

## SUPPLEMENTAL MATERIAL

### **Impact of Geocoding Methods on Associations between Long-term Exposure to Urban Air Pollution and Lung Function**

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**Table S1:** Median (min, 25<sup>th</sup> centile, 75<sup>th</sup> centile, max) of the mean annual pollutant concentration ( $\mu\text{g}/\text{m}^3$ ) differences between the building matching geocodes and each spatial interpolation geocodes, n=354

	A. Building matching versus B.NavTEQ	A. Building matching versus B. Google Maps	A. Building matching versus C.Multimap
<b>NO<sub>2</sub></b>			
min	-20.8	-20.8	-20.8
25th centile	-1.7	-1.4	-2.2
median	-0.1	-0.1	-0.2
75th centile	0.1	0.1	0.1
max	21	15.5	19
<b>PM<sub>10</sub></b>			
min	-5	-4.3	-4.6
25th centile	-0.5	-0.4	-0.7
median	-0.2	0	-0.1
75th centile	0	0	0
max	5.4	4.1	5.9

**Table S2:** Correlation (Spearman) between the pollutant concentrations according to the different geocoding techniques, n=354

PM <sub>10</sub>	NO <sub>2</sub>			
	A. Building matching	B. NavTEQ	C. Google Maps	D. Multimap
A. Building matching	-	0.76	0.82	0.75
B. NavTEQ	0.89	-	0.82	0.83
C. Google Maps	0.91	0.90	-	0.83
D. Multimap	0.88	0.89	0.91	-

**Table S3:** Median (minimum, 25th centile, 75th centile and maximum) annual pollutant concentrations using the building matching geocoding technique by survey (n=354)

	NO <sub>2</sub> , µg/m <sup>3</sup>	PM <sub>10</sub> , µg/m <sup>3</sup>
<b>ECRHS</b>		
Min	25.1	27.5
25th centile	29.6	28.6
Median	31.3	29.1
75th centile	34.1	29.8
Max	53.8	34.9
<b>EGEA</b>		
Min	27.8	29.5
25th centile	33	31
Median	34.4	32.1
75th centile	37.2	33.2
Max	58.2	39.8
p value (non-parametric test)	<0.001	<0.001

**Table S4:** Median (minimum, 25th centile, 75th centile and maximum) annual pollutant concentrations using the building matching geocoding technique by asthma status (n=354)

	NO <sub>2</sub> , µg/m <sup>3</sup>	PM <sub>10</sub> , µg/m <sup>3</sup>
<b>Among participants with asthma</b>		
Min	25.7	27.5
25th centile	30.7	29.0
Median	32.9	30.3
75th centile	35.9	32.0
Max	58.2	39.8
<b>Among participants without asthma</b>		
Min	26.7	27.7
25th centile	31.3	29.7
Median	33.8	30.9
75th centile	35.9	32.7
Max	56.5	38.4
p value <sup>a</sup>	0.18	0.02

<sup>a</sup> p-value comparing participants with and without asthma using Kruskal and Wallis test for pollutants.

**Table S5:** Associations between air pollution and lung function per one increase of one interquartile range in air pollutants levels (5.2  $\mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and 3.0  $\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ ) estimated using matching building.

	FEV <sub>1</sub> % predict		FVC % predict	
	Beta (CI 95%)	P	Beta (CI 95%)	p
<b>Model 0</b>				
a- Annual mean $\text{NO}_2$	-1.13 (-2.70, 0.44)	0.16	-0.39 (-1.82, 1.04)	0.60
b- Annual mean $\text{PM}_{10}$	-1.11 (-3.32, 1.10)	0.33	0.62 (-1.40, 2.64)	0.55
c- $\text{NO}_2$ lag 0	0.08 (-1.57, 1.73)	0.92	-0.29 (-1.76, 1.18)	0.70
d- $\text{PM}_{10}$ lag 0	-0.92 (-2.98, 1.14)	0.38	-0.32 (-3.26, -0.16)	0.74
<b>Model 1</b>				
a- Annual mean $\text{NO}_2$	-1.65 (-3.34, 0.04)	0.05	-1.71 (-3.26, -0.16)	0.03
b- Annual mean $\text{PM}_{10}$	-3.95 (-7.09, -0.81)	0.01	-3.99 (-6.87, -1.11)	0.01
<b>Model 2</b>				
a- Annual mean $\text{NO}_2$	-1.62 (-3.31, 0.07)	0.06	-1.69 (-3.14, -0.14)	0.03
$\text{NO}_2$ lag 0	-0.61 (-2.39, 1.17)	0.50	-0.88 (-2.49, 0.73)	0.28
b- Annual mean $\text{PM}_{10}$	-3.72 (-6.88, -0.56)	0.02	-3.86 (-6.76, -0.96)	0.01
$\text{PM}_{10}$ lag 0	-1.08 (-3.22, 1.06)	0.32	-0.67 (-2.65, 1.31)	0.51

Model 0: Crude (n=354 for model a and b, n=343 for model c and n=349 for model d)

Model 1: Adjusted on sex, age, BMI, active and passive smoking, occupational group, allergic sensitization, survey and asthma (n= 321)

Model 2: Further adjustment on the pollutant level at lag 0<sup>†</sup> (n=310 for model a and n=316 for model b)

**Table S6:** Associations between air pollution and lung function per one increase of one interquartile range in air pollutants levels (5.2  $\mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and 3.0  $\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ ) stratified by asthma status.

	FEV1 % predicted						FVC% predicted					
	Asthmatics			Non asthmatics			Asthmatics			Non asthmatics		
	Beta	(CI95%)	p	Beta	(CI95%)	p	Beta	(CI95%)	p	Beta	(CI95%)	p
<b>NO<sub>2</sub></b>												
A. Building matching	-0.78	(-3.86, 2.31)	0.62	-1.89	(-3.85, 0.07)	0.06	-2.29	(-4.74, 0.15)	0.07	-1.89	(-3.78, 0.00)	0.05
B. NavTEQ	-0.46	(-3.03, 2.12)	0.72	-1.86	(-3.49, -0.24)	0.02	-0.86	(-2.93, 1.20)	0.41	-2.08	(-3.65, -0.52)	0.01
C. Google Map	0.14	(-2.21, 2.49)	0.90	-1.33	(-2.89, 0.24)	0.10	-0.44	(-2.33, 1.44)	0.64	-1.39	(-2.90, 0.12)	0.07
D. Multimap	-0.50	(-2.61, 1.60)	0.64	-1.19	(-2.59, 0.22)	0.10	-0.97	(-2.63, 0.69)	0.25	-1.48	(-2.83, -0.12)	0.03
<b>PM<sub>10</sub></b>												
A. Building matching	-3.10	(-9.41, 3.21)	0.33	-3.30	(-6.92, 0.31)	0.07	-4.19	(-9.23, 0.84)	0.10	-3.75	(-7.27, -0.22)	0.04
B. NavTEQ	-2.40	(-8.19, 3.38)	0.41	-2.51	(-5.62, 0.59)	0.11	-1.54	(-6.26, 3.17)	0.52	-3.18	(-6.21, -0.16)	0.04
C. Google Map	-1.03	(-6.89, 4.83)	0.73	-1.67	(-4.73, 1.39)	0.28	-1.35	(-6.11, 3.41)	0.57	-2.18	(-5.17, 0.81)	0.15
D. Multimap	-2.21	(-7.08, 2.66)	0.37	-1.50	(-4.31, 1.31)	0.29	-2.52	(-6.41, 1.38)	0.20	-2.32	(-5.06, 0.42)	0.10

Adjusted for: sex, age, BMI, active smoking, ETS, occupational group, atopy, level of pollutant exposure the day of examination, study and ICS for asthmatics only

$\text{NO}_2$  analyses include 79 participants with asthma and 231 without asthma,  $\text{PM}_{10}$  analyses include 79 with asthma and 237 without asthma.

**Table S7:** Associations between air pollution and lung function per one increase of one interquartile range in air pollutants levels (5.2  $\mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and 3.0  $\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ ) stratified by study.

	FEV1 % predicted						FVC% predicted					
	ECRHS			EGEA			ECRHS			EGEA		
	Beta	(CI95%)	p	Beta	(CI95%)	p	Beta	(CI95%)	p	Beta	(CI95%)	p
<b>NO<sub>2</sub></b>												
A. Building matching	-1.30	(-3.51, 0.92)	0.25	-2.59	(-5.34, 0.17)	0.06	-1.89	(-3.97, 0.18)	0.07	-1.88	(-4.24, 0.48)	0.12
B. NavTEQ	-2.09	(-3.98, -0.20)	0.03	-1.30	(-3.46, 0.86)	0.23	-2.14	(-3.92, -0.36)	0.02	-1.15	(-2.99, 0.70)	0.22
C. Google Map	-1.14	(-2.99, 0.82)	0.23	-0.86	(-2.83, 1.11)	0.39	-1.54	(-3.28, 0.20)	0.08	-0.52	(-2.20, 1.16)	0.54
D. Multimap	-1.36	(-2.96, 0.23)	0.09	-0.75	(-2.52, 1.02)	0.40	-1.55	(-3.05, -0.05)	0.04	-0.76	(-2.26, 0.75)	0.32
<b>PM<sub>10</sub></b>												
A. Building matching	-2.43	(-7.07, 2.21)	0.30	-5.42	(-10.03, -0.80)	0.02	-3.22	(-7.64, 1.20)	0.15	-4.73	(-8.75, -0.71)	0.02
B. NavTEQ	-3.08	(-7.19, 1.04)	0.14	-3.14	(-7.13, 0.85)	0.12	-2.73	(-6.66, 1.20)	0.17	-3.09	(-6.56, 0.38)	0.08
C. Google Map	-1.29	(-5.28, 2.69)	0.52	-2.77	(-6.82, 1.29)	0.18	-1.93	(-5.73, 1.86)	0.32	-2.39	(-5.94, 1.16)	0.18
D. Multimap	-1.76	(-5.25, 1.73)	0.32	-2.40	(-5.98, 1.19)	0.19	-1.91	(-5.25, 1.41)	0.26	-2.62	(-5.74, 0.49)	0.10

Adjusted for: sex, age, BMI, active smoking, ETS, occupational group, atopy, level of pollutant exposure the day of examination and asthma

$\text{NO}_2$  analyses include 169 ECHRS participants and 141 EGEA participants,  $\text{PM}_{10}$  analyses include 176 ECHRS participants and 140 EGEA participants.

**Table S8:** Associations between air pollution and lung function per one increase of one interquartile range in air pollutants levels (5.2  $\mu\text{g}/\text{m}^3$  for  $\text{NO}_2$  and 3.0  $\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ ), with 12-months back-extrapolated air pollution estimates, without back-extrapolation (as estimated by the SIRANE 2004 model for  $\text{NO}_2$  and the SIRANE 2008 model for  $\text{PM}_{10}$ ) and with 24-month back-extrapolated air pollution estimates (12 months before and after lung function testing)

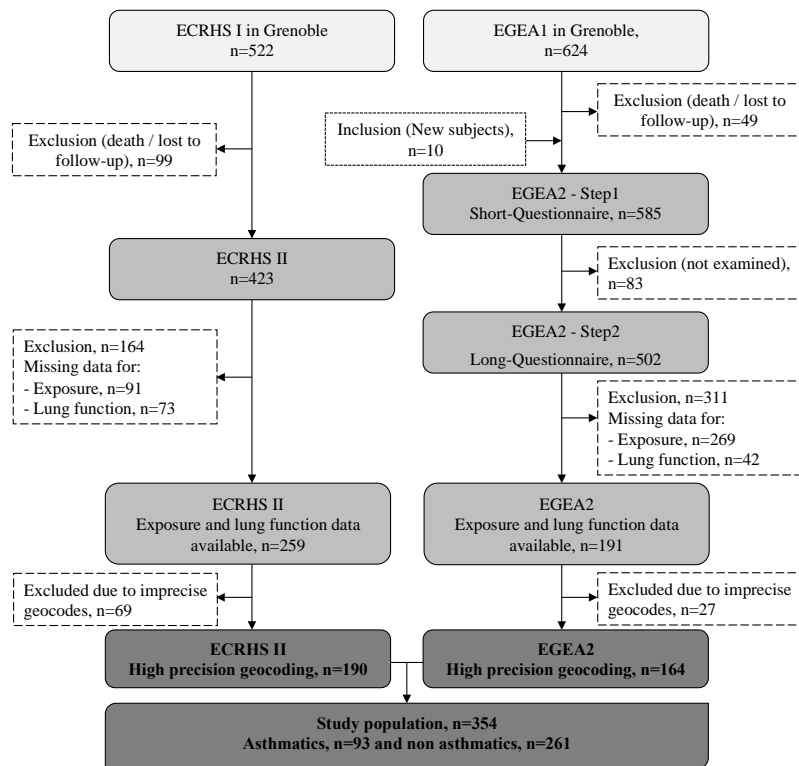
	FEV <sub>1</sub> % predict		FVC % predict	
	Beta (CI 95%)	P	Beta (CI 95%)	p
<b>12-month average exposure<sup>a</sup></b>				
Annual mean $\text{NO}_2$	-1.00 (-2.59, 0.59)	0.22	-1.08 (-2.50, 0.34)	0.13
Annual mean $\text{PM}_{10}$	-3.15 (-6.15, -0.14)	0.04	-2.97 (-5.64, -0.29)	0.03
<b>No back-extrapolation<sup>b</sup></b>				
Annual mean $\text{NO}_2$	-1.29 (-2.91, 0.33)	0.12	-1.37 (-2.86, 0.12)	0.07
Annual mean $\text{PM}_{10}$	-2.50 (-7.31, 2.31)	0.31	-2.98 (-7.41, 1.45)	0.19
<b>24-month average exposure<sup>c</sup></b>				
Annual mean $\text{NO}_2$	-1.33 (-2.96, 0.29)	0.11	-1.41 (-2.91, 0.09)	0.06
Annual mean $\text{PM}_{10}$	-2.94 (-6.68, 0.79)	0.12	-3.40 (-6.84, 0.03)	0.05

All estimates adjusted for sex, age, BMI, active smoking, ETS, occupational group, atopy study and asthma (Model 2)

<sup>a</sup> Using the 12-month back-extrapolated air pollution estimates (results reported in the article)

<sup>b</sup> Using air pollution concentration estimated by the SIRANE model without back-extrapolation

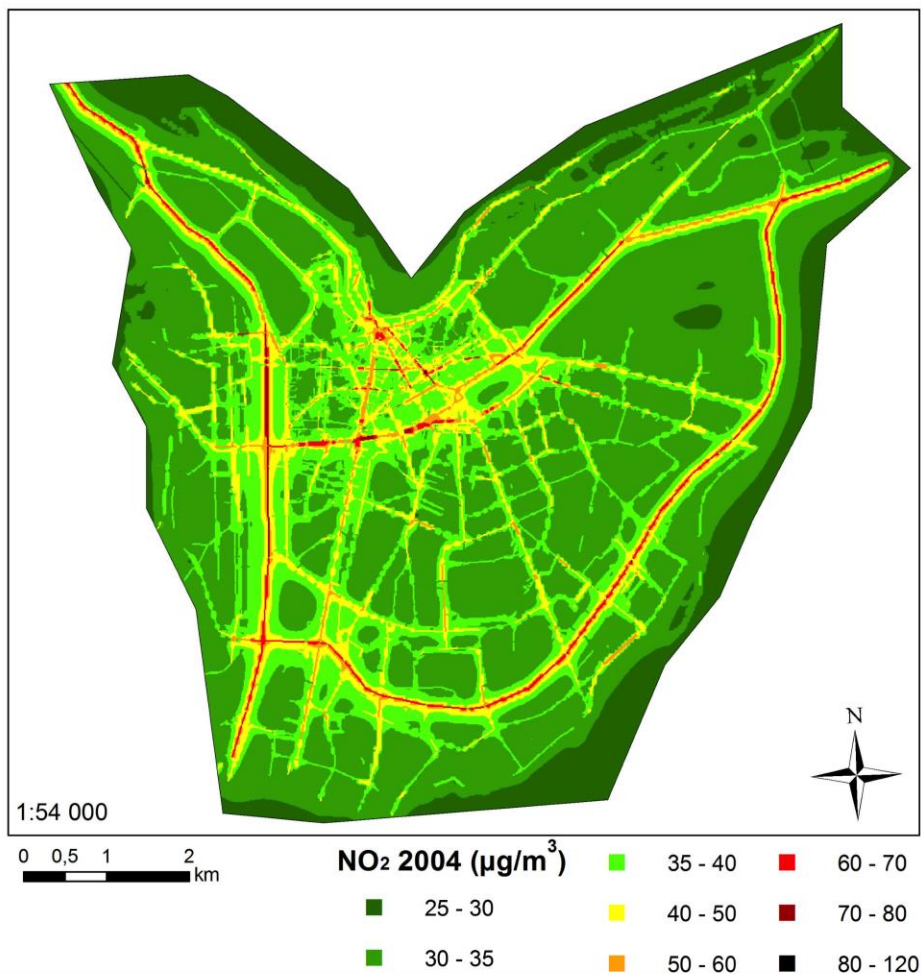
<sup>c</sup> Using the 24-month back-extrapolated air pollution estimates (12 months before and after lung function testing)



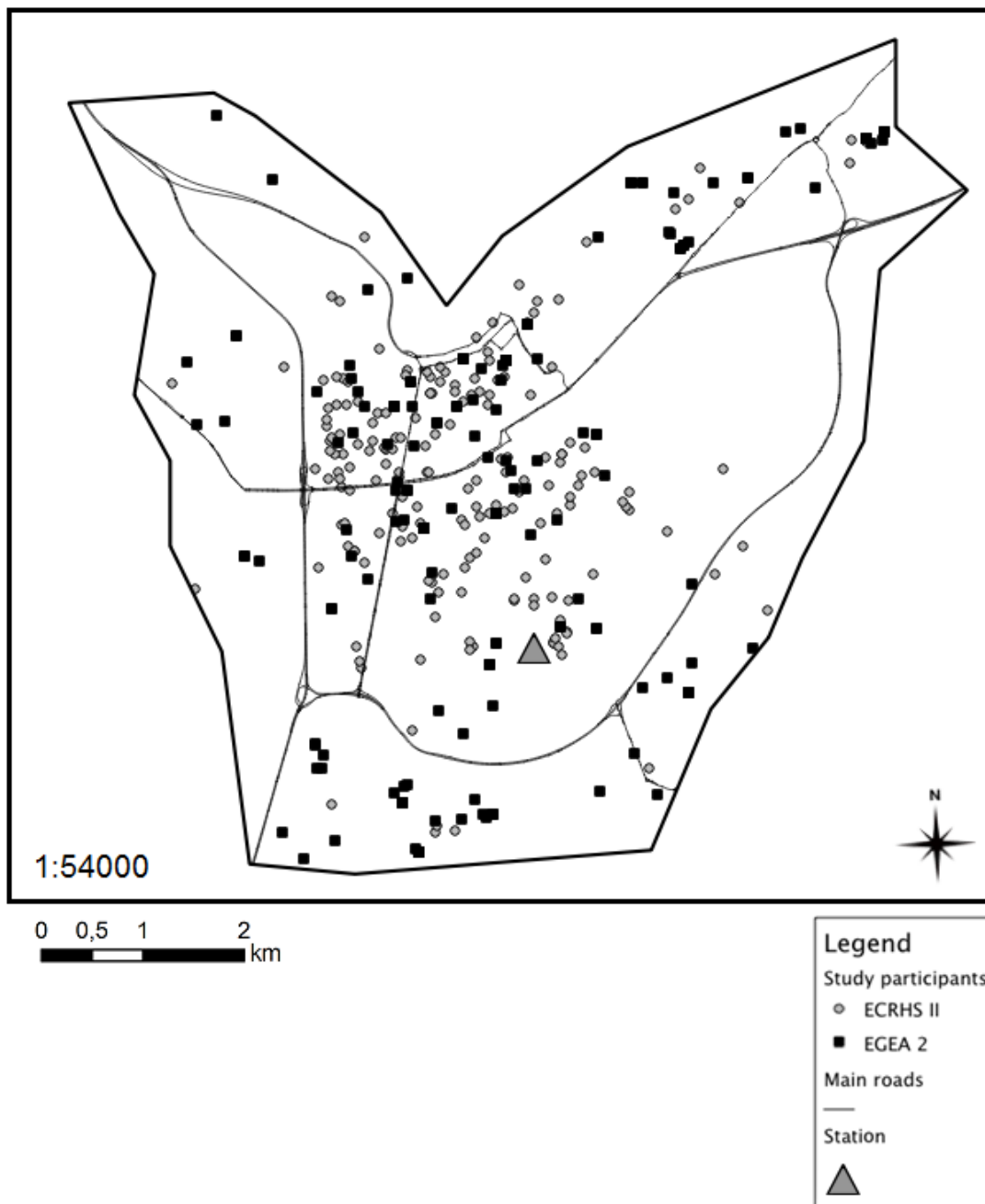
**Figure S1:** Description of the study population



Grid of the SIRANE dispersion model (2004)  
Grenoble Metropolitan Area



**Figure S2:** Mean annual NO<sub>2</sub> concentration estimated by the SIRANE dispersion model in 2004 in Grenoble, France.



**Figure S3:** Map showing the participant's distribution in the Grenoble area, taking into account the study they come from. Station refers to the Villeneuve les Frênes background fixed monitoring station.