1.016, 1.246)	1.110 (1.086, 1.135)	0.720		1.071 (1.031, 1.113)	1.053 (1.044, 1.062)	0.222
Pneumonia	1.146 (1.107, 1.185)	1.106 (1.097, 1.116)	0.005		1.068 (1.054, 1.083)	1.055 (1.052, 1.059)	0.014
COPD	1.151 (1.115, 1.189)	1.108 (1.096, 1.120)	0.001		1.065 (1.051, 1.079)	1.045 (1.040, 1.049)	6.59E-05
Asthma	1.158 (1.108, 1.211)	1.159 (1.140, 1.179)	0.950		1.059 (1.043, 1.076)	1.060 (1.054, 1.066)	0.952
Other respiratory diseases	1.147 (1.124, 1.170)	1.111 (1.104, 1.118)	1.27E-05		1.074 (1.064, 1.084)	1.065 (1.062, 1.068)	0.020

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter.

Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 16. Subgroup analysis by comorbidity status of diabetes.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}		
	Diabetes	Non-diabetes	<i>P</i> -value ^a		Diabetes	Non-diabetes	<i>P</i> -value ^b
CVD							
Ischemic heart disease	1.144 (1.125, 1.162)	1.122 (1.110, 1.134)	0.004		1.073 (1.067, 1.080)	1.061 (1.057, 1.065)	3.93E-06
Cerebrovascular disease	1.151 (1.128, 1.175)	1.123 (1.110, 1.137)	0.003		1.085 (1.076, 1.094)	1.066 (1.061, 1.071)	1.01E-07
Heart failure	1.106 (1.091, 1.121)	1.096 (1.085, 1.106)	0.109		1.059 (1.054, 1.065)	1.052 (1.048, 1.056)	0.004
Arrhythmia	1.114 (1.093, 1.135)	1.118 (1.107, 1.129)	0.582		1.053 (1.045, 1.061)	1.051 (1.047, 1.055)	0.498
Hypertension	1.116 (1.103, 1.129)	1.119 (1.111, 1.127)	0.600		1.100 (1.094, 1.105)	1.078 (1.075, 1.081)	6.65E-25
Other cardiovascular diseases	1.110 (1.092, 1.127)	1.119 (1.110, 1.128)	0.178		1.062 (1.055, 1.068)	1.062 (1.059, 1.066)	0.776
RD							
Acute respiratory infections	1.068 (0.993, 1.150)	1.114 (1.089, 1.140)	0.120		1.059 (1.031, 1.089)	1.054 (1.045, 1.062)	0.595
Pneumonia	1.123 (1.103, 1.144)	1.104 (1.094, 1.115)	0.020		1.066 (1.058, 1.073)	1.053 (1.049, 1.057)	5.07E-05
COPD	1.111 (1.087, 1.134)	1.113 (1.100, 1.126)	0.821		1.048 (1.040, 1.057)	1.046 (1.041, 1.051)	0.437
Asthma	1.147 (1.095, 1.202)	1.161 (1.142, 1.180)	0.505		1.039 (1.024, 1.055)	1.062 (1.056, 1.069)	8.69E-05
Other respiratory diseases	1.134 (1.119, 1.148)	1.109 (1.102, 1.116)	1.74E-05		1.073 (1.067, 1.079)	1.064 (1.061, 1.067)	0.000152

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 17. Subgroup analysis by severity of the disease.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}		
	Died during hospitalization	Not died during hospitalization	<i>P</i> -value ^a		Died during hospitalization	Not died during hospitalization	<i>P</i> -value ^b
CVD							
Ischemic heart disease	1.096 (1.051, 1.143)	1.130 (1.120, 1.140)	0.045		1.080 (1.061, 1.099)	1.064 (1.060, 1.068)	0.016
Cerebrovascular disease	1.158 (1.108, 1.210)	1.129 (1.117, 1.141)	0.115		1.082 (1.062, 1.102)	1.070 (1.066, 1.075)	0.113
Heart failure	1.112 (1.064, 1.162)	1.099 (1.090, 1.107)	0.445		1.054 (1.035, 1.074)	1.054 (1.051, 1.058)	0.990
Arrhythmia	1.099 (1.033, 1.168)	1.117 (1.107, 1.127)	0.443		1.047 (1.023, 1.071)	1.051 (1.048, 1.055)	0.618
Hypertension	1.254 (1.175, 1.339)	1.120 (1.114, 1.127)	1.04E-06		1.114 (1.081, 1.149)	1.084 (1.082, 1.087)	0.011
Other cardiovascular diseases	1.110 (1.065, 1.157)	1.117 (1.109, 1.126)	0.662		1.061 (1.042, 1.080)	1.062 (1.059, 1.065)	0.856
RD							
Acute respiratory infections	1.301 (0.703, 2.407)	1.110 (1.086, 1.134)	0.463		1.148 (0.892, 1.477)	1.053 (1.045, 1.062)	0.335
Pneumonia	1.094 (1.053, 1.137)	1.109 (1.099, 1.119)	0.344		1.062 (1.046, 1.078)	1.055 (1.052, 1.059)	0.252
COPD	1.087 (0.996, 1.185)	1.112 (1.101, 1.124)	0.449		1.038 (1.004, 1.073)	1.046 (1.042, 1.050)	0.487
Asthma	1.098 (0.788, 1.529)	1.159 (1.142, 1.177)	0.643		1.003 (0.896, 1.122)	1.060 (1.054, 1.065)	0.164
Other respiratory diseases	1.120 (1.099, 1.142)	1.113 (1.106, 1.120)	0.367		1.075 (1.066, 1.084)	1.065 (1.062, 1.068)	0.002

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 18. Subgroup analysis by percentage of the population who graduated high school.

Outcome	Wildfire-specific PM _{2.5}			Non-wildfire PM _{2.5}		
	Percentage of the population who graduated high school ≤ 25th	Percentage of the population who graduated high school > 25th	<i>P</i> -value ^a	Percentage of the population who graduated high school ≤ 25th	Percentage of the population who graduated high school > 25th	<i>P</i> -value ^b
CVD						
Ischemic heart disease	1.181 (1.154, 1.209)	1.126 (1.115, 1.137)	6.32E-08	1.107 (1.099, 1.115)	1.050 (1.046, 1.054)	1.09E-73
Cerebrovascular disease	1.205 (1.172, 1.238)	1.125 (1.113, 1.138)	5.46E-11	1.125 (1.115, 1.136)	1.052 (1.047, 1.057)	1.69E-75
Heart failure	1.179 (1.154, 1.204)	1.092 (1.083, 1.102)	1.96E-21	1.098 (1.090, 1.106)	1.036 (1.032, 1.040)	2.13E-98
Arrhythmia	1.187 (1.161, 1.214)	1.118 (1.107, 1.129)	3.73E-12	1.096 (1.088, 1.104)	1.037 (1.033, 1.041)	4.78E-75
Hypertension	1.245 (1.225, 1.266)	1.112 (1.105, 1.120)	1.77E-71	1.130 (1.124, 1.136)	1.062 (1.059, 1.066)	2.5E-177
Other cardiovascular diseases	1.169 (1.147, 1.192)	1.114 (1.105, 1.123)	3.74E-11	1.119 (1.112, 1.126)	1.044 (1.040, 1.047)	7.6E-167
RD						
Acute respiratory infections	1.125 (1.064, 1.189)	1.111 (1.084, 1.138)	0.561	1.072 (1.054, 1.091)	1.043 (1.033, 1.053)	6.13E-05
Pneumonia	1.159 (1.134, 1.185)	1.110 (1.100, 1.121)	3.16E-07	1.095 (1.087, 1.103)	1.040 (1.036, 1.044)	7.02E-70
COPD	1.193 (1.162, 1.225)	1.108 (1.096, 1.121)	1.72E-13	1.087 (1.078, 1.097)	1.033 (1.028, 1.037)	6.5E-49
Asthma	1.213 (1.163, 1.265)	1.160 (1.140, 1.179)	0.005	1.094 (1.081, 1.108)	1.049 (1.043, 1.056)	1.26E-18
Other respiratory diseases	1.192 (1.175, 1.211)	1.105 (1.098, 1.112)	1.7E-39	1.124 (1.118, 1.130)	1.044 (1.040, 1.047)	7.8E-258

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, median household income, townsend deprivation index, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 19. Subgroup analysis by townsend deprivation index.

Outcome	Wildfire-specific PM _{2.5}				Non-wildfire PM _{2.5}		
	Townsend deprivation index ≤ 75th	Townsend deprivation index > 75th	<i>P</i> -value ^a		Townsend deprivation index ≤ 75th	Townsend deprivation index > 75th	<i>P</i> -value ^b
CVD							
Ischemic heart disease	1.104 (1.093, 1.115)	1.226 (1.199, 1.253)	2E-35		1.042 (1.038, 1.046)	1.108 (1.101, 1.116)	5E-109
Cerebrovascular disease	1.105 (1.092, 1.118)	1.219 (1.187, 1.252)	5.01E-22		1.047 (1.042, 1.052)	1.123 (1.114, 1.133)	2.38E-87
Heart failure	1.078 (1.069, 1.088)	1.180 (1.155, 1.205)	2.83E-29		1.034 (1.030, 1.038)	1.100 (1.093, 1.107)	4.9E-122
Arrhythmia	1.085 (1.074, 1.096)	1.235 (1.209, 1.261)	8.15E-56		1.031 (1.027, 1.035)	1.097 (1.089, 1.104)	1.8E-103
Hypertension	1.103 (1.096, 1.110)	1.240 (1.217, 1.264)	2.43E-60		1.061 (1.058, 1.064)	1.137 (1.131, 1.143)	1E-228
Other cardiovascular diseases	1.090 (1.082, 1.099)	1.229 (1.206, 1.252)	4.13E-60		1.039 (1.035, 1.042)	1.117 (1.110, 1.124)	4E-194
RD							
Acute respiratory infections	1.089 (1.064, 1.115)	1.223 (1.141, 1.310)	6.82E-06		1.040 (1.030, 1.049)	1.072 (1.053, 1.092)	1.56E-05
Pneumonia	1.078 (1.068, 1.088)	1.198 (1.173, 1.224)	7.8E-38		1.030 (1.026, 1.034)	1.103 (1.096, 1.111)	1.1E-131
COPD	1.080 (1.068, 1.093)	1.210 (1.181, 1.239)	2.17E-33		1.020 (1.015, 1.024)	1.103 (1.094, 1.112)	8E-126
Asthma	1.150 (1.131, 1.169)	1.163 (1.088, 1.243)	0.635		1.059 (1.053, 1.065)	1.055 (1.042, 1.069)	0.481
Other respiratory diseases	1.090 (1.083, 1.097)	1.214 (1.197, 1.231)	8.29E-86		1.035 (1.032, 1.038)	1.131 (1.126, 1.137)	1E-384

Abbreviations: CVD, cardiovascular diseases; RD, respiratory diseases; COPD, chronic obstructive pulmonary disease.

The model was adjusted for calendar year, percentage of White, percentage of Black, percentage of the population who graduated high school, median household income, mean temperature of summer and winter, standard deviation of summer and winter. Relative risks were reported per 1 µg/m³ increase in 2-year average PM_{2.5} concentrations. All statistical tests were two-sided.

^a The comparison of wildfire-specific PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

^b The comparison of non-wildfire PM_{2.5} effect values between subgroups. *P*-value was calculated by Z-test.

Supplementary Table 20. Study periods of each state.

State	Abbreviation	Study periods
Arizona	AZ	2006-2019
California	CA	2018-2019
Colorado	CO	2014-2019
Delaware	DE	2016-2019
Georgia	GA	2010-2019
Iowa	IA	2006-2019
Indiana	IN	2017-2019
Kentucky	KY	2006-2019
Maryland	MD	2006-2019
Michigan	MI	2006-2019
Minnesota	MN	2010-2019
North Carolina	NC	2006-2019
Nebraska	NE	2014-2019
New Jersey	NJ	2006-2019
New York	NY	2006-2019
Oregon	OR	2006-2019
Rhode Island	RI	2006-2019
Vermont	VT	2017-2019
Washington	WA	2006-2019
Wisconsin	WI	2012-2019

Supplementary Table 21. The ICD codes used for the disease identification in this study.

Types of diseases	ICD-9 code	ICD-10 code
Cardiovascular diseases		
Ischemic heart disease	410-414	I20-I25
Cerebrovascular disease	430-438	I60-I69
Heart failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428	I50
Arrhythmia	426, 427, 785.0	I44, I45, I47-I49, R00.0, R00.1, R00.8, R94.31, T82.1, T82.11, T82.110, T82.111, T82.118, T82.119, Z45.0, Z45.01, Z45.010, Z45.018, Z45.02, Z45.09, Z95.0
Hypertension	401-405	I10-I15
Other cardiovascular diseases	All other codes within the range 390-459	All other codes within the range I00-I99
Respiratory diseases		
Acute respiratory infections	460-466	J00-J06, J20-J22
Pneumonia	480-486	J12-J18
COPD	491, 492, 496	J41-J44
Asthma	493	J45, J46
Other respiratory diseases	All other codes within the range 460-519	All other codes within the range J00-J99
Obesity	2780, 6491	E66, O99.21
Diabetes	6480, 249, 250	E08-E13

Abbreviations: COPD, chronic obstructive pulmonary disease.