

[GeoHelath]

Supporting Information for

[Spatial Heterogeneity of the Respiratory Health Impacts of Wildfire Smoke PM_{2.5} in California]

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Additional Supporting Information (Files uploaded separately)

Table S1.csv for Tables S1

Text S1. List of ICD codes for respiratory acute care utilizations (unscheduled hospitalizations and emergency department visits)

Below is a list of International Classification of Diseases (ICD) codes used to identify respiratory acute care utilizations.

ICD-9 codes: "460", "461", "462", "463", "464", "465", "466", "470", "471", "472", "473", "474", "475", "476", "477", "478", "480", "481", "482", "483", "484", "485", "486", "487", "490", "491", "492", "493", "494", "495", "496", "500", "501", "502", "503", "504", "505", "506", "507", "508", "510", "511", "512", "513", "514", "515", "516", "517", "518", "519".

ICD-10 codes: "J00", "J01", "J02", "J03", "J04", "J05", "J06", "J09", "J10", "J11", "J12", "J13", "J14", "J15", "J16", "J17", "J18", "J20", "J21", "J22", "J30", "J31", "J32", "J33", "J34", "J35", "J36", "J37", "J38", "J39", "J40", "J41", "J42", "J43", "J44", "J45", "J46", "J47", "J60", "J61", "J62", "J63", "J64", "J65", "J66", "J67", "J68", "J69", "J70", "J80", "J81", "J82", "J83", "J84", "J85", "J86", "J90", "J91", "J92", "J93", "J94", "J95", "J96", "J97", "J98", "J99".

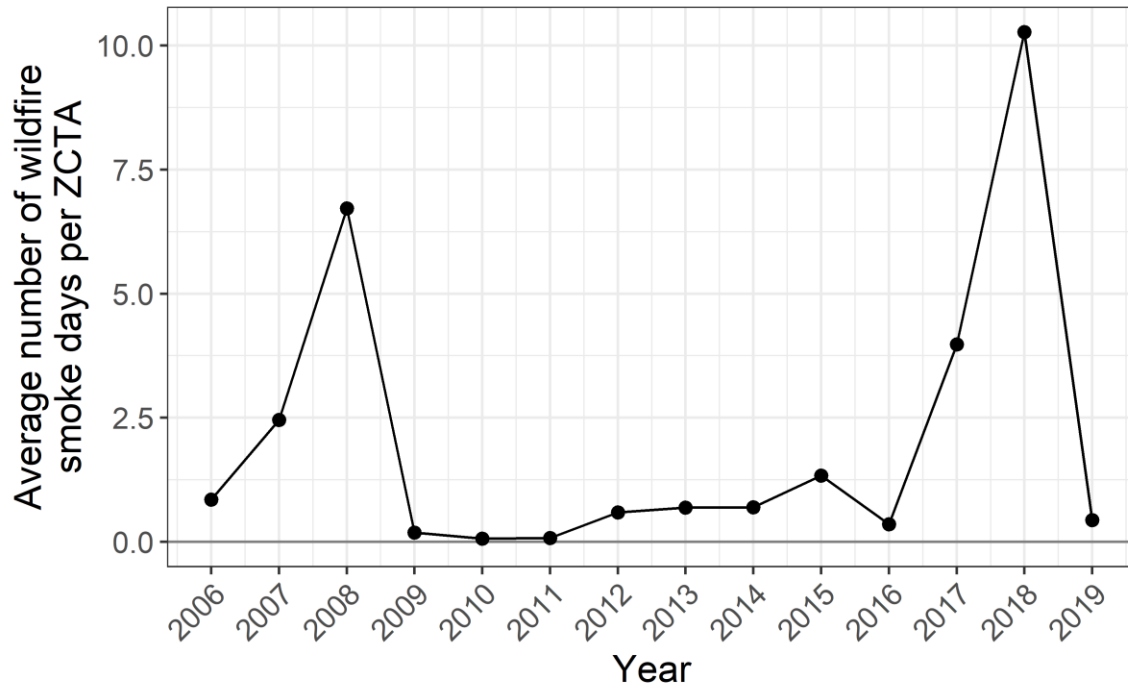
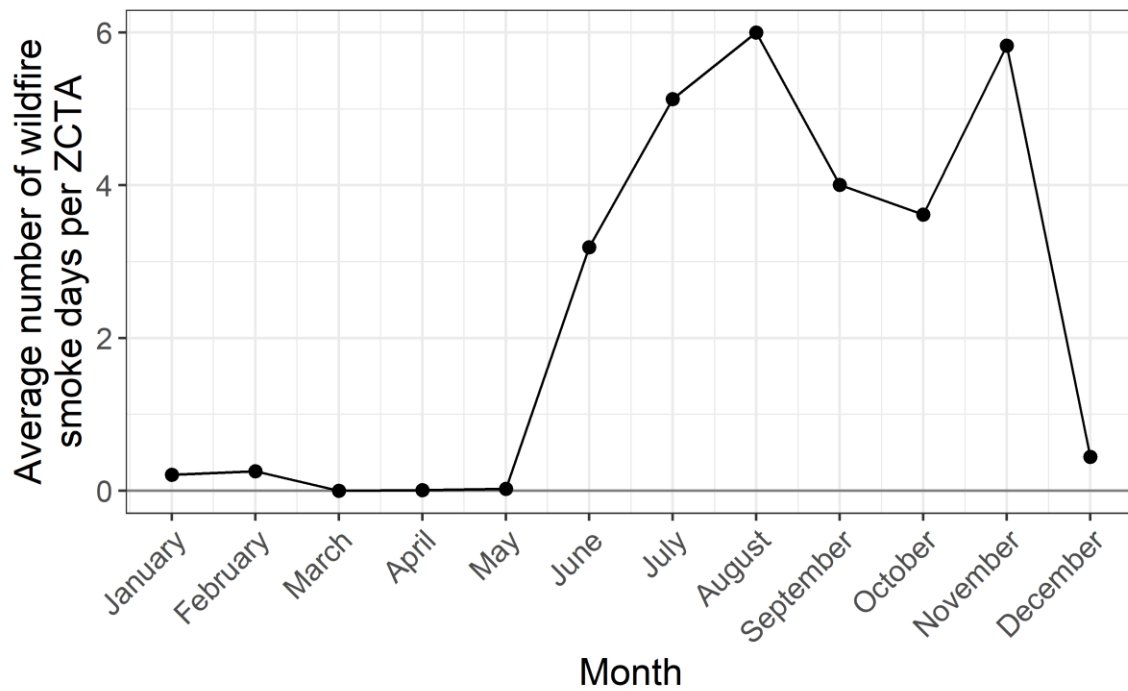


Figure S1. The temporal distribution of average wildfire smoke days per ZCTA. Top: distribution by month; Bottom: distribution by year.

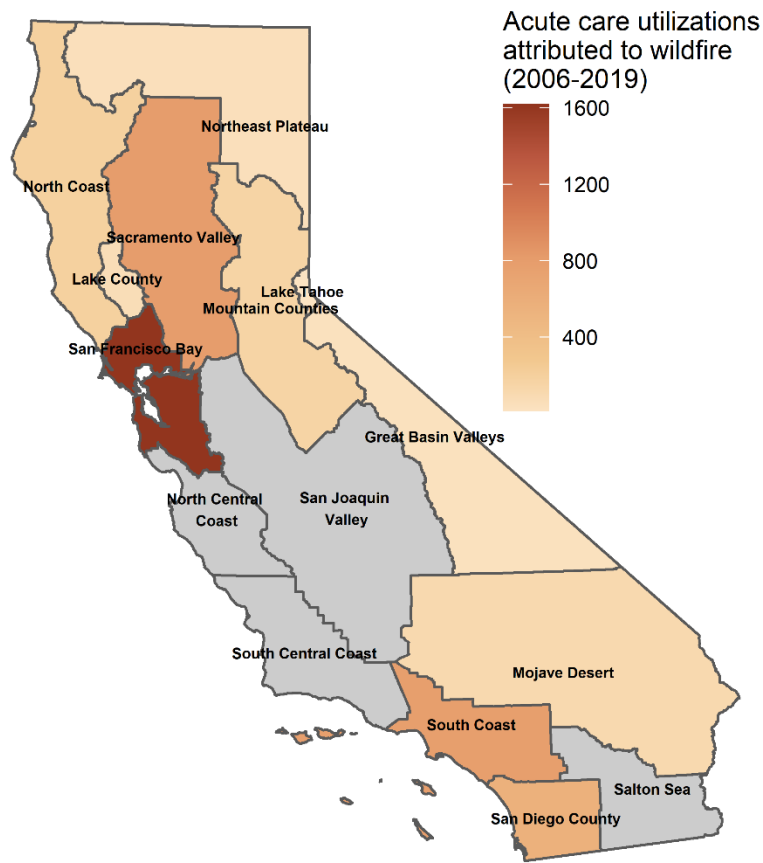


Figure S2. The air basin specific number of acute care utilizations attributable to wildfire smoke, 2006-2019. Grey areas represent air basins with negative odds ratios.

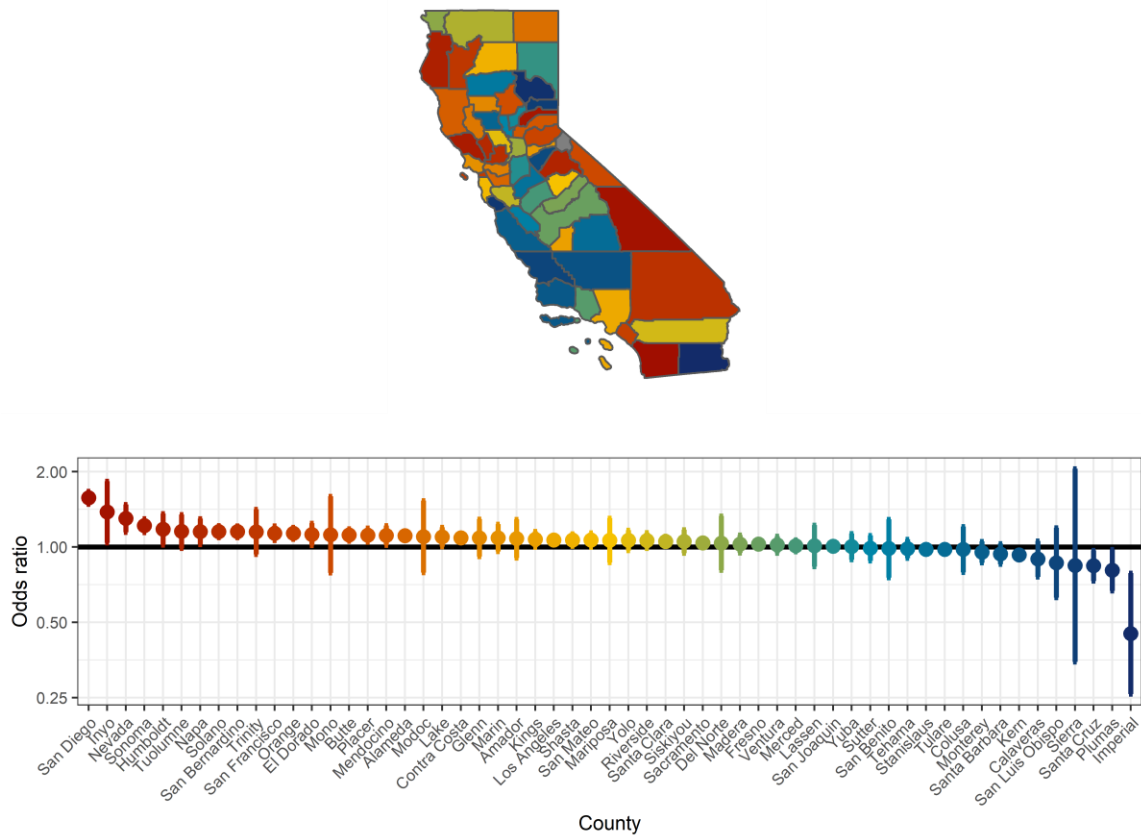


Figure S3. The county specific effect estimates (odds ratio) of wildfire smoke day on same-day respiratory acute care utilization. Top: spatial distribution of the effect estimates; Bottom: point estimates and 95% confidence intervals. We employed conditional logistic regressions in a time-stratified case-crossover design, matching on ZCTA, day of week, month and year. Note: the Alpine county (grey) was excluded from analysis because both ZCTAs in this county have a population smaller than 1000).

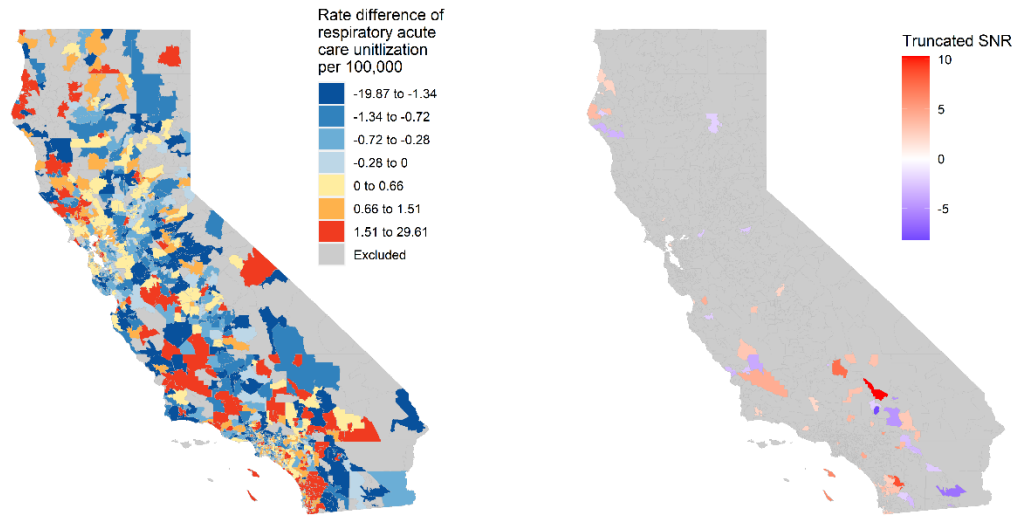


Figure S5. The ZCTA specific effect estimates (rate difference) of wildfire smoke day on same-day respiratory acute care utilization: A) spatial distribution of the effect estimates and B) signal to noise ratio with absolute value larger than two.

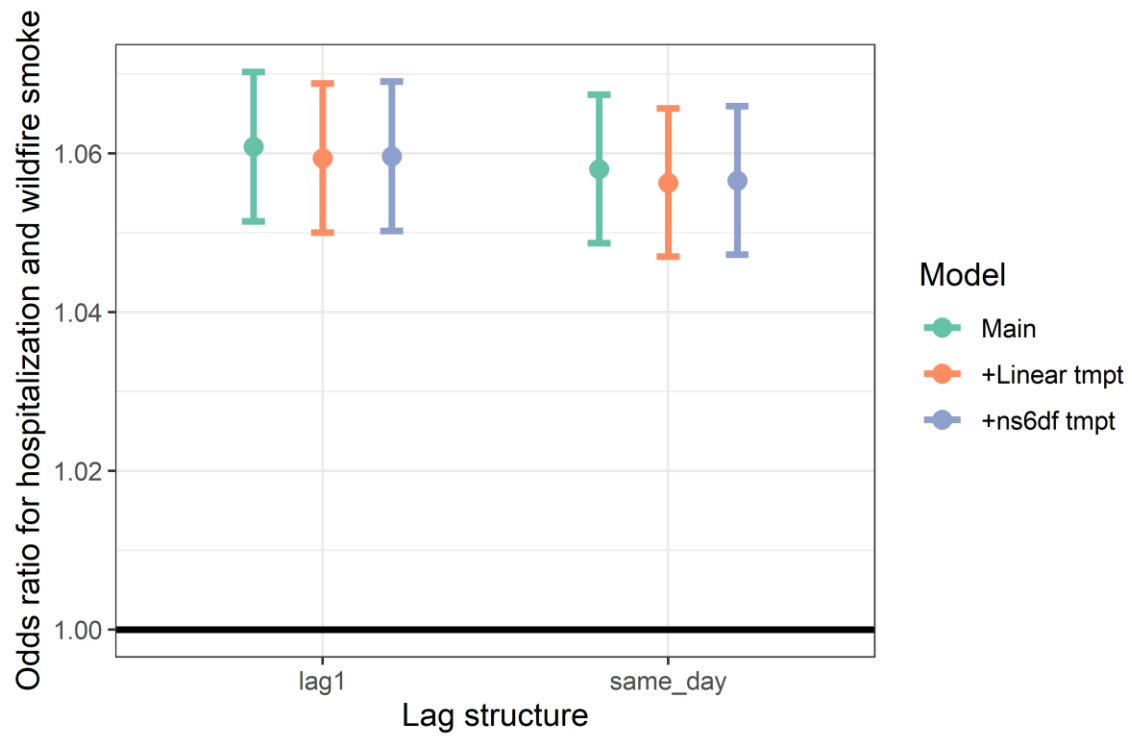


Figure S6. The state-level effect estimates (odds ratio) of wildfire smoke day on the risk of acute care utilization by model specification and lag structure.

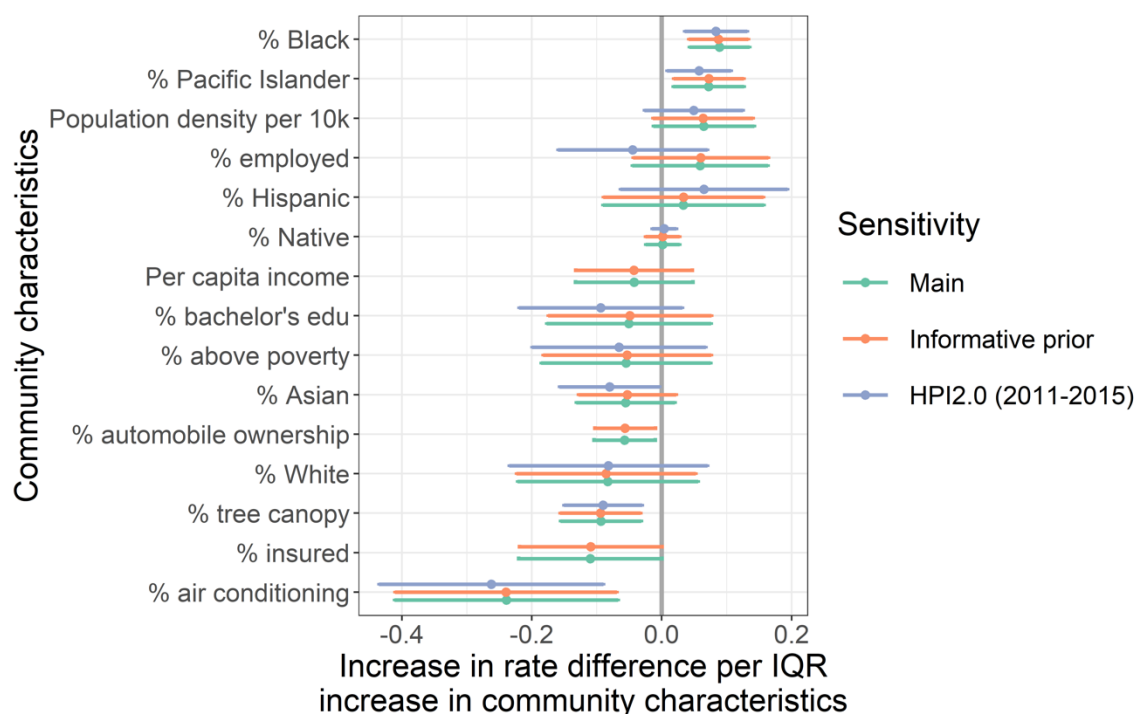


Figure S7. Effect modification of community characteristics on the effect of wildfire smoke (i.e., days with wildfire $\text{PM}_{2.5} \geq 15 \mu\text{g}/\text{m}^3$) on same-day respiratory acute care utilization rate by different analytical decisions. Note: Informative prior analysis uses informative priors for the sill and nugget in the spatial Bayesian hierarchical model (1122 ZCTAs for air conditioning and 1296 ZCTAs for all other community characteristics); and HPI2.0 analysis used socioeconomic information obtained from the Healthy Place Index 2.0 dataset (2011-2015) instead of the Healthy Place Index 3.0 dataset (2015-2019) (1074 ZCTAs for air conditioning and 1296 ZCTAs for all other community characteristics; four community characteristics not available).

Table S1. Numeric results for state, air basin specific and county specific effect estimates (odds ratio and population attributable number) of wildfire smoke day on respiratory acute care utilization (included in a separate excel file with code book).

Indicators	Description	Data source	ZCTAs used	Median (Q1, Q3)	IQR	Increase in rate difference per IQR increase (95% CI)
% employed	Percentage of the population aged 25-64 who are employed	ACS, 2015-2019*	1296	72.7 (66.6, 76.6)	10.0	0.06 (-0.05, 0.16)
% Bachelor's education	Percentage of the population over age 25 with a Bachelor's education or higher	ACS, 2015-2019*	1296	29.8 (17.5, 47.5)	30.0	-0.05 (-0.18, 0.08)
% insured	Percentage of adults aged 18 to 64 years currently insured	ACS, 2015-2019*	1296	91.2 (86.7, 94.4)	7.7	-0.11 (-0.22, 0)
% above poverty	Percentage of the population with an income exceeding 200% of federal poverty level	ACS, 2015-2019*	1296	72.1 (58.9, 82.1)	23.2	-0.06 (-0.19, 0.08)
Per capita income (\$)	Per capita income in U.S. dollars	ACS, 2015-2019*	1296	33920 (24660.2, 48049.2)	23389	-0.04 (-0.13, 0.05)
% automobile ownership	Percentage of households with access to an automobile	ACS, 2015-2019*	1296	95.1 (92.5, 97)	4.5	-0.06 (-0.1, -0.01)
% tree canopy	Population-weighted percentage of the area with tree canopy	National Land Cover Database, 2011*	1296	6.1 (4, 11.8)	7.7	-0.09 (-0.16, -0.03)
Population density per 10k	Population density in 10,000 population per square meters	Census, 2010	1296	889.7 (101.4, 2412.1)	2310.8	0.06 (-0.01, 0.14)
% air conditioning	Percentage of households that have central air conditioning	California Residential Appliance	1122	62.5 (26.4, 86.4)	60	-0.24 (-0.41, -0.07)

		Saturation Study, 2009				
% white	Percentage of the population that is self-identified non-Hispanic white	Census, 2010	1296	64.7 (48.7, 79.8)	31.1	-0.08 (-0.22, 0.06)
% Black	Percentage of the population that is self-identified non-Hispanic Black	Census, 2010	1296	2.2 (1, 5.7)	4.7	0.09 (0.04, 0.14)
% Asian	Percentage of the population that is self-identified non-Hispanic Asian	Census, 2010	1296	6.3 (2.1, 14)	11.9	-0.06 (-0.13, 0.02)
% Hispanic	Percentage of the population that is self-identified Hispanic	Census, 2010	1296	25.3 (12.8, 46.1)	33.3	0.03 (-0.09, 0.16)
% Native American	Percentage of the population that is self-identified non-Hispanic American Indian or Alaska Native	Census, 2010	1296	0.9 (0.6, 1.3)	0.8	0 (-0.02, 0.03)
% Pacific Islander	Percentage of the population that is self-identified non-Hispanic Native Hawaiian or other Pacific Islander	Census, 2010	1296	0.2 (0.1, 0.4)	0.3	0.07 (0.02, 0.13)

ACS: American Community Survey; ZCTA: ZIP Code Tabulation Area.

*Obtained from the Health Places Index

Table S2. Summary of meta-regression results in the main analysis and distribution of community characteristics explored among ZCTAs in the study.