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Supplemental Material

Near-Roadway Air Pollution and Coronary Heart Disease: Burden of Disease and Potential Impact of a Greenhouse Gas Reduction Strategy in Southern California

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Figure S1. Traffic density[a] within 300m buffer from residence (S2a), proportion living within ≤150m from a freeway or ≤50m from a major road (S2b), elemental carbon (2c) and regional $PM_{2.5}$[b] (2d) in the South Coast Air Basin in 2008 and in 2035. Boxes extend from the 25th to the 75th percentile, horizontal bar represent the median, whiskers extend 1.5 times the length of the interquartile range above and below the 75th and 25th percentiles, respectively, and outliers are represented as points. [a]Emission-weighted traffic density based on $PM_{2.5}$ reduction from 1990 to 2008 and 2035, which were -62.1% and -76.4%, respectively. [b]Double-headed arrow represents U.S. $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) of 12μg/m^3

Supplemental References

Methods

The CRF for elemental carbon was obtained from a study in which black carbon absorption was measured (Gan et al. 2011). Elemental carbon data available for SoCAB was converted to black carbon absorption (Watson and Chow 2002) (for estimation of PAF and population attributable number) in units of 10^{-5}/m, as follows:

$$Step\,1.\quad 10^{-5} \times Black\ Carbon_{absorption}(/m) = 0.8 \times Black\ Carbon_{mass}(\mu g / m^3)$$

$$Step\,2.\quad Black\ Carbon_{mass}\ (\mu g / m^3) = 0.79 \times Elemental\ Carbon_{mass}(\mu g / m^3)$$

$$Substituting\ Black\ Carbon_{mass}\ from\ step\ 2\ in\ step\ 1\ above$$

$$Step\,3.\quad 10^{-5} \times Black\ Carbon_{absorption}(/m) = 0.8 \times 0.79 \times Elemental\ Carbon_{mass}(\mu g / m^3)$$

Table S1. Distribution of traffic density, elemental carbon and regional $PM_{2.5}$, and proportion living within ≤150m from a freeway or ≤50m from a major road among the population≥45 years of age in the South Coast Air Basin, by county, in 2008 and in 2035.

	2008		2035	
County	**Mean ± SD or %**	**Median (Interquartile range)**	**Mean ± SD or %**	**Median (Interquartile range)**
Traffic density				
Los Angeles	35.0 ± 54.0	18.5 (6.9, 35.0)	25.6 ± 36.6	13.8 (6.0, 25.1)
Orange	28.9 ± 50.2	14.7 (3.8, 28.9)	20.4 ± 32.8	10.9 (3.7, 20.0)
Riverside	10.7 ± 24.7	3.0 (0.4, 10.4)	11.6 ± 23.5	3.9 (0.2, 11.8)
San Bernardino	16.9 ± 33.4	6.8 (1.3, 15.5)	14.2 ± 25.0	6.3 (1.5, 13.3)
Residence within 150m from freeway or 50m from major road (%)				
Los Angeles	9.78		12.79	
Orange	7.44		8.99	
Riverside	2.75		4.55	
San Bernardino	6.24		7.69	
Elemental Carbon ($\mu g/m^3$)				
Los Angeles	1.26 ± 0.39	1.32 (1.02, 1.51)	0.81 (± 0.24)	0.84 (0.68, 0.98)
Orange	0.87 ± 0.28	0.91 (0.64, 1.08)	0.57 (± 0.15)	0.60 (0.45, 0.68)
Riverside	0.59 ± 0.24	0.54 (0.41, 0.79)	0.40 (± 0.15)	0.37 (0.28, 0.51)
San Bernardino	0.93 ± 0.32	0.93 (0.74, 1.09)	0.62 (± 0.16)	0.64 (0.51, 0.73)
Regional $PM_{2.5}$ ($\mu g/m^3$)				
Los Angeles	14.8 ± 4.1	15.9 (12.7, 17.4)	12.4 ± 3.5	13.3 (10.6, 14.8)
Orange	11.5 ± 2.7	12.2 (9.6, 13.6)	9.1 ± 2.1	9.7 (7.5, 10.9)
Riverside	8.5 ± 2.9	8.1 (6.3, 10.7)	6.6 ± 2.2	6.1 (4.8, 8.3)
San Bernardino	11.9 ± 3.0	12.4 (10.4, 13.8)	9.3 ± 2.3	9.7 (7.8, 11.1)

[a] Traffic density values were adjusted based on $PM_{2.5}$ reduction from 1990 to 2008 and to 2035, which were 62.1% and 76.4%, respectively.

Table S2. Population attributable fraction (PAF) and 95% uncertainty interval (UI) for coronary heart disease mortality attributed to traffic density, residential proximity to roadways, elemental carbon and regional $PM_{2.5,}$ for the South Coast Air Basin, by county, for 2008 and for 2035.

	2008[a]	**2035**[a]
County	**PAF (%)**	**PAF (%)**
Traffic density		
Los Angeles	7.56 (2.66, 12.21)	6.98 (2.45, 11.30)
Orange	6.74 (2.37, 10.92)	6.12 (2.15, 9.94)
Riverside	3.73 (1.30, 6.10)	4.01 (1.40, 6.56)
San Bernardino	5.03 (1.76, 8.20)	4.84 (1.69, 7.89)
Residence within 150m from freeway or 50m from major road		
Los Angeles	2.76 (1.69, 3.81)	3.58 (2.20, 4.94)
Orange	2.11 (1.29, 2.93)	2.54 (1.55, 3.52)
Riverside	0.79 (0.48, 1.10)	1.30 (0.79, 1.81)
San Bernardino	1.78 (1.09, 2.47)	2.18 (1.33, 3.02)
Elemental Carbon		
Los Angeles	4.39 (2.29, 6.45)	2.69 (2.04, 3.34)
Orange	2.90 (1.50, 4.28)	2.19 (1.13, 3.24)
Riverside	1.83 (0.94, 2.71)	1.08 (0.56, 1.61)
San Bernardino	3.12 (1.61, 4.61)	1.92 (0.99, 2.84)
Regional $PM_{2.5}$		
Los Angeles	12.42 (9.37, 15.37)	9.34 (7.00, 11.62)
Orange	8.11 (6.09, 10.09)	4.88 (3.64, 6.10)
Riverside	4.16 (3.10, 5.21)	1.37 (1.02, 1.72)
San Bernardino	8.68 (6.53, 10.78)	5.21 (3.88, 6.52)

[a] Estimates were for the difference between the 2008 or 2035 mean exposure (from Table S1) and background levels of 1 for traffic density, 0% for proximity, 0.12μg/m^3 for EC, and 5.6μg/m^3 for $PM_{2.5}$.

Table S3. Population attributable number and 95% uncertainty interval (UI) for coronary heart disease mortality for the South Coast Air Basin, by county, attributed to traffic density, residential proximity to roadways, elemental carbon and regional $PM_{2.5}$ for 2008 and for 2035.

	2008 [a]	2035 [a]
County	**Attributable Number**	**Attributable Number**
Traffic density		
Los Angeles	930 (330, 1500)	1800 (640, 2900)
Orange	190 (70, 310)	360 (130, 590)
Riverside	90 (30, 140)	140 (50, 230)
San Bernardino	50 (20, 80)	180 (60, 290)
Residence within 150m from freeway or 50m from major road		
Los Angeles	340 (210, 470)	930 (570, 1300)
Orange	60 (40, 80)	170 (100, 230)
Riverside	20 (10, 30)	50 (30, 60)
San Bernardino	20 (10, 30)	80 (50, 110)
Elemental Carbon		
Los Angeles	540 (280, 790)	700 (530, 870)
Orange	80 (40, 120)	150 (80, 210)
Riverside	40 (20, 60)	40 (20, 60)
San Bernardino	30 (20, 50)	70 (40, 100)
Regional $PM_{2.5}$		
Los Angeles	1500 (1200, 1900)	2400 (1800, 3000)
Orange	230 (170, 290)	320 (240, 400)
Riverside	100 (70, 120)	50 (40, 60)
San Bernardino	90 (70, 110)	190 (140, 240)

[a] Estimates were for the difference between the 2008 or 2035 mean exposure (from Table S1) and background levels of 1 for traffic density, 0% for proximity, 0.12μg/m^3 for EC, and 5.6μg/m^3 for $PM_{2.5}$.

Table S4. Population attributable fraction (PAF) and population attributable number with 95% uncertainty interval (UI) for coronary heart disease hospitalizations for SoCAB and for each county attributed to elemental carbon exposure.

	2008		2035	
County	**PAF (%)**	**Attributable Number**	**PAF (%)**	**Attributable Number**
Los Angeles	2.25 (0.78, 3.69)	680 (240, 1100)	1.37 (0.48, 2.25)	760 (270, 130)
Orange	1.48 (0.51, 2.44)	110 (40, 180)	1.12 (0.38, 1.85)	160 (60, 270)
Riverside	0.93 (0.33, 1.53)	70 (20, 110)	0.55 (0.20, 0.90)	60 (20, 90)
San Bernardino	1.59 (0.54, 2.63)	60 (20, 100)	0.98 (0.34, 1.62)	90 (30, 150)
SoCAB	1.90 (0.66, 3.12)	920 (320, 1500)	1.18 (0.42, 1.93)	1100 (380, 1700)

[a] Estimates were for the difference between the 2008 or 2035 mean exposure to EC (from Table S1) and background EC levels of 0.12μg/m^3. The SoCAB means for for 2008 and 2035 EC were 1.1 and 0.7μg/m^3, respectively.

Figure Legend

Figure S1. Traffic density[a] within 300m buffer from residence (S2a), proportion living within ≤150m from a freeway or ≤50m from a major road (S2b), elemental carbon (2c) and regional $PM_{2.5}$[b] (2d) in the South Coast Air Basin in 2008 and in 2035. Boxes extend from the 25th to the 75th percentile, horizontal bar represent the median, whiskers extend 1.5 times the length of the interquartile range above and below the 75th and 25th percentiles, respectively, and outliers are represented as points. [a]Emission-weighted traffic density based on $PM_{2.5}$ reduction from 1990 to 2008 and 2035, which were -62.1% and -76.4%, respectively. [b]Double-headed arrow represents U.S. $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) of 12μg/m^3

Supplemental Material, Figure S1a.

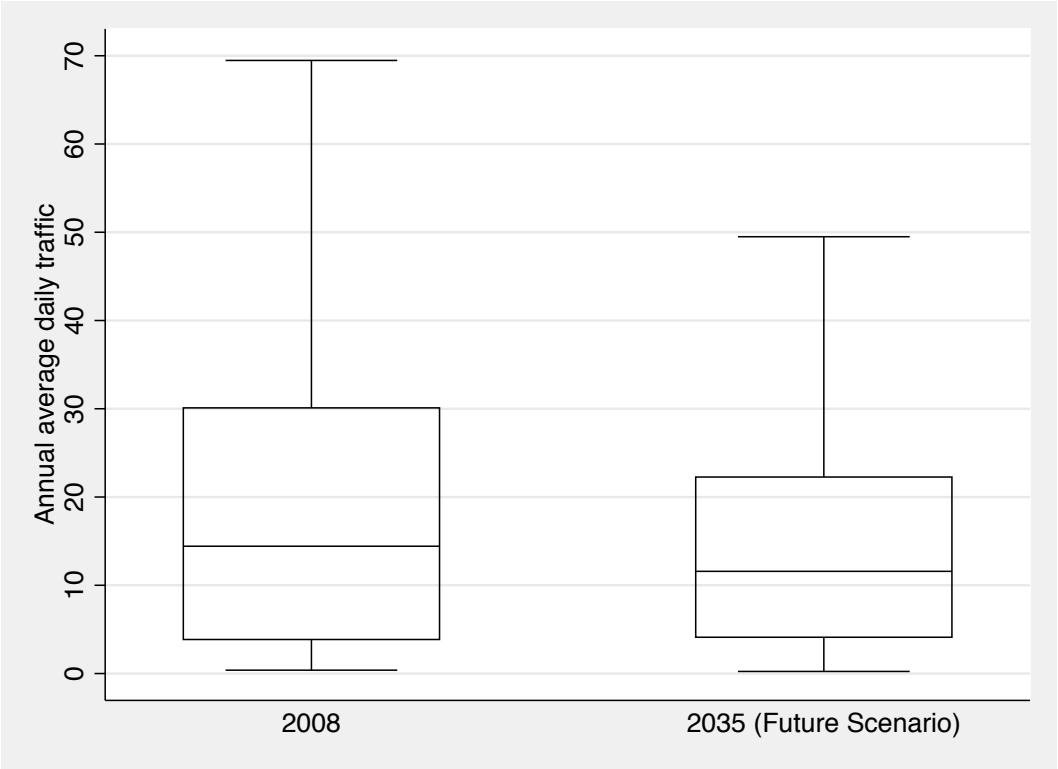


Figure S1b.

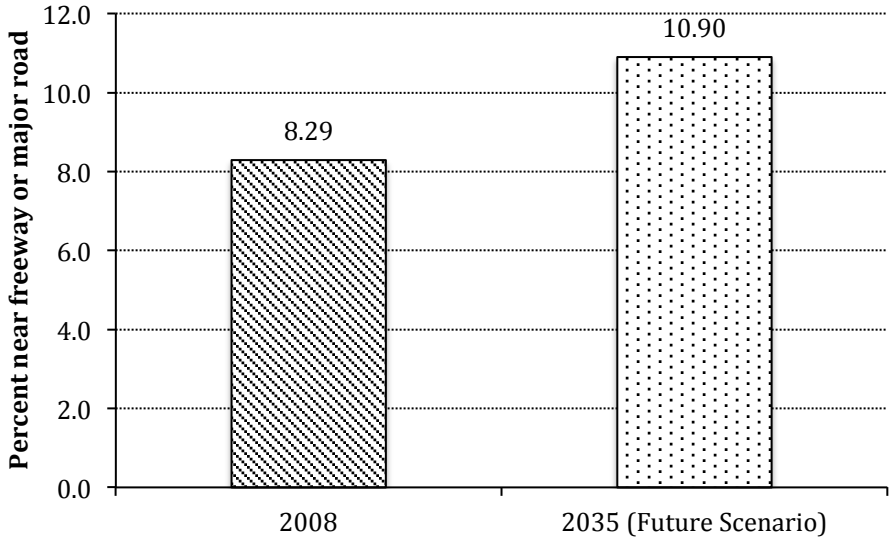


Figure S1c.

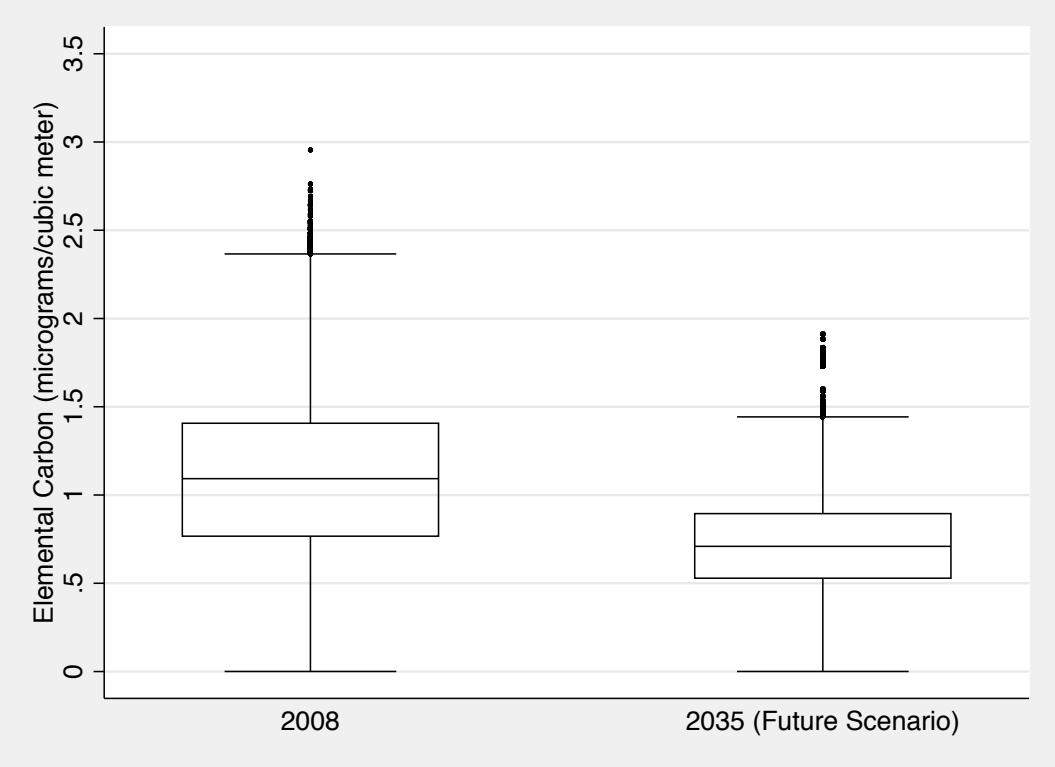
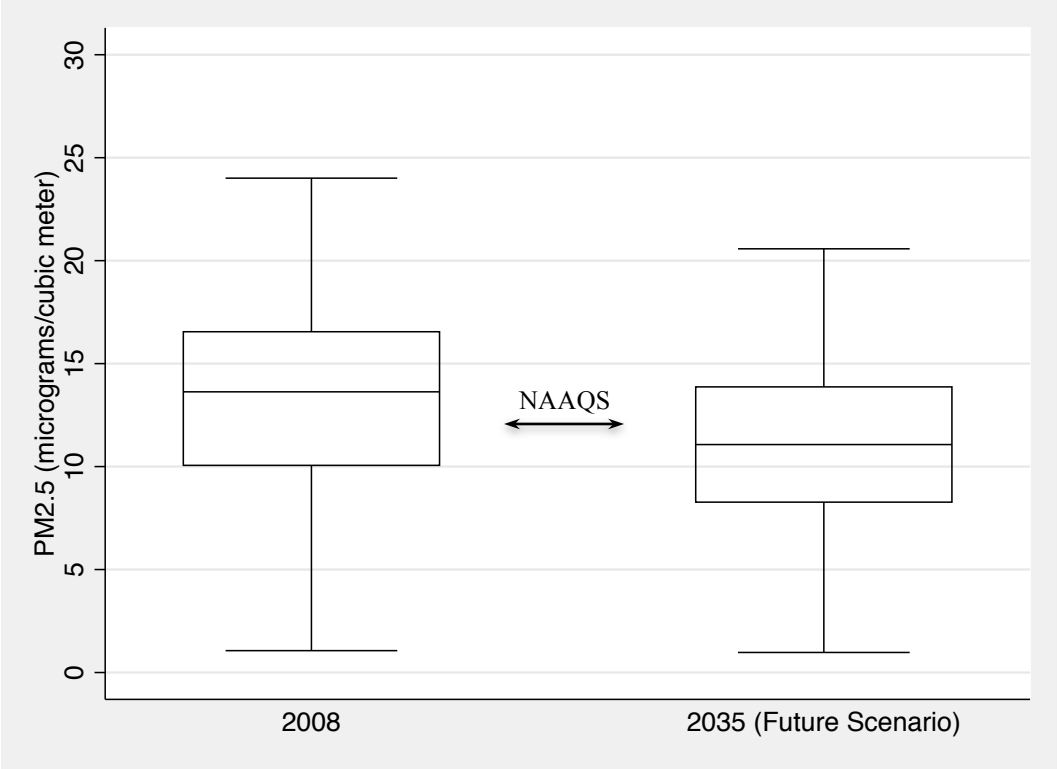

Elemental Carbon (micrograms/cubic meter)
0
.5
1
1.5
2
2.5
3
3.5
2008
2035 (Future Scenario)

Figure S1d.


PM2.5 (micrograms/cubic meter)
0
5
10
15
20
25
30
NAAQS
2008
2035 (Future Scenario)

Supplemental References

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Watson JG, Chow JC. 2002. Comparison and evaluation of in situ and filter carbon measurements at the fresno supersite. Journal of Geophysical Reseasrch 107:8341.