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Supplemental Material

Prenatal Exposure to PM$_{2.5}$ Oxidative Potential and Lung Function in Infants and Preschool- Age Children: A Prospective Study

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Figure S2. Test of linearity of the OP_v^{DTT}-lung function parameters at 6 weeks. Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to OP_v^{DTT} and lung function at 6 weeks. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.

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Figure S4. Test of linearity of the $PM_{2.5}$-lung function parameters at 3 years. Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to $PM_{2.5}$ and lung function at 3 years. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.

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Figure S7. Spearman correlation coefficients between the exposures. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 µm; OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay; OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay.

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Figure S9. Effect of each confounder separately on the regression models at 6 weeks, adjusted for sex, height and weight, and comparison to the main model, adjusted on all the confounders listed. Outcomes and exposures were scaled by their IQR. See Excel supplemental file for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm ($\mu g\ m^{-3}$); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay ($nmol\ min^{-1}\ m^{-3}$); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay ($nmol\ min^{-1}\ m^{-3}$); FRC, functional residual capacity; LCI, lung clearance index; V_T, tidal volume; t_{PTEF}/t_E ratio of time to peak tidal expiratory flow to expiratory time.

Figure S10. Effect of each confounder separately on the regression models at 3 years, adjusted for sex, height and weight, and comparison to the main model, adjusted on all the confounders listed. Outcomes and exposures were scaled by their IQR. See Table S3 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm ($\mu g\ m^{-3}$); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay ($nmol\ min^{-1}\ m^{-3}$); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay ($nmol\ min^{-1}\ m^{-3}$); Rrs_7, resistance at a frequency of 7 Hz; Rrs_{7-19}, difference between the resistance at 7 Hz and at 19 Hz; Xrs_7, reactance at a frequency of 7 Hz; AX, area under the reactance curve.

Figure S11. Association between personal exposure to $PM_{2.5}$, OP_v^{DTT} and OP_v^{AA} during pregnancy and lung function parameters measured at 6 weeks in the multiple linear models and in the sensitivity analysis excluding leverage and influencing points, estimated by Cook's distance. Outcomes and exposures were scaled by their IQR. See Table S4 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. Models were adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm ($\mu g\ m^{-3}$); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay ($nmol\ min^{-1}\ m^{-3}$); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay ($nmol\ min^{-1}\ m^{-3}$); FRC, functional residual capacity; LCI, lung clearance index; V_T, tidal volume; t_{PTEF}/t_E ratio of time to peak tidal expiratory flow to expiratory time.

Figure S12. Association between personal exposure to $PM_{2.5}$, OP_v^{DTT} and OP_v^{AA} during pregnancy and lung function parameters measured at 3 years in the multiple linear models and in the sensitivity analysis excluding leverage and influencing points, estimated by Cook's distance. Outcomes and exposures were scaled by their IQR. See Table S5 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. Model were adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm (μg m^{-3}); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay (nmol min^{-1} m^{-3}); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay (nmol min^{-1} m^{-3}); Rrs_7, resistance at a frequency of 7 Hz; Rrs_{7-19}, difference between the resistance at 7 Hz and at 19 Hz; Xrs_7, reactance at a frequency of 7 Hz; AX, area under the reactance curve.

Additional File- Excel Document

Table S1. Description of covariates and child's characteristics in the group that have lung function measurements performed at 6 weeks (by the Nitrogen Multiple Breath Washout technique or by Tidal Breathing analysis) and in the group with lung function at 3 years (Forced Oscillation Technique).

Characteristics	Children with N_2MBW at 6 weeks (median age: 47 days) N=325/356	Children with AOS at 3 years (median age: 3.07 yrs.) N=248/356
Sex of child		
Male	172 (53%)	129 (52%)
Female	153 (47%)	119 (48%)
Missing	/	/
Birthweight (g)		
Median (IQR)	3280 (3040, 3560)	3305 (3078, 3582)
Missing	/	/
Preterm birth, <37 weeks	14 (4.3%)	11 (4.4%)
Missing	/	/
Parental educational level >5 years	235 (72%)	187 (75%)
Delivery mode		
Vaginal	277 (85%)	207 (83%)
C-section	48 (15%)	41 (17%)
Missing	/	/
Child still breastfed at 6 weeks	281 (86%)	219 (88%)
Missing	1	/
Parental history of rhinitis	186 (61%)	144 (61%)
Missing	21	12
Parity		
0 (nulliparous)	145 (45%)	105 (42%)
1 (primiparous)	146 (45%)	119 (48%)
2 or more (multiparous)	34 (10%)	24 (9.7%)
ETS in utero and < 6 wks.		
0	232 (71%)	178 (72%)
1	93 (29%)	68 (28%)
Missing	0	2
ETS < 3 yrs.		
0	243 (78%)	195 (79%)
1	69 (22%)	53 (21%)
Missing	13	0
Maternal age at conception		
Median (IQR)	32 (30, 35)	32 (30, 35)
Maternal BMI at conception		
Median (IQR)	21 (20, 24)	21 (20, 23)
Season of sampling		
Warm	112	96
Warm+Cold	133	90
Cold	80	62
Mean temperature during pregnancy		
Median (IQR)	13.0 (10.5, 14.6)	12.9 (10.5, 14.7)
Season at the clinical visit		
Fall	107	94
Spring	68	28
Summer	59	57
Winter	91	69

Note: N_2MBW, nitrogen multiple breath washout; TBFVL, tidal breathing flow-volume loops; AOS, airwave oscillometry; ETS, environmental tobacco smoke.

Table S2. *Monthly distribution of personal measurements of PM$_{2.5}$, OP$_v^{DTT}$, and OP$_v^{AA}$.*

Exposure	Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PM$_{2.5}$ (μg m^{-3})	Minimum	5.70	4.70	5.00	4.30	4.80	4.90	4.10	5.10	5.10	5.60	7.50	7.00
	25th percentile	10.17	9.95	10.65	8.10	9.58	9.60	9.30	8.92	10.50	10.80	12.52	15.23
	Median	14.40	13.30	13.00	9.70	12.75	12.60	11.90	12.20	13.20	13.80	17.65	19.50
	75th percentile	19.97	16.90	15.17	11.95	15.95	16.45	15.52	15.55	17.90	20.30	21.67	23.95
	Maximum	77.60	26.20	23.50	18.30	50.30	27.70	30.70	30.50	51.10	44.30	49.30	41.50
OP$_v^{DTT}$ (nmol min^{-1} m^{-3})	Minimum	0.34	0.59	0.44	0.39	0.13	0.45	0.25	0.30	0.41	1.06	0.18	0.85
	25th percentile	1.08	0.85	1.10	0.84	1.02	1.11	0.94	0.78	0.89	1.52	1.46	1.69
	Median	1.51	1.34	1.56	1.07	1.27	1.45	1.18	1.03	1.34	1.91	1.98	2.71
	75th percentile	2.07	1.90	1.82	1.63	1.73	1.97	1.55	1.38	1.79	2.41	2.72	3.23
	Maximum	6.09	3.01	2.78	3.08	5.44	3.72	2.69	2.44	3.43	4.48	5.34	5.32
OP$_v^{AA}$ (nmol min^{-1} m^{-3})	Minimum	0.40	0.58	0.77	0.28	0.34	0.36	0.04	0.07	0.18	0.90	0.13	1.08
	25th percentile	1.67	1.39	1.29	0.72	0.82	1.03	0.65	0.37	0.45	1.79	1.56	2.98
	Median	2.16	1.88	1.76	1.01	1.12	1.47	0.96	0.48	0.89	2.16	2.17	3.73
	75th percentile	3.34	2.56	2.07	1.27	1.67	1.78	1.46	0.60	1.12	2.71	3.16	4.53
	Maximum	11.43	5.57	3.51	7.55	5.58	5.75	3.75	2.04	3.99	3.48	8.42	6.09

Note: *PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm; OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay; OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay.*

Table S3. *Comparison of the distribution of personal measurements of PM$_{2.5}$, OP$_v^{DTT}$ and OP$_v^{AA}$ during each week of sampling, and their average.*

Exposure	Trimester	Minimum	25th percentile	Median	75th percentile	Maximum
PM$_{2.5}$ (μg m^{-3})	early pregnancy	4.30	9.70	13.85	18.85	51.10
	late pregnancy	4.20	9.78	12.75	17.32	77.60
	average	5.25	11.36	13.75	17.46	46.70
OP$_v^{DTT}$ (nmol min^{-1} m^{-3})	early pregnancy	0.18	1.05	1.46	1.97	4.22
	late pregnancy	0.13	1.01	1.44	2.08	6.09
	average	0.57	1.17	1.52	2.00	3.79
OP$_v^{AA}$ (nmol min^{-1} m^{-3})	early pregnancy	0.04	0.83	1.52	2.19	11.43
	late pregnancy	0.07	0.87	1.48	2.33	7.86
	average	0.27	1.17	1.61	2.22	6.60

Note: *PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm; OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay; OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay.*

Table S4. Sensitivity analyses of the associations between prenatal exposure to air pollution and lung function at 6 weeks. Regression coefficients are estimated from multiple linear models.

Pollutants	Regression model	FRC (mL) Coefficients (95% CI)	N	LCI Coefficients (95% CI)	N	V_T (mL) Coefficients (95% CI)	N	t_{PTEF}/t_E (%) Coefficients (95% CI)	N
PM$_{2.5}$ (µg m^{-3})	Complete Cases	-1.54 (-3.69, 0.60)	262	-0.01 (-0.15, 0.13)	262	-0.66 (-1.51, 0.19)	285	0.30 (-0.99, 1.59)	285
	Main model	-1.58 (-3.67, 0.50)	284	-0.01 (-0.14, 0.13)	284	-0.54 (-1.35, 0.28)	309	0.25 (-1.02, 1.51)	309
	2 sampling periods	-1.58 (-4.23, 1.07)	178	-0.01 (-0.20, 0.17)	178	-0.64 (-1.74, 0.45)	204	0.11 (-1.67, 1.89)	204
	Excluding extreme values	-0.71 (-2.96, 1.53)	270	0.05 (-0.10, 0.20)	271	0.03 (-0.89, 0.95)	293	0.00 (-1.34, 1.34)	293
	Adjusted on NO$_2$	-1.56 (-3.67, 0.55)	284	-0.02 (-0.15, 0.12)	284	0.31 (-0.96, 1.59)	309	-0.56 (-1.39, 0.27)	309
	Cook's distance	-1.97 (-3.56, -0.38)	266	0.04 (-0.08, 0.16)	262	-0.22 (-0.97, 0.53)	290	-0.5 (-1.6, 0.59)	295
	Excluding high degrees of hypoventilation	-1.09 (-3.45, 1.27)	212	0.04 (-0.12, 0.20)	212	/	/	/	/
OP$_v$^{DTT} (nmol min^{-1} m^{-3})	Complete Cases	-2.65 (-5.16, -0.14)	262	-0.06 (-0.22, 0.10)	262	-0.64 (-1.66, 0.37)	285	0.71 (-0.84, 2.25)	285
	Main model	-2.26 (-4.68, 0.15)	284	-0.06 (-0.22, 0.09)	284	-0.58 (-1.54, 0.38)	309	0.69 (-0.79, 2.17)	309
	2 sampling periods	-2.15 (-5.60, 1.30)	178	0.03 (-0.21, 0.27)	178	-0.83 (-2.22, 0.55)	204	0.51 (-1.74, 2.76)	204
	Excluding extreme values	-1.8 (-4.16, 0.56)	272	-0.02 (-0.19, 0.14)	272	-0.03 (-1.02, 0.96)	296	0.68 (-0.78, 2.15)	296
	Adjusted on NO$_2$	-2.24 (-4.67, 0.19)	284	-0.07 (-0.23, 0.09)	284	-0.60 (-1.57, 0.37)	309	0.75 (-0.74, 2.24)	309
	Cook's distance	-2.19 (-4.11, -0.27)	263	-0.06 (-0.20, 0.08)	263	-0.37 (-1.24, 0.49)	291	0.61 (-0.66, 1.87)	296
	Excluding high degrees of hypoventilation	-1.91 (-4.49, 0.68)	212	-0.03 (-0.20, 0.15)	212	/	/	/	/
OP$_v$^{AA} (nmol min^{-1} m^{-3})	Complete Cases	-0.70 (-3.03, 1.63)	262	-0.06 (-0.21, 0.09)	262	0.09 (-0.83, 1.02)	285	0.13 (-1.27, 1.54)	285
	Main model	-0.59 (-2.85, 1.68)	284	-0.05 (-0.19, 0.10)	284	0.13 (-0.76, 1.02)	309	0.14 (-1.23, 1.51)	309
	2 sampling periods	-1.24 (-4.33, 1.84)	178	0.01 (-0.21, 0.23)	178	-0.31 (-1.58, 0.95)	204	-0.34 (-2.39, 1.72)	204
	Excluding extreme values	0.73 (-1.83, 3.28)	271	0.01 (-0.16, 0.18)	271	0.84 (-0.18, 1.85)	295	-0.53 (-2.06, 1.00)	294
	Adjusted on NO$_2$	-0.55 (-2.83, 1.72)	284	-0.05 (-0.20, 0.09)	284	0.12 (-0.77, 1.01)	309	0.18 (-1.20, 1.55)	309
	Cook's distance	-0.43 (-2.35, 1.48)	266	-0.03 (-0.17, 0.10)	265	0.59 (-0.24, 1.43)	292	0.25 (-0.97, 1.46)	296
	Excluding high degrees of hypoventilation	-0.92 (-3.19, 1.34)	212	-0.06 (-0.21, 0.09)	212	/	/	/	/

Note: Coefficients are calculated for an increase of one IQR for PM$_{2.5}$, OP$_v$^{DTT} and OP$_v$^{AA}, corresponding to 6.9 µg m^{-3}, 0.89 nmol min^{-1} m^{-3}, and 1.14 nmol min^{-1} m^{-3}, respectively. FRC, functional residual capacity; LCI, lung clearance index; V_T, tidal volume; t_{PTEF}/t_E ratio of time to peak tidal expiratory flow to expiratory time; PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 µm; OP$_v$^{AA}, volume-normalised oxidative potential measured by the AA assay; OP$_v$^{DTT}, volume-normalised oxidative potential measured by the DTT assay.

Table S5. Sensitivity analyses of the associations between prenatal exposure to air pollution and lung function at 3 years. Regression coefficients are estimated from multiple linear models.

Pollutants	Regression model	Rrs$_7$ (hPa.s/L) Coefficients (95% CI)	N	Rrs$_{7-19}$ (hPa.s/L) Coefficients (95% CI)	N	Xrs$_7$ (hPa.s/L) Coefficients (95% CI)	N	AX (hPa/L) Coefficients (95% CI)	N
PM$_{2.5}$ (µg m^{-3})	Complete Cases	-0.01 (-0.33, 0.31)	235	0.02 (-0.13, 0.17)	235	0.01 (-0.15, 0.18)	235	0.36 (-4.82, 5.53)	235
	Main model	-0.02 (-0.33, 0.30)	248	0.02 (-0.13, 0.16)	248	0.01 (-0.15, 0.17)	248	0.22 (-4.81, 5.25)	248
	2 sampling periods	0.1 (-0.35, 0.55)	151	0.05 (-0.17, 0.26)	151	-0.01 (-0.24, 0.22)	151	1.62 (-5.42, 8.66)	151
	Excluding extreme values	-0.01 (-0.32, 0.29)	238	0.04 (-0.1, 0.18)	239	-0.02 (-0.18, 0.14)	238	-1.05 (-6.03, 3.92)	238
	Adjusted on NO$_2$	0.03 (-0.29, 0.35)	248	0.04 (-0.11, 0.18)	248	0.00 (-0.16, 0.16)	248	1.03 (-4.03, 6.09)	248
	Cook's distance	-0.07 (-0.35, 0.21)	232	0.04 (-0.07, 0.16)	233	-0.05 (-0.17, 0.08)	235	-0.50 (-4.81, 3.80)	237
OP$_v$^{DTT} (nmol min^{-1} m^{-3})	Complete Cases	0.03 (-0.3, 0.36)	235	0.09 (-0.06, 0.25)	235	-0.06 (-0.22, 0.11)	235	0.99 (-4.38, 6.35)	235
	Main model	0.05 (-0.28, 0.37)	248	0.09 (-0.06, 0.24)	248	-0.05 (-0.22, 0.11)	248	1.07 (-4.08, 6.22)	248
	2 sampling periods	0.19 (-0.36, 0.74)	151	0.12 (-0.14, 0.38)	151	-0.13 (-0.41, 0.15)	151	1.48 (-7.15, 10.11)	151
	Excluding extreme values	0.1 (-0.25, 0.45)	235	0.20 (0.04, 0.36)	235	-0.10 (-0.28, 0.08)	236	0.14 (-5.53, 5.81)	235
	Adjusted on NO$_2$	0.06 (-0.26, 0.39)	248	0.10 (-0.05, 0.25)	248	-0.06 (-0.22, 0.10)	248	1.33 (-3.78, 6.45)	248
	Cook's distance	0.15 (-0.13, 0.43)	233	0.16 (0.04, 0.29)	233	-0.09 (-0.21, 0.04)	235	0.38 (-4.04, 4.8)	237
OP$_v$^{AA} (nmol min^{-1} m^{-3})	Complete Cases	-0.12 (-0.46, 0.22)	235	0.12 (-0.04, 0.27)	235	-0.06 (-0.23, 0.11)	235	-2.35 (-7.78, 3.07)	235
	Main model	-0.08 (-0.41, 0.25)	248	0.12 (-0.04, 0.27)	248	-0.07 (-0.23, 0.10)	248	-2.21 (-7.48, 3.07)	248
	2 sampling periods	0.23 (-0.29, 0.75)	151	0.25 (0, 0.49)	151	-0.25 (-0.52, 0.01)	151	0.87 (-7.33, 9.06)	151
	Excluding extreme values	0.03 (-0.33, 0.4)	238	0.16 (-0.02, 0.33)	237	-0.03 (-0.22, 0.16)	237	-4.28 (-10.19, 1.63)	237
	Adjusted on NO$_2$	-0.08 (-0.41, 0.25)	248	0.12 (-0.03, 0.27)	248	-0.07 (-0.23, 0.10)	248	-2.16 (-7.39, 3.07)	248
	Cook's distance	0.01 (-0.28, 0.29)	233	0.17 (0.05, 0.29)	234	-0.1 (-0.23, 0.03)	235	-3.55 (-8.54, 1.44)	236

Note: Coefficients are calculated for an increase of one IQR for PM$_{2.5}$, OP$_v$^{DTT} and OP$_v$^{AA}, corresponding to 6.9 µg m^{-3}, 0.89 nmol min^{-1} m^{-3}, and 1.14 nmol min^{-1} m^{-3}, respectively. PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 µm; OP$_v$^{AA}, volume-normalised oxidative potential measured by the AA assay; OP$_v$^{DTT}, volume-normalised oxidative potential measured by the DTT assay; Rrs$_7$, resistance at a frequency of 7 Hz; Rrs$_{7-19}$, difference between the resistance at 7 Hz and at 19 Hz; Xrs$_7$, reactance at a frequency of 7 Hz; AX, area under the reactance curve.

Table S6. Results of the two-pollutant models for exposure to air pollution and lung function at 6 weeks.

	Single-pollutant model Coefficients (95% CI)[1]	Two-pollutant model (adjusted for exposures below)		
		$PM_{2.5}$ Coefficients (95% CI)[1]	OP_v^{DTT} Coefficients (95% CI)[1]	OP_v^{AA} Coefficients (95% CI)[1]
FRC (mL)				
$PM_{2.5}$	-1.58 (-3.67, 0.50)	--	-0.59 (-3.37, 2.19)	-1.74 (-4.10, 0.62)
OP_v^{DTT}	-2.26 (-4.68, 0.15)	-1.82 (-5.03, 1.40)	--	--
OP_v^{AA}	-0.59 (-2.85, 1.68)	0.27 (-2.27, 2.81)	--	--
LCI				
$PM_{2.5}$	-0.01 (-0.14, 0.13)	--	0.03 (-0.15, 0.21)	0.00 (-0.15, 0.15)
OP_v^{DTT}	-0.06 (-0.22, 0.09)	-0.09 (-0.29, 0.12)	--	--
OP_v^{AA}	-0.05 (-0.19, 0.10)	-0.05 (-0.21, 0.12)	--	--
V_T (mL)				
$PM_{2.5}$	-0.54 (-1.35, 0.28)	--	-0.22 (-1.29, 0.86)	-0.62 (-1.53, 0.29)
OP_v^{DTT}	-0.58 (-1.54, 0.38)	-0.41 (-1.67, 0.85)	--	--
OP_v^{AA}	0.13 (-0.76, 1.02)	0.43 (-0.56, 1.41)	--	--
t_{PTEF}/t_E (%)				
$PM_{2.5}$	0.25 (-1.02, 1.51)	--	-0.19 (-1.85, 1.47)	0.27 (-1.14, 1.68)
OP_v^{DTT}	0.69 (-0.79, 2.17)	0.83 (-1.11, 2.78)	--	--
OP_v^{AA}	0.14 (-1.23, 1.51)	0.01 (-1.51, 1.54)	--	--

Note: Coefficients are calculated for an increase of one IQR for $PM_{2.5}$, OP_v^{DTT} and OP_v^{AA}, corresponding to 6.9 µg m^{-3}, 0.89 nmol min^{-1} m^{-3}, and 1.14 nmol min^{-1} m^{-3}, respectively. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 µm; OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay; OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay; FRC, functional residual capacity; LCI, lung clearance index; V_T, tidal volume; t_{PTEF}/t_E ratio of time to peak tidal expiratory flow to expiratory time.

[1]adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy.
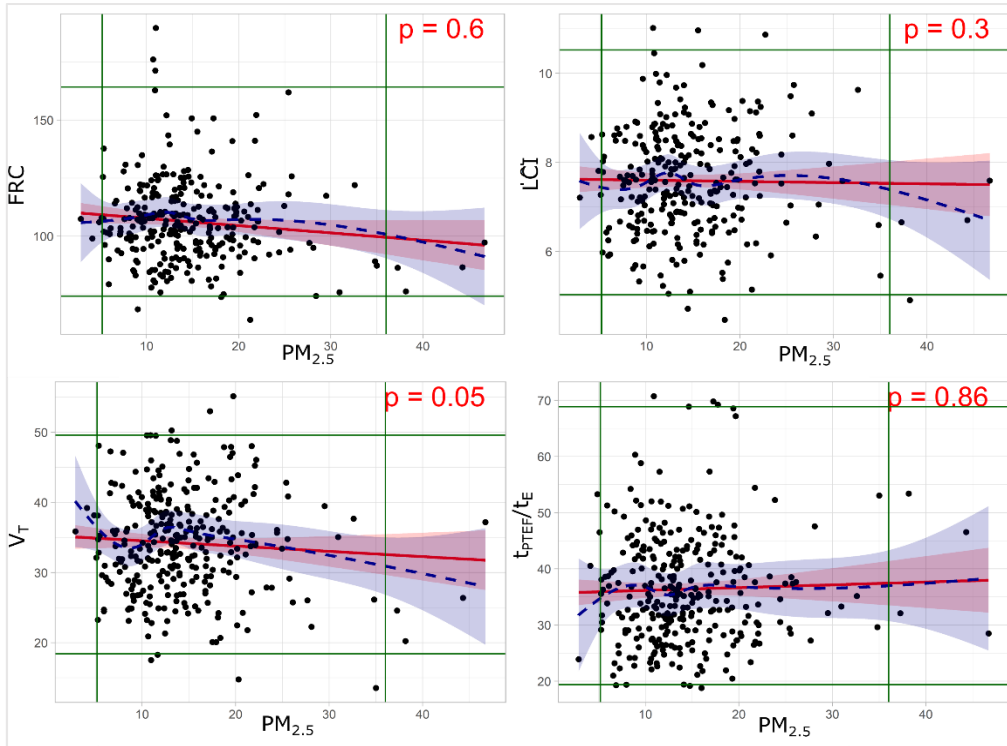
Table S7. Results of the two-pollutant models for exposure to air pollution and lung function at 3 years.

	Single-pollutant model Coefficients (95% CI)[1]	Two-pollutant model (adjusted for exposures below)		
		$PM_{2.5}$ Coefficients (95% CI)[1]	OP_v^{DTT} Coefficients (95% CI)[1]	OP_v^{AA} Coefficients (95% CI)[1]
Rrs_7 (hPa.s/L)				
$PM_{2.5}$	-0.02 (-0.33, 0.30)	--	-0.12 (-0.54, 0.30)	0.00 (-0.36, 0.37)
OP_v^{DTT}	0.05 (-0.28, 0.37)	0.13 (-0.3, 0.56)	--	--
OP_v^{AA}	-0.08 (-0.41, 0.25)	-0.08 (-0.46, 0.30)	--	--
Rrs_{7-19} (hPa.s/L)				
$PM_{2.5}$	0.02 (-0.13, 0.16)	--	-0.07 (-0.27, 0.13)	-0.05 (-0.22, 0.12)
OP_v^{DTT}	0.09 (-0.06, 0.24)	0.14 (-0.06, 0.34)	--	--
OP_v^{AA}	0.12 (-0.04, 0.27)	0.15 (-0.03, 0.33)	--	--
Xrs_7 (hPa.s/L)				
$PM_{2.5}$	0.01 (-0.15, 0.17)	--	0.08 (-0.13, 0.29)	0.06 (-0.13, 0.24)
OP_v^{DTT}	-0.05 (-0.22, 0.11)	-0.11 (-0.32, 0.11)	--	--
OP_v^{AA}	-0.07 (-0.23, 0.10)	-0.10 (-0.29, 0.10)	--	--
AX (hPa/L)				
$PM_{2.5}$	0.22 (-4.81, 5.25)	--	-1.58 (-8.27, 5.10)	1.12 (-4.72, 6.96)
OP_v^{DTT}	1.07 (-4.08, 6.22)	2.13 (-4.71, 8.96)	--	--
OP_v^{AA}	-2.21 (-7.48, 3.07)	-2.80 (-8.91, 3.32)	--	--

Note: Coefficients are calculated for an increase of one IQR for $PM_{2.5}$, OP_v^{DTT} and OP_v^{AA}, corresponding to 6.9 µg m^{-3}, 0.89 nmol min^{-1} m^{-3}, and 1.14 nmol min^{-1} m^{-3}, respectively. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 µm; OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay; OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay; Rrs_7, resistance at a frequency of 7 Hz; Rrs_{7-19}, difference between the resistance at 7 Hz and at 19 Hz; Xrs_7, reactance at a frequency of 7 Hz; AX, area under the reactance curve.

[1]adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy.
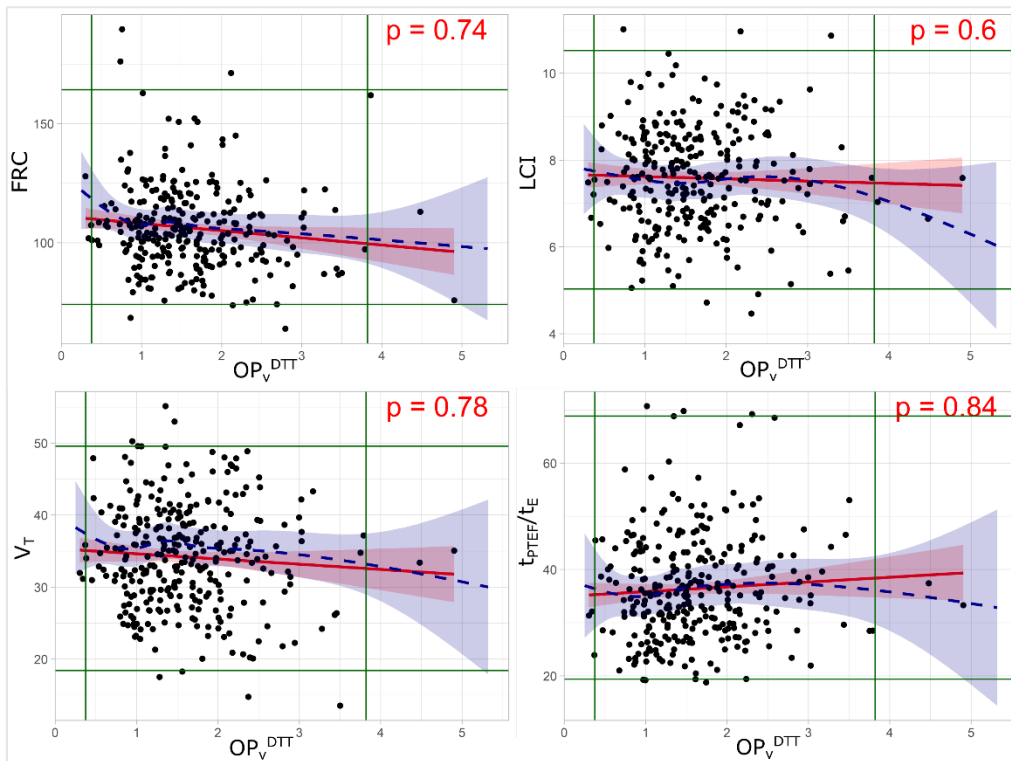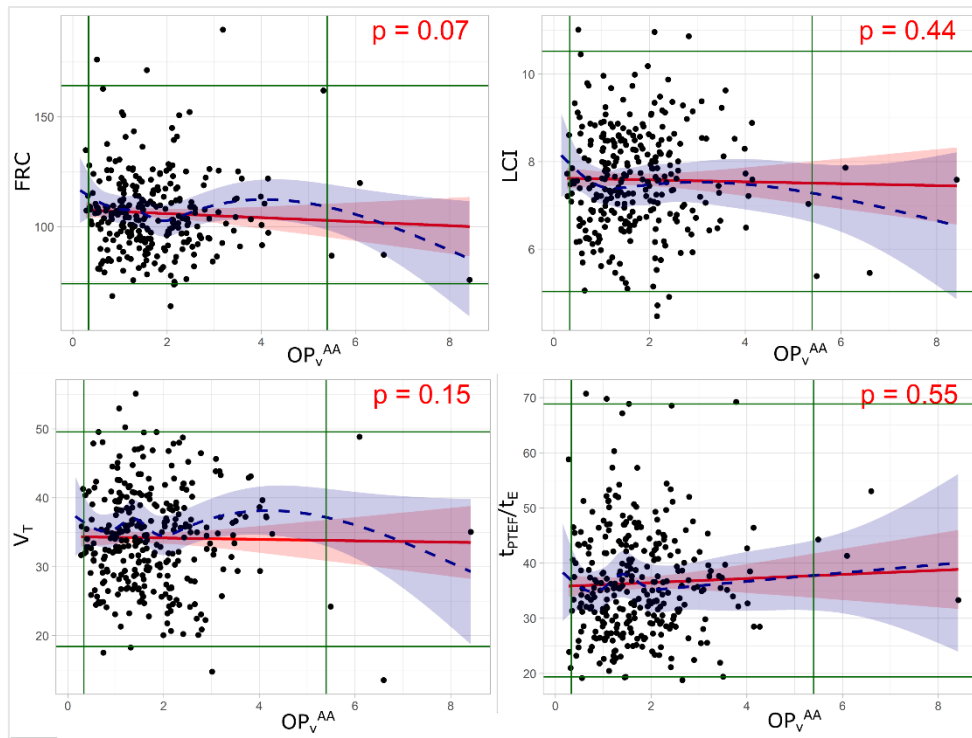
Figure S1. Test of linearity of the PM$_{2.5}$-lung function parameters at 6 weeks.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to PM$_{2.5}$ and lung function at 6 weeks. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.
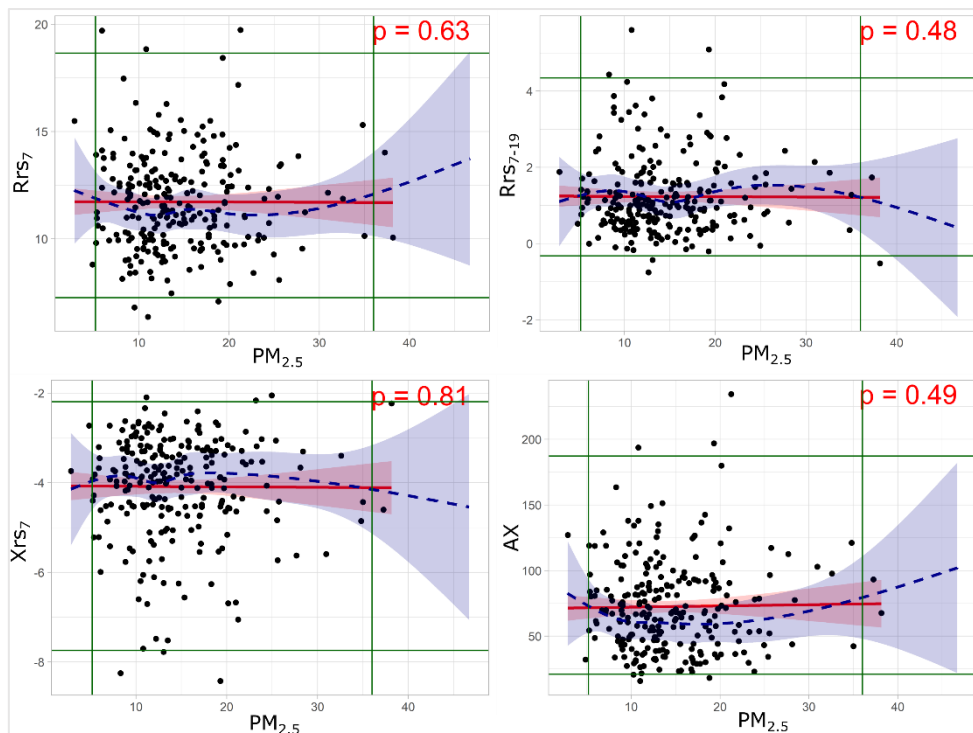

Figure S2. Test of linearity of the OP$_v^{DTT}$-lung function parameters at 6 weeks.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to OP$_v^{DTT}$ and lung function at 6 weeks. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.

Figure S3. Test of linearity of the OP_v^{AA}-lung function parameters at 6 weeks.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to OP_v^{AA} and lung function at 6 weeks. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.
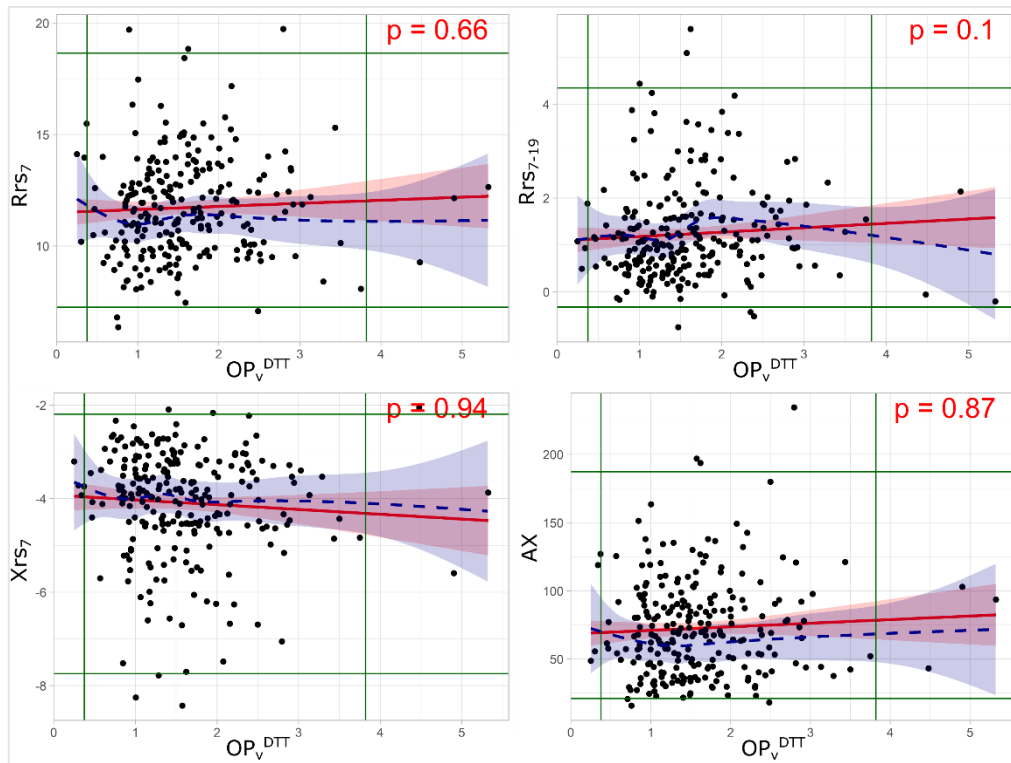

Figure S4. Test of linearity of the $PM_{2.5}$-lung function parameters at 3 years.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to $PM_{2.5}$ and lung function at 3 years. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.
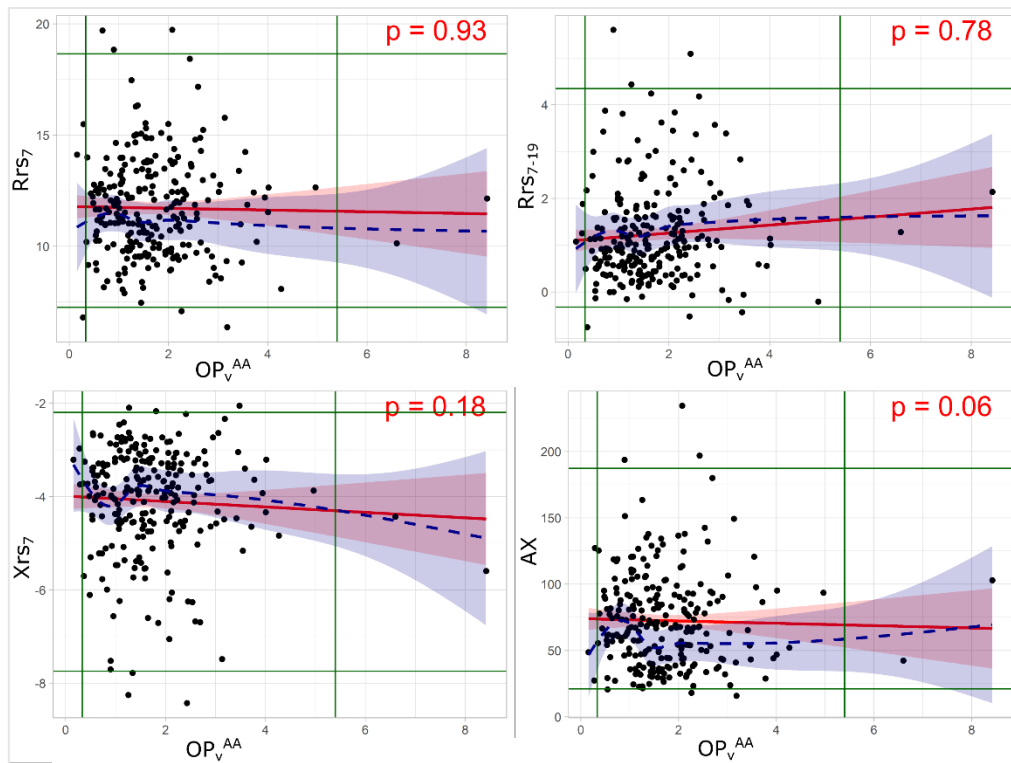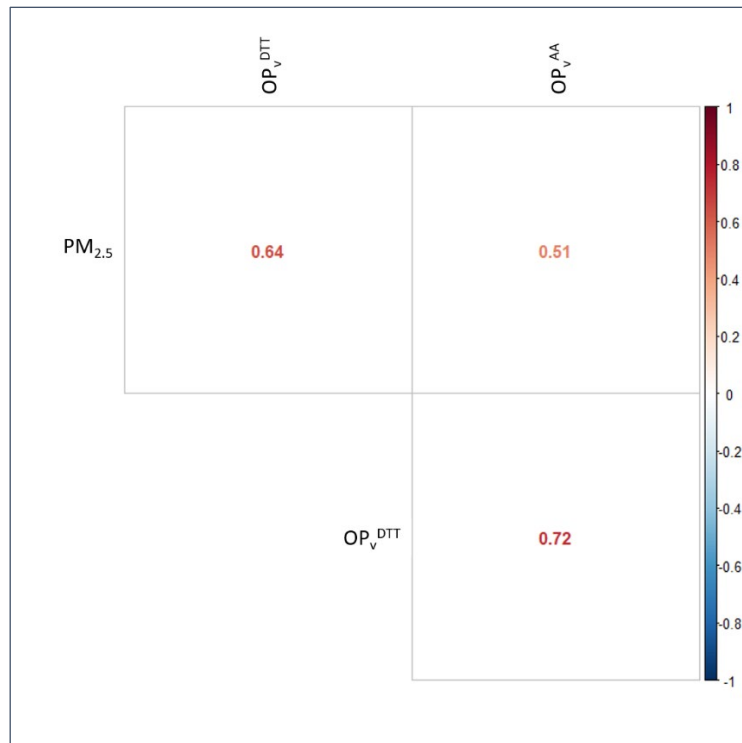
Figure S5. Test of linearity of the OP_v^{DTT}-lung function parameters at 3 years.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to OP_v^{DTT} and lung function at 3 years. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.

Figure S6. Test of linearity of the OP_v^{AA}-lung function parameters at 3 years.
Comparison of the adjusted linear model (red) and the adjusted model, modelling exposure as a natural spline with 5 degrees of freedom (blue dashed line), for exposure to OP_v^{AA} and lung function at 3 years. P-value is from the likelihood-ratio test. Summary table available in the Excel supplemental file. The green lines represent the thresholds for 1st and 99th percentile of outcome and exposure.

Figure S7. Spearman correlation coefficients between the exposures.
PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm; OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay; OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay
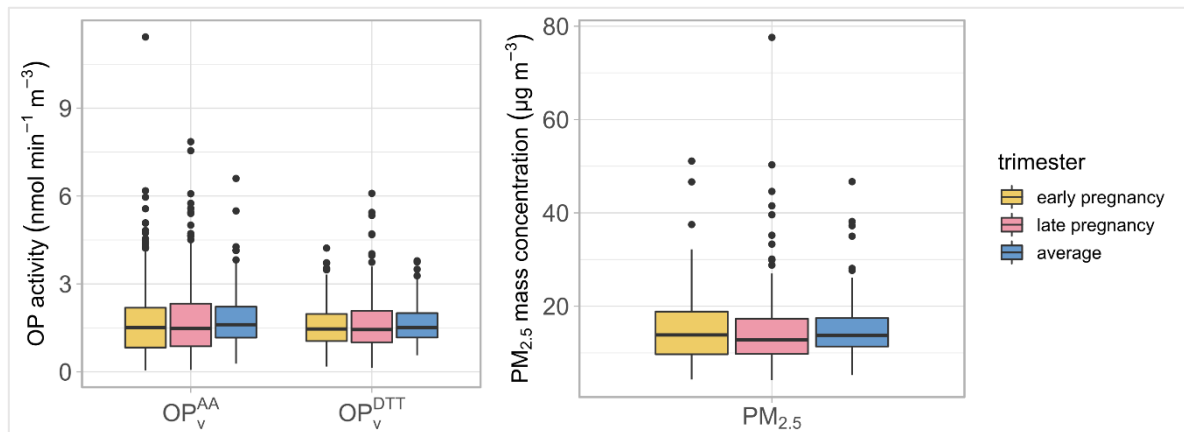

Figure S8. Comparison of the distribution of personal measurements of OP$_v^{AA}$ (left), OP$_v^{DTT}$ (center) and PM$_{2.5}$ (right) during each week of sampling, and their average. See Table S3 for corresponding numeric data.
Note: Boxes represent 25th to 75th percentiles, the middle horizontal line represents the median, whiskers extend to the most extreme point within 1.5 interquartile ranges of the box and the dots outside boxes indicate outliers. PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm; OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay; OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay.
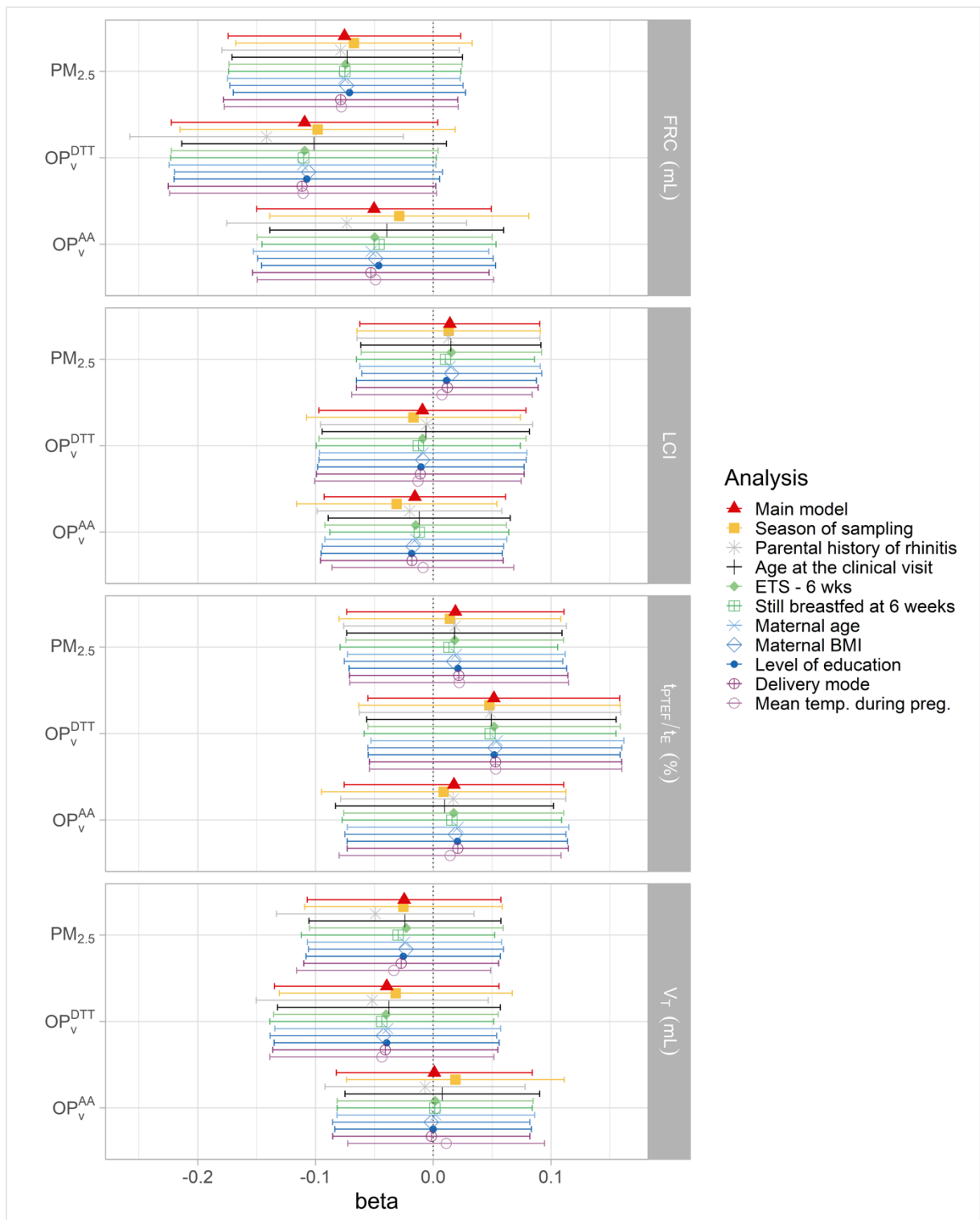
Figure S9. Effect of each confounder separately on the regression models at 6 weeks, adjusted for sex, height and weight, and comparison to the main model, adjusted on all the confounders listed.

Outcomes and exposures were scaled by their IQR. See Excel supplemental file for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm (μg m^{-3}); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay (nmol min^{-1} m^{-3}); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay (nmol min^{-1} m^{-3}); FRC, functional residual capacity; LCI, lung clearance index; V_T, tidal volume; t_{PTEF}/t_E ratio of time to peak tidal expiratory flow to expiratory time.
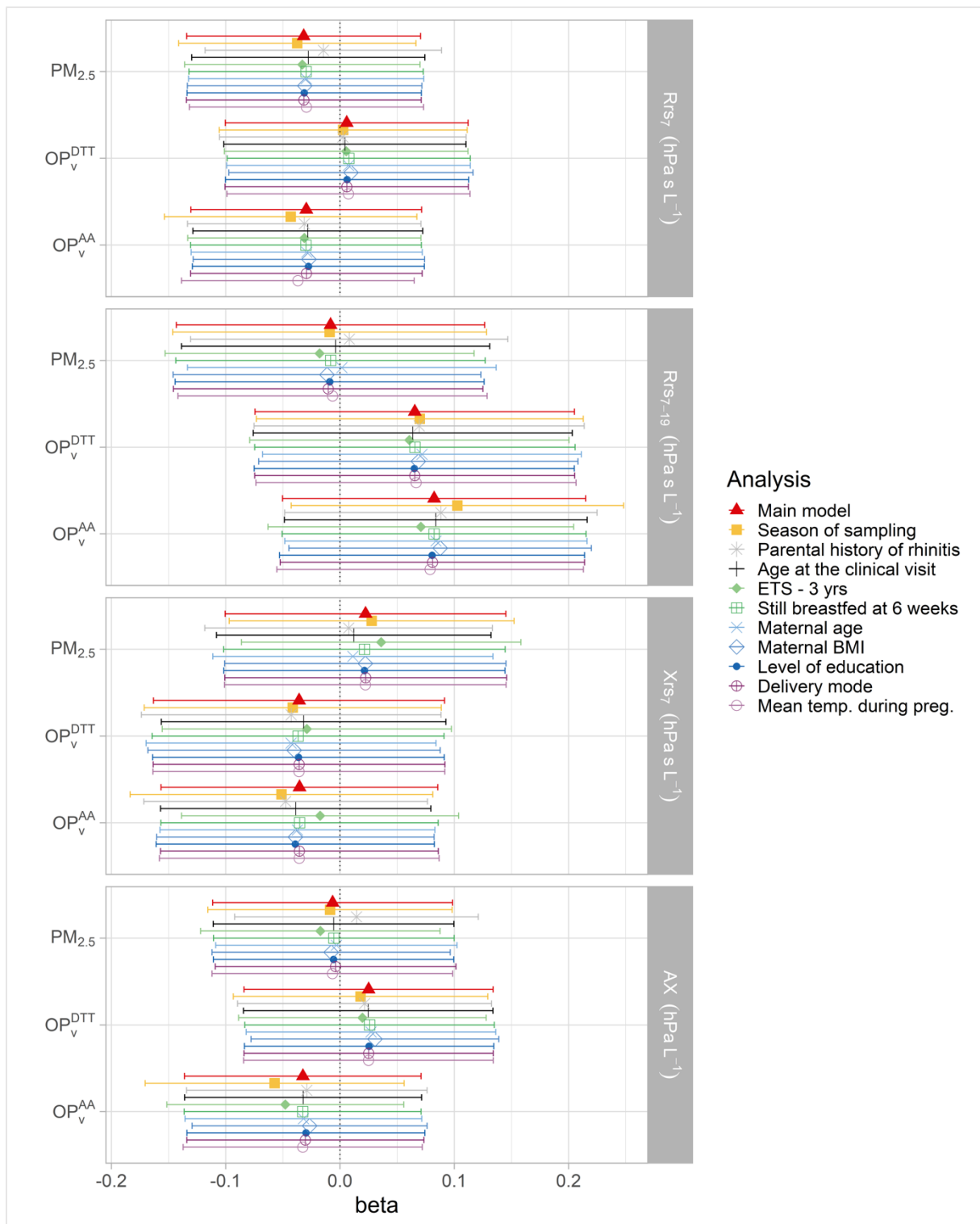
Figure S10. Effect of each confounder separately on the regression models at 3 years, adjusted for sex, height and weight, and comparison to the main model, adjusted on all the confounders listed.

Outcomes and exposures were scaled by their IQR. See Table S3 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. $PM_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm (μg m^{-3}); OP_v^{DTT}, volume-normalised oxidative potential measured by the DTT assay (nmol min^{-1} m^{-3}); OP_v^{AA}, volume-normalised oxidative potential measured by the AA assay (nmol min^{-1} m^{-3}); Rrs_7, resistance at a frequency of 7 Hz; Rrs_{7-19}, difference between the resistance at 7 Hz and at 19 Hz; Xrs_7, reactance at a frequency of 7 Hz; AX, area under the reactance curve.
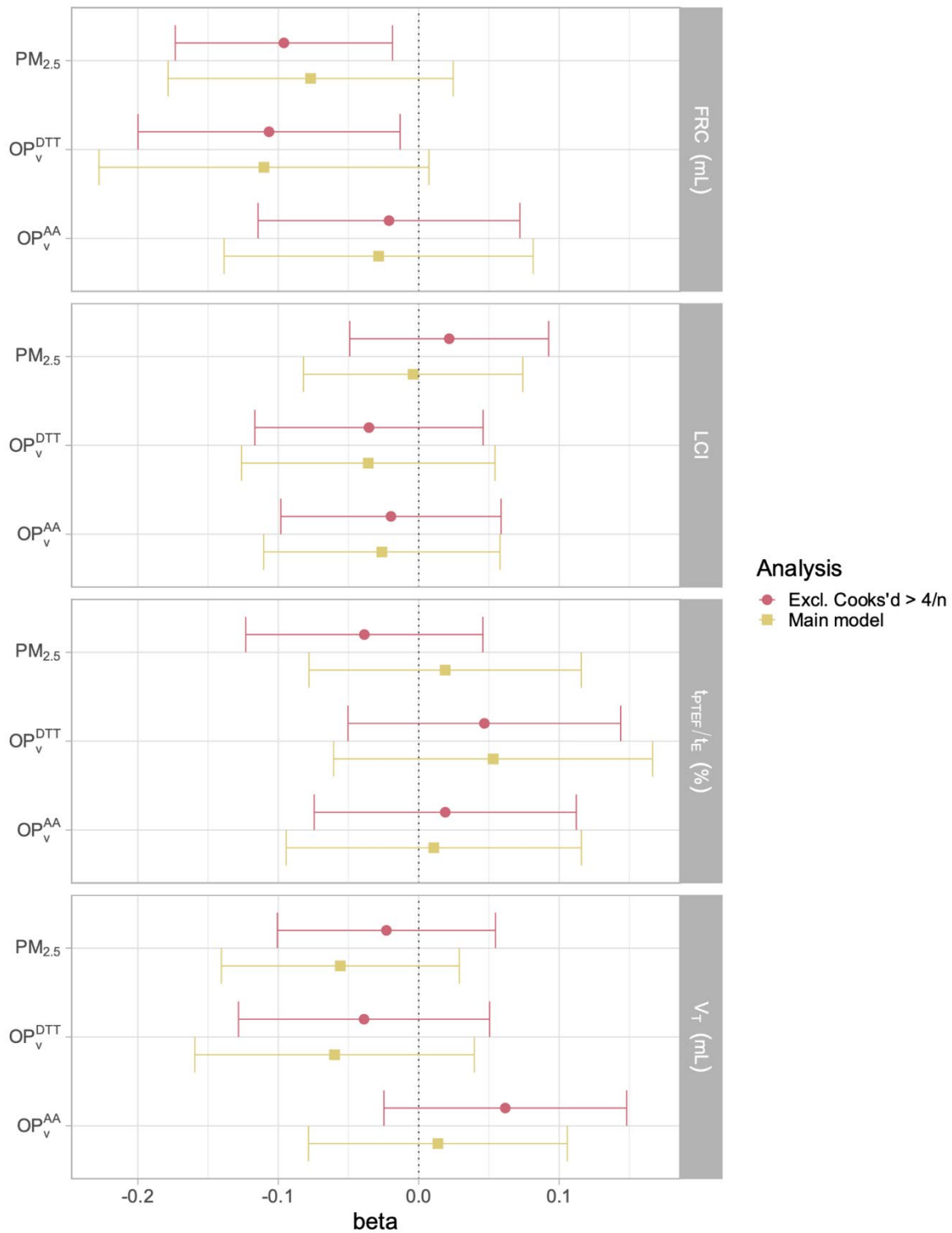
Figure S11. *Association between personal exposure to PM$_{2.5}$, OP$_v^{DTT}$ and OP$_v^{AA}$ during pregnancy and lung function parameters measured at 6 weeks in the multiple linear models and in the sensitivity analysis excluding leverage and influencing points, estimated by Cook's distance.*

Outcomes and exposures were scaled by their IQR. See Table S4 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. Models were adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy. PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm (μg m^{-3}); OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay (nmol min^{-1} m^{-3}); OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay (nmol min^{-1} m^{-3}); FRC, functional residual capacity; LCI, lung clearance index; V$_T$, tidal volume; t$_{PTEF}$/t$_E$ ratio of time to peak tidal expiratory flow to expiratory time.
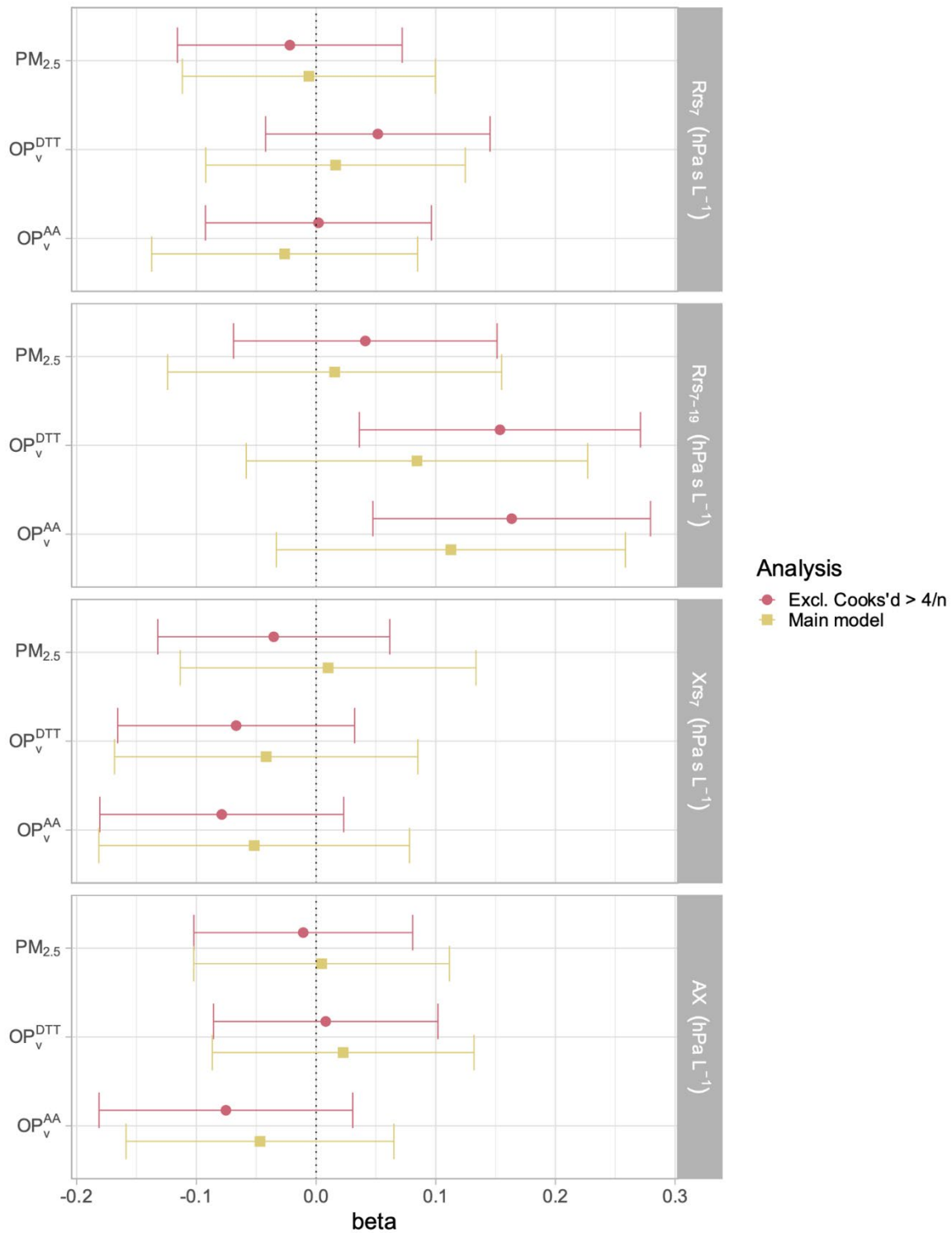
Figure S12. *Association between personal exposure to PM$_{2.5}$, OP$_v^{DTT}$ and OP$_v^{AA}$ during pregnancy and lung function parameters measured at 3 years in the multiple linear models and in the sensitivity analysis excluding leverage and influencing points, estimated by Cook's distance.*

Outcomes and exposures were scaled by their IQR. See Table S5 for corresponding numeric data. Whiskers represent the 95% confidence interval around the estimate. Model were adjusted on child's height, weight, sex, age, season of sampling, breastfeeding, environmental tobacco smoke, maternal age and BMI before pregnancy, parental level of education, parental history of rhinitis and mean temperature during pregnancy. PM$_{2.5}$, particulate matter with an aerodynamic diameter <2.5 μm (μg m^{-3}); OP$_v^{DTT}$, volume-normalised oxidative potential measured by the DTT assay (nmol min^{-1} m^{-3}); OP$_v^{AA}$, volume-normalised oxidative potential measured by the AA assay (nmol min^{-1} m^{-3}); Rrs$_7$, resistance at a frequency of 7 Hz; Rrs$_{7-19}$, difference between the resistance at 7 Hz and at 19 Hz; Xrs$_7$, reactance at a frequency of 7 Hz; AX, area under the reactance curve.