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Supplemental Material

Long-Term Exposure to Ambient Air Pollution and Incidence of Postmenopausal Breast Cancer in 15 European Cohorts within the ESCAPE Project

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Table S1. Baseline characteristics of 15 European cohorts (CEANS consist of 4 Stockholm Sweden cohorts: SNACK-K, SALT/Twin gene, 60 y/IMPROVE, and SDPP; EPIC-NL consisting of 2 Dutch cohorts: EPIC MORGEN and EPIC PROSPECT).

Individual characteristic at Baseline	EPIC-Umeå, Sweden N = 3,762	HUBRO, Norway N = 1,931	CEANS, Sweden N = 5,997	DCH, Denmark N = 15,835	EPIC-NL, Netherlands N = 12,837	EPIC-Oxford, UK N = 7,299	VHM&PP, Austria 13,387	EPIC-E3N, France N = 5,319	EPIC-Varese, Italy N = 4,727	EPIC-Turin, Italy N = 1,950	EPIC-San Sebastian, Spain N = 1,776
Age, mean±SD	54.4 (6.0)	57.2 (5.7)	59.8 (12.9)	57.7 (4.2)	58.6 (5.9)	59.7 (8.3)	65.1 (7.5)	57.2 (5.3)	56.6 (6.7)	55.2 (5.1)	55.3 (5.7)
BMI (kg/m ²), mean±SD	25.3 (4.3)	25.3 (4.3)	25.7 (4.4)	25.6 (4.4)	25.7 (4.1)	25.1 (4.2)	26.5 (4.6)	23.1 (3.2)	26.2 (4.4)	25.3 (4.2)	28.0 (4.5)
Physical Activity, n (%)	NA						NA				
No		592 (30.7)	4,039 (67.4)	6,591 (41.6)	4,634 (36.1)	5,020 (68.8)		7 (0.1)	1,061 (22.4)	537 (27.5)	337 (19.0)
Yes		1,339 (69.3)	1,958 (32.6)	9,244 (58.4)	8,203 (63.9)	2,279 (31.2)		5,312 (99.9)	3,666 (77.6)	1,413 (72.5)	1,439 (81.0)
Smoking Status											
Current, n (%)	729 (19.3)	553 (28.6)	1,281 (21.4)	5,495 (34.7)	2,929 (22.8)	593 (8.1)	632 (4.7)	737 (13.9)	758 (16.0)	355 (18.2)	127 (7.2)
Previous, n (%)	606 (16.1)	540 (28.0)	1,848 (30.8)	3,680 (23.2)	4,031 (31.4)	2,468 (33.8)	368 (2.7)	1,317 (24.8)	607 (12.8)	382 (19.6)	118 (6.6)
Never, n (%)	2,427 (64.5)	838 (43.4)	2,868 (47.8)	6,660 (42.1)	5,877 (45.8)	4,238 (58.1)	12,387 (92.5)	3,265 (61.4)	3,362 (71.1)	1,213 (62.2)	1,531 (86.2)
Smoking intensity ^a (g/day), mean±SD	2.2 (5.2)	7.0 (8.2)	5.7 (7.3)	5.0 (8.2)	5.8 (7.7)	4.1 (7.1)		3.6 (6.9)	2.4 (4.8)	3.5 (5.8)	1.4 (4.7)
Smoking duration ^a (years), mean±SD	9.8 (14.7)	14.7 (16.0)	13.4 (15.9)	16.9 (17.2)	15.4 (16.9)	8.5 (13.6)	NA	8.3 (13.2)	7.4 (13.0)	9.2 (13.5)	2.9 (8.3)
Alcohol use ^b (g/day), mean±SD	1.8 (2.5)		2.5 (0.7)	14.4 (15.9)	8.6 (12.4)	7.0 (9.1)	NA	12.2 (14.6)	8.4 (11.2)	9.1 (12.7)	6.1 (10.1)
Weekly		1,009 (52.3)									
Occasionally		784 (40.6)									
Never/not in the past		138 (7.1)									
Educational Level							NA				
Low, n (%)	1,594 (42.4)	435 (22.5)	2,223 (37.1)	4,810 (30.4)	3,184 (24.8)	4,135 (56.7)		336 (6.3)	3,505 (74.1)	1,233 (63.2)	1,550 (87.3)
Medium, n (%)	1,481 (39.4)	906 (46.9)	1,961 (32.7)	8,108 (51.2)	7,894 (61.5)	1,504 (20.6)		387 (7.3)	993 (21)	575 (29.5)	226 (12.7)
High, n (%)	687 (18.3)	590 (30.6)	1,813 (30.2)	2,917 (18.4)	1,759 (13.7)	1,660 (22.7)		4,596 (86.4)	229 (4.8)	142 (7.3)	-
Employment Status					NA					NA	NA
Unemployed, n (%)	699 (18.5)	468 (24.2)	2,660 (44.4)	4,599 (29)		3,760 (51.5)	11,149 (83.3)	1,925 (36.2)	1,320 (27.9)		
Employed, n (%)	3,063 (81.4)	1,463 (75.8)	3,377 (55.6)	11,236 (71)		3,539 (48.5)	2,238 (16.7)	3,367 (63.3)	3407 (72.1)		
Nigh shift work (nurse, physician)	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
No, n (%)				12,814 (80.9)							
Yes, n (%)				3,021 (19.1)							

Nulliparous, n (%)	NA	NA	3,337 (55.6)	1,509 (9.5)	1,638 (12.8)	1,004 (13.8)	NA	834 (15.7)	484 (10.2)	92 (4.7)	NA
Age at 1 st birth (years), mean±SD	NA	NA	NA	23.3 (4.3)	25.6 (4.0)	25.9 (4.4)	NA	21.5 (10.0)	23.2 (8.8)	24.8 (6.9)	NA
Number of children	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0 children, n (%)				1,509 (9.5)		1,004 (13.8)			484 (10.2)	92 (4.7)	
1 child, n (%)				1,888 (11.9)		3,502 (48.0)			888 (18.8)	674 (34.6)	
2 children, n (%)				4,860 (30.7)		1,846 (25.3)			2,151 (45.5)	920 (47.2)	
3 children, n (%)				3,783 (23.9)		699 (9.6)			856 (18.1)	205 (10.5)	
4 children, n (%)				2,165 (13.7)		180 (2.5)			242 (5.1)	38 (1.9)	
5 children, n (%)				971 (6.1)		41 (0.6)			68 (1.4)	17 (0.9)	
6 children, n (%)				419 (2.6)		12 (0.2)			23 (0.5)	2 (0.1)	
7 children, n (%)				151 (1.0)		9 (0.1)			14 (0.3)	2 (0.1)	
8 children, n (%)				89 (0.6)		5 (0.1)			1 (0)	-	
9 children, n (%)						1 (0)			-	-	

Individual characteristic at Baseline	EPIC-Umeå, Sweden	HUBRO, Norway	CEANS, Sweden	DCH, Denmark	EPIC-NL, Netherlands	EPIC- Oxford, UK	VHM&PP, Austria	E3N, France	EPIC-Varese, Italy	EPIC-Turin, Italy	EPIC-San Sebastian, Spain
Breast feeding	NA	NA	NA	NA			NA			NA	NA
No, n (%)					3,241 (25.2)			2,130 (40.0)	1,316 (27.8)		
Yes, n (%)					8,116 (63.2)			3,189 (60.0)	3,411 (72.2)		
Hormone Therapy (HT) Use	NA		NA				NA				
Current, n (%)		940 (48.7)		6,023 (38.0)	1,296 (10.1)	2,375 (32.5)			209 (4.4)		
Former, n (%)		264 (13.7)		2,495 (15.8)	1,741 (13.6)	977 (13.4)			825 (17.5)		
Never, n (%)		727 (37.6)		7,317 (46.2)	9,695 (75.5)	3,947 (54.1)			3,693 (78.1)		
No, n (%)								1,997 (37.5)		598 (30.7)	298 (16.8)
Yes, n (%)								3,322 (62.5)		1,352 (69.3)	1,478 (83.2)
HT use duration ^c (years), mean±SD	4.1 (5.0)		NA	3.4 (5.4)		2.0 (3.5)	NA	4.2 (4.1)	0.5 (1.5)	0.9 (2.0)	NA
Oral contraceptive use	NA	NA	NA				NA	NA			NA
Never/No, n (%)				9,157 (57.8)	12,752 (99.3)	3,553 (48.7)			3,471 (73.4)	1,363 (69.9)	
Ever/Yes, n (%)				6,678 (42.2)	64 (0.5)	3,746 (51.3)			1,256 (26.6)	587 (30.1)	
Definition of area SES											
Area-separator based on municipality	X	X	X	X		X	X		X		X
Area-separator based on neighborhood					X					X	
Census block											
Definition of SES											
Unemployed rate in municipality	X	X	X			X			X		
Mean income in municipality				X							X
% people low income, neighborhood					X						
Area deprivation index										X	

^aamong smokers, ^bamong alcohol consumers; ^camong HT users.

Table S2. Mean (SD) of the elemental levels of PM_{2.5} and PM₁₀ at participants residential addresses in 11 European cohorts (CEANS consist of 4 Stockholm Sweden cohorts: SNACK-K, SALT/Twin gene, 60 y/IMPROVE, and SDPP; EPIC-NL consisting of 2 Dutch cohorts: EPIC MORGEN and EPIC PROSPECT).

Exposure	Cu (ng/m ³)	Fe (ng/m ³)	K (ng/m ³)	Ni (ng/m ³)	S (ng/m ³)	Si (ng/m ³)	V (ng/m ³)	Zn (ng/m ³)
PM_{2.5}								
HUBRO, Norway	3.0 (1.7)	44.4 (30.3)	87.5 (17.4)	0.6 (0.3)	374.5 (28.7)	-	-	14.1 (2.7)
CEANS, Sweden	2.2 (1.9)	106.0 (68.4)	103.6 (18.2)	-	509.9 (16)	178.3 (69.1)	1.3 (0.2)	10.7 (1)
DCH, Denmark	2.9 (1.3)	98.2 (52.4)	112.1 (4.8)	1.1 (0.1)	716.9 (25.9)	50.6 (7)	2.4 (0.3)	12.7 (0.8)
EPIC-NL, Netherlands	3.6 (0.7)	91.5 (17.9)	115.1 (6.7)	2 (0.3)	895.9 (26)	85.4 (9.2)	3.2 (0.5)	25.0 (8.2)
VHM&PP, Austria	4.0 (1.0)	67.4 (7.8)	332.9 (30.8)	0.1 (0.1)	620.4 (31.6)	64.7 (7)	-	22.4 (3.3)
EPIC-Turin, Italy	10.1 (2.4)	301.1 (58.8)	379.5 (21.3)	2.7 (0.5)	1081.2 (39.8)	196.7 (31.5)	2.2 (0.3)	37.3 (4.3)
PM₁₀								
HUBRO, Norway	9.9 (6.7)	346.9 (177.8)	-	-	426.4 (32.9)	527.0 (232.4)	2.4 (0.8)	17.5 (5.3)
CEANS, Sweden	11.1 (10.2)	516.2 (295.6)	307.6 (106)	-	552.4 (25.8)	1073.3 (521.1)	2.2 (0.5)	17.5 (8.2)
DCH, Denmark	12.1 (9.5)	304.8 (187.8)	189.2 (10.6)	1.0 (0.2)	794.2 (31.4)	301.8 (80.2)	2.8 (0.5)	19.8 (3.9)
EPIC-NL, Netherlands	12.8 (4)	418 (127.8)	211.5 (16.8)	2.4 (0.4)	1014.3 (22.2)	400.7 (83.4)	3.8 (0.5)	37 (12.9)
VHM&PP, Austria	9.2 (2.7)	325.8 (43.9)	397.9 (35.1)	0.2 (0.2)	662.6 (46.3)	376.5 (61)	0.5 (0.1)	29.3 (5.7)
EPIC-Turin, Italy	67.1 (17.8)	1701.9 (413.6)	607.7 (51.8)	6.8 (1.3)	1192.3 (76.7)	1463.7 (257.5)	3.9 (0.6)	68.2 (10.4)

Cu-copper; Fe-iron; K-potassium; Ni-nickel; S- sulphur; Si-silicon;V-vanadium; Zn-zinc.

Tables S3-S13: Correlations between NO₂ (µg/m³), NO_x (µg/m³), PM_{2.5} (µg/m³), PM_{2.5} absorbance (PM_{2.5} abs) (10⁻⁵ m⁻¹), PM₁₀ (µg/m³), and PM_{coarse} (µg/m³) concentrations, and traffic intensity on the nearest road (trafnear) (motor vehicles/day) at participant addresses in each cohort.

Table S3. Pearson correlations between exposure measures in EPIC-Umeå, Sweden (n = 3,762)

Pollutant	NO ₂	NO _x	trafnear
NO ₂	1.00		
NO _x	0.99	1.00	
Trafnear	0.25	0.25	1.00

Table S4. Pearson correlations between exposure measures in HUBRO, Norway (n = 1,931)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.92	1.00					
PM _{2.5}	0.41	0.42	1.00				
PM _{2.5} abs	0.75	0.73	0.45	1.00			
PM ₁₀	0.37	0.51	0.73	0.28	1.00		
PM _{coarse}	0.54	0.73	0.26	0.39	0.66	1.00	
trafnear	0.38	0.38	0.08	0.24	0.37	0.55	1.00

Table S5. Pearson correlations between exposure measures in CEANS, Sweden (n = 5,997)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.95	1.00					
PM _{2.5}	0.67	0.55	1.00				
PM _{2.5} abs	0.90	0.79	0.86	1.00			
PM ₁₀	0.55	0.56	0.55	0.64	1.00		
PM _{coarse}	0.57	0.58	0.56	0.66	0.99	1.00	
trafnear	0.50	0.59	0.28	0.39	0.37	0.38	1.00

Table S6. Pearson correlations between exposure measures in DCH, Denmark (n = 15,835)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.97	1.00					
PM _{2.5}	0.56	0.47	1.00				
PM _{2.5} abs	0.70	0.65	0.47	1.00			
PM ₁₀	0.76	0.66	0.73	0.68	1.00		
PM _{coarse}	0.71	0.66	0.59	0.60	0.65	1.00	
trafnear	0.62	0.71	0.20	0.42	0.30	0.43	1.00

Table S7. Pearson correlations between exposure measures in EPIC-NL, Netherlands (n = 12,837)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.79	1.00					
PM _{2.5}	0.37	0.51	1.00				
PM _{2.5} abs	0.77	0.80	0.79	1.00			
PM ₁₀	0.80	0.85	0.66	0.94	1.00		
PM _{coarse}	0.64	0.68	0.50	0.61	0.70	1.00	
trafnear	0.23	0.25	0.28	0.30	0.22	0.38	1.00

Table S8. Pearson correlations between exposure measures in EPIC-Oxford, UK (n = 7,299)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.92	1.00					
PM _{2.5}	0.86	0.85	1.00				
PM _{2.5} abs	0.74	0.66	0.57	1.00			
PM ₁₀	0.51	0.53	0.56	0.54	1.00		
PM _{coarse}	0.16	0.20	0.16	0.35	0.75	1.00	
trafnear	0.26	0.36	0.19	0.23	0.22	0.21	1.00

Table S9. Pearson correlations between exposure measures in VHM&PP, Austria (n = 13,387)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1.00						
NO _x	0.51	1.00					
PM _{2.5}	0.46	0.46	1.00				
PM _{2.5} abs	0.68	0.50	0.69	1.00			
PM ₁₀	0.60	0.40	0.69	0.74	1.00		
PM _{coarse}	0.85	0.50	0.29	0.65	0.56	1.00	
trafnear	0.25	0.21	0.01	0.39	0.07	0.35	1.00

Table S10. Pearson correlations between exposure measures in E3N, France (n = 5,319)

	NO ₂	NO _x	trafnear
NO ₂	1.00		
NO _x	0.93	1.00	
Trafnear	0.37	0.39	1.00

Table S11. Pearson correlations between exposure measures in EPIC-Varese, Italy (n 4,727)

Pollutant	NO ₂	NO _x
NO ₂	1.00	
NO _x	1.00	1.00

Table S12. Pearson correlations between exposure measures in EPIC-Turin, Italy (n = 1,950)

Pollutant	NO ₂	NO _x	PM _{2.5}	PM _{2.5} abs	PM ₁₀	PM _{coarse}	trafnear
NO ₂	1						
NO _x	0.81	1					
PM _{2.5}	0.71	0.80	1				
PM _{2.5} abs	0.93	0.77	0.77	1			
PM ₁₀	0.61	0.42	0.57	0.56	1		
PM _{coarse}	0.45	0.25	0.46	0.42	0.95	1	
trafnear	0.22	0.49	0.37	0.18	0.12	-0.00	1

Table S13. Pearson correlations between exposure measures in EPIC-San Sebastian, Italy (n = 1,776)

Pollutant	NO ₂	NO _x
NO ₂	1.00	
NO _x	0.99	1.00

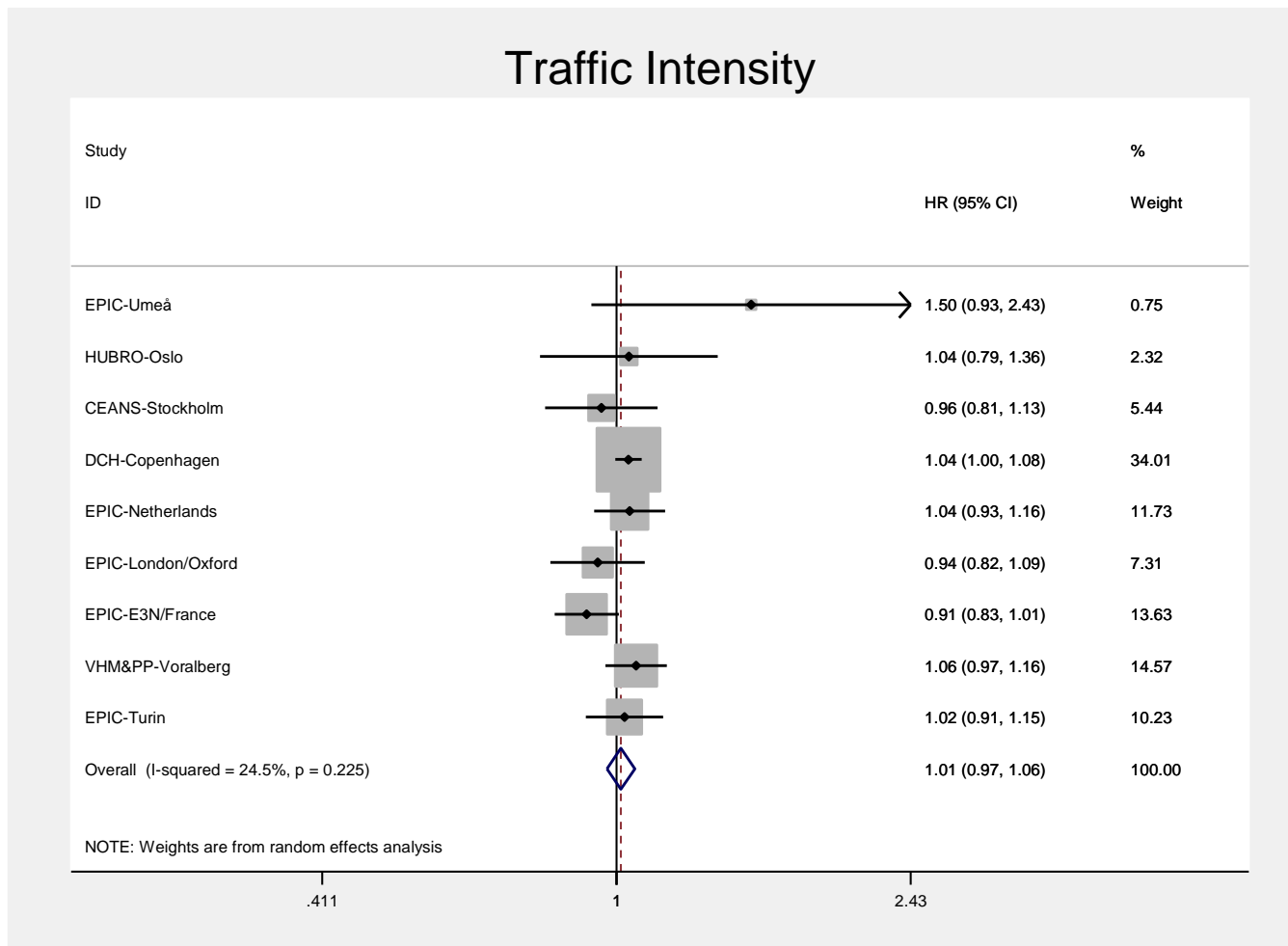


Figure S1. Adjusted associations between breast cancer and traffic intensity on the nearest road (per 5,000 mv/day), (main Model 3), results from cohort-specific analyses and random-effects analyses.

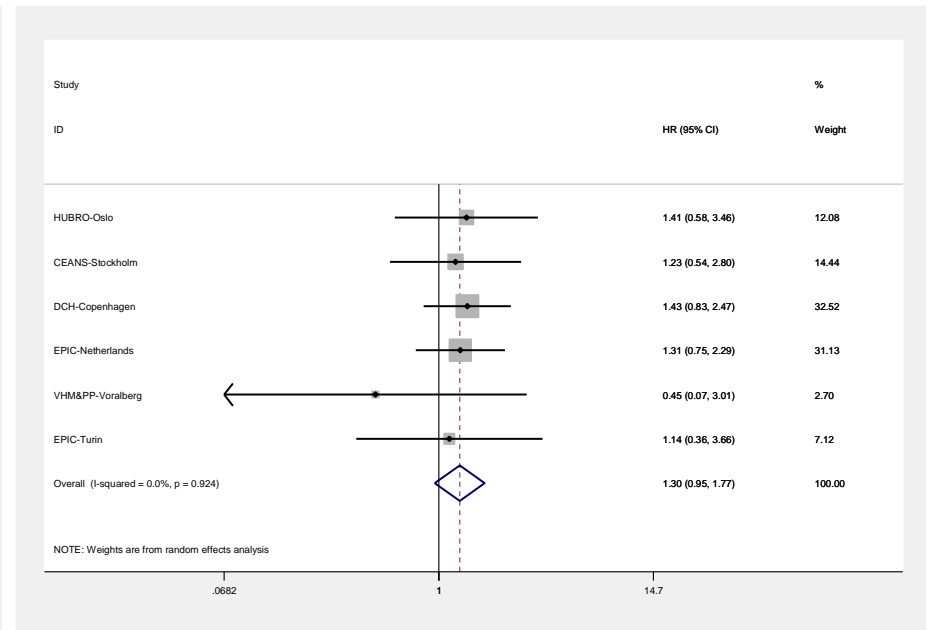
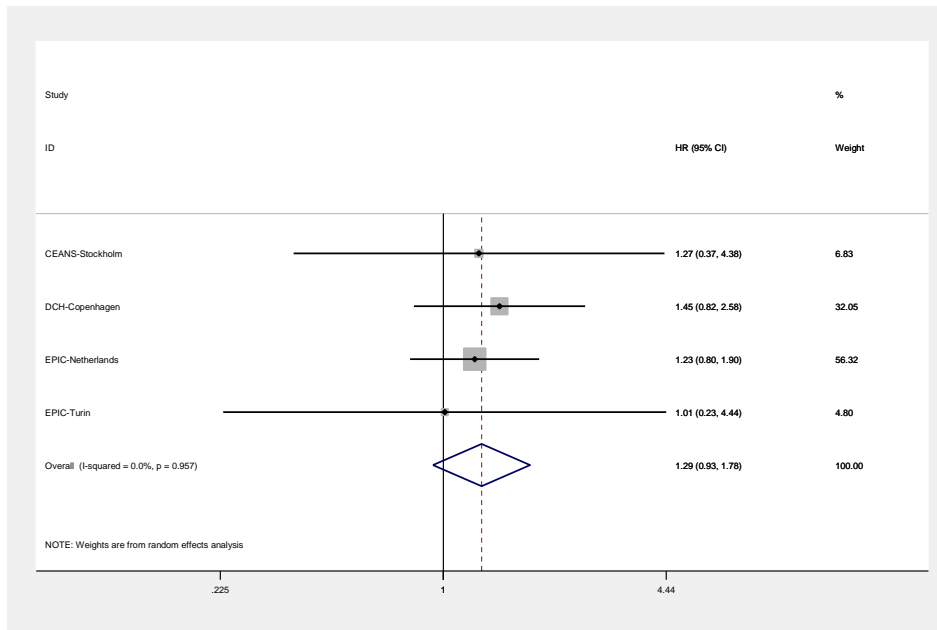


Figure S2. Adjusted associations between breast cancer and vanadium component of PM_{2.5} (right) and PM₁₀ (left) (main Model 3) and, results from cohort-specific analyses and random-effects analyses.