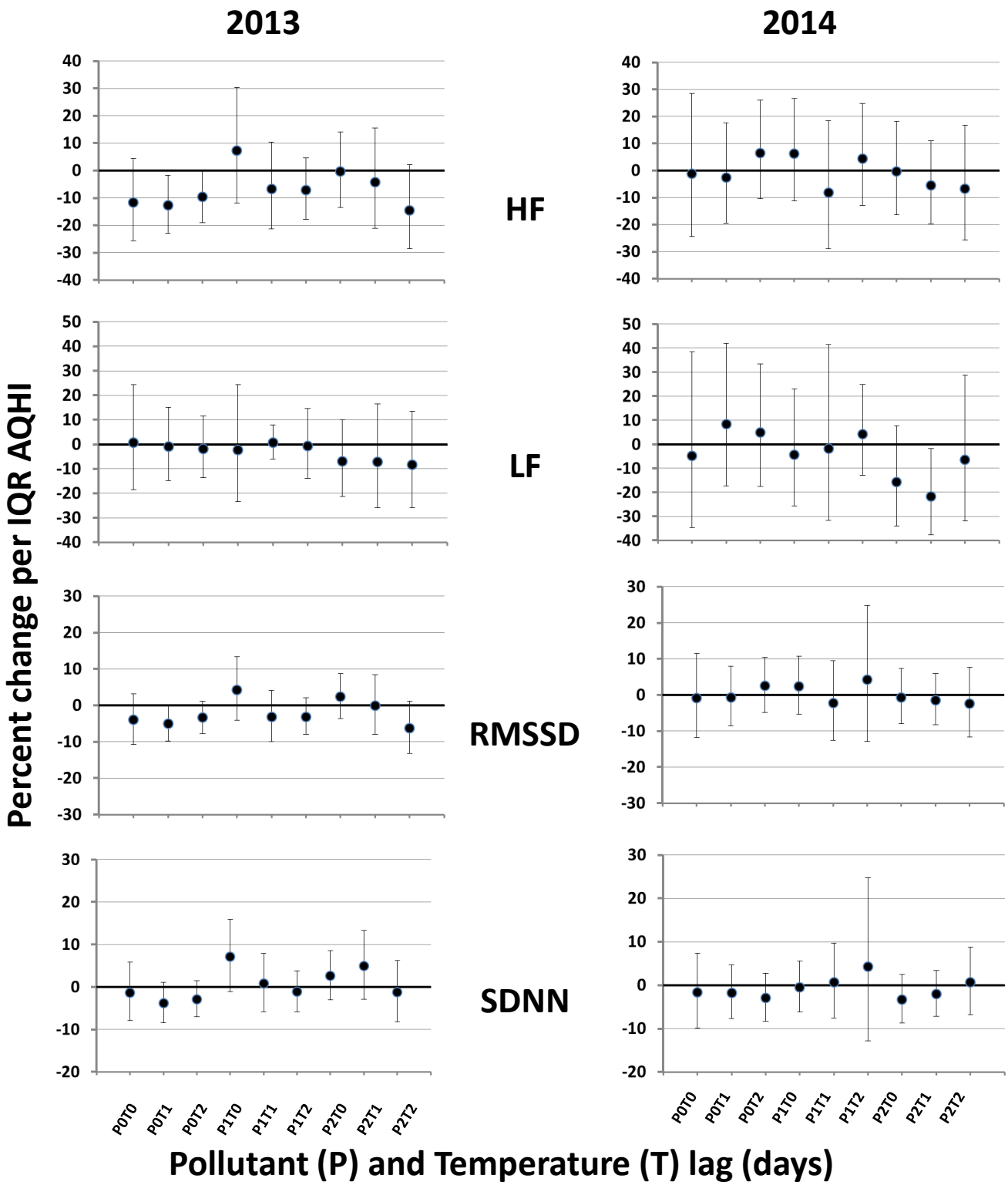
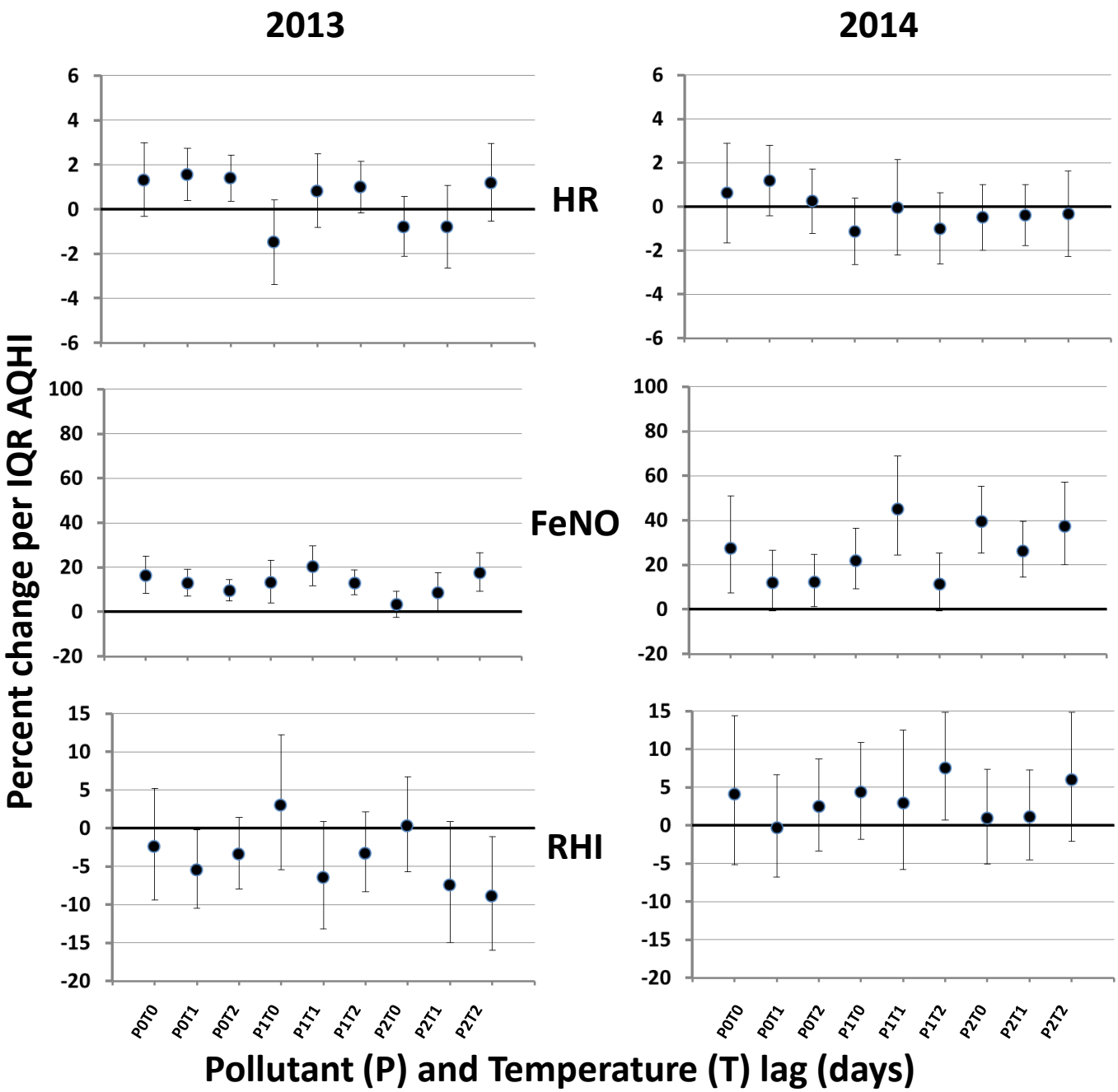
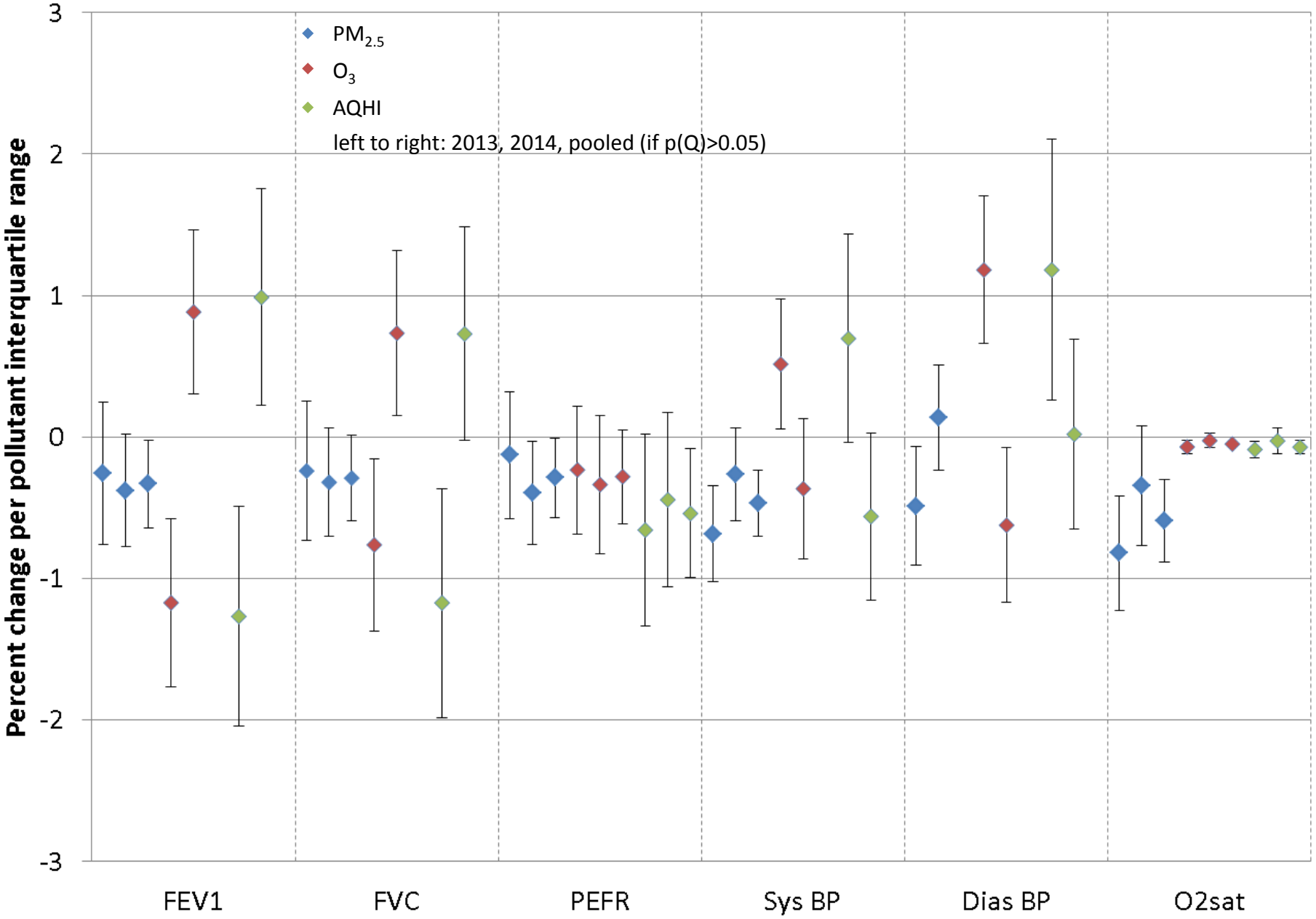


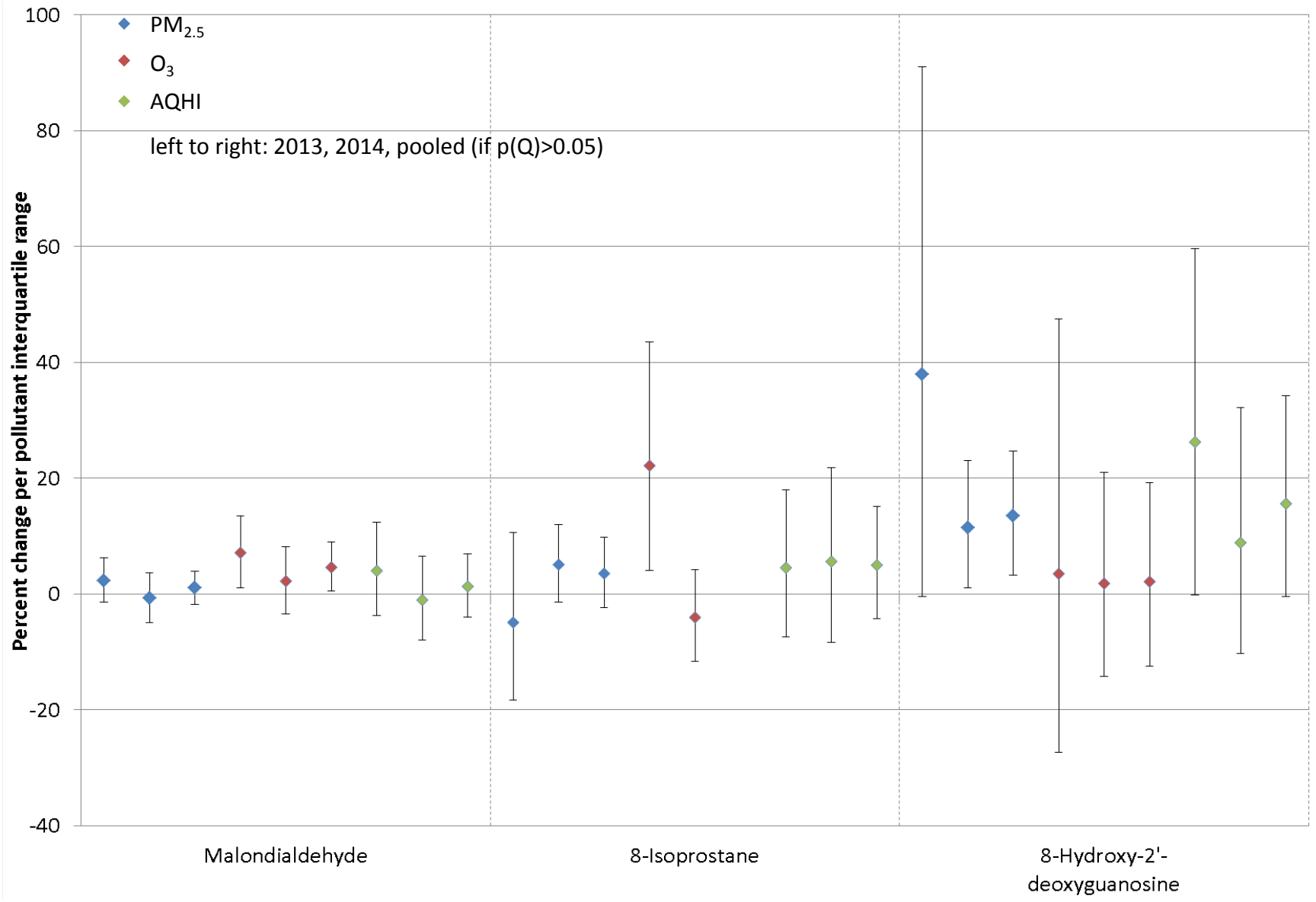
Supplemental Digital Content 1. Percent change (95% CI) pre-exercise high frequency (HF) and low frequency (LF) power, root mean square successive differences (RMSSD), standard deviation NN (SDNN) per IQR AQHI, by lag air pollution (P) and temperature (T). Analyses employed log transformed values.



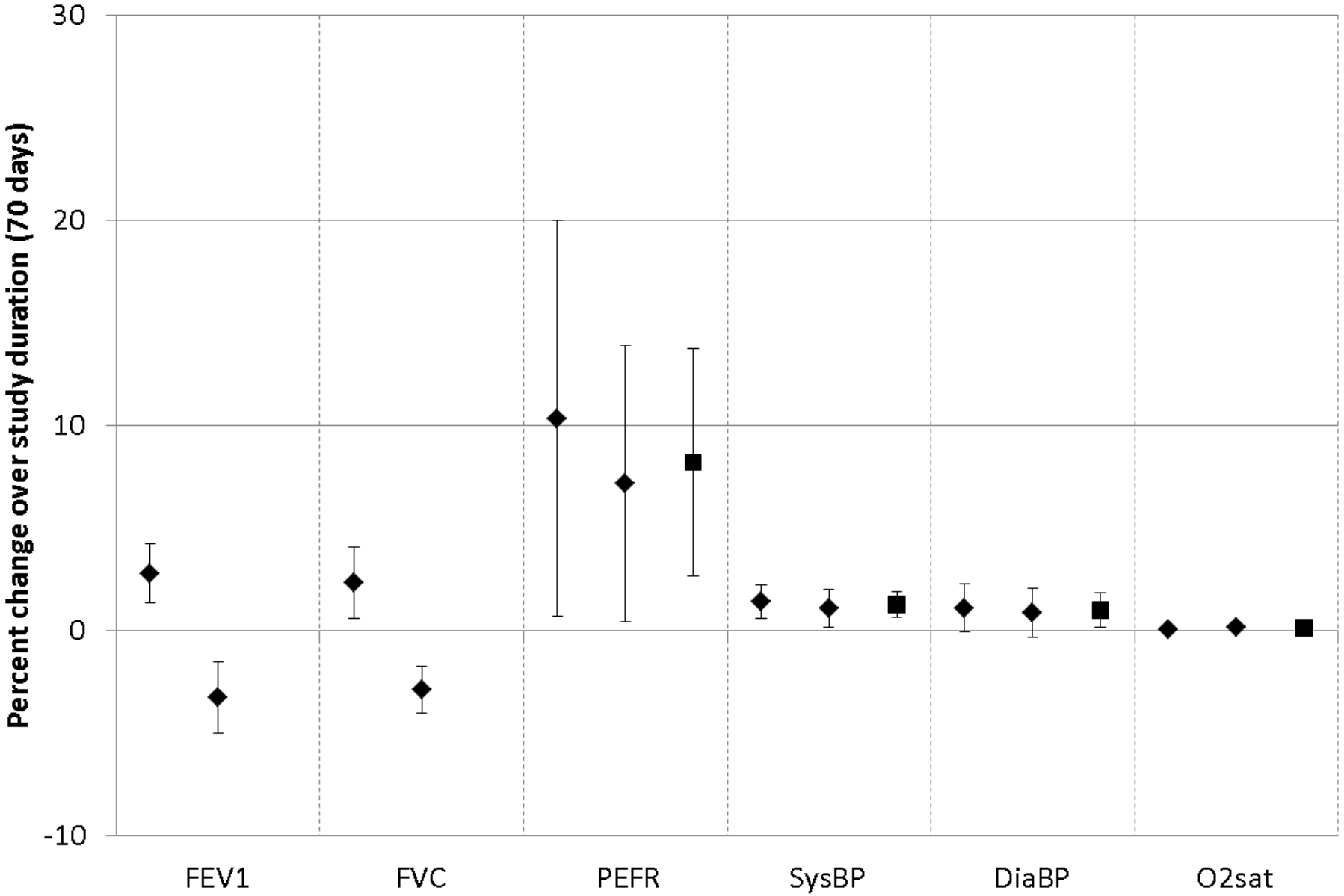
Supplemental Digital Content 2. Percent change (95% CI) pre-exercise heart rate (HR) and fraction exhaled nitric oxide (FeNO), and post-exercise reactive hyperemia index (RHI) per IQR AQHI, by lag of air pollution (P) and temperature (T). Analyses employed untransformed values for HR, others were log transformed.



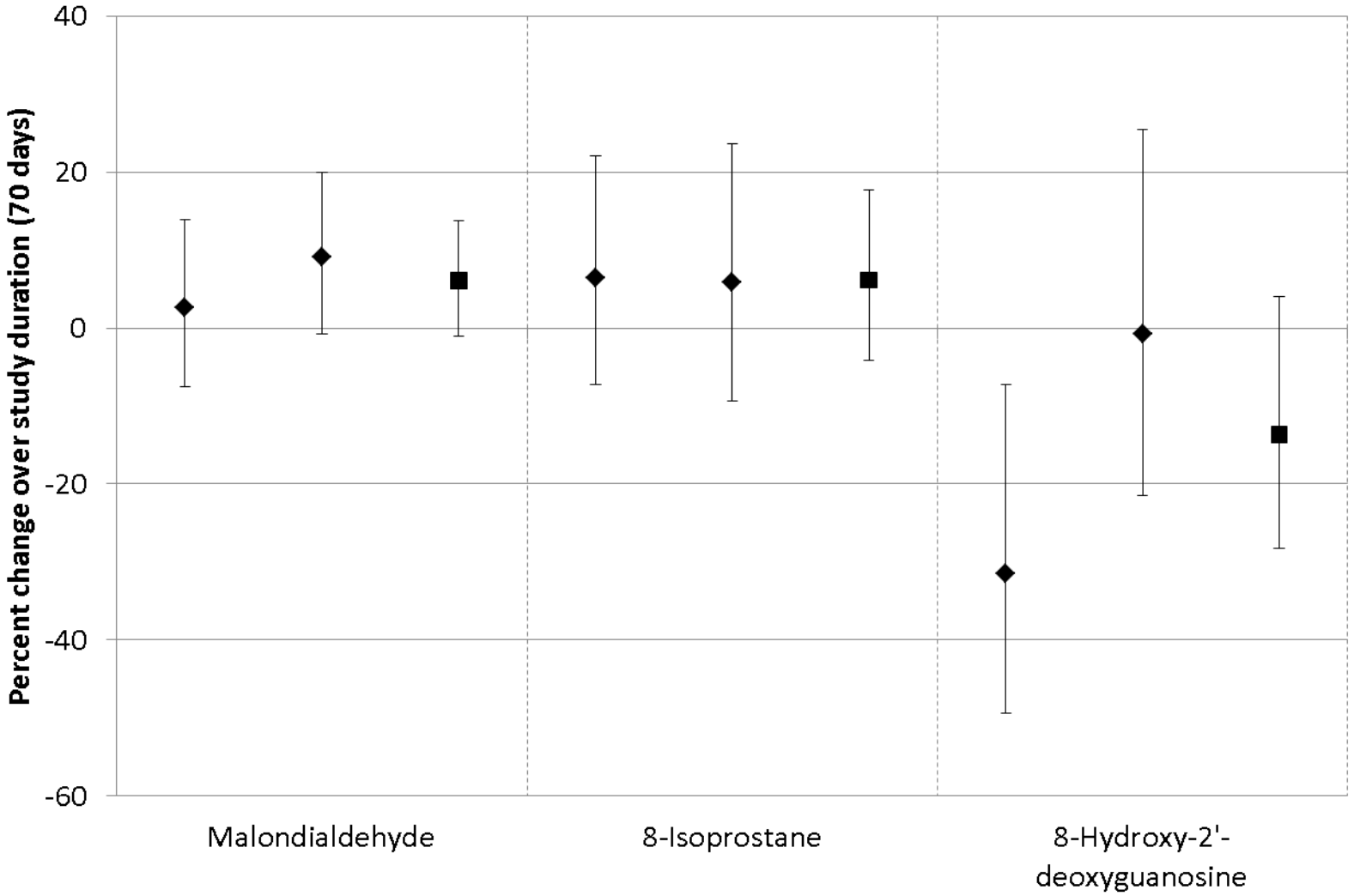
Supplemental Digital Content 3. Percent change (95% CI) FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; PEFR, peak expiratory flow rate; Sys BP, systolic blood pressure; Dias BP, diastolic blood pressure; O2sat, oxygen saturation per IQR $PM_{2.5}$, O_3, AQHI. Analyses employed untransformed values.



Supplemental Digital Content 4. Percent change (95% CI) in oxidative stress markers per IQR $PM_{2.5}$, O_3, AQHI. Analyses employed log transformed values.



Supplemental Digital Content 5. Percent change (95% CI) FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; PEFR, peak expiratory flow rate; Sys BP, systolic blood pressure; Dias BP, diastolic blood pressure; O2sat, oxygen saturation per 70 days. Analyses employed untransformed values. Left to right for each outcome: 2013, 20014, pooled (if p(Q)>0.05).



Supplemental Digital Content 6. Percent change (95% CI) in oxidative stress markers per 70 days. Analyses employed log transformed values. Left to right for each outcome: 2013, 20014, pooled.

Supplemental Digital Content 7. Subgroup analyses of air pollution and study duration effects by sex and statin use, 2013

	Percent change* per IQR Air Quality Health Index (AQHI) (1.42)					
	Male	Female	p (difference)	Statin	No statin	p (difference)
HF†	-11.7 (-35.4, 20.9)	-28.2 (-41.4, -12.1)	0.2760	70.7 (6.9, 172.4)	-28.5 (-39.1, -15.9)	0.0006
LF	-17.5 (-39.5, 12.4)	-9.6 (-24.3, 8.0)	0.6140	51.6 (-5.2, 142.4)	-14.3 (-25.8, -0.9)	0.0229
RMSSD	-5.0 (-13.7, 4.7)	-14.3 (-20.7, -7.4)	0.1022	27.8 (2.6, 59.3)	-13.5 (-18.9, -7.7)	0.0009
SDNN	16.0 (1.7, 32.4)	-2.7 (-11.9, 7.4)	0.0360	33.1 (11.1, 59.5)	0.6 (-7.9, 9.8)	0.0062
HR	2.8 (0.1, 5.5)	2.4 (0.1, 4.6)	0.9314	3.4 (0.1, 6.6)	2.6 (0.5, 4.6)	0.6844
FENO	11.7 (1.8, 22.5)	10.6 (-1.3, 23.9)	0.8959	3.6 (-5.0, 12.9)	12.1 (2.9, 22.2)	0.1992
RHI	-9.3 (-15.6, -2.6)	-4.6 (-11.1, 2.3)	0.3198	-11.3 (-19.9, -1.8)	-6.8 (-15.1, 2.4)	0.4808
	Percent change* per study duration (70 days)					
	Male	Female	p (difference)	Statin	No statin	p (difference)
HF	12.1 (-27.6, 73.7)	16.4 (-18.8, 66.7)	0.8975	-31.8 (-65.1, 33.4)	37.1 (1.4, 85.3)	0.0628
LF	-3.0 (-36.6, 48.4)	46.4 (6.7, 100.8)	0.1277	-30.5 (-65.7, 41.0)	48.6 (14.2, 93.4)	0.0483
RMSSD	7.4 (-12.4, 31.6)	16.7 (1.3, 34.5)	0.5107	0.2 (-26.3, 36.2)	18.6 (5.2, 33.7)	0.3161
SDNN	-4.8 (-20.1, 13.3)	0.0 (-12.7, 14.7)	0.6570	0.2 (-21.6, 27.9)	-2.9 (-13.9, 9.5)	0.8235
HR	-6.9 (-11.5, -2.4)	-4.5 (-8.6, -0.3)	0.4360	-6.2 (-11.8, -0.7)	-5.4 (-9.3, -1.6)	0.8208
FENO	8.3 (-4.1, 22.1)	17.5 (3.9, 33.0)	0.3499	2.7 (-10.8, 18.4)	17.7 (6.3, 30.4)	0.1270
RHI	-8.0 (-19.7, 5.3)	28.0 (13.1, 44.8)	0.0004	-0.8 (-16.1, 17.4)	14.3 (2.9, 27.1)	0.1608

* Analyses employed untransformed values for HR, others were log transformed. †HF, high frequency power; LF, low frequency power; RMSSD, root mean square of successive differences; SDNN, standard deviation of NN (normal RR) intervals; HR, heart rate; FeNO, fraction of exhaled nitric oxide; RHI, reactive hyperemia index.

Supplemental Digital Content 8. Subgroup analyses of air pollution and study duration effects by sex and statin use, 2014

	Percent change* per IQR Air Quality Health Index (AQHI) (1.42)					
	Male	Female	p (difference)	Statin	No statin	p (difference)
HF†	-0.4 (-28.3, 38.5)	-12.7 (-28.4, 6.6)	0.5024	10.8 (-17.7, 49.0)	-14.7 (-31.5, 6.2)	0.1649
LF	2.0 (-29.8, 48.3)	-2.4 (-27.3, 31.0)	0.8541	-7.6 (-35.8, 32.8)	3.2 (-25.3, 42.7)	0.6542
RMSSD	5.3 (-8.4, 21.1)	1.7 (-5.7, 9.6)	0.6640	4.0 (-14.7, 27.0)	-3.4 (-14.7, 9.5)	0.5382
SDNN	0.4 (-11.0, 13.1)	-9.3 (-17.2, -0.7)	0.1857	5.0 (-9.5, 21.8)	-9.5 (-17.3, -0.9)	0.0941
HR	3.1 (0.0, 6.3)	-2.5 (-4.5, -0.6)	0.0026	2.6 (-0.5, 5.8)	-1.5 (-3.3, 0.3)	0.0235
FENO	37.8 (6.3, 78.5)	23.2 (7.9, 40.6)	0.4507	38.6 (3.7, 85.3)	24.8 (11.0, 40.4)	0.5119
RHI	-9.8 (-20.9, 2.9)	-6.2 (-13.2, 1.3)	0.6206	-10.2 (-19.9, 0.6)	-4.5 (-12.0, 3.7)	0.3846
	Percent change* per study duration (70 days)					
	Male	Female	p (difference)	Statin	No statin	p (difference)
HF	73.1 (-8.1, 225.9)	55.3 (8.0, 123.5)	0.7716	108.1 (-0.5, 335.4)	49.9 (3.6, 117.0)	0.4364
LF	24.9 (-30.4, 124.1)	6.4 (-28.2, 57.6)	0.6554	54.6 (-26.7, 226.0)	4.7 (-28.3, 52.9)	0.3612
RMSSD	17.1 (-11.8, 55.5)	22.7 (4.8, 43.6)	0.7791	43.7 (-2.8, 112.6)	15.2 (-1.2, 34.3)	0.3029
SDNN	-1.4 (-22.1, 24.8)	2.6 (-13.3, 21.5)	0.7881	11.7 (-16.7, 49.9)	1.3 (-12.9, 17.7)	0.5596
HR	-4.2 (-9.2, 0.9)	-7.2 (-11.3, -3.2)	0.3505	0.4 (-6.0, 6.8)	-7.4 (-10.9, -3.8)	0.0367
FENO	67.9 (26.2, 123.4)	68.0 (40.6, 100.6)	0.9993	45.3 (-1.7, 114.7)	74.8 (48.0, 106.4)	0.3941
RHI	24.5 (8.0, 43.4)	5.8 (-4.9, 17.6)	0.0717	8.8 (-6.0, 26.0)	12.5 (1.4, 24.8)	0.7179

* Analyses employed untransformed values for HR, others were log transformed. †HF, high frequency power; LF, low frequency power; RMSSD, root mean square of successive differences; SDNN, standard deviation of NN (normal RR) intervals; HR, heart rate; FeNO, fraction of exhaled nitric oxide; RHI, reactive hyperemia index.

Supplemental Digital Content 9. Summary of panel studies of air pollution and cardiorespiratory physiological parameters in older adults

Reference	Study	Location	Number of Subjects	Age Range	Duration	Pollutant Concentrations*	Findings†	Lag
1	Adar et al. 2007	St. Louis	44	62-94	4 days per subject	Median $PM_{2.5}$ 7.7 $\mu g/m^3$	4.5 $\mu g/m^3$ (IQR) increase in $PM_{2.5}$ associated with 15% decrease in HF	24 hour mean, lag 0 days
2	Brauer et al. 2001	Vancouver	16 COPD patients	54-86	7 days	Mean ambient $PM_{2.5}$ 11.4 $\mu g/m^3$ Mean personal $PM_{2.5}$ 18.2 $\mu g/m^3$	No associations with HRV, blood pressure or spirometry	
3	Dales et al. 2004	Toronto	36 cardiac patients	51-88	Weekly up to 10 weeks	Mean $PM_{2.5}$ 19.9 $\mu g/m^3$ (max 146 $\mu g/m^3$) Mean CO 2.4 ppm (daily 95th %ile) (max 16.5 ppb)	CO associated with increased SDNN in those not taking beta blockers	Not stated
4	Fan et al. 2008	Paterson, NJ	11 crossing guards	Mean 61	3 days per subject	Changes in exposure Morning shift 35 $\mu g/m^3$ mean, 71 $\mu g/m^3$ peak Afternoon shift 24 $\mu g/m^3$ mean, 64 $\mu g/m^3$ peak	SDNN decreased 18-26%	15 minutes, 2 h and 4 h after morning shift
5	Gold et al. 2000	Boston	21	53-87	Weekly up to 12 weeks	$PM_{2.5}$ (4 h) 3-49 $\mu g/m^3$ O_3 (1 h) 1-77 ppb NO_2 (24 h) 3-41 ppb	$PM_{2.5}$, O_3 associated with reduced SDNN, RMSSD (9.9-18.4% per 14.4 $\mu g/m^3$, 23 ppb (IQR))	0-4 hours
6	Holguin et al. 2003	Mexico City	34	60-96	Mean 18/subject	Means: $PM_{2.5}$ (24 h) 37.2 $\mu g/m^3$ O_3 (1 h) 149 ppb CO (24 h) 3.3 ppm NO_2 (24 h) 36 ppb SO_2 (24 h) 24 ppb	5.0% decrease in HF per 10 $\mu g/m^3$ $PM_{2.5}$ (6.4% in those with hypertension)	0 days
7	Jia et al. 2011	Beijing	20	52-73		Median O_3 (5 minute, ppb): 23.7	10 ppb increase in O_3 associated with 5.0% and 2.9% decreases in HF, LF	Concurrent 5 minute average
8	Jia et al. 2012	Beijing	30	51-73		Median $PM_{2.5}$ (5 minute, $\mu g/m^3$) 37.5 (outdoor) 45.6 (indoor)	10 $\mu g/m^3$ increase in outdoor $PM_{2.5}$ associated with 2.9% and 2.3% decrease in HF, LF	Concurrent 5 minute average
9	Luttmann-Gibson et al. 2006	Steubenville, OH	32	54-90	Weekly (mean 20.2 per subject)	Mean $PM_{2.5}$ 20 $\mu g/m^3$	13.4 $\mu g/m^3$ (IQR) increase in $PM_{2.5}$ associated with decreases of 4% in SDNN, 6.5% in RMSSD, 11.4% in HF, 10.7% in LF and 1.1% increase in heart rate	1 day

Reference	Study	Location	Number of Subjects	Age Range	Duration	Pollutant Concentrations*	Findings†	Lag
10	Pope et al. 2004	Utah	88	54-89	Approximately 3 observations per subject	Mean $PM_{2.5}$ 23.7 µg/m^3 Range 1.7-74.0	$PM_{2.5}$ associated with decreased SDNN, RMSSD	0 days
11	Schwartz et al. 2004	Boston	28	61-89	Weekly up to 12 weeks	Medians: $PM_{2.5}$ (24 h) 10 µg/m^3 O_3 (1 h) 34 ppb CO (24 h) 0.45 ppm	10 µg/m^3 (IQR) increase in $PM_{2.5}$ associated with 10.1% decrease in RMSSD (stronger association with black carbon)	0 days
12	Sullivan et al. 2005	Seattle	34	57-87	Up to 6 days per subject per 10 day period	Median $PM_{2.5}$ 10.7 µg/m^3	No association with HRV measures	
13	Demeo et al. 2004	Boston	28	60-89	Weekly up to 12 weeks	Medians: $PM_{2.5}$ (24 h) 10 µg/m^3 O_3 (1 h) 34 ppb CO (24 h) 0.45 ppm	0.172% decrease in O_2 saturation per 11.45 µg/m^3 $PM_{2.5}$ (IQR)	6 hours
14	Goldberg et al. 2008	Montreal	31 heart failure patients	50-85	Daily for 2 months		Only SO_2 was associated with reduced O_2 saturation (-0.091%) and increased heart rate (0.393 beats/min) per 8.6 µg/m^3 (IQR) SO_2	1 day
15	Pope et al. 1999	Utah Valley	90	Mean 77	8777 O_2 sat and 8760 heart rate observations		100 µg/m^3 increase in previous day PM_{10} associated with increase of 0.8 beats/min No associations with O_2 saturation	1-5 days
16	Brook et al. 2011	Detroit	65	19-80	up to 5 days	Mean: Personal 21.9 µg/m^3 Ambient 15.4 µg/m^3	10 µg/m^3 personal $PM_{2.5}$ associated with 1.41 mmHg increase in systolic blood pressure	1 day
17	Hoffman et al. 2012	Boston	70 adult type 2 diabetics	45-86	5 measurements	Mean: $PM_{2.5}$ 8.6 µg/m^3 O_3 25 ppb	3.54 µg/m^3 (IQR) increase in $PM_{2.5}$ associated with 1.4 mmHg increase in systolic blood pressure 13.3 ppb (IQR) increase in O_3 associated with 5.2 mmHg decrease in systolic blood pressure	1-5 days

Reference	Study	Location	Number of Subjects	Age Range	Duration	Pollutant Concentrations*				Findings†	Lag
18	Ibaldi-Mulli et al. 2004	Amsterdam Erfurt Helsinki	131 coronary artery disease patients		Average of 10 measurements per subject	Mean:	Amsterdam	Erfurt	Helsinki	10 μg/m^3 increase in $PM_{2.5}$ associated with 0.27 to 0.62 mmHg decrease in systolic and diastolic blood pressure	0, 1 days, 5 day average
						CO (mg/m^3)	0.6	0.4	0.4		
						NO_2 (μg/m^3)	42.7	28.9	31.1		
						SO_2 (μg/m^3)	6.7	5.6	5.8		
						$PM_{2.5}$ (μg/m^3)	20.0	23.1	12.7		
19	Liu et al. 2009	Windsor, ON	28	Mean 78	Up to 16 days	Median $PM_{2.5}$ Personal 6.3 μg/m^3 Indoor 6.8 μg/m^3 Outdoor 15.3 μg/m^3				$PM_{2.5}$ and black carbon associated with increased blood pressure, heart rate, endothelin 1, VEGF, TBARS and decreased brachial artery diameter	Not stated
20	Liu et al. 2007	Windsor, ON	25 diabetic	Mean age 47	7 weeks	Mean personal PM_{10} 25.5 μg/m^3				PM_{10} associated with increased blood pressure among those not taking vasoactive medication and in all subjects with flow mediated vasodilation, TBARS and end-systolic brachial artery diameter	Variable within 0-24 h
21	Mar et al. 2005	Seattle	88	57+	1179 person-days of oxygen saturation and heart rate data and 1029 person-days of blood pressure data	Outdoor Mean $PM_{2.5}$ ~10 μg/m^3 Mean PM_{10} ~15 μg/m^3 (among subgroups)				$PM_{2.5}$ and PM_{10} associated with decreased heart rate in healthy subjects taking no medications; PM_{10} associated with. small increase in blood pressure in healthy subjects on medication; O_2 saturation not associated with PM in any subject subgroup.	0 days
22	Zanobetti et al. 2004	Boston	62 cardiac rehab patients	39-90	3-33 measurements over 2 years	Mean: $PM_{2.5}$ 10.9 μg/m^3 SO_2 7.0 ppb O_3 20.0 ppb				10.5 μg/m^3 increase in $PM_{2.5}$ (10^{th}-90^{th} %ile) associated with 2.8 and 2.7 mmHg increase in systolic and diastolic blood pressure	1-5 days
23	Lee et al. 2007	Seoul	150	61-89	Daily for approximately 1 month	Mean: PM_{10} 78 μg/m^3 $PM_{2.5}$ 56 μg/m^3				-0.39 L/min and -0.54 L/min decreases in PEFR per 10 μg/m^3 PM_{10} and $PM_{2.5}$	1 day

Reference	Study	Location	Number of Subjects	Age Range	Duration	Pollutant Concentrations*			Findings†	Lag
24	Kubesch et al. 2015	Barcelona	28	21-53	4 x 2 hour exposures	Mean	Low Traffic	High Traffic	Increased FEV1 (34 mL), FVC (29 mL), FeNO (0.890 ppb) with physical activity; increased FeNO (0.803 ppb) per IQR $PM_{10-2.5}$	0-6 hours
						BC ($\mu g/m^3$)	8.59	60.82		
						UFP (n/cm^3)	32992.75	164464.30		
						NO_x (ppb)	71.62	722.18		
						PM_{10} ($\mu g/m^3$)	67.79	129.68		
						$PM_{2.5}$ ($\mu g/m^3$)	30.03	80.76		
						$PM_{10-2.5}$ ($\mu g/m^3$)	37.75	48.91		
26	Kim et al. 2012	Seoul	560	60-87	up to 5 measurements over 3 years	Mean: PM_{10} 42.38 $\mu g/m^3$ SO_2 3.86 ppb O_3 19.24 ppb NO_2 35.58 ppb CO 0.61 ppm			25.5% increase in urine MDA per 34.78 $\mu g/m^3$ PM_{10} (IQR)	2-3 days
27	Ren et al. 2011	Boston	320	63-96	Cross sectional	Mean: CO 0.30 ppm BC 0.88 $\mu g/m^3$ EC 0.44 $\mu g/m^3$ O_3 (1h) 39.2 ppb NO_2 17.8 ppb $PM_{2.5}$ 13.0 $\mu g/m^3$			IQR increase in $PM_{2.5}$, OC, SO_4^{2-}, NO_2 and O_3 associated with 24.4%-47.7% increase urine 8-OHdG	21 days

*CO-carbon monoxide, NO_2-nitrogen dioxide, O_3-ozone, $PM_{2.5, 10, 10-2.5}$-particulate matter of median aerodynamic diameter < 2.5 µm, < 10 µm, 2.5-10 µm, SO_2-sulfur dioxide, BC-black carbon, UFP-ultrafine particles, NO_x-oxides of nitrogen, EC-elemental carbon. †IQR-interquartile range, HRV-heart rate variability, PEFR, peak expiratory flow rate, SDNN-standard deviation of NN (normal RR) intervals, RMSSD-root mean square of successive differences, LF-low frequency power, HF-high frequency power, FeNO-fraction of exhaled nitric oxide, FEV1-forced expiratory volume in 1 second, FVC-forced vital capacity, MDA-malondialdehyde, 8-OHdG-8-hydroxy-2'-deoxyguanosine, VEGF-vascular endothelial growth factor, TBARS-thiobarbituric acid reactive substances.