Supplemental Material:

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Table S2: Availability of potential confounders in the different cohorts

Table S3: Test of linearity of the association between ambient air pollutants and risk for gastric and upper aerodigestive tract (UADT) cancers

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Figure S1: Results of sensitivity analyses for the association of gastric cancer with NO_2

Table S1: Characteristics of each of the 15 cohorts and their participants

EPIC-Umeå, Sweden (European Prospective Investigation into Cancer and Nutrition – Umeå)

No. of participants:

Enrolled (within restricted area): 25 600

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 3699

Included in this study: 21 901

Variable	Mean (SD)	N (%)
Age at baseline	45.9 (10.2)	
Smoking intensity (g tobacco/day)	2.4 (5.6)	
Smoking duration (years)	8.8 (13.0)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	162.6 (132.4)	
Meat intake (g/day)	76.8 (48.2)	
Alcohol intake (g/day)	3.6 (4.5)	
Sex		
- Women		11 372 (52%)
- Men		10 529 (48%)
Smoking status		
- Current		4146 (19%)
- Ex		4185 (19%)
- Never		13 570 (62%)
Environmental tobacco smoking		NA
Occupation with higher risk for gastric cancer		NA
Marital status		
- Single		2059 (9%)
- Married/living with partner		17 905 (82%)
- Divorced/separated		1341 (6%)
- Widowed		441 (2%)
Educational level*		
- Low		6122 (28%)
- Medium		11 088 (51%)
- High		4691 (21%)
Employment status		
- Not employed		3184 (15%)
- Employed		18 717 (85%)
Changed address during follow-up		NA
Definition of area-SES: Unemployment rate in neighbourhood, 1992, Statistics Sweden		

* Low: primary school or less; medium: secondary school; high: university

HUBRO, Oslo, Norway (The population-based Oslo Health Study)

No. of participants:

Enrolled (within restricted area): 21 363

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 3405

Included in this study: 17 958

Variable	Mean (SD)	N (%)
Age at baseline	47.9 (15.0)	
Smoking intensity (g tobacco/day)	6.7 (8.4)	
Smoking duration (years)	11.4 (14.3)	
Time since quitting smoking (years)	NA	
Meat intake (g/day)	NA	
Alcohol intake (g/day)		
- Weekly		8993 (51%)
- Occasionally		7160 (40%)
- Never/not past year		1609 (9%)
Fruit intake		
- Rarely		2055 (12%)
- Weekly		8681 (49%)
- Daily		7026 (40%)
Sex		
- Women		10 026 (56%)
- Men		7932 (44%)
Smoking status		
- Current		4700 (26%)
- Ex		4923 (27%)
- Never		8335 (46%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Single		5621 (31%)
- Married/living with partner		8942 (50%)
- Divorced/separated		2417 (13%)
- Widowed		974 (5%)
Educational level		
- Low		3242 (18%)
- Medium		6446 (36%)
- High		8270 (46%)
Employment status		
- Not employed		4705 (26%)
- Employed		13 253 (74%)
Changed address during follow-up		
- No		8590 (48%)
- Yes		9368 (52%)
Definition of area-SES: Unemployment rate in municipality, 2002, Statistics Norway		

* Low: primary school or less; medium: secondary school (at least 1 year); high: college and university

CEANS, Stockholm, Sweden (=SDPP+SALT+SIXTY+SNACK)

No. of participants:

Enrolled (within restricted area): 22 036

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 3194

Included in this study: 18 842

Variable	Mean (SD)	N (%)
Age at baseline	56.2 (11.5)	
Smoking intensity (g tobacco/day)	7.5 (9.1)	
Smoking duration (years)	13.9 (15.6)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	NA	
Meat intake (g/day)	NA	
Alcohol intake (g/day)	NA	
Sex		
- Women		10 593 (56%)
- Men		8249 (44%)
Smoking status		
- Current		4173 (22%)
- Ex		6727 (36%)
- Never		7942 (42%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		NA
Educational level		
- Low		5820 (31%)
- Medium		6975 (37%)
- High		6047 (32%)
Employment status		
- Gainfully employed		13 294 (71%)
- Unemployed / not gainfully employed		1142 (6%)
- Retired		4406 (23%)
Changed address during follow-up		
- No		12 087 (64%)
- Yes		6755 (36%)
Definition of area-SES: Mean income of municipality, 2009, Statistics Sweden		

DCH (Diet Cancer and Health), Copenhagen, Denmark

No. of participants:

Enrolled (within restricted area): 38 760

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 1084

Included in this study: 37 676

Variable	Mean (SD)	N (%)
Age at baseline	56.8 (4.3)	
Smoking intensity (g tobacco/day)	10.4 (11.0)	
Smoking duration (years)	19.3 (17.2)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	212.7 (167.4)	
Meat intake (g/day)	113.3 (58.0)	
Alcohol intake (g/day)	21.8 (23.0)	
Sex		
- Women		19 956 (53%)
- Men		17 720 (47%)
Smoking status		
- Current		14 022 (37%)
- Ex		10 276 (27%)
- Never		13 378 (36%)
Environmental tobacco smoking		
- No		6676 (18%)
- Yes		30 867 (82%)
Occupation with higher risk for gastric cancer		
- No		25 752 (68%)
- Yes*[1]		11 924 (32%)
Occupation with higher risk for UADT cancer		
- No		34 752 (92%)
- Yes[*2]		2924 (8%)
Marital status		
- Single		2444 (7%)
- Married/living with partner		25 783 (69%)
- Divorced/separated		6972 (19%)
- Widowed		2179 (6%)
Educational level*[3]		
- Low		11 447 (30%)
- Medium		17 755 (47%)
- High		8474 (22%)
Employment status		
- Not employed		7793 (21%)
- Employed		29 883 (79%)
Changed address during follow-up		
- No		22 544 (60%)
- Yes		15 132 (40%)
Definition of area-SES: Mean income of municipality, 1995, Statistics Denmark		

*1 Ever employed for at least one year in any of the following occupations/jobs: Rubber industry, metal processing (welding, painting, electroplating), manufacture of asbestos or asbestos cement, asbestos insulation, mining, farming, cement article industry, butcher, painter, cook, health sector.

*2 For UADT cancer there was 8% yes and 92% no and the definition was: Ever employed for at least one year in any of the following occupations/jobs: building/construction industry, painter, cement article industry.

*3 Low: 7 years or less in school; medium: 8-10 years in school; high: more than 10 years in school.

EPIC-Netherlands

No. of participants:

Enrolled (within restricted area): 32 592

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 2458

Included in this study: 30 134

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	50.4 (11.3)	
Smoking intensity (g tobacco/day)	8.1 (9.7)	
Smoking duration (years)	14.6 (15.0)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	200.3 (137.0)	
Meat intake (g/day)	104.0 (54.0)	
Alcohol intake (g/day)	10.9 (15.4)	
Sex		
- Women		22 851 (76%)
- Men		7283 (24%)
Smoking status		
- Current		8796 (29%)
- Ex		9281 (31%)
- Never		12 057 (40%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Single		4328 (14%)
- Married/living with partner		21 744 (72%)
- Divorced/separated		2331 (8%)
- Widowed		1672 (6%)
Educational level		
- Low		4979 (17%)
- Medium		19 233 (64%)
- High		5922 (20%)
Employment status		NA
Changed address during follow-up		NA
Definition of area-SES: Percentage of people with low income in the neighborhood, 2001, Statistics Netherlands		

EPIC-Oxford, UK (European Prospective Investigation into Cancer and Nutrition – Oxford)

No. of participants:

Enrolled (within restricted area): 57 446

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 18 879

Included in this study: 38 567

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	45.5 (13.7)	
Smoking intensity (g tobacco/day)	4.6 (8.2)	
Smoking duration (years)	6.4 (11.0)	
Time since quitting smoking (years)	NA	
Alcohol intake	10.1 (13.2)	
Fruit intake (quintiles)		
		7627 (20%)
		7754 (20%)
		7757 (20%)
		7784 (20%)
		7645 (20%)
Meat intake (quintiles)		
		9902 (26%)
		5656 (15%)
		7305 (19%)
		7870 (20%)
		7834 (20%)
Sex		
- Women		29 475 (76%)
- Men		9092 (24%)
Smoking status		
- Current		4246 (11%)
- Ex		11 256 (29%)
- Never		23 065 (60%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Single		6307 (16%)
- Married/living with partner		27 355 (71%)
- Divorced/separated		3366 (9%)
- Widowed		1511 (4%)
Educational level*[1]		
- Low		13 973 (36%)
- Medium		9263 (24%)
- High		15 331 (40%)
Employment status		
- Employed		24 132 (63%)
- Self employed		4165 (11%)
- Unemployed		968 (3%)
- Stay at home		4402 (11%)
- Retired		4900 (13%)
Changed address during follow-up		
- No		19 977 (52%)
- Yes		18 568 (48%)
Definition of area-SES: Carstairs index 2001*[2]		

*[1]: primary school or less; medium: secondary school; high: university

*[2]: Morgan O. Measuring derivation in England and Wales using 2001 Carstairs scores. Health Statistics Quarterly 31, autumn 2006. National Statistics, UK.

Main reference describing the study design: Davey GK, Spencer EA, Appleby PN, et al. EPIC-Oxford: lifestyle characteristics and nutrient intakes in a cohort of 33 883 meat-eaters and 31 546 non meat-eaters in the UK. *Public Health Nutr* 2003; **6**: 259-69.

VHM&PP, Vorarlberg, Austria (The Vorarlberg Health Monitoring and Prevention Program)

No. of participants:

Enrolled (within restricted area): 131 907

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 27 193

Included in this study: 104 714

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	42.9 (14.9)	
Smoking intensity (g tobacco/day)	NA	
Smoking duration (years)	NA	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	NA	
Meat intake (g/day)	NA	
Alcohol intake (g/day)	NA	
Sex		
- Women		58 739 (56%)
- Men		45 975 (44%)
Smoking status		
- Current		13 725 (13%)
- Ex		7295 (7%)
- Never		83 694 (80%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Single		16 515 (16%)
- Married/living with partner		71 043 (69%)
- Divorced/separated		7360 (7%)
- Widowed		7599 (7%)
Educational level		NA
Employment status		
- Employed or self-employed		71 482 (68%)
- Unemployed		3441 (3%)
- Retired		29 791 (28%)
Changed address during follow-up		
- No		47 046 (80%)
- Yes		11 595 (20%)
Definition of area-SES: Average income of municipality, 2008, Bundesanstalt Statistik Österreich		

EPIC-Varese, Italy

No. of participants:

Enrolled (within restricted area): 11 466

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 1156

Included in this study: 10 310

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	51.6 (8.2)	
Smoking intensity (g tobacco/day)	4.5 (6.8)	
Smoking duration (years)	10.0 (13.5)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	302.4 (173.8)	
Alcohol intake	12.8 (17.2)	
Meat intake		
- Daily		6479 (63%)
- Weekly		3765 (37%)
- Seldom		48 (0.5%)
- Never		17 (0.2%)
Sex		
- Women		8163 (79%)
- Men		2147 (21%)
Smoking status		
- Current		2175 (21%)
- Ex		2210 (21%)
- Never		5925 (57%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Single		414 (4%)
- Married/living with partner		8255 (87%)
- Divorced/separated		234 (2%)
- Widowed		591 (6%)
Educational level		
- Low		6180 (60%)
- Medium		3417 (33%)
- High		713 (7%)
Employment status		
- Employed		5121 (50%)
- Unemployed		1425 (14%)
- Homemaker/housewife		1768 (17%)
- Retired		1996 (19%)
Changed address during follow-up		
- No		8979 (87%)
- Yes		1294 (13%)
Definition of area-SES: Unemployment rate of municipality, 2001, Italian National Institute of Statistics		

EPIC-Turin, Italy

No. of participants:

Enrolled (within restricted area): 8774

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 828

Included in this study: 7946

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	50.4 (7.5)	
Smoking intensity (g tobacco/day)	7.3 (8.3)	
Smoking duration (years)	13.6 (13.9)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	318.6 (182.8)	
Meat intake (g/day)	107.4 (52.9)	
Alcohol intake (g/day)	18.8 (20.6)	
Sex		
- Women		3576 (45%)
- Men		4370 (55%)
Smoking status		
- Current		2051 (26%)
- Ex		2563 (32%)
- Never		3332 (42%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Married		6179 (86%)
- Others		1037 (14%)
Educational level*[1]		
- Low		3532 (44%)
- Medium		3372 (43%)
- High		1042 (13%)
Employment status		NA
Changed address during follow-up		NA
Definition of area-SES: Deprivation index of census block, 2001 *[2]		

*1 Low: primary school or less; medium: high school, secondary school, technical/professional school; high: university

*2 Caranci N, Biggeri A, Grisotto L, et al. The Italian deprivation index at census block level: definition, description and association with general mortality. Epidemiol Prev 2010; 34: 167-76.

SIDRIA-Rome, Italy

No. of participants:

Enrolled (within restricted area): 10 596

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 821

Included in this study: 9775

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	44.2 (6.0)	
Smoking intensity (g tobacco/day)	6.1 (9.3)	
Smoking duration (years)	14.2 (11.1)	
Time since quitting smoking (years)	NA	
Fruit intake (g/day)	NA	
Meat intake (g/day)	NA	
Alcohol intake (g/day)	NA	
Sex		
- Women		5161 (53%)
- Men		4614 (47%)
Smoking status		
- Current		3866 (40%)
- Ex		2754 (28%)
- Never		3155 (32%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Married		9775 (100%)
Educational level*[1]		
- Low		4374 (45%)
- Medium		3927 (40%)
- High		1474 (15%)
Employment status		
- Employed		6910 (71%)
- Unemployed		429 (4%)
- Housewife/retired		2436 (25%)
Changed address during follow-up		
- No		8056 (82%)
- Yes		1719 (18%)
Definition of area-SES: Index of socio-economic position in census block, 2001*[2]		

*[1] Low: compulsory/primary school (5 years + 3 years for children aged 6-13 years); medium: high school; high: university.

*[2] Cesaroni G, Badaloni C, Romano V, Donato E, Perucci CA, Forastiere F. Socioeconomic position and health status of people who live near busy roads: the Rome Longitudinal Study (RoLS). Environ Health. 2010; 9:41.

EPIC-San Sebastian, Spain

No. of participants:

Enrolled (within restricted area): 8157

Initial exclusion (failed exposure assessment, cancer before baseline, unsuccessful follow-up, missing in any covariate in model 3): 571

Included in this study: 7586

V**ariable**	**Mean (SD)**	**N (%)**
Age at baseline	49.4 (7.7)	
Smoking intensity (g tobacco/day)	6.9 (10.0)	
Smoking duration (years)	11.5 (14.2)	
Time since quitting smoking (years)	NA	
Fruit intake		
- <150 g		1969 (26%)
- 150-300 g		2014 (27%)
- >300 g		3603 (47%)
Meat intake		
- Daily		1950 (26%)
- Weekly		1935 (26%)
- Seldom		1900 (25%)
- Never		1801 (24%)
Alcohol intake		
- Daily		2112 (28%)
- Weekly		1245 (16%)
- Seldom		696 (9%)
- never		3533 (47%)
Sex		
- Women		4076 (54%)
- Men		3510 (46%)
Smoking status		
- Current		2067 (27%)
- Ex		1440 (19%)
- Never		4079 (54%)
Environmental tobacco smoking		NA
Occupation with higher risk for cancer		NA
Marital status		
- Married/living together		931 (12%)
- Single		6533 (88%)
Educational level		
- Primary school or less		5347 (70%)
- Secondary school or more		2239 (30%)
Employment status		NA
Changed address during follow-up		NA
Definition of area-SES: Percentage of people with low income in the neighborhood, 2001, Statistics Netherlands		

Table S2: Availability of potential confounders in the different cohorts

Variable	EPIC Umea	HUBRO	CEANS, Stockholm	DCH Denmark	EPIC Netherlands	EPIC Oxford	VHM&&PP Austria	EPIC Varese	EPIC Turin	SIDRIA Rome	EPIC San Sebastian
Sex	+	+	+	+	+	+	+	+	+	+	+
Calendar time	+	+	+	+	+	+	+	+	+	-[$]	+
Smoking status	+	+	+	+	+	+	+	+	+	+	+
Smoking intensity	+	+	+	+	+	+	+	+	+	+	+
Smoking duration	+	+	+	+	+	+	+	+	+	+	+
ETS	-	-	-	+	-	-	-	-	-	-	-
Occupational exposure	-	-	-	+	-	-	-	-	-	-	-
Fruit intake	+	+	-	+	+	+	-	+	+	-	+
Meat intake	+	-	-	+	+	+	-	+	+	-	+
Alcohol intake	+	+	-	+	+	+	-	+	+	-	+
Marital status	+	+	-	+	+	+	+	+	+	-[$]	+
Education level	+	+	+	+	+	+	-	+	+	+	+
Employment status	+	+	+	+	+	+	+	+	-	+	-
AREA SES	+	+	+	+	+	+	+	+	+	+	+
Degree of urbanity	+	-	+	+	+	+	+	+	-	-[$]	+

ETS: environmental tobacco smoke; AREA SES: area-level socioeconomic status; §: in the SIDRIA Rome study was conducted within one year, only married couples participated and only areas within urban Rome were included

Table S3: Test of linearity of the association between air pollutants and risk for gastric and upper aerodigestive tract (UADT) cancer

Gastric cancer

Study	p for linearity					
	PM_{10}	$PM_{2.5}$	$PM_{2.5abs}$	PM_{coarse}	NO_X	NO_2
EPIC Umea	NA	NA	NA	NA	0.795	0.816
HUBRO Norway	0.282	0.340	0.400	0.751	0.136	0.607
CEANS Stockholm	1.000	0.013	0.299	0.241	0.715	1.000
DCH Denmark	0.763	0.574	0.929	0.595	0.687	0.770
EPIC Netherlands	0.583	0.560	0.897	0.359	0.154	0.619
EPIC Oxford	0.524	0.300	0.593	0.488	0.546	0.499
VHM&PP Austria	0.511	0.858	0.873	0.296	0.816	0.841
EPIC Varese	NA	NA	NA	NA	0.823	0.712
EPIC Turin	0.445	0.389	0.462	0.128	0.544	0.367
SIDRIA Rome	0.640	0.289	0.048	0.704	0.380	0.889
EPIC San Sebastian, Spain	NA	NA	NA	NA	0.661	0.683

NA, not relevant

Upper aerodigestive tract (UADT) cancer

Study	p for linearity					
	PM_{10}	$PM_{2.5}$	$PM_{2.5abs}$	PM_{coarse}	NO_X	NO_2
EPIC Umea	NA	NA	NA	NA	0.434	0.457
HUBRO Norway	0.360	0.716	0.055	0.697	0.368	0.345
CEANS Stockholm	0.173	0.656	0.679	0.195	0.081	0.016
DCH Denmark	0.023	0.178	0.878	0.468	0.837	0.855
EPIC Netherlands	0.209	0.968	0.324	0.946	0.111	0.673
EPIC Oxford	0.986	0.543	0.494	0.571	0.701	0.292
VHM&PP Austria	0.686	0.487	0.607	0.108	0.539	0.911
EPIC Turin-Varese	NA	NA	NA	NA	0.870	0.489
SIDRIA Rome	0.906	0.910	0.756	0.388	0.306	0.213
EPIC San Sebastian, Spain	NA	NA	NA	NA	0.556	0.557

NA, not relevant

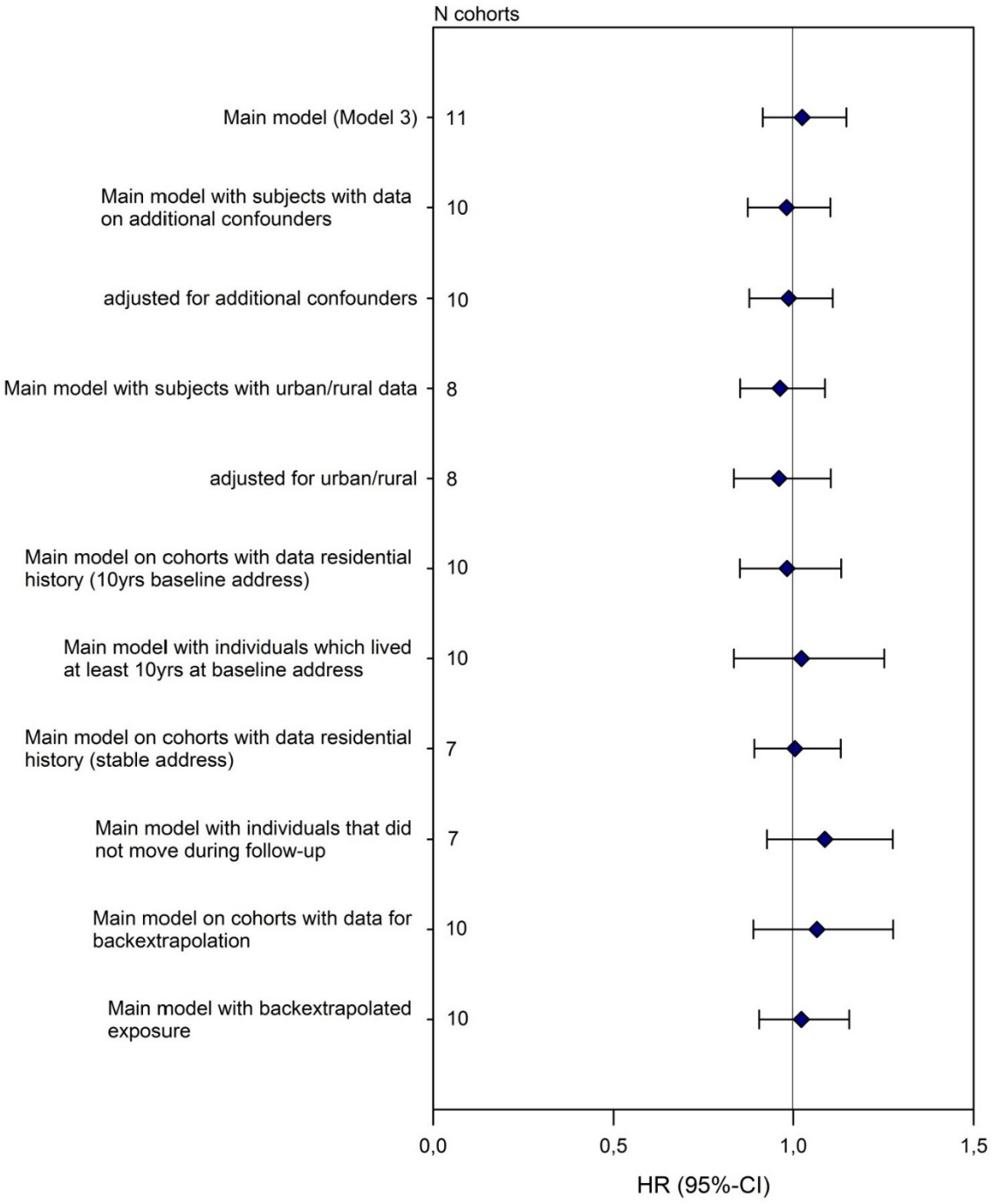


Figure S1: Results of sensitivity analyses for the association of gastric cancer with NO_2. Hazard ratios (HR) with 95% confidence intervals are shown. N= number of cohorts. The additional confounders were alcohol consumption, environmental tobacco smoke (ETS), intake of fruit, intake of meat and marital status where available.

Table S4: Results of analysis of effect modification by smoking for particulate matter (PM)

exposure	fixed increase	smoking status	Ncohorts	HR (95% confidence interval)	p-value (vs smokers)	p-value (ex- vs never smokers)
$PM_{2.5}$	5	smoker	8	1.38 (0.68-2.80)		
		ex-smoker	8	2.48 (1.09-5.67)	0.29	
		never smoker	8	1.23 (0.81-1.86)	0.79	0.14
$PM_{2.5abs}$	1	smoker	8	1.14 (0.48-2.72)		
		ex-smoker	8	2.10 (1.03-4.31)	0.29	
		never smoker	8	0.74 (0.47-1.15)	0.38	0.02
PM_{10}	10	smoker	8	0.95 (0.42-2.15)		
		ex-smoker	8	1.45 (0.72-2.91)	0.44	
		never smoker	8	1.04 (0.65-1.66)	0.86	0.44
PM_{coarse}	5	smoker	6	1.14 (0.65-2.01)		
		ex-smoker	8	1.04 (0.60-1.79)	0.81	
		never smoker	8	0.93 (0.50-1.75)	0.64	0.80

Hazard rate (HR) from Main Model (= Model 3), Number of centers (Ncohorts), p-values for difference of effect estimates of strata; * In HUBRO and EPIC-Oxford no stable effect estimates could be obtained