

## Supplement Material

Respiratory effects of a reduction in outdoor air pollution concentrations

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Supplement Table 1 Association between 2010-2008 changes in average air pollution concentrations at street level and 2010-2008 changes in FVC of residents - mixed model analysis

	Unadjusted				Adjusted - Basic			Adjusted - Extensive		
	IQR	% change	SE	P- value	% change	SE	P- value	% change	SE	P- value
Forced vital capacity (FVC) (N=585)										
PM <sub>10</sub>	5.5	0.13	1.19	0.91	0.06	0.94	0.95	0.18	1.05	0.87
PM <sub>2.5</sub>	2.6	-1.07	1.04	0.30	-0.94	0.81	0.25	-1.11	0.95	0.24
Soot	0.55	-0.91	0.68	0.19	-0.91	0.51	0.08	-0.90	0.59	0.13
NO <sub>2</sub>	5.4	-1.32	0.85	0.12	-1.19	0.65	0.07	-1.12	0.78	0.15
NO <sub>x</sub>	13.5	-0.86	0.84	0.31	-0.96	0.64	0.13	-0.84	0.73	0.25
Cr	2.4	-0.96	1.25	0.45	-0.89	0.98	0.36	-0.91	1.10	0.41
Cu	12.6	-1.19	0.71	0.09	-1.01	0.55	0.07	-0.94	0.65	0.15
Fe	385.2	-1.33	1.03	0.20	-1.22	0.79	0.12	-1.08	0.93	0.25

Effect estimates are expressed as percentage change of the dependent variable per interquartile range (IQR) in exposure. Percentage change is calculated from linear regression with the 2010-2008 change in health outcome as dependent variable and 2010-2008 difference in air pollution concentration as independent variable in one-pollutant models. Percentage change was calculated as the regression slope multiplied by the IQR and divided by the mean baseline value listed in Table 2 in the Main article. See the data analysis section for the confounders included in the basic and extensive models. A decrease in air pollution from 2008 to 2010 was hypothesized to result in an increase in FVC from 2008 to 2010, which would be reflected here as a negative percentage change.

Supplement Table 2 Association between 2010-2008 changes in average air pollution concentrations at street level and 2010-2008 changes in FEV<sub>1</sub>, PEF and MMEF of residents

	Unadjusted				Adjusted - Basic			Adjusted - Extensive		
	IQR	% change	SE	P-value	% change	SE	P-value	% change	SE	P-value
Forced expiratory flow in the first second (FEV <sub>1</sub> ) (N=585)										
PM <sub>10</sub>	5.5	0.40	0.57	0.49	0.20	0.46	0.67	0.27	0.47	0.57
PM <sub>2.5</sub>	2.6	-0.71	0.53	0.18	-0.63	0.43	0.14	-0.20	0.49	0.68
Soot	0.55	-0.34	0.37	0.36	-0.36	0.30	0.23	-0.41	0.31	0.18
NO <sub>2</sub>	5.4	-0.46	0.45	0.30	-0.14	0.36	0.70	-0.75	0.40	0.06
NO <sub>x</sub>	13.5	-0.41	0.48	0.39	-0.34	0.39	0.38	-0.31	0.39	0.44
Cr	2.4	-0.61	0.65	0.34	-0.62	0.52	0.23	-0.91	0.53	0.08
Cu	12.6	-0.45	0.40	0.26	-0.17	0.32	0.60	-0.33	0.33	0.32
Fe	385.2	-0.44	0.55	0.43	-0.19	0.45	0.67	-0.46	0.46	0.32
Peak expiratory flow (PEF) (N=585)										
PM <sub>10</sub>	5.5	0.39	0.78	0.62	-0.20	0.72	0.78	-0.08	0.73	0.91
PM <sub>2.5</sub>	2.6	-0.98	0.72	0.17	-1.13	0.66	0.09	-1.29	0.76	0.09
Soot	0.55	-0.36	0.50	0.48	-0.29	0.46	0.53	-0.18	0.48	0.70
NO <sub>2</sub>	5.4	-1.02	0.61	0.09	-0.41	0.56	0.46	-0.37	0.63	0.55
NO <sub>x</sub>	13.5	-1.11	0.65	0.09	-0.82	0.60	0.17	-0.66	0.61	0.28
Cr	2.4	-0.04	0.88	0.97	0.39	0.81	0.63	0.26	0.82	0.75
Cu	12.6	-0.81	0.53	0.13	-0.33	0.49	0.50	-0.18	0.51	0.73
Fe	385.2	-0.91	0.75	0.23	-0.26	0.69	0.71	-0.06	0.71	0.93
Maximal Mid Expiratory Flow (MMEF) (N=585)										
PM <sub>10</sub>	5.5	0.56	1.36	0.68	0.80	1.34	0.55	0.82	1.35	0.55
PM <sub>2.5</sub>	2.6	-0.04	1.26	0.97	0.38	1.23	0.76	2.08	1.41	0.14
Soot	0.55	0.60	0.88	0.49	0.50	0.86	0.56	0.33	0.89	0.71
NO <sub>2</sub>	5.4	1.11	1.05	0.30	1.20	1.04	0.25	-0.69	1.17	0.55
NO <sub>x</sub>	13.5	1.29	1.14	0.26	1.36	1.12	0.23	1.21	1.13	0.28
Cr	2.4	-0.21	1.53	0.89	-0.65	1.50	0.66	-1.32	1.52	0.38
Cu	12.6	1.43	0.93	0.13	1.49	0.92	0.11	0.85	0.94	0.36
Fe	385.2	1.87	1.31	0.15	1.69	1.29	0.19	0.69	1.32	0.60

Effect estimates are expressed as percentage change of the dependent variable per interquartile range (IQR) in exposure. Percentage change is calculated from linear regression with the 2010-2008 change in health outcome as dependent variable and 2010-2008 change in air pollution concentration as independent variable in one-pollutant models. Percentage change was calculated as the regression slope multiplied by the IQR and divided by the mean baseline value listed in Table 2 in the Main article. See the data analysis section for the confounders included in the basic and extensive models. A decrease in air pollution from 2008 to 2010 was hypothesized to result in an increase in FEV<sub>1</sub>, PEF and MMEF from 2008 to 2010, which would be reflected here as a negative percentage change.

Supplement Table 3 Description of self-reported respiratory symptoms at baseline and follow up

	Prevalence of symptoms		Change in symptoms at follow-up		
	Baseline	Follow up	Yes-No	No-Yes	No change
Whole population (N=640)					
Wheeze	129	99 (15)	63	33	544
Dyspnea	95	64 (10)	13	2	625
Phlegm production	151	139 (22)	67	55	518
Running noise	297	279 (44)	91	73	476
Itchy eyes	119	106 (17)	34	22	584
Cough	192	151 (24)	101	60	479
Stille Veerkade (N=31)					
Wheeze	7	0	7	0	24
Dyspnea	3	0	3	0	31
Phlegm production	8	10	3	5	23
Running noise	16	14	4	2	25
Itchy eyes	5	2	3	0	28
Cough	9	7	3	1	27
Matching suburban control population (N=48)					
Wheeze	9	11	5	7	36
Dyspnea	7	7	4	3	41
Phlegm production	15	7	9	1	38
Running noise	19	18	7	6	35
Itchy eyes	6	4	2	1	45
Cough	16	18	7	9	32

Supplement Table 4 Changes (%) in lung function, airway resistance, and exhaled NO between 2010-2008 comparing the street with the largest reduction in air pollution and residents at four suburban background locations with a more modest air pollution change

	Unadjusted			Adjusted - Basic			Adjusted - Extensive		
	% change	SE	P-value	% change	SE	P-value	% change	SE	P-value
Spirometry (N=293)									
FVC	4.26	1.77	0.02	4.53	1.52	0.00	4.92	1.69	0.00
FEV <sub>1</sub>	2.57	1.72	0.13	3.05	1.31	0.02	3.00	1.45	0.04
PEF	0.50	2.17	0.82	1.48	1.90	0.44	2.43	2.10	0.25
MMEF	0.23	4.10	0.95	0.62	3.98	0.88	-1.00	4.38	0.82
Airway resistance (N=261)									
	-1.60	8.56	0.85	-20.41	9.21	0.03	-15.34	11.34	0.18
Exhaled NO (N=321)									
	-2.10	12.84	0.87	-4.19	12.49	0.74	5.29	13.80	0.70

Effect estimates are calculated from linear regression with change in lung function, airway resistance and exhaled NO (2010-2008) as dependent variable and living at the street (yes/no) with the largest air pollution reduction as independent variable. Percentage change was calculated as the regression slope divided by the mean baseline value (see below). See the data analysis section for the confounders included in the basic and extensive models. The 4.26% estimate for FVC implies that the FVC at the street with the large reduction air pollution increased 4.26% more from 2008 to 2010 than at the four suburban background locations. Thus, the hypothesized direction of effects was an increase in spirometric indicators, and a decrease in airway resistance and exhaled NO. Mean baseline values: 3989 ml (FVC); 3028 ml (FEV<sub>1</sub>); 7844 ml/s (PEF); 2708 ml/s (MMEF); 34 kPa/l/s (airway resistance); 22.3 ppb (exhaled NO).

Supplement Table 5 Distribution of important individual covariates per location

Cities	Urban streets	N people <sup>a</sup>	Age (range)	N current smokers (%)	N cigarettes per day (range)	N passive smokers (%)	N people highly educated (%)
Amsterdam	Haarlemmerweg	58 (2)	39 (6-71)	12 (21)	11 (1-20)	2 (3)	48 (83)
Amsterdam	Hoofdweg	28 (4)	50 (5-84)	5 (18)	4 (1-8)	3 (11)	15 (54)
The Hague	Stille Veerkade	31 (4)	45 (11-75)	7 (23)	11 (6-15)	6 (19)	14 (45)
Den Bosch	Brugstraat	29 (0)	40 (5-57)	7 (24)	9 (1-25)	7 (24)	17 (59)
Den Bosch	Koningsweg	52 (11)	44 (4-76)	7 (13)	10 (1-20)	8 (15)	41 (79)
Tilburg	HVB	78 (6)	64 (18-87)	17 (22)	14 (1-25)	9 (12)	11 (14)
Utrecht	Vleutenseweg	62 (1)	39 (5-74)	9 (15)	10 (2-20)	8 (13)	48 (77)
Utrecht	Weerdsingel Wz	12 (0)	39 (8-75)	2 (17)	8 (4-12)	4 (33)	8 (67)
<i>Suburban control</i>							
Amsterdam		45 (8)	49 (5-77)	7 (16)	10 (3-20)	2 (4)	17 (38)
The Hague		48 (3)	54 (12-86)	7 (15)	13 (3-25)	4 (8)	11 (23)
Den Bosch/Tilburg		89 (4)	53 (4-82)	9 (10)	9 (1-20)	5 (6)	45 (51)
Utrecht		108 (8)	49 (4-85)	5 (5)	13 (2-20)	1 (1)	73 (68)

<sup>a</sup>in brackets the number of people visiting at home for the follow-up health measurements.

Supplement Table 6 Association between 2010-2008 changes in average air pollution concentrations at street level and 2010-2008 changes in FVC and airway resistance of residents- results of two-pollutant models<sup>a</sup>

	Unadjusted				Adjusted - Basic			Adjusted - Extensive		
	IQR	% change	SE	P-value	% change	SE	P-value	% change	SE	P-value
Forced vital capacity (FVC) (N=585)										
With PM10 also included in the models										
Soot	0.55	-0.89	0.39	0.02	-0.86	0.33	0.01	-0.87	0.35	0.01
NO <sub>2</sub>	5.4	-1.38	0.47	0.00	-1.02	0.41	0.01	-0.99	0.47	0.03
NO <sub>x</sub>	13.5	-1.09	0.50	0.03	-0.99	0.43	0.02	-0.90	0.43	0.02
Cu	12.6	-1.27	0.41	0.00	-0.94	0.36	0.01	-0.85	0.37	0.02
Fe	385.2	-1.53	0.60	0.01	-1.21	0.51	0.02	-1.06	0.53	0.05
Airway resistance (N=497)										
With soot also included in the models										
PM <sub>10</sub>	5.5	10.12	3.06	0.00	6.23	3.38	0.07	10.34	3.84	0.01
PM <sub>2.5</sub>	2.6	14.13	3.42	0.00	8.87	3.40	0.01	9.04	4.64	0.05
With PM10 also included in the models										
PM <sub>2.5</sub>	2.6	6.58	3.06	0.03	6.42	3.16	0.04	0.62	3.84	0.87
With PM25 also included in the models										
PM <sub>10</sub>	5.5	7.26	3.28	0.03	3.15	3.73	0.40	9.08	4.21	0.03

Effect estimates are expressed as percentage change of the dependent variable per interquartile range (IQR) in exposure. Percentage change is calculated from linear regression with the 2010-2008 change in health outcome as dependent variable and 2010-2008 change in air pollution concentration as independent variable in two-pollutant models. Percentage change was calculated as the regression slope multiplied by the IQR and divided by the mean baseline value listed in Table 2 in the Main article. See the data analysis section for the confounders included in the basic and extensive models. A decrease in air pollution from 2008 to 2010 was hypothesized to result in an increase in FVC from 2008 to 2010, which would be reflected here as a negative percentage change. Similarly, a decrease in air pollution from 2008 to 2010 was hypothesized to result in a decrease in airway resistance, thus as a positive percentage change.

Supplement Table 7 Association between 2010-2008 differences in average air pollution concentrations at street level and 2010-2008 differences in FVC and airway resistance of residents - subgroup analysis excluding residents from the street with the largest air pollution reduction and their matching suburban background<sup>a</sup>

	Unadjusted				Adjusted - Basic			Adjusted - Extensive		
	IQR	% change	SE	P-value	% change	SE	P-value	% change	SE	P-value
Forced vital capacity (FVC) (N=515)										
PM <sub>10</sub>	5.5	0.68	0.60	0.26	0.30	0.52	0.56	0.42	0.54	0.43
PM <sub>2.5</sub>	2.6	0.51	0.71	0.47	0.45	0.60	0.46	0.30	0.70	0.66
Soot	0.55	-0.28	0.58	0.63	-0.04	0.49	0.94	0.02	0.52	0.97
NO <sub>2</sub>	5.4	-0.98	0.56	0.08	-0.30	0.49	0.55	0.16	0.61	0.79
NO <sub>x</sub>	13.5	-0.16	0.72	0.82	0.37	0.63	0.56	0.63	0.64	0.33
Cr	2.4	-1,34	0,77	0,08	-0,81	0,67	0,23	-0,78	0,69	0,26
Cu	12.6	-0.98	0.51	0.05	-0.29	0.44	0.52	-0.10	0.46	0.82
Fe	385.2	-1.28	0.71	0.07	-0.43	0.62	0.49	-0.17	0.64	0.79
Airway resistance (N=427)										
PM <sub>10</sub>	5.5	10.87	2.94	0.00	7.09	3.27	0.03	5.82	3.33	0.08
PM <sub>2.5</sub>	2.6	6.60	3.60	0.07	6.39	3.67	0.08	3.28	4.22	0.44
Soot	0.55	2.55	3.32	0.44	-0.83	3.62	0.82	-2.09	3.73	0.58
NO <sub>2</sub>	5.4	-4.82	3.31	0.15	-5.83	3.99	0.14	-3.50	4.81	0.47
NO <sub>x</sub>	13.5	-7.01	3.66	0.06	-5.66	3.75	0.13	-6.08	3.75	0.11
Cr	2.4	15.07	4.31	0.00	14.82	4.37	0.00	13.81	4.49	0.00
Cu	12.6	-6.46	2.82	0.02	-6.15	2.98	0.04	-6.29	3.11	0.04
Fe	385.2	-9.22	3.90	0.02	-8.94	4.08	0.03	-9.42	4.42	0.03

Effect estimates are expressed as percentage change of the dependent variable per interquartile range (IQR) in exposure. Percentage change is calculated from linear regression with the 2010-2008 difference in health outcome as dependent variable and 2010-2008 difference in air pollution concentration as independent variable in one-pollutant models. Percentage change was calculated as the regression slope multiplied by the IQR and divided by the mean baseline value (see below). See the data analysis section for the confounders included in the basic and extensive models. A decrease in air pollution from 2008 to 2010 was hypothesized to result in an increase in FVC from 2008 to 2010, which would be reflected here as a negative percentage change. Similarly, a decrease in air pollution from 2008 to 2010 was hypothesized to result in a decrease in airway resistance, thus as a positive percentage change. Mean baseline values: 3956 ml (FVC); 0.35 kPa/l/s (airway resistance).