Supplemental material

Description of pollution measurement devices:

Particle size distribution (PSD) ranging from 3 nm to 10 µm was measured by a twin differential mobility particle sizer (TDMPS). The TDMPS consists of three sub-systems: 1) an Ultrafine Differential Mobility Analyser (UDMA) combined with an ultrafine Condensation Particle Counter (UCPC), which measures PSD from 3-20 nm; 2) a differential mobility analyser (DMA) combined with a Condensation Particle Counter (CPC), which measures PSD from 10-800 nm; and 3) an aerodynamic particle sizer (APS, Model 3321, TSI Inc., Shoreview, MN, U.S.), which measures PSD from 500 nm – 10 µm. The sub-systems overlap at certain size ranges. We merged the final PSD into 3 nm – 10 µm as our final data set.

Particle mass concentration of $PM_{2.5}$ and PM_{10} was measured by two independent Tapered Element Oscillating Microbalances (TEOM, model 1400ab, Thermo Fisher Scientific Inc., Waltham, MA, U.S.). For further details see (Pitz et al. 2008a). Particle density for $PM_{2.5}$ ($\rho 2.5$) and PM_{10} ($\rho 10$) was calculated as the ratio of the mass concentration and the corresponding volume concentration, assuming that particles were spherically shaped. For details see (Pitz et al. 2008b).

Table A. Confounder models for blood markers

Blood marker	Relative humidity	Barometric pressure	Air temperature	Trend	Else
hsCRP[a]	lag 1, linear	lag 3, linear	lag 3, smooth	smooth	--
MPO[b]	Lag 2 (3rd degree polynomial)	--	lag 4, linear	smooth	--
IL-6[c]	lag 1, linear	lag 3, linear	lag 4, linear	smooth	weekday
Fibrinogen	lag 4, linear	lag 0, cubic	lag 3, linear	smooth	weekday

a: high sensitivity C-reactive protein, b: myeloperoxidase, c: Interleukin-6

Table B1. Spearman correlation coefficients – all panels

	MPO	IL-6	Fibrinogen
CRP	0.19	0.49	0.51
MPO	1.0	0.13	0.18
IL-6		1.0	0.48

Table B2. Spearman correlation coefficients – genetically susceptible participants

	MPO	IL-6	Fibrinogen
CRP	0.13	0.42	0.44
MPO	1.0	-0.04	0.07
IL-6		1.0	0.40

Table B3. Spearman correlation coefficients – participants with IGT and diabetes

	MPO	IL-6	Fibrinogen
CRP	0.18	0.51	0.52
MPO	1.0	0.11	0.13
IL-6		1.0	0.45

Table C.1 Associations between air pollution and blood markers in the panel of genetically susceptible participants presented as % change from geometric mean per increase in IQR of air pollutant.

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
$NC^{b}_{3\text{-}10nm}$	0-23 h	2.9	-6.3	12.9	4.6#	-0.7	10.1	3.6	-2.6	10.1	0.6	-0.5	1.6
	24-47 h	0.9	-9.1	12.0	-3.8	-9.1	1.9	10.6*	3.0	18.7	0.1	-1.1	1.3
	48-71 h	2.0	-8.1	13.2	1.5	-4.2	7.5	-3.2	-9.5	3.7	0.8	-0.4	2.0
	72-95 h	10.3#	0.0	21.8	-3.5	-8.6	1.9	0.8	-5.7	7.8	0.5	-0.7	1.6
	96-119 h	9.8*	1.4	18.8	-1.1	-5.4	3.4	-4.7#	-9.5	0.5	-0.1	-1.1	0.9
	0-119 h	12.9*	0.7	26.6	-0.4	-6.5	6.1	4.9	-5.0	15.8	0.7	-0.6	2.0
$NC^{b}_{10\text{-}30nm}$	0-23 h	1.9	-5.5	9.8	3.9#	-0.4	8.4	-1.2	-5.9	3.6	0.0	-0.9	0.9
	24-47 h	3.6	-4.7	12.5	2.6	-1.7	7.0	1.4	-3.9	6.9	0.4	-0.5	1.3
	48-71 h	3.4	-5.5	13.1	2.6	-2.3	7.7	-7.1*	-12.3	-1.5	0.9#	-0.1	1.9
	72-95 h	13.1*	3.3	23.8	1.1	-3.7	6.2	0.3	-5.3	6.3	1.1*	0.0	2.2
	96-119 h	10.9*	1.4	21.3	-2.6	-7.5	2.5	-5.8*	-11.0	-0.4	-0.3	-1.4	0.8
	0-119 h	13.9*	2.6	26.5	3.6	-2.1	9.7	-6.8#	-13.9	0.9	0.8	-0.4	2.0
$NC^{b}_{30\text{-}50nm}$	0-23 h	-0.5	-7.0	6.5	2.8	-1.0	6.7	-3.4	-7.4	0.8	-0.1	-0.9	0.7
	24-47 h	3.7	-3.9	11.9	4.5*	0.5	8.6	-1.9	-6.5	3.0	0.8*	0.0	1.7
	48-71 h	4.2	-3.7	12.8	4.2#	-0.1	8.7	-6.4*	-10.9	-1.6	0.6	-0.2	1.5
	72-95 h	10.9*	2.2	20.4	3.3	-1.1	7.9	-1.1	-6.0	4.0	1.2*	0.2	2.1
	96-119 h	7.5	-1.4	17.2	0.3	-4.5	5.2	-5.6*	-10.4	-0.6	-0.1	-1.2	1.0
	0-119 h	10.2*	0.1	21.3	6.0	0.9	11.4	-10.4*	-16.1	-4.4	0.9#	-0.1	2.0
$NC^{b}_{50\text{-}100nm}$	0-23 h	0.4	-5.9	7.1	2.6	-1.0	6.2	-4.0*	-7.8	-0.1	0.1	-0.6	0.8
	24-47 h	4.3	-2.5	11.7	4.1*	0.4	7.8	-3.3	-7.4	1.0	0.8*	0.0	1.5
	48-71 h	6.6#	-0.8	14.6	5.3*	1.4	9.4	-5.3*	-9.4	-1.0	0.5	-0.3	1.2
	72-95 h	9.6*	1.8	18.0	3.1	-0.8	7.3	-0.8	-5.2	3.7	1.0*	0.1	1.8
	96-119 h	4.5	-3.6	13.3	2.3	-2.1	6.9	-4.2*	-8.7	0.5	0.3	-0.7	1.2
	0-119 h	9.9*	1.4	19.1	5.8*	1.6	10.1	-9.2*	-14.0	-4.2	0.8#	0.0	1.7
Particle density $PM_{2.5}$	0-23 h	9.2	-9.4	31.7	-5.2	-12.6	2.9	0.8	-11.7	15.1	-0.1	-1.8	1.7
	24-47 h	6.7	-11.4	28.5	-11.5*	-18.6	-3.7	6.9	-6.0	21.7	-0.1	-1.9	1.8
	48-71 h	-6.3	-21.7	12.1	-12.3*	-19.6	-4.4	5.4	-6.3	18.5	-0.5	-2.1	1.2
	72-95 h	-6.9	-21.3	10.2	-9.3#	-17.8	0.0	-6.7	-18.0	6.2	-1.5	-3.2	0.3
	96-119 h	0.0	-17.0	20.4	-7.9#	-16.0	1.0	10.5	-4.4	27.8	-0.9	-2.7	0.9
	0-119 h	-8.1	-22.6	9.0	-12.5*	-19.5	-5.0	4.1	-9.9	20.3	-0.8	-2.4	0.8
Particle density PM_{10}	0-23 h	18.8*	5.3	33.9	-3.4	-9.2	2.8	1.7	-7.1	11.3	-0.1	-1.4	1.2
	24-47 h	10.2	-2.8	24.9	-2.6	-8.3	3.5	-3.9	-11.6	4.5	-0.5	-1.8	0.8
	48-71 h	1.7	-10.5	15.6	-5.5#	-11.0	0.4	1.3	-7.5	10.9	-0.3	-1.5	0.9
	72-95 h	5.2	-7.3	19.2	-5.1	-11.1	1.3	-7.3	-15.4	1.5	-1.4*	-2.7	-0.1
	96-119 h	9.9	-2.7	24.3	2.7	-3.8	9.7	1.5	-7.4	11.3	-0.6	-1.8	0.7
	0-119 h	11.9	-3.9	30.3	-7.7*	-14.3	-0.6	-3.2	-13.8	8.8	-0.7	-2.1	0.8

a: particulate matter with aerodynamic diameter<=2.5µm, b: particulate matter with aerodynamic diameter<=10µm,
c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6; f: confidence interval, $p<0.05$ #$p<0.1$

Table C.2. Associations between air pollution and blood markers in the panel of genetically susceptible participants presented as % change from geometric mean per increase in IQR of air pollutant.

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
LC(EAD) [a]	0-23 h	17.8*	7.2	29.4	7.5*	2.7	12.6	-5.8*	-11.2	-0.2	-1.0#	-2.0	0.0
	24-47 h	22.9*	11.4	35.5	6.7*	1.8	11.8	-3.1	-8.9	3.1	-0.3	-1.3	0.7
	48-71 h	25.5*	14.0	38.2	6.0*	1.2	11.0	-4.9	-10.5	1.1	-0.2	-1.2	0.9
	72-95 h	24.4*	12.5	37.4	5.2*	0.3	10.4	-2.7	-8.4	3.4	0.3	-0.8	1.4
	96-119 h	20.0*	8.5	32.7	2.7	-2.4	8.0	-7.2*	-12.6	-1.3	-0.4	-1.5	0.7
	0-119 h	34.6*	21.8	48.8	8.3*	3.2	13.6	-9.2*	-15.4	-2.5	-0.5	-1.5	0.6
$LC^{b}_{10\text{-}800nm}$	0-23 h	1.4	-4.9	8.1	3.4#	-0.1	7.0	-4.2*	-8.0	-0.3	0.2	-0.6	0.9
	24-47 h	5.4	-1.5	12.8	4.3*	0.7	8.1	-3.2	-7.4	1.1	0.7*	0.0	1.4
	48-71 h	6.8#	-0.6	14.9	4.5*	0.7	8.5	-5.8*	-10.0	-1.5	0.5	-0.3	1.2
	72-95 h	9.5*	1.7	17.9	3.1	-0.9	7.3	-0.7	-5.2	4.0	0.9*	0.1	1.8
	96-119 h	4.6	-3.3	13.3	1.8	-2.5	6.3	-4.2#	-8.6	0.4	0.4	-0.5	1.4
	0-119 h	10.8*	1.8	20.7	5.7*	1.3	10.3	-9.2*	-14.2	-3.8	0.9#	0.0	1.8
$LC^{b}_{3\text{-}10nm}$	0-23 h	2.4	-5.5	11.1	4.0#	-0.6	8.8	2.8	-2.6	8.5	0.6	-0.4	1.5
	24-47 h	0.2	-8.5	9.6	-2.8	-7.4	2.1	8.2*	1.7	15.1	0.2	-0.8	1.2
	48-71 h	0.8	-8.2	10.8	1.5	-3.6	6.9	-3.5	-9.3	2.6	1.0#	-0.1	2.1
	72-95 h	7.4	-1.7	17.4	-2.8	-7.3	1.9	1.3	-4.4	7.3	0.5	-0.5	1.5
	96-119 h	7.6*	0.3	15.4	-1.3	-5.1	2.7	-4.1#	-8.5	0.4	-0.1	-1.0	0.7
	0-119 h	12.2#	-1.0	27.2	-0.3	-6.9	6.9	4.8	-5.9	16.6	0.9	-0.5	2.3
$LC^{b}_{10\text{-}30nm}$	0-23 h	1.6	-5.0	8.6	3.5#	-0.4	7.5	-1.4	-5.6	2.9	-0.1	-0.8	0.7
	24-47 h	3.4	-4.0	11.4	2.6	-1.2	6.6	0.9	-3.8	5.8	0.4	-0.4	1.2
	48-71 h	3.3	-4.6	11.9	2.5	-1.8	7.0	-6.4*	-11.1	-1.5	0.8#	-0.1	1.6
	72-95 h	12.0*	3.3	21.5	1.5	-2.9	6.0	0.1	-4.9	5.4	1.0*	0.1	2.0
	96-119 h	10.0*	1.4	19.3	-2.2	-6.6	2.5	-5.4*	-10.0	-0.4	-0.3	-1.3	0.8
	0-119 h	12.9*	2.6	24.2	3.8	-1.4	9.2	-7.1*	-13.5	-0.3	0.7	-0.3	1.8
$LC^{b}_{30\text{-}50nm}$	0-23 h	-0.6	-7.7	7.1	3.0	-1.1	7.3	-3.7	-8.1	0.8	-0.1	-0.9	0.8
	24-47 h	4.0	-4.3	13.1	4.9*	0.5	9.5	-2.1	-7.2	3.2	0.9*	0.0	1.8
	48-71 h	4.7	-4.0	14.1	4.7#	0.0	9.6	-6.9*	-11.8	-1.7	0.7	-0.2	1.6
	72-95 h	11.8*	2.3	22.3	3.6	-1.2	8.7	-1.2	-6.5	4.4	1.3*	0.2	2.3
	96-119 h	8.0	-1.7	18.7	0.4	-4.8	5.8	-6.1*	-11.3	-0.6	-0.1	-1.3	1.1
	0-119 h	10.2#	0.0	21.6	6.1*	0.9	11.6	-10.6*	-16.4	-4.5	0.9#	-0.1	2.0
$LC^{b}_{50\text{-}100nm}$	0-23 h	0.6	-5.9	7.5	2.7	-1.0	6.4	-4.2*	-8.1	-0.1	0.1	-0.7	0.9
	24-47 h	4.6	-2.5	12.2	4.2*	0.4	8.1	-3.4	-7.6	1.0	0.8#	0.0	1.5
	48-71 h	7.0#	-0.7	15.2	5.6*	1.5	9.8	-5.4*	-9.7	-1.0	0.5	-0.3	1.3
	72-95 h	9.9*	1.9	18.6	3.3	-0.8	7.6	-0.8	-5.3	3.9	1.0*	0.1	1.9
	96-119 h	4.6	-3.7	13.7	2.5	-2.1	7.2	-4.3#	-8.9	0.5	0.3	-0.7	1.3
	0-119 h	10.7*	1.6	20.5	6.2*	1.7	10.8	-9.7*	-14.7	-4.4	0.8#	-0.1	1.7

a: particle length of particles between 10 and 1000nm (aerodynamic diameter) measured by EAD; b: length concentration of particles with 10-800, 3-100, 3-10nm, 10-30nm, 30-50nm and 50-100nm of aerodynamic diameter, respectively, measured by SMPS, c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6, f: confidence interval *p<0.05; #p<0.1

Table C.3. Associations between air pollution and blood markers in the panel of genetically susceptible participants presented as % change from geometric mean per increase in IQR of air pollutant.

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
SC(DCPS)[a]	0-23 h	8.6*	0.1	17.9	5.2*	1.0	9.7	-5.8*	-10.4	-1.0	-0.4	-1.3	0.5
	24-47 h	14.2*	4.9	24.2	6.0*	1.5	10.7	-3.2	-8.1	2.0	0.2	-0.7	1.2
	48-71 h	15.7*	6.5	25.8	5.6*	1.2	10.2	-4.4#	-9.2	0.7	0.1	-0.8	1.0
	72-95 h	19.3*	9.3	30.2	5.1*	0.4	10.0	0.5	-4.7	6.1	0.6	-0.4	1.6
	96-119 h	11.5*	1.9	22.0	4.0	-0.8	9.0	-5.7*	-10.6	-0.5	-0.2	-1.1	0.8
	0-119 h	29.8*	15.9	45.3	10.4*	4.4	16.7	-9.9*	-16.5	-2.9	0.2	-1.0	1.4
$SC^{b}_{10\text{-}800nm}$	0-23 h	1.6	-4.9	8.4	3.6*	0.1	7.2	-4.7*	-8.6	-0.7	0.2	-0.5	0.9
	24-47 h	5.7	-1.2	13.2	4.2*	0.6	7.9	-3.8#	-8.0	0.5	0.7#	0.0	1.4
	48-71 h	7.4#	-0.2	15.7	4.2*	0.3	8.1	-5.6*	-9.9	-1.2	0.4	-0.4	1.2
	72-95 h	8.5*	0.6	17.1	3.0	-1.1	7.3	-1.1	-5.8	3.8	0.9*	0.0	1.7
	96-119 h	3.0	-4.3	10.9	2.0	-2.0	6.2	-3.0	-7.3	1.5	0.6	-0.2	1.5
	0-119 h	9.2*	0.8	18.3	4.9*	0.9	9.1	-7.7*	-12.5	-2.7	0.8#	0.0	1.6
$SC^{b}_{3\text{-}10nm}$	0-23 h	2.7	-6.4	12.6	4.5#	-0.7	10.1	2.7	-3.4	9.3	0.6	-0.4	1.7
	24-47 h	-0.1	-9.8	10.6	-2.7	-7.9	2.8	8.3*	1.0	16.0	0.2	-0.9	1.4
	48-71 h	0.5	-9.8	11.9	1.8	-4.0	8.1	-4.6	-11.2	2.5	1.3*	0.0	2.5
	72-95 h	8.4	-1.9	19.9	-2.9	-8.0	2.6	1.8	-4.7	8.7	0.6	-0.5	1.7
	96-119 h	8.4#	0.0	17.6	-1.8	-6.2	2.7	-4.7#	-9.7	0.5	-0.2	-1.2	0.8
	0-119 h	9.7#	-1.5	22.3	-0.1	-5.9	6.0	3.5	-5.6	13.4	0.8	-0.4	2.1
$SC^{b}_{10\text{-}30nm}$	0-23 h	1.6	-5.8	9.7	4.0#	-0.4	8.6	-1.9	-6.5	3.0	-0.1	-1.0	0.8
	24-47 h	4.1	-4.3	13.2	3.3	-1.0	7.9	0.7	-4.6	6.3	0.5	-0.4	1.4
	48-71 h	4.0	-5.0	13.8	3.0	-1.9	8.1	-7.3*	-12.5	-1.8	0.8#	-0.1	1.8
	72-95 h	14.1*	4.0	25.2	2.1	-2.8	7.3	-0.1	-5.8	6.0	1.2*	0.1	2.3
	96-119 h	11.6*	1.6	22.5	-2.3	-7.3	3.0	-6.1*	-11.4	-0.5	-0.3	-1.4	0.9
	0-119 h	13.9*	2.9	26.0	4.4	-1.1	10.2	-8.3*	-14.8	-1.2	0.8	-0.3	2.0
$SC^{b}_{30\text{-}50nm}$	0-23 h	-0.6	-7.4	6.6	2.8	-1.1	6.8	-3.6#	-7.7	0.7	-0.1	-0.9	0.8
	24-47 h	3.8	-4.1	12.3	4.7*	0.5	8.9	-2.1	-6.9	2.9	0.9*	0.1	1.7
	48-71 h	4.5	-3.7	13.4	4.5*	0.1	9.1	-6.5*	-11.2	-1.6	0.7	-0.2	1.5
	72-95 h	11.1*	2.1	20.9	3.4	-1.1	8.2	-1.2	-6.2	4.1	1.2*	0.2	2.1
	96-119 h	7.4	-1.7	17.4	0.5	-4.4	5.6	-5.8*	-10.7	-0.6	-0.1	-1.2	1.0
	0-119 h	9.5	-0.1	20.1	5.8*	0.9	10.9	-10.1*	-15.5	-4.3	0.9#	-0.1	1.9
$SC^{b}_{50\text{-}100nm}$	0-23 h	0.7	-5.7	7.5	2.6	-0.9	6.3	-4.1*	-8.0	-0.1	0.1	-0.6	0.9
	24-47 h	4.6	-2.3	12.0	4.1*	0.4	7.9	-3.4	-7.5	0.9	0.8	0.0	1.5
	48-71 h	6.9#	-0.6	15.0	5.5*	1.5	9.6	-5.3*	-9.5	-1.0	0.5	-0.3	1.2
	72-95 h	9.6*	1.8	18.1	3.2	-0.8	7.4	-0.7	-5.1	3.9	1.0*	0.1	1.8
	96-119 h	4.5	-3.7	13.3	2.4	-2.0	7.1	-4.2#	-8.7	0.5	0.3	-0.7	1.3
	0-119 h	10.7*	1.8	20.4	6.1*	1.7	10.7	-9.6*	-14.6	-4.4	0.8#	-0.1	1.7

a: active surface measured by DCPS; b: surface area concentration of particles with 10-800, 3-100, 3-10nm, 10-30nm, 30-50nm and 50-100nm of aerodynamic diameter, respectively; c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6, f: confidence interval *p<0.05; #p<0.1

Table D.1. Associations between air pollution and blood markers in the panel of T2D or IGT presented as % change from geometric mean per increase in IQR air pollutant

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
$NC^{b}_{3\text{-}10nm}$	0-23 h	2.8	-2.7	8.7	0.8	-1.8	3.5	0.0	-3.4	3.6	-0.7*	-1.4	0.0
	24-47 h	3.1	-2.6	9.2	-2.0	-4.4	0.6	2.1	-1.6	5.8	-0.2	-0.9	0.5
	48-71 h	5.8#	-0.3	12.3	0.2	-2.8	3.3	1.4	-2.4	5.3	-0.5	-1.2	0.3
	72-95 h	1.5	-3.9	7.3	-1.2	-3.9	1.5	-2.2	-5.6	1.4	0.4	-0.4	1.1
	96-119 h	5.9*	0.4	11.8	-0.7	-3.3	2.1	1.5	-2.1	5.1	0.5	-0.3	1.3
	0-119 h	11.1*	2.6	20.3	-2.4	-6.9	2.4	2.5	-3.4	8.8	-0.3	-1.4	0.7
$NC^{b}_{10\text{-}30nm}$	0-23 h	-0.2	-5.9	5.8	0.1	-2.7	3.0	2.9	-0.9	6.7	-0.6	-1.3	0.2
	24-47 h	2.1	-4.2	8.9	0.4	-2.5	3.4	2.5	-1.7	6.8	0.5	-0.3	1.3
	48-71 h	3.6	-3.3	11.0	-0.3	-3.6	3.1	0.3	-4.1	4.9	-0.1	-1.0	0.7
	72-95 h	3.6	-2.9	10.5	-1.1	-4.0	1.9	-2.1	-6.1	2.1	0.3	-0.6	1.1
	96-119 h	1.4	-4.6	7.6	-2.5#	-5.4	0.4	1.1	-2.8	5.2	0.5	-0.4	1.3
	0-119 h	5.3	-2.9	14.1	-2.1	-6.6	2.6	4.6	-1.7	11.2	0.2	-0.9	1.2
$NC^{b}_{30\text{-}50nm}$	0-23 h	1.4	-3.8	6.8	-1.1	-3.5	1.3	1.7	-1.5	5.0	0.0	-0.6	0.7
	24-47 h	-0.7	-6.3	5.4	0.5	-2.1	3.2	1.4	-2.2	5.2	0.8*	0.1	1.5
	48-71 h	2.4	-3.7	8.9	-0.3	-3.1	2.6	-0.7	-4.5	3.3	0.3	-0.4	1.0
	72-95 h	2.9	-2.8	9.0	0.3	-2.3	3.0	-1.1	-4.7	2.5	0.3	-0.4	1.0
	96-119 h	1.1	-4.4	6.9	-1.3	-3.8	1.4	0.9	-2.5	4.5	0.2	-0.6	1.0
	0-119 h	3.3	-4.1	11.4	-1.2	-4.9	2.7	2.1	-3.0	7.5	0.7	-0.2	1.6
$NC^{b}_{50\text{-}100nm}$	0-23 h	1.9	-3.2	7.2	-1.3	-3.7	1.1	0.7	-2.5	4.0	0.4	-0.3	1.0
	24-47 h	-0.4	-5.7	5.2	1.6	-1.0	4.3	1.4	-2.0	4.9	0.9*	0.2	1.5
	48-71 h	2.1	-3.7	8.3	-1.3	-3.9	1.4	-0.8	-4.4	2.9	0.4	-0.3	1.1
	72-95 h	4.4	-1.2	10.3	1.5	-1.0	4.1	1.1	-2.3	4.6	0.6#	-0.1	1.3
	96-119 h	2.4	-2.9	7.9	0.3	-2.2	2.8	2.1	-1.2	5.5	0.1	-0.6	0.9
	0-119 h	3.9	-2.5	10.7	0.2	-2.9	3.5	2.3	-2.0	6.8	0.9*	0.1	1.6
Particle density $PM_{2.5}$	0-23 h	-17.9*	-26.9	-7.8	-1.6	-6.6	3.6	2.9	-5.8	12.5	-0.6	-2.1	1.0
	24-47 h	-7.6	-19.4	5.9	-5.2#	-10.6	0.6	1.5	-8.9	13.1	0.2	-1.5	1.9
	48-71 h	-7.0	-19.5	7.4	-12.6*	-18.5	-6.3	7.8	-4.5	21.7	0.0	-1.6	1.7
	72-95 h	-14.7*	-26.4	-1.1	-13.0*	-18.8	-6.7	3.9	-7.7	16.9	-0.3	-2.0	1.5
	96-119 h	-8.7	-19.5	3.5	-11.7*	-16.5	-6.5	4.9	-6.4	17.5	0.2	-1.5	2.0
	0-119 h	-11.8*	-21.7	-0.6	-7.0*	-11.9	-1.8	6.1	-6.3	20.1	0.6	-0.9	2.2
Particle density PM_{10}	0-23 h	-8.5*	-15.5	-0.9	-3.2	-6.9	0.6	2.2	-3.1	7.7	0.7	-0.3	1.7
	24-47 h	-3.4	-11.3	5.2	0.6	-3.7	5.0	0.1	-5.8	6.4	-0.1	-1.2	0.9
	48-71 h	-1.0	-9.5	8.3	-0.9	-6.1	4.6	-0.9	-7.6	6.2	-0.2	-1.3	0.9
	72-95 h	-3.7	-12.7	6.3	-4.3	-9.6	1.4	-2.8	-9.9	4.8	-0.2	-1.5	1.0
	96-119 h	-6.4	-13.6	1.3	-2.7	-7.0	1.9	-1.5	-8.0	5.5	-0.5	-1.6	0.6
	0-119 h	-8.0#	-16.6	1.5	-2.3	-8.1	4.0	0.1	-7.9	8.8	0.3	-1.0	1.5

a: particulate matter with aerodynamic diameter<=2.5µm, b: particulate matter with aerodynamic diameter<=10µm,
c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6; f: confidence interval, $p<0.05$ #$p<0.1$

Table D.2 Associations between air pollution and blood markers in the panel of T2D or IGT presented as % change from geometric mean per increase in IQR air pollutant

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
LC(EAD) [a]	0-23 h	6.0#	-0.6	13.1	-1.1	-3.9	1.7	-0.4	-4.4	3.7	0.4	-0.4	1.2
	24-47 h	6.6*	0.1	13.6	1.9	-1.0	4.9	0.8	-3.3	5.1	1.0*	0.2	1.8
	48-71 h	3.9	-3.7	12.0	-0.3	-3.2	2.7	-0.7	-5.1	3.9	0.2	-0.7	1.0
	72-95 h	6.3#	-0.9	13.9	2.3	-0.5	5.1	1.3	-2.8	5.5	0.5	-0.2	1.3
	96-119 h	4.1	-2.5	11.1	0.9	-1.7	3.6	2.0	-1.9	6.0	0.2	-0.6	1.0
	0-119 h	8.7*	0.3	17.8	1.8	-1.6	5.2	1.5	-3.3	6.6	0.7#	-0.1	1.6
$LC^{b}_{10\text{-}800nm}$	0-23 h	2.1	-3.0	7.4	-1.6	-4.0	0.9	0.4	-2.8	3.7	0.4	-0.3	1.1
	24-47 h	0.5	-4.8	6.0	1.2	-1.3	3.8	0.2	-3.1	3.6	0.9*	0.2	1.5
	48-71 h	2.8	-3.0	8.9	-0.9	-3.5	1.7	0.0	-3.5	3.7	0.5	-0.2	1.2
	72-95 h	3.7	-1.8	9.5	1.5	-1.1	4.0	1.8	-1.7	5.3	0.6#	-0.1	1.3
	96-119 h	2.0	-3.2	7.5	0.7	-1.8	3.2	2.3	-1.0	5.8	0.3	-0.5	1.0
	0-119 h	4.1	-2.6	11.2	0.2	-3.0	3.6	2.4	-2.1	7.0	0.9*	0.1	1.7
$LC^{b}_{3\text{-}10nm}$	0-23 h	1.7	-3.0	6.8	0.6	-1.7	3.0	0.1	-2.9	3.2	-0.7*	-1.3	-0.1
	24-47 h	3.2	-1.9	8.6	-1.8	-3.9	0.5	1.9	-1.3	5.3	-0.2	-0.8	0.4
	48-71 h	5.0#	-0.3	10.6	0.0	-2.6	2.7	1.8	-1.6	5.2	-0.4	-1.1	0.2
	72-95 h	1.9	-2.9	7.0	-1.2	-3.5	1.2	-1.7	-4.8	1.5	0.4	-0.3	1.0
	96-119 h	4.9*	0.1	10.0	-1.1	-3.5	1.3	1.4	-1.7	4.6	0.5	-0.2	1.3
	0-119 h	11.7*	2.5	21.7	-3.3	-8.1	1.9	3.6	-2.9	10.5	-0.4	-1.5	0.7
$LC^{b}_{10\text{-}30nm}$	0-23 h	-0.1	-5.1	5.3	-0.1	-2.5	2.5	2.6	-0.7	6.0	-0.4	-1.1	0.2
	24-47 h	1.5	-4.2	7.5	0.5	-2.1	3.2	2.1	-1.6	5.9	0.6	-0.2	1.3
	48-71 h	3.0	-3.2	9.6	-0.3	-3.3	2.7	-0.1	-4.0	4.0	-0.1	-0.8	0.7
	72-95 h	3.0	-2.8	9.2	-0.9	-3.5	1.8	-2.0	-5.6	1.8	0.2	-0.6	1.0
	96-119 h	0.9	-4.4	6.5	-2.2	-4.7	0.5	0.9	-2.6	4.5	0.4	-0.4	1.1
	0-119 h	4.3	-3.2	12.3	-1.7	-5.8	2.5	3.8	-1.9	9.7	0.2	-0.7	1.2
$LC^{b}_{30\text{-}50nm}$	0-23 h	1.5	-4.1	7.5	-1.3	-3.9	1.4	1.8	-1.8	5.4	0.0	-0.7	0.8
	24-47 h	-0.8	-6.9	5.8	0.6	-2.3	3.6	1.5	-2.4	5.7	0.9*	0.1	1.7
	48-71 h	2.6	-4.1	9.8	-0.3	-3.4	2.9	-0.7	-4.9	3.6	0.3	-0.5	1.1
	72-95 h	3.2	-3.0	9.9	0.4	-2.5	3.3	-1.2	-5.0	2.8	0.3	-0.5	1.1
	96-119 h	1.2	-4.7	7.6	-1.4	-4.2	1.5	1.1	-2.7	5.0	0.2	-0.6	1.1
	0-119 h	3.4	-4.2	11.6	-1.2	-5.0	2.8	2.1	-3.1	7.6	0.7	-0.2	1.7
$LC^{b}_{50\text{-}100nm}$	0-23 h	2.0	-3.3	7.5	-1.4	-3.8	1.2	0.7	-2.6	4.1	0.4	-0.3	1.1
	24-47 h	-0.3	-5.8	5.5	1.7	-1.0	4.4	1.3	-2.1	4.9	0.9*	0.2	1.6
	48-71 h	2.2	-3.8	8.5	-1.4	-4.1	1.4	-0.8	-4.5	3.0	0.5	-0.3	1.2
	72-95 h	4.6	-1.2	10.7	1.6	-1.0	4.3	1.3	-2.2	4.9	0.6#	-0.1	1.3
	96-119 h	2.5	-2.9	8.3	0.4	-2.1	3.1	2.3	-1.2	5.8	0.1	-0.6	0.9
	0-119 h	4.2	-2.6	11.5	0.3	-3.0	3.8	2.5	-2.0	7.2	0.9*	0.1	1.7

a: particle length of particles between 10 and 1000nm (aerodynamic diameter) measured by EAD; b: length concentration of particles with 10-800, 3-100, 3-10nm, 10-30nm, 30-50nm and 50-100nm of aerodynamic diameter, respectively, measured by SMPS, c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6, f: confidence interval *p<0.05; #p<0.1

Table D.3 Associations between air pollution and blood markers in the panel of T2D or IGT presented as % change from geometric mean per increase in IQR air pollutant

		CRP[c]			MPO[d]			IL-6[e]			Fibrinogen		
	lag	% change	95% CI[f]		% change	95% CI		% change	95% CI		% change	95% CI	
SC(DCPS)[a]	0-23 h	1.9	-3.6	7.7	0.0	-2.8	2.8	0.3	-3.3	4.1	0.6	-0.1	1.3
	24-47 h	3.0	-2.4	8.7	2.4	-0.5	5.3	0.3	-3.3	3.9	0.9*	0.2	1.6
	48-71 h	3.7	-2.3	10.0	-0.7	-3.6	2.3	0.5	-3.4	4.5	0.4	-0.3	1.2
	72-95 h	4.3	-1.2	10.1	1.9	-0.9	4.8	2.8	-0.9	6.6	0.7*	0.1	1.4
	96-119 h	3.7	-1.5	9.2	1.5	-1.2	4.3	2.9	-0.6	6.6	0.6#	-0.1	1.2
	0-119 h	5.9	-1.3	13.6	2.7	-1.6	7.1	3.3	-2.2	9.0	1.1*	0.2	1.9
$SC^{b}_{10\text{-}800nm}$	0-23 h	2.0	-3.1	7.4	-2.0	-4.5	0.5	-0.5	-3.7	2.8	0.6	-0.1	1.3
	24-47 h	0.4	-4.7	5.8	0.9	-1.6	3.4	-0.9	-4.1	2.4	0.8*	0.1	1.4
	48-71 h	2.4	-3.1	8.3	-0.9	-3.3	1.7	0.6	-2.8	4.2	0.6	-0.1	1.2
	72-95 h	2.6	-2.7	8.2	1.7	-0.8	4.3	2.8	-0.7	6.3	0.6#	0.0	1.3
	96-119 h	1.3	-3.8	6.7	1.5	-1.0	4.1	2.7	-0.7	6.2	0.3	-0.4	1.0
	0-119 h	2.8	-3.2	9.1	0.3	-2.7	3.3	1.8	-2.2	6.0	0.9*	0.1	1.6
$SC^{b}_{3\text{-}10nm}$	0-23 h	1.4	-4.0	7.2	0.7	-2.0	3.4	0.2	-3.2	3.8	-0.8*	-1.5	-0.1
	24-47 h	3.9	-2.0	10.2	-2.0	-4.6	0.5	2.3	-1.5	6.2	-0.2	-0.9	0.5
	48-71 h	5.7#	-0.4	12.2	0.0	-3.0	3.1	2.4	-1.4	6.4	-0.5	-1.2	0.3
	72-95 h	2.7	-3.0	8.7	-1.4	-4.1	1.4	-1.7	-5.3	2.0	0.4	-0.3	1.2
	96-119 h	5.5#	-0.1	11.5	-1.7	-4.4	1.1	1.7	-2.0	5.5	0.7	-0.2	1.5
	0-119 h	9.6*	1.9	18.0	-3.2	-7.4	1.2	3.6	-2.0	9.5	-0.4	-1.3	0.6
$SC^{b}_{10\text{-}30nm}$	0-23 h	0.1	-5.7	6.1	-0.2	-3.0	2.7	3.0	-0.8	6.9	-0.4	-1.2	0.3
	24-47 h	1.3	-5.1	8.1	0.6	-2.3	3.7	2.3	-1.9	6.6	0.7#	-0.1	1.5
	48-71 h	3.1	-3.9	10.6	-0.4	-3.7	3.0	-0.4	-4.8	4.2	0.0	-0.9	0.8
	72-95 h	3.3	-3.3	10.3	-0.8	-3.8	2.2	-2.3	-6.3	1.9	0.2	-0.7	1.1
	96-119 h	0.8	-5.2	7.3	-2.3	-5.2	0.7	1.0	-3.0	5.1	0.4	-0.5	1.3
	0-119 h	4.1	-3.7	12.6	-1.7	-5.9	2.8	3.6	-2.2	9.9	0.3	-0.7	1.3
$SC^{b}_{30\text{-}50nm}$	0-23 h	1.4	-3.9	7.1	-1.2	-3.7	1.3	1.6	-1.7	5.1	0.0	-0.6	0.7
	24-47 h	-0.8	-6.6	5.4	0.6	-2.2	3.4	1.4	-2.3	5.4	0.8*	0.1	1.6
	48-71 h	2.5	-3.8	9.2	-0.3	-3.2	2.8	-0.7	-4.6	3.4	0.3	-0.4	1.1
	72-95 h	3.1	-2.8	9.4	0.4	-2.3	3.2	-1.0	-4.7	2.8	0.3	-0.4	1.1
	96-119 h	1.2	-4.4	7.2	-1.3	-3.9	1.4	1.0	-2.5	4.7	0.2	-0.6	1.0
	0-119 h	3.2	-3.9	10.9	-1.1	-4.6	2.6	2.0	-2.9	7.2	0.7	-0.2	1.6
$SC^{b}_{50\text{-}100nm}$	0-23 h	2.0	-3.2	7.4	-1.3	-3.7	1.2	0.7	-2.5	4.0	0.4	-0.3	1.1
	24-47 h	-0.3	-5.6	5.4	1.7	-0.9	4.3	1.2	-2.2	4.7	0.9*	0.2	1.6
	48-71 h	2.1	-3.7	8.3	-1.4	-4.0	1.3	-0.8	-4.4	2.9	0.5	-0.2	1.1
	72-95 h	4.4	-1.2	10.4	1.6	-0.9	4.3	1.4	-2.1	4.9	0.6#	-0.1	1.3
	96-119 h	2.6	-2.8	8.2	0.5	-2.0	3.1	2.3	-1.1	5.8	0.1	-0.6	0.9
	0-119 h	4.2	-2.5	11.4	0.4	-2.9	3.8	2.5	-2.0	7.2	0.9*	0.1	1.7

a: active surface measured by DCPS; b: surface area concentration of particles with 10-800, 3-100, 3-10nm, 10-30nm, 30-50nm and 50-100nm of aerodynamic diameter, respectively; c: high sensitivity C-reactive protein, d: myeloperoxidase, e: interleukin-6, f: confidence interval *p<0.05; #p<0.1

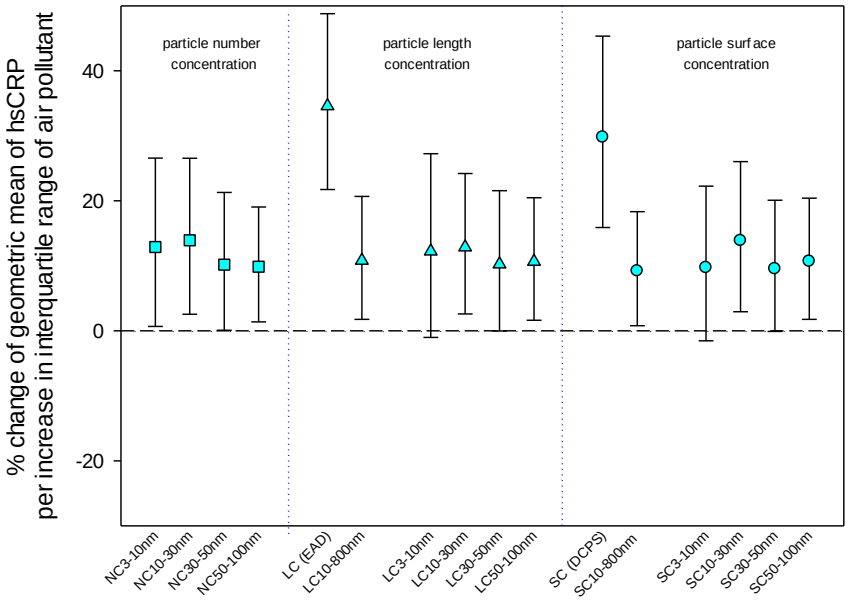


Figure A1: hsCRP in association with the 5-day average exposure of ambient air pollutants in the panel of genetically susceptible participants.

NC: number concentration of particles with 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, respectively; LC(EAD): length concentration measured by EAD; LC: length concentration of particles with 10-800nm, 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, SC(DCPS): surface concentration measured by DCPS; SC: surface concentration of particles with 10-800nm, 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, respectively

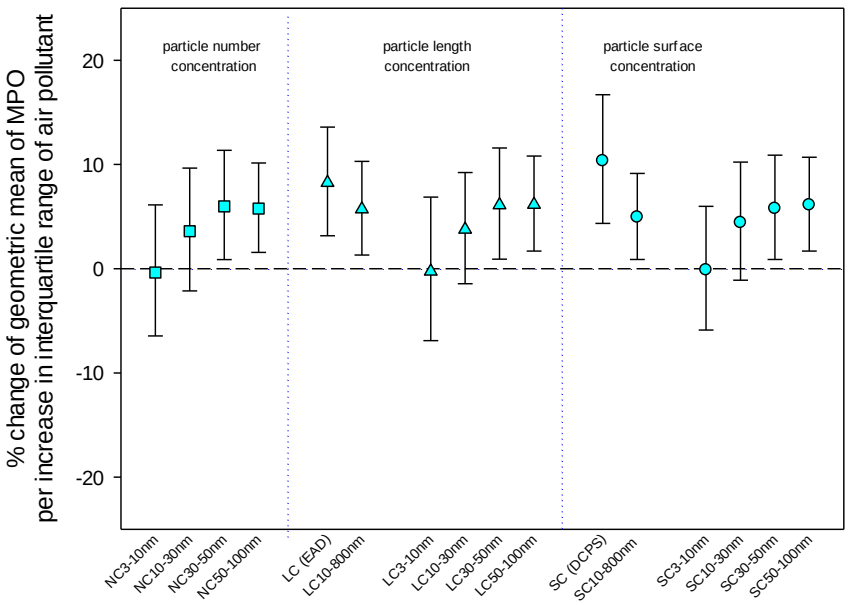
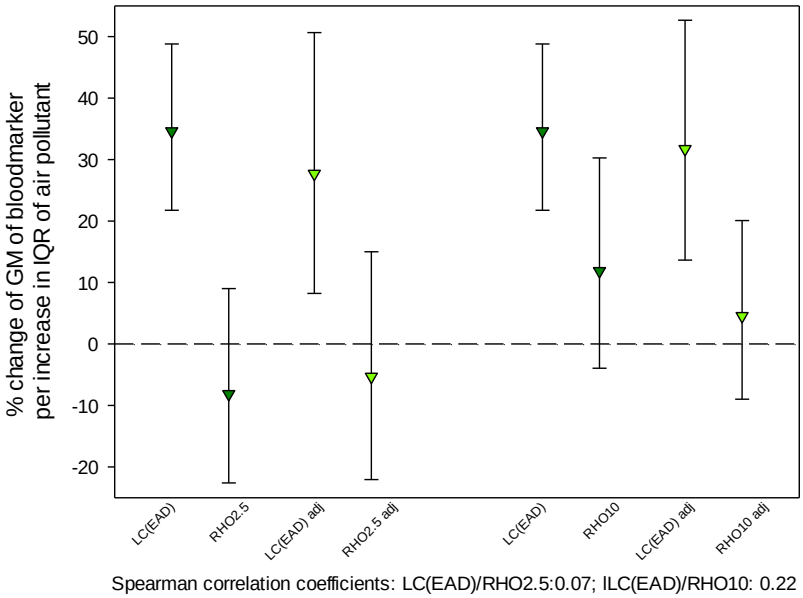


Figure A2: MPO in association with the 5-day average exposure of ambient air pollutants in the panel of genetically susceptible participants.

NC: number concentration of particles with 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, respectively; LC(EAD): length concentration measured by EAD; LC: length concentration of particles with 10-800nm, 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, SC(DCPS): surface concentration measured by DCPS; SC: surface concentration of particles with 10-800nm, 3-10nm, 10-30nm, 30-50nm, and 50-100nm of mobility diameter, respectively;



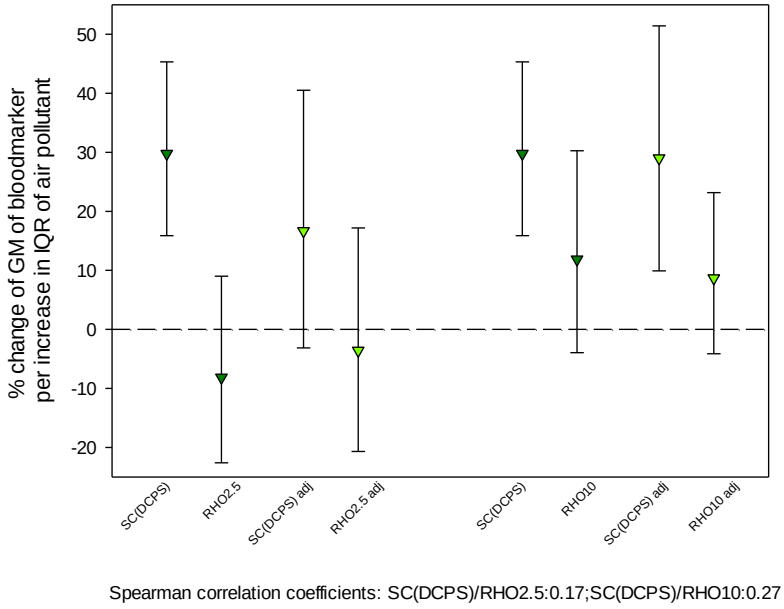
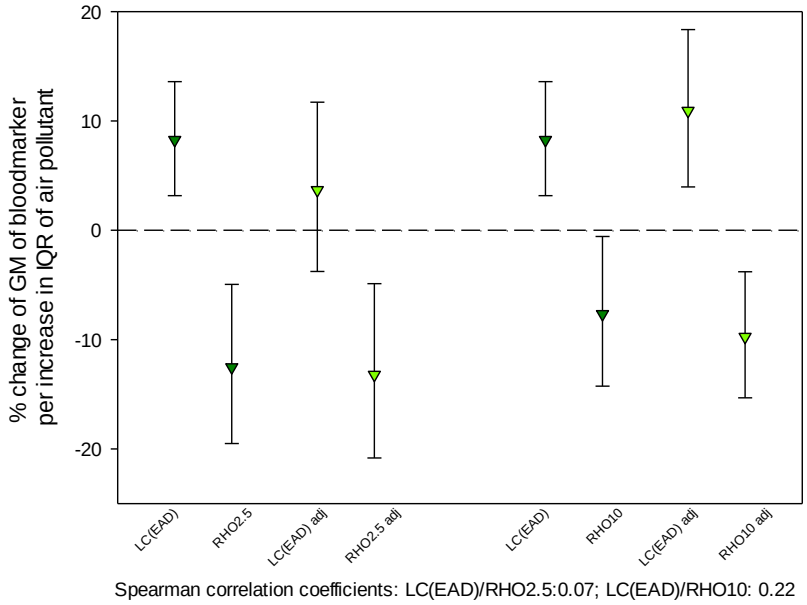


Figure B: Two-pollutant models for hsCRP, 5-day average exposure, panel of genetically susceptible participants

LC(EAD): particle length measured by EAD, SC(DCPS), particle surface measured by DCPS
RHO: apparent particle density of particulate matter with aerodynamic diameter <2.5µm and <10µm, respectively
GM: geometric mean; hsCRP: high sensitivity C-reactive protein



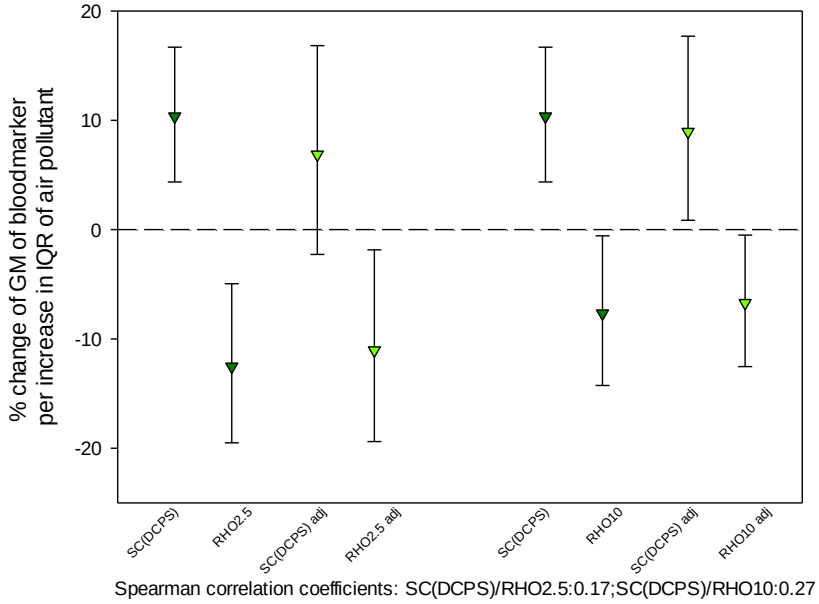
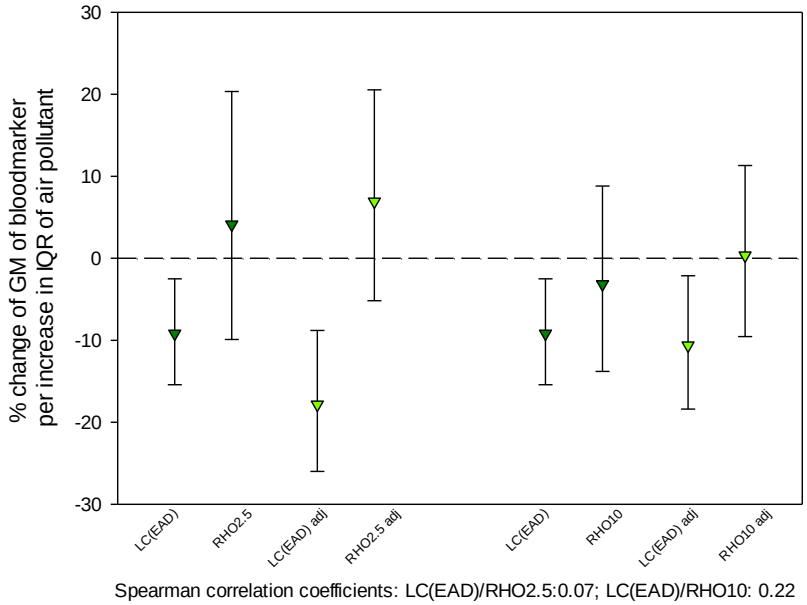


Figure C: Two-pollutant models for MPO, 5-day average exposure, panel of genetically susceptible participants

LC(EAD): particle length measured by EAD, SC(DCPS), particle surface measured by DCPS
RHO: apparent particle density of particulate matter with aerodynamic diameter <2.5µm and <10µm, respectively
GM: geometric mean; MPO: myeloperoxidase



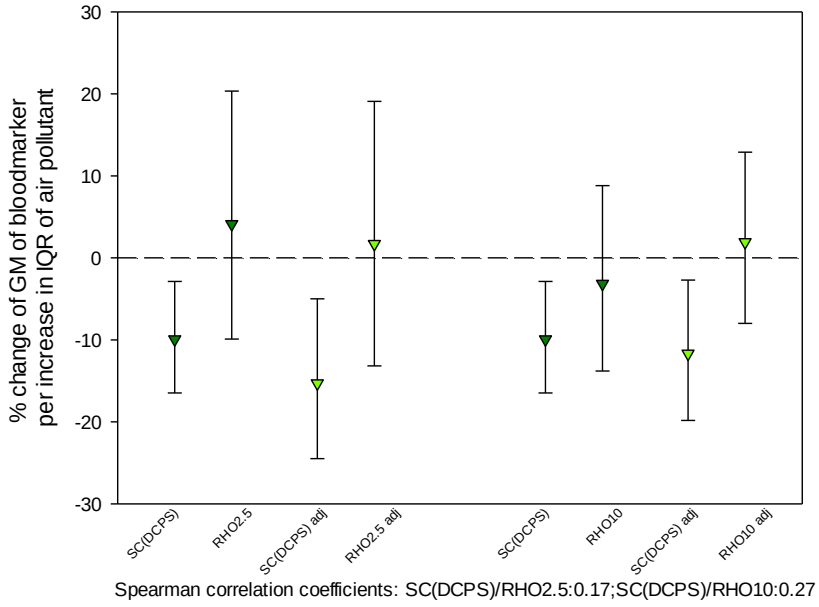
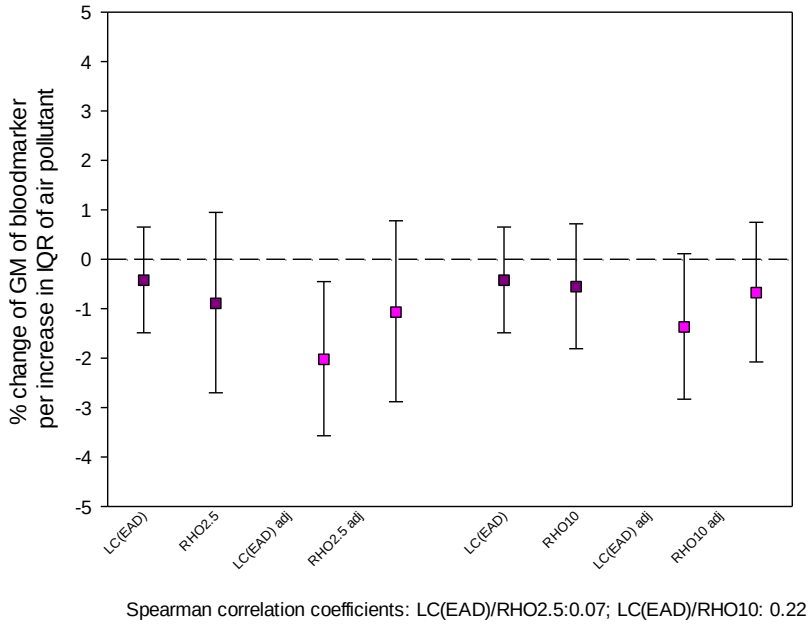


Figure D: Two-pollutant models for IL-6, 5-day average exposure, panel of genetically susceptible participants

LC(EAD): particle length measured by EAD, SC(DCPS), particle surface measured by DCPS
RHO: apparent particle density of particulate matter with aerodynamic diameter <2.5µm and <10µm, respectively
GM: geometric mean; IL-6: interleukin 6



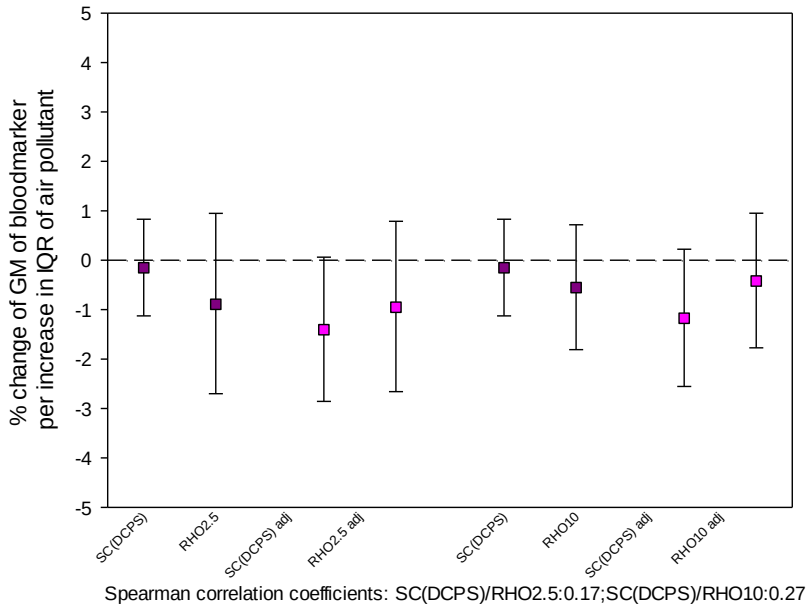


Figure E: Two-pollutant models for fibrinogen, lag 4, panel of genetically susceptible participants

LC(EAD): particle length measured by EAD, SC(DCPS), particle surface measured by DCPS
RHO: apparent particle density of particulate matter with aerodynamic diameter <2.5µm and <10µm, respectively
GM: geometric mean;

The relationship of total aerosol length to other particle measurement metrics

The relationship of total aerosol length to other particle measurement metrics is a concept that is not easily understood. As it is a relatively new parameter the literature only provides limited information. However, a good correlation has been found between total aerosol length and model predictions of the penetration of aerosol particles into the respiratory system (Fissan et al. 2006, Wilson et al. 2007).

The total aerosol length is defined as the total length of a chain consisting of all particles detected within a 1 cm^3 volume, and is equivalent to d^1 weighting, falling between number concentration ($\sim d^0$) and surface area ($\sim d^2$). One may assume that total aerosol length is the product of particle number concentration and mean particle diameter.

The following thought experiment might help to visualize the concept:

Assuming that we have four particles within a 1 cm^3 volume and assuming that the particles have different diameters (d_1=10, d_2=30, d_3=50 and d_4=100 nm, respectively) we can then calculate the particle number concentration ($\sim d^0$), particle length ($\sim d^1$), surface area $\sim(d^2)$ and volume concentration ($\sim d^3$) using the following formulas:

Particle number = sum of the particles.

Particle length = $d_1 + d_2 + d_3 + d_4$

Particle surface = $\Pi*d_1^2 + \Pi*d_2^2 + \Pi*d_3^2 + \Pi*d_4^2$

Particle volume = $1/6*\Pi*d_1^3 + 1/6*\Pi*d_2^3 + 1/6*\Pi*d_3^3 + 1/6*\Pi*d_4^3$

The results are summarised in the following table:

Table E: Overview of four hypothetical particles in 1cm^3 volume of air

	Particle 1 (d_1=10 nm)	Particle 2 (d_2=30 nm)	Particle 3 (d_3=50 nm)	Particle 4 (d_4=100 nm)	Sum
Particle size d (nm)	10	30	50	100	
Number	1	1	1	1	4
Length (nm)	10	30	50	100	190
Surface (nm^2)	314	2826	7850	31400	42390
Volume (nm^3)	523	14130	65417	523333	603403

One can calculate the contribution of each hypothetical particle (in %) to each sum of the specific parameter:

Table F: Contribution of each hypothetical particle (in %) to each sum of the specific parameter

Contribution to	Particle 1 (d_1=10 nm)	Particle 2 (d_2=30 nm)	Particle 3 (d_3=50 nm)	Particle 4 (d_4=100 nm)
Number concentration	25.0	25.0	25.0	25.0
Length concentration	5.3	15.8	26.3	52.6
Surface concentration	0.7	6.7	18.5	74.1
Volume concentration	0.1	2.3	10.8	86.7

While each particle contributes to 25% of the total number concentration, the smallest particle (d_1=10 nm) contributes to the volume concentration only 0.1% and the largest 87%. This is presented also in the following figure:

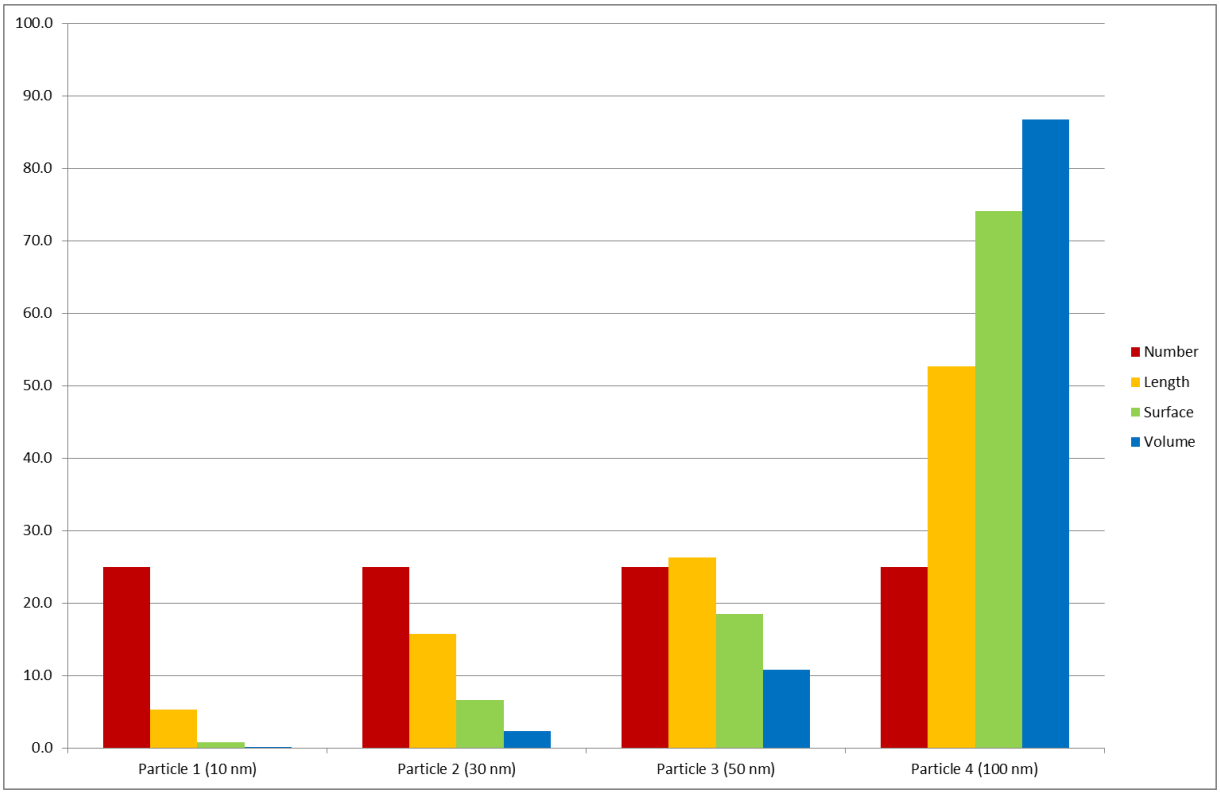


Figure F: Contribution of each hypothetical particle to the total number concentration, length concentration, surface concentration and volume concentration, respectively.

Another way of visualizing the difference between particle number, particle surface and volume concentration is the calculation of the size distribution for the specific parameters. In the following figure the number, surface and volume weighted particle distributions is presented (based on Finlayson-Pitts and Pitts (2000)):

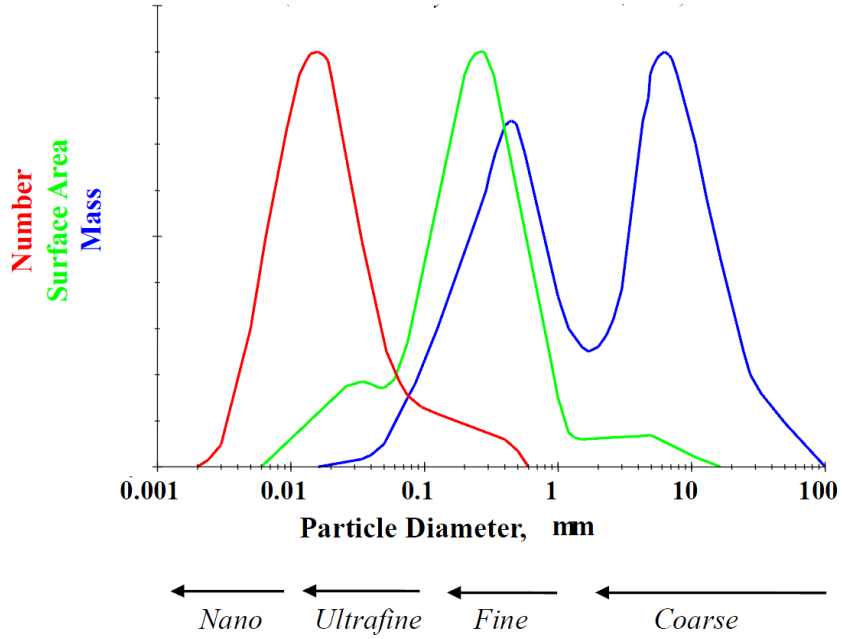


Figure G: Number, surface and volume weighted particle distribution (adapted from Finlayson-Pitts and Pitts (2000))

Assuming a hypothetical particle number concentration (in the table G the assumed numbers are in bold), one can calculate the corresponding particle length, surface and volume:

Table G: particle length, surface and volume calculated based on a hypothetical number concentration (assumed numbers in bold)

Size range	5 nm	10 nm	50 nm	100 nm	300 nm	500 nm	1000 nm	Sum
Number	**800**	**8000**	**2500**	**700**	**150**	**40**	**1**	12191
Length	4000	80000	125000	70000	45000	20000	1000	345000
Surface	62800	2512000	19625000	21980000	42390000	31400000	3140000	121109800
Volume	52333	4186667	163541667	366333333	2119500000	2616666667	523333333	5793614000

The corresponding contribution of each size range to the total concentration (size distribution) is shown in figure H. The red peak indicates that small particles (10 nm) account for the vast percentage of particle number. On the other hand the blue peak shows that larger particles (300 nm and 500 nm) contribute mainly to particle volume concentrations. As described before, particle length distribution peaks between particle number and particle surface distribution (yellow curve).

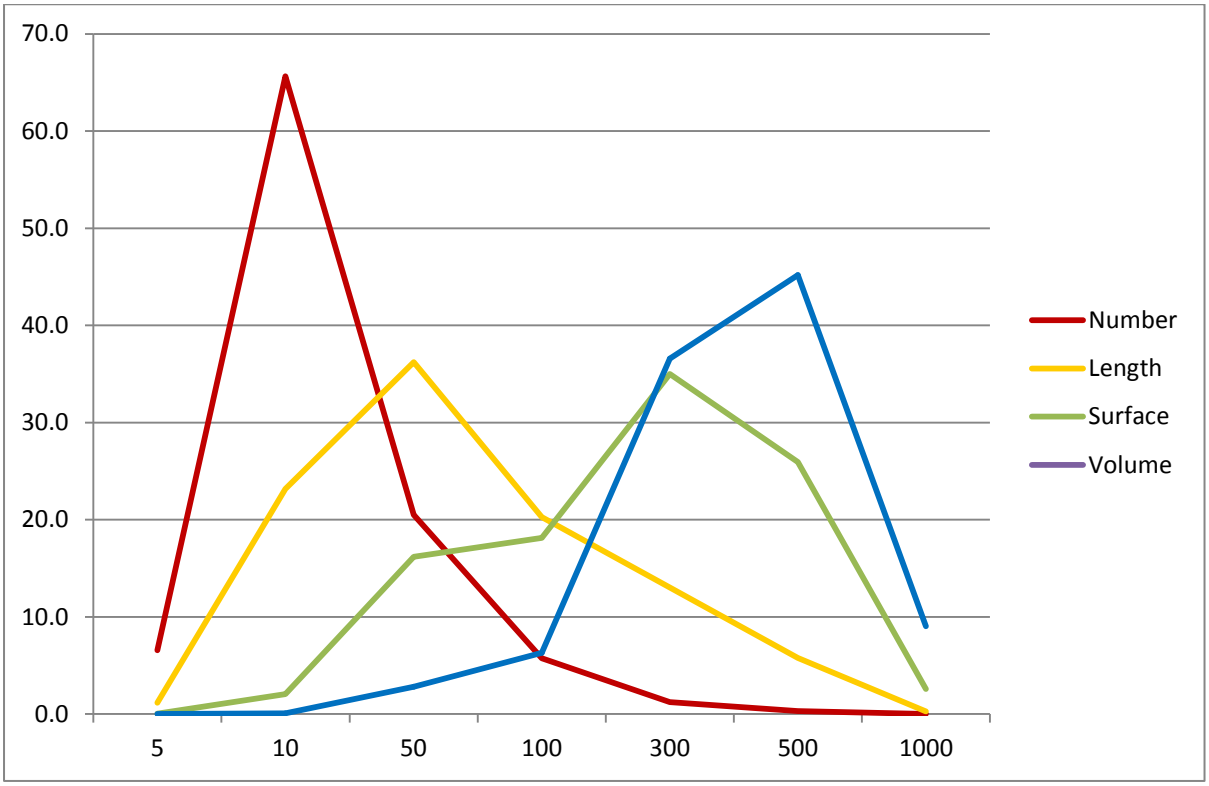


Figure H: Contribution of each size range to the total concentration (size distribution)

References:

Finlayson-Pitts, B. & J. Pitts. 2000. *Chemistry of the Upper and Lower Atmosphere. Theory, Experiments, and Applications* San Diego, California: Academic Press.

Fissan, H., S. Neumann, A. Trampe, D. Y. H. Pui & W. G. Shin (2006) Rationale and principle of an instrument measuring lung deposited nanoparticle surface area. *Journal of Nanoparticle Research,* 9**,** 53-59.

Pitz, M., W. Birmili, O. Schmid, A. Peters, H. E. Wichmann & J. Cyrys (2008a) Quality control and quality assurance for particle size distribution measurements at an urban monitoring station in Augsburg, Germany. *Journal of Environmental Monitoring,* 10**,** 8.

Pitz, M., O. Schmid, J. Heinrich, W. Birmili, J. Maguhn, R. Zimmermann, H.-E. Wichmann, A. Peters & J. Cyrys (2008b) Seasonal and Diurnal Variation of PM2.5 Apparent Particle Density in Urban Air in Augsburg, Germany. *Environ. Sci. Technol. ,* 42**,** 5087–5093.

Wilson, W. E., J. Stanek, H.-S. Han, T. Johnson, H. Sakurai, D. Y. H. Pui, J. T. and, D.-R. Chen & S. Duthie (2007) Use of the Electrical Aerosol Detector as an Indicator of the Surface Area of Fine Particles Deposited in the Lung. *Journal of the Air & Waste Management Association,* 57**,** 211-220.