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Supplemental Material

An Analysis of Temporal Variability in the Short-Term Effects of Ambient Air Pollutants on Nonaccidental Mortality in Rome, Italy (1998–2014)

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Table S1. EU Emission Standards for Passenger Cars (Category M1[a]) and motorcycles, by stage

Stage	Date	CO	NO_x	PM
		g/km		
Compression Ignition (Diesel)				
Euro 1[b]	1992.07	2.72 (3.16)	-	0.14(0.18)
Euro 2, IDI	1996.01	1	-	0.08
Euro 2, DI	1996.01[c]	1	-	0.1
Euro 3	2000.01	0.64	0.5	0.05
Euro 4	2005.01	0.5	0.25	0.025
Euro 5[c]	2009.09[d]	0.5	0.18	0.005[f]
Euro 5[d]	2011.09[e]	0.5	0.18	0.005[f]
Positive Ignition (Gasoline)				
Euro 1[b]	1992.07	2.72 (3.16)	-	-
Euro 2	1996.01	2.2	-	-
Euro 3	2000.01	2.3	0.15	-
Euro 4	2005.01	1	0.08	-
Euro 5	2009.09[d]	1	0.06	0.005[g,h]
Motorcycles				
I (< 150 cm^3)	2003	5,5	0.3	-
II (≥ 150 cm^3)	2003	5,5	0.3	-
I (< 150 cm^3)	2006	2,0	0.15	-
II (≥ 150 cm^3)	2006	2,0	0.15	-

a At the Euro 1..4 stages, passenger vehicles > 2,500 kg were type approved as Category N1 vehicles

b Values in brackets are conformity of production (COP) limits

c. until 1999.09.30 (after that date direct Ignition (DI) engines must meet the Indirect Ignition (IDI) limits)

d 2011.01 for all models

e. 2013.01 for all models

f. and NMHC = 0.068 g/km

g. applicable only to vehicles using DI engines

h. 0.0045 g/km using the PMP measurement procedure

Table S2 Number of vehicles by type and euro emission standards (EURO 0 and EURO 1) in Rome during 2000-2014

Period	Number of vehicles			
	EURO 0	EURO 1	Diesel	Motorcycles
2000	907,600	322,187	345,148	201,876
2005	346,209	232,677	798,540	315,763
2010	210,229	117,837	1,107,659	404,349
2014	194,605	55,744	1,067,583	398,104

Table S3. Mortality counts and environmental data in Rome during the study period 1998-2014

Variables	Number of days	Mean	Standard deviation	Percentiles					IQR[a]
				Min	25°	50°	75°	Max	
Deaths	5,479	55.71	10.86	25	48	55	62	104	14.0
PM_{10}[b] ($\mu g/m^3$)	6,204	36.3	16.0	1.9	25.1	33.3	44.0	181.7	18.9
NO_2 ($\mu g/m^3$)	6,206	59.5	16.6	9.1	47.4	59.4	70.9	118.8	23.5
$PM_{2.5}$[c] ($\mu g/m^3$)	4,720	19.9	10.8	0.0	12.5	17.7	24.5	91.7	12.0
SO_2 ($\mu g/m^3$)	5,983	1.5	1.4	0.0	0.4	1.1	2.1	17.6	1.7
CO (mg/m^3)	6198	1.19	0.79	0.07	0.57	0.95	1.59	5.83	1.0
Temperature (°C)	6,126	15.8	7.0	-1.0	10.2	15.6	21.8	31.0	11.6
Relative Humidity (%)	5,456	75.0	12.2	24.5	67.0	76.4	84.5	105.4	17.5
Barometric pressure (hPa)	6,167	1011.3	55.6	540.0	1010.4	1014.5	1018.3	1039.3	7.9
Apparent temperature (°C)	6,129	15.6	8.6	-3.6	8.4	15.1	22.9	33.7	14.5

[a] Interquartile range : 75th percentile – 25th percentile

[b] From 2001 to 2014

[c] From 2006 to 2014

Table S4. Yearly correlations between pairs of pollutants, measured by Pearson's Coefficient r

Year	Pearson's Coefficient r					
	PM_{10} - NO_2	PM_{10} - SO_2	NO_2 - SO_2	PM_{10} - PM_{25}	PM_{10} - CO	SO_2 - CO
1998	0.37	0.18	0.46	-	0.44	0.26
1999	0.57	0.46	0.51	-	0.75	0.41
2000	0.38	0.05	0.45	-	0.43	0.21
2001	0.33	0.11	0.22	-	0.31	0.18
2002	0.48	0.36	0.47	-	0.55	0.48
2003	0.56	0.35	0.46	-	0.61	0.42
2004	0.51	0.36	0.35	-	0.63	0.36
2005	0.63	0.43	0.37	-	0.66	0.27
2006	0.67	0.38	0.38	0.90	0.65	0.30
2007	0.59	0.48	0.49	0.86	0.60	0.36
2008	0.65	0.43	0.28	0.89	0.56	0.31
2009	0.43	0.21	0.25	0.86	0.54	0.04
2010	0.55	0.11	-0.06	0.90	0.56	0.01
2011	0.65	0.27	0.26	0.94	0.75	0.29
2012	0.66	0.01	-0.01	0.92	0.67	0.08
2013	0.67	0.26	0.31	0.95	0.74	0.32
2014	0.49	0.20	0.30	0.84	0.61	0.25

Table S5. Heterogeneity of the yearly estimates of association between air pollutants and non-accidental mortality. I^2 (%) and p-value of the heterogeneity test (p-het) from different meta-analytical models: first line shows results of the meta-analysis of yearly estimates, with no meta-regressors; second to fifth lines shows results of the meta-analysis of yearly estimates, when the reported meta-regressor is added, in turn; last line shows results of the meta-analysis of yearly estimates, when all meta-regressors are added together

	PM_{10}				**NO_2**				**PM_{25}**				**SO_2**				**CO**			
	Current year		**Previous year**		**Current year**		**Previous year**		**Current year**		**Previous year**		**Current year**		**Previous year**		**Current year**		**Previous year**	
	I2 %	**p-het**	**I2%**	**p-het**	**I2 %**	**p-het**	**I2%**	**p-het**	**I2 %**	**p-het**	**I2%**	**p-het**	**I2 %**	**p-het**	**I2%**	**p-het**	**I2 %**	**p-het**	**I2%**	**p-het**
Overall	10.77	0.323	-	-	72.04	0	-	-	38.84	0.1771	-	-	0	0.375	-	-	0	1	-	-
Mean Concentration	14.56	0.288	18.79	0.243	72.96	0	73.92	0	46.04	0.119	47.47	0.116	2.55	0.323	6.49	0.291	0	1	0	1
Mean Temperature	0	1	18.78	0.232	70.99	0	74	0	45.45	0.127	14.79	0.364	0	0.396	10.69	0.215	0	1	0	1
Hot Temperature	7.69	0.402	0	0.414	72.82	0	65.74	0.000	21.5	0.411	0	0.468	0	0.345	6.99	0.209	0	1	0	1
Cold Temperature	11.26	0.325	0.71	0.425	71.7	0	72.32	0	5.95	0.476	38.84	0.190	0	1	4.2	0.283	0	1	0	1
Population	23.13	0.210	28.96	0.153	70.73	0.000	74.67	0	46.15	0.112	44.64	0.135	0	0.424	0	1	0	1	0	1
All	13.06	0.436	8.37	0.285	74.59	0.000	66.11	0.006	10.1	0.435	13.54	0.4529	0	1	0	1	8.66	1	0	1