

Online Data Supplement

The Association of Ambient Air Pollution with Sleep Apnea: The Multi-Ethnic Study of Atherosclerosis

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Methods

MESA AIR: In brief, ambient-source air pollution was assessed by utilizing Environmental Protection Agency operated Air Quality System (AQS) monitors and by deploying more than 7,420 monitors throughout the six MESA metropolitan areas, including some participants' homes. The pollution measurements were integrated with geographical features including residential location, roadway proximity, population density, vegetative index, industrial pollution sources and land use. Dispersion modeling incorporated seasonal and meteorological trends. Participants reported their addresses and estimates were made reflecting time spent at each location if moves occurred in the interval.

MESA SLEEP: Eligible MESA subjects not using positive airway pressure, an oral appliance or home oxygen; ineligible (n= 147) were invited to participate and 60% agreed (n=2055). Subjects wore an Actiwatch Spectrum actigraph (Philips Respironics, Murrysville, PA) on their non-dominant wrist for one week and underwent one night in-home full polysomnography with a 15-channel device (Somte System; Compumedics Ltd.). Polysomnography and actigraphy studies were scored by a central Sleep Reading Center by certified polysomnologists, blinded to other data. Sleep/wake status for each 30 second epoch of actigraphy data was computed using the Actiware-Sleep v. 5.59 scoring algorithm. Sleep periods were identified by technicians using sleep diaries, light levels, event markers, and activity levels. Sleep efficiency was time spent in sleep over total time in bed, averaged over the 7-day actigraphy recording.

MESA: Subjects reported race/ethnicity (White non-Hispanic, Black non-Hispanic, Hispanic and Chinese), cigarette smoking status (never, current/former), education level (categorized as high school or less, some college/associate degree, college degree or more) and household income (categorized as < \$ 25,000, \$25-75,000, > \$75,000). Measured weight and height were used to calculate BMI category (<25, 25-29.9, 30-40, >40 kg/m²) at Exam 5.

Results

Supplemental table E1: Association of NO₂ and PM_{2.5} exposure levels for year prior to PSG using multivariate logistic regression for outcome of CMS AHI_{≥15} (only 4% desaturation hypopneas), presented as odds ratio (95% CI).

	Model 1	Model 2	Model 3
<u>Annual</u>	N=1983	N=1906	N=1906
NO₂ (per 10 ppb)	1.04 (0.94, 1.15)	0.991 (0.86, 1.14)	1.24 (0.90, 1.71)
	N=1948	N=1873	N=1873
PM_{2.5} (per 5 µg/m ³)	1.86 (1.28, 2.69) [‡]	1.61 (1.06, 2.46) [‡]	1.59 (0.94, 1.27) [§]

Supplemental table E2: Association of NO₂ and PM_{2.5} exposure levels for year prior to PSG with apnea hypopnea index (AHI) outcome, using generalized linear models, presented as beta (95% CI).

	Model 1	Model 2	Model 3
<u>One year prior</u>	N=1961	N=1884	N=1884
NO₂ (per 10 ppb)	-0.22 (-0.89, 0.46)	-0.48 (-1.10, 0.13)	0.50 (-1.25, 2.24)
	N=1928	N=1853	N=1853
PM_{2.5} (per 5µg/m ³)	2.33 (0.35, 4.31) [‡]	1.30 (-0.84, 3.44)	1.22 (-1.34, 3.79)

Adjusting for age, sex, BMI (**model 1**); plus race/ethnicity, hypertension, diabetes, smoking status, household income, and residential SES (**model 2**), and for site (**model 3**);

[‡]p< 0.05, [§] p<0.10

Supplemental table E3: Stratified by site: Association of NO₂ and PM_{2.5} exposure levels for year prior to PSG with OSA (AHI≥15), using logistic regression, presented as odds ratio, (95% CI).

Site	NO ₂ (per 10 ppb)	PM _{2.5} (per 5µg/m ³)
Winston-Salem, NC n=275	1.07 (0.19, 6.15)	0.57 (0.01, 35.18)
NYC, NY N=342	1.57 (0.99, 2.47) [§]	1.72 (0.74, 4.00)
Baltimore, MD n=267	0.68 (0.27, 1.68)	0.51 (0.11, 2.52)
Minneapolis, MN, n=317	1.39 (0.41, 4.69)	1.57 (0.41, 6.05)
Chicago, IL n=352	1.72 (0.66, 4.48)	2.58 (0.59, 11.18)
Los Angeles, CA n=320	2.89 (1.13, 7.43) [‡]	4.15 (0.95, 18.11) [§]

Adjusting for age, sex, BMI, race/ethnicity, hypertension, diabetes, smoking status, household income, and residential SES.

[‡]p< 0.05, [§] p<0.10