

Appendix 1. ICD codes for circulatory and respiratory acute care utilizations

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

The ICD codes included to identify a circulatory acute care utilization are:

ICD-9 codes: "390", "391", "392", "393", "394", "395", "396", "397", "398", "401", "402", "404", "405", "410", "411", "412", "413", "414", "415", "416", "417", "420", "421", "422", "423", "424", "425", "426", "427", "428", "429", "430", "431", "432", "433", "434", "435", "436", "437", "438", "440", "441", "442", "443", "444", "445", "446", "447", "448", "451", "452", "453", "454", "455", "456", "457", "458", "459".

ICD-10 codes: "I00", "I01", "I02", "I03", "I05", "I06", "I07", "I08", "I09", "I10", "I11", "I12", "I13", "I14", "I15", "I16", "I20", "I21", "I22", "I23", "I24", "I25", "I26", "I27", "I28", "I30", "I31", "I32", "I33", "I34", "I35", "I36", "I37", "I38", "I39", "I40", "I41", "I42", "I43", "I44", "I45", "I46", "I47", "I48", "I49", "I50", "I51", "I52", "I5A", "I60", "I61", "I62", "I63", "I64", "I65", "I66", "I67", "I68", "I69", "I70", "I71", "I72", "I73", "I74", "I75", "I76", "I77", "I78", "I79", "I80", "I81", "I82", "I83", "I84", "I85", "I86", "I87", "I88", "I89", "I95", "I96", "I97", "I98", "I99".

The ICD codes included to identify a respiratory acute care utilization are:

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".

Table A.1. The association between moving average of PM_{2.5} concentration in same day and previous two days and risk of acute care utilizations by cause of hospitalization and subgroup using the basic model not considering temporal trend among 192 California ZCTAs. Note: age 0 to 14 subgroup and non-Hispanic Native American subgroup were emitted due to small population size and first-stage model convergence failures in more than half of the included ZCTAs.

Population	Percentage increase in circulatory hospitalization per 10 µg/m ³ increase in PM _{2.5}		Percentage increase in respiratory hospitalization per 10 µg/m ³ increase in PM _{2.5}	
	Effect estimate (95% CI)	Cochrane's Q (p-value)	Effect estimate (95% CI)	Cochrane's Q (p-value)
Total population	0.56 (0.17, 0.96)	NA	2.61 (2.29, 2.94)	NA
Age group				
15 to 64 years	0.15 (-0.42, 0.71)	3.96 (0.05)	2.84 (2.39, 3.31)	1.56 (0.21)
65 years old and up	0.95 (0.41, 1.51)		2.3 (1.63, 2.98)	
Sex				
Female	0.61 (0.03, 1.21)	0.03 (0.87)	2.76 (2.38, 3.16)	2.94 (0.09)
Male	0.54 (-0.01, 1.09)		2.26 (1.84, 2.69)	
Race/Ethnicity				
Hispanic	0.79 (0.05, 1.54)	11.23 (0.02)	2.87 (2.46, 3.3)	7.62 (0.11)
Non-Hispanic Asian*	1.75 (0.54, 2.98)		3.03 (2.01, 4.06)	
Non-Hispanic Black*	0.21 (-0.97, 1.41)		1.81 (0.94, 2.69)	
Non-Hispanic white	0.15 (-0.44, 0.75)		2.35 (1.77, 2.95)	
Other races than above or multiracial*	3.29 (0.95, 5.65)		1.75 (0.49, 3.01)	
Wildfire				
No day with >35 µg/m ³ wildfire PM _{2.5} ⁺	0.87 (0.16, 1.57)	1.22 (0.27)	3.27 (2.8, 3.76)	14.04 (<0.01)
Some days with >35 µg/m ³ wildfire PM _{2.5} ⁺	0.84 (-0.07, 1.75)		2.08 (1.7, 2.49)	

*Results for non-Hispanic Asian, non-Hispanic Black, and other races than above or multiracial are based on 161, 159 and 141 ZCTAs due to failure to convergence.

⁺Results for no day with wildfire PM_{2.5} >35 µg/m³ are based on 101 ZCTAs and for some days with wildfire PM_{2.5} >35 µg/m³ are based on 91 ZCTAs.

Table A.2. The difference in associations between moving average of PM_{2.5} concentration in same day and previous two days and risk of acute care utilizations by cause of hospitalization, subgroup and study period using the basic model stratified into two periods among 192 California ZCTAs. Note: age 0 to 14 subgroup and non-Hispanic Native American subgroup were emitted due to small population size and first-stage model convergence failures in more than half of the included ZCTAs.

Population	Difference in percentage increase in circulatory hospitalization per 10 µg/m ³ increase in PM _{2.5} (2013 to 2019 minus 2006 to 2012)		Difference in percentage increase in respiratory hospitalization per 10 µg/m ³ increase in PM _{2.5} (2013 to 2019 minus 2006 to 2012)	
	Effect estimate (95% CI)	Cochrane's Q (p-value)	Effect estimate (95% CI)	Cochrane's Q (p-value)
Total population	0.13 (0.02, 0.22)	NA	1.40 (1.24, 1.54)	NA
Age group				
15 to 64 years	-0.27 (-0.37, -0.18)	12.23 (<0.01)	0.91 (0.71, 1.06)	27.19 (<0.01)
65 years old and up	0.42 (0.23, 0.59)		0.29 (0.13, 0.42)	
Sex				
Female	-0.07 (-0.24, 0.07)	43.55 (<0.01)	1.11 (0.94, 1.21)	8.76 (<0.01)
Male	0.33 (0.18, 0.51)		1.47 (1.23, 1.62)	
Race/Ethnicity				
Hispanic	-0.06 (-0.19, 0.05)	113.85 (<0.01)	1.35 (1.17, 1.47)	83.68 (<0.01)
Non-Hispanic Asian*	1.85 (1.22, 2.49)		2.08 (1.55, 2.61)	
Non-Hispanic Black*	-0.25 (-0.43, -0.11)		0.41 (0.25, 0.61)	
Non-Hispanic white	0.23 (0.16, 0.31)		1.41 (0.97, 1.71)	
Other races than above or multiracial*	-3.62 (-4.69, -2.62)		0.73 (0.33, 1.13)	
Wildfire				
No day with >35 µg/m ³ wildfire PM _{2.5} ⁺	0.36 (0.09, 0.57)	1.45 (0.23)	1.69 (1.49, 1.91)	6.42 (0.01)
Some days with >35 µg/m ³ wildfire PM _{2.5} ⁺	0.16 (-0.06, 0.37)		1.34 (1.12, 1.46)	

*Results for non-Hispanic Asian, non-Hispanic Black, and other races than above or multiracial are based on 161, 159 and 141 ZCTAs due to failure to convergence.

⁺Results for no day with wildfire PM_{2.5} >35 µg/m³ are based on 101 ZCTAs and for some days with wildfire PM_{2.5} >35 µg/m³ are based on 91 ZCTAs.

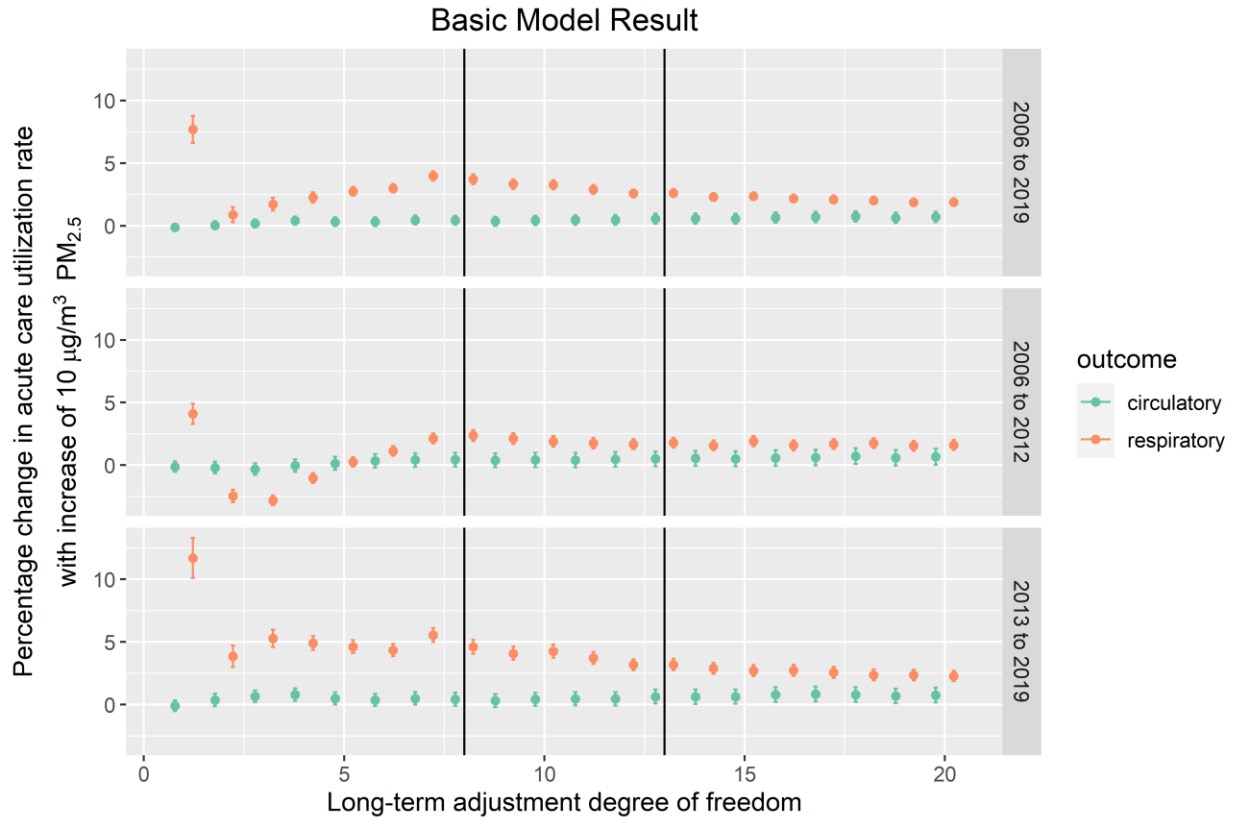


Fig. A.1. The association between moving average of $\text{PM}_{2.5}$ concentration in same day and previous two days and risk of acute care utilizations in the general population of California among 192 ZCTAs by cause and adjustment of long-term trend with varying degree of freedom (1 to 20) using the basic model with and without stratification by periods.

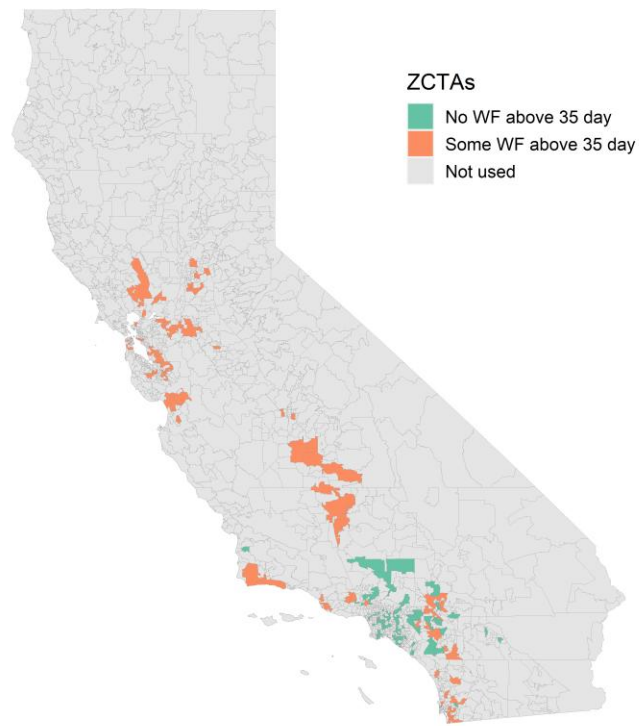


Fig. A.2. 192 ZIP code Tabulation Areas included in the study stratified by whether intense wildfire smoke days (daily wildfire specific PM_{2.5} concentrations $\geq 15\mu\text{g}/\text{m}^3$) existed between 2006 and 2019.

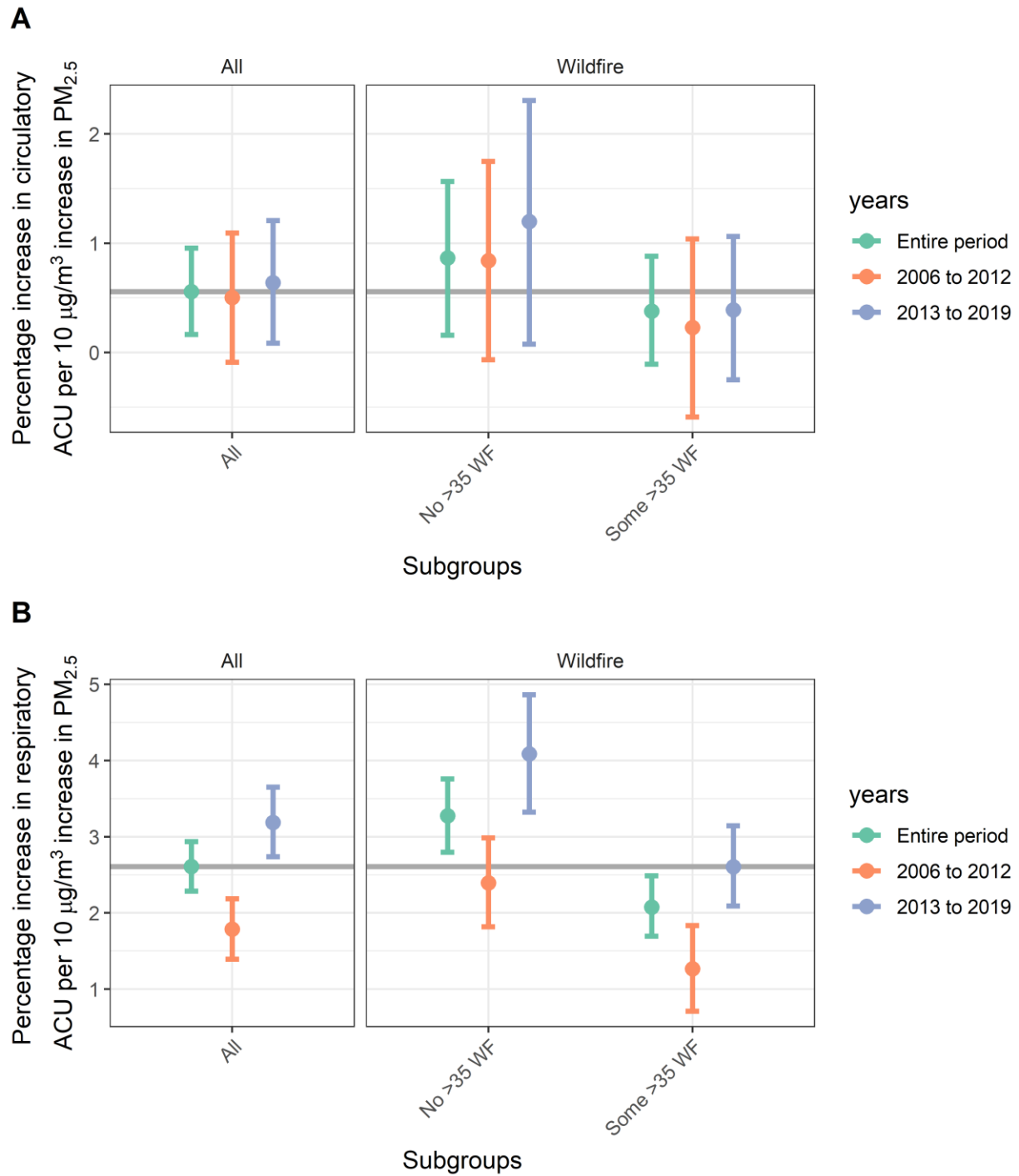


Fig. A.3. The association between moving average of $\text{PM}_{2.5}$ concentration in same day and previous two days and risk of acute care utilizations by cause, extreme wildfire frequency and study period using the basic model stratified into two periods. Gray line represents the association in the total population across the entire study period. Note: 192 California ZCTAs were included in analysis for all, with 91 ZCTAs without intense wildfire smoke day and 101 ZCTAs with some intense wildfire smoke day.

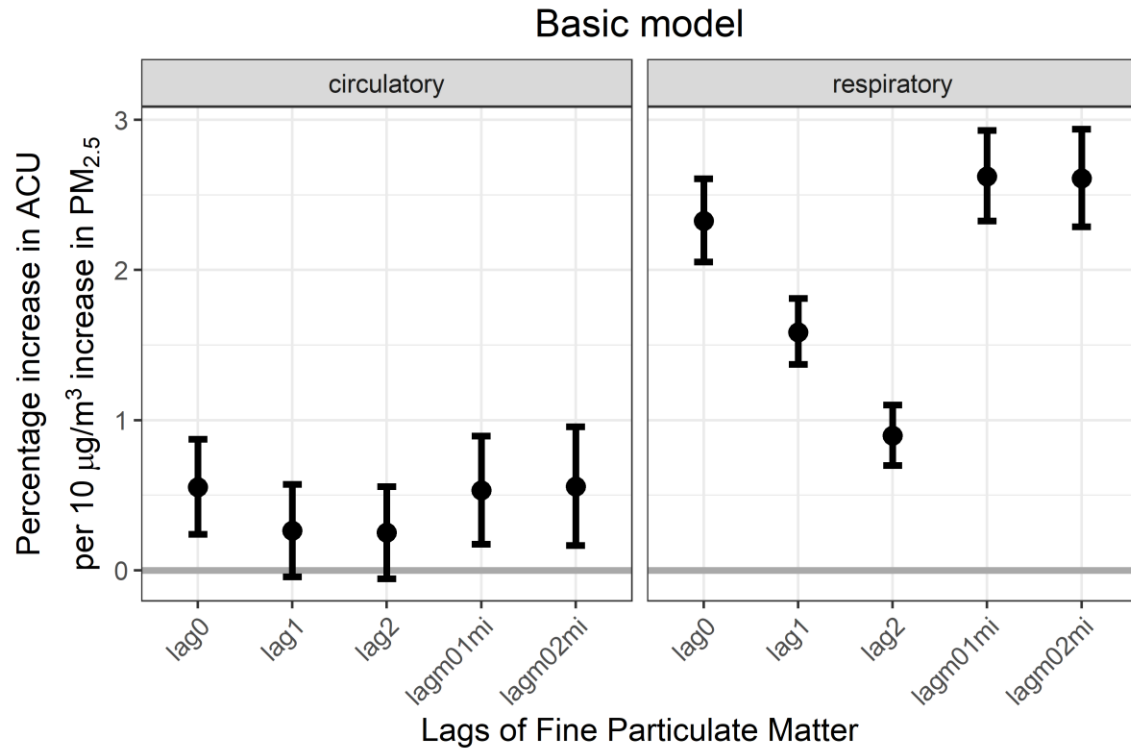


Fig. A.4. The association between daily PM_{2.5} concentration and risk of acute care utilizations in the general population of California among 192 ZCTAs by cause and lag structure using the basic model not considering temporal trend.

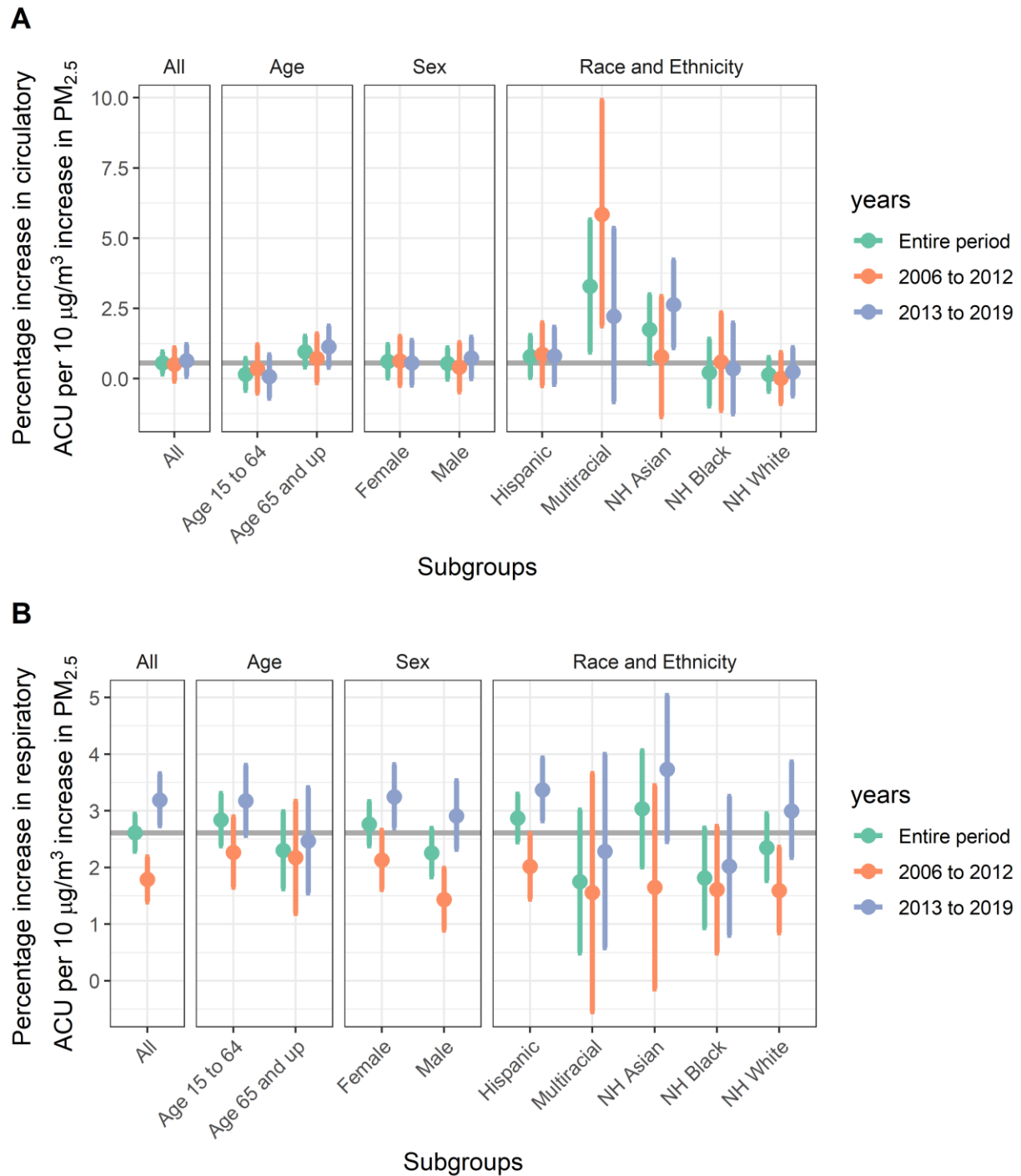


Fig. A.5. The association between moving average of $\text{PM}_{2.5}$ concentration in same day and previous two days and risk of acute care utilizations by cause, subgroup and study period using the basic model stratified into two periods among 192 ZCTAs. Gray line represents the association in the total population across the entire study period. Note: age 0 to 14 subgroup and non-Hispanic Native American subgroup were emitted due to small population size and first-stage model convergence failures in more than half of the included ZCTAs. Results for non-

Hispanic Asian, non-Hispanic Black, and other races than above or multiracial are based on 161, 159 and 141 ZCTAs due to failure to convergence in some ZCTAs.

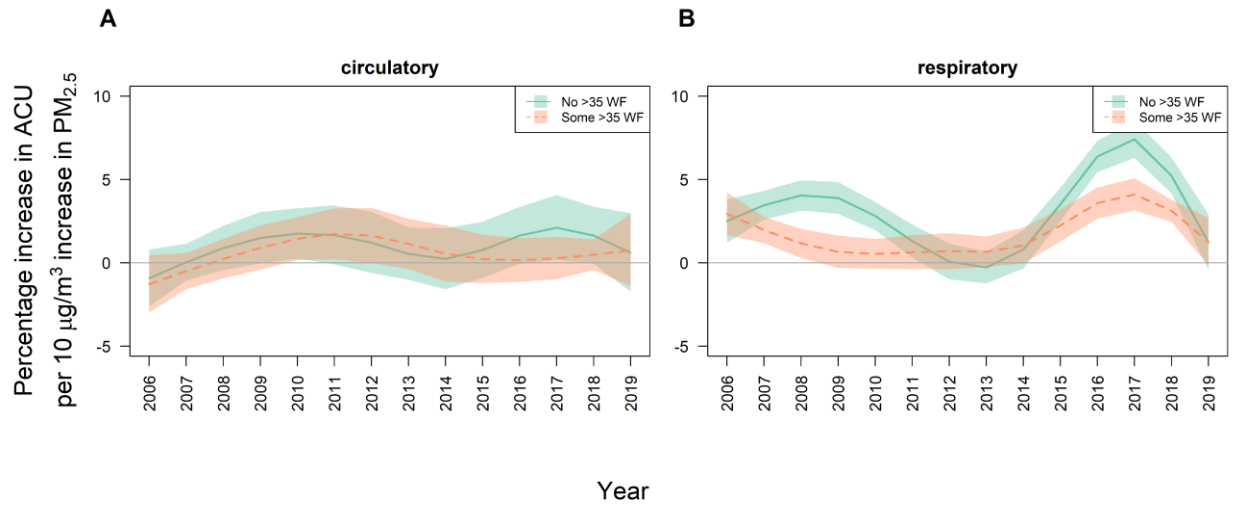


Fig. A.6. The association between moving average of $\text{PM}_{2.5}$ concentration in same day and previous two days and risk of acute care utilizations by cause and extreme wildfire frequency using the non-linear temporal model. A: circulatory acute care utilizations; and B: respiratory acute care utilizations. Note: 91 California ZCTAs did not have any intense wildfire smoke day during the study period while 101 ZCTAs has some intense wildfire smoke day.