

Supplemental Material, Table 1. Overview of final confounder variables by analysis period. Variables were included as covariates into the models if an x or the functional form are given.

Selected time-varying confounder variables

		PI 1993/1994 (lag 0 weeks)	PI 1994/1995 (lag -3 weeks)	PI 1995/1996 (lag -1 week)	PI 1998/1999 (lag 2 weeks)	PI 1999/2000 (lag 2 weeks)	PI 2000/2001 (lag 3 weeks)	Air temperature (lag 0 days)	Air temperature (lag 1 days)	Relative humidity (lag 2 days)	Indicator variable for Sunday
Time trend											
Analysis period	Smooth	Smooth	Smooth	Smooth		Smooth	Smooth	Smooth	x	Smooth	x
1991-2002	function	function	function	function		function	function	function		function	
Analysis period	Smooth			Smooth	x	x	Smooth	Smooth	x	Smooth	x
1995-2002	function			function			function	function		function	

Supplemental Material, Table 2. Spearman rank correlation for daily means of air pollutants and meteorological parameters in Erfurt, Germany.

	NO <sub>2</sub> <sup>a</sup>	CO	UFP <sup>b</sup>	PM <sub>10</sub> <sup>b</sup>	PM <sub>2.5</sub> <sup>b</sup>	Temp.	RH
NO <sub>2</sub> <sup>a</sup>	1	0.68	0.62	0.64	0.63	-0.28	0.14
CO		1	0.51	0.65	0.62	-0.49	0.25
UFP <sup>b</sup>			1	0.57	0.48	-0.32	0.07
PM <sub>10</sub> <sup>b</sup>				1	0.85	-0.12	0.00
PM <sub>2.5</sub> <sup>b</sup>					1	-0.31	0.18
Temp.						1	-0.53

<sup>a</sup> Data from April 1, 1994 to January 31, 1995 deleted.

<sup>b</sup> Imputed time series.

Supplemental Material, Table 3. Relative risk (RR) of mortality together with confidence intervals (CI) per an interquartile (IQR) increase of NO<sub>2</sub>, CO, PM<sub>10</sub>, PM<sub>2.5</sub> and UFP in Erfurt, Germany.

Pollutant	Analysis period	IQR	Lag (days)	RR / IQR	CI
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	0	0.994	0.973 ; 1.016
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	1	1.010	0.990 ; 1.030
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	2	1.008	0.989 ; 1.028
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	3	1.015	0.996 ; 1.035
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	4	1.014	0.995 ; 1.033
NO <sub>2</sub> <sup>a</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	19.7	5	1.002	0.983 ; 1.021
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	0	0.995	0.976 ; 1.014
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	1	1.005	0.986 ; 1.023
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	2	1.005	0.987 ; 1.023
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	3	1.014	0.996 ; 1.032
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	4	1.019	1.002 ; 1.036
CO (mg/m <sup>3</sup> ), old city limits	1991-2002	0.48	5	1.012	0.994 ; 1.029
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	0	0.992	0.973 ; 1.011
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	1	0.998	0.980 ; 1.016
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	2	1.000	0.983 ; 1.018
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	3	0.990	0.973 ; 1.008
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	4	1.005	0.988 ; 1.023
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), old city limits	1991-2002	27.8	5	1.007	0.990 ; 1.025
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	0	0.989	0.960 ; 1.020
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	1	1.004	0.977 ; 1.032
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	2	1.004	0.978 ; 1.031
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	3	1.017	0.990 ; 1.044
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	4	1.011	0.985 ; 1.038
NO <sub>2</sub> (µg/m <sup>3</sup> ), new city limits	1995-2002	17.2	5	0.997	0.971 ; 1.024
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	0	1.002	0.981 ; 1.023
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	1	1.002	0.982 ; 1.023
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	2	1.014	0.993 ; 1.034
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	3	1.012	0.991 ; 1.032
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	4	1.015	0.994 ; 1.035
CO (mg/m <sup>3</sup> ), new city limits	1995-2002	0.33	5	0.999	0.979 ; 1.019
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	0	1.005	0.982 ; 1.029
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	1	1.003	0.981 ; 1.026
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	2	0.999	0.978 ; 1.021
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	3	0.987	0.966 ; 1.009
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	4	0.996	0.975 ; 1.018
PM <sub>10</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	23.0	5	0.991	0.970 ; 1.013
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	0	1.008	0.987 ; 1.029
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	1	1.005	0.985 ; 1.025
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	2	1.004	0.984 ; 1.023
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	3	0.992	0.973 ; 1.011
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	4	1.004	0.985 ; 1.022
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> ), new city limits	1995-2002	16.3	5	1.001	0.982 ; 1.020
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	0	1.019	0.993 ; 1.047
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	1	1.004	0.978 ; 1.030
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	2	0.998	0.974 ; 1.023
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	3	1.013	0.988 ; 1.038
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	4	1.032	1.007 ; 1.057
UFP <sup>b</sup> (cm <sup>-3</sup> ), new city limits	1995-2002	9419	5	1.010	0.986 ; 1.035

<sup>a</sup> Plausible data only, period from April 1, 1994 to January 31, 1995 omitted.

<sup>b</sup> Imputed time series.

Supplemental Material, Table 4. Sensitivity analysis for the ultrafine subclass NC 0.03-0.05  $\mu\text{m}$  for the analysis period 1995-2001 in Erfurt, Germany.

Type	6-day IQR	Cumulative 6-day RR (CI) per IQR – PDL model <sup>a</sup>	Cumulative 6-day RR (CI) per IQR – mean of lags 0-5	15-day IQR	Cumulative 15-day RR (CI) per IQR – PDL model <sup>a</sup>	Cumulative 15-day RR (CI) per IQR – mean of lags 0-14
Original model	1783	1.033 (0.997;1.071)	1.029 (0.997;1.062)	1483	1.054 (1.005;1.105)	1.034 (0.998 , 1.072)
Trend with 6 DF (less DF than in original model)	1783	1.033 (0.996;1.071)	1.029 (0.997;1.062)	1483	1.045 (0.999;1.093)	1.034 (0.998 , 1.072)
Air temperature variables with 6 DF (more DF than in original model)	1783	1.033 (0.996;1.071)	1.030 (0.997;1.062)	1483	1.048 (1.002; 1.097)	1.037 (1.001 , 1.076)
Indicator for day of the week (instead of Sunday indicator)	1783	1.034 (0.997;1.071)	1.031 (0.999;1.064)	1483	1.046 (1.000;1.094)	1.038 (1.003 , 1.075)
Old city limits and same confounder model as for period 1991-2002	1783	1.032 (0.994;1.072)	1.028 (0.994;1.062)	1483	1.050 (1.001;1.101)	1.041 (1.003 , 1.081)

<sup>a</sup> polynomial distributed lag models were estimated with a third-degree polynomial.

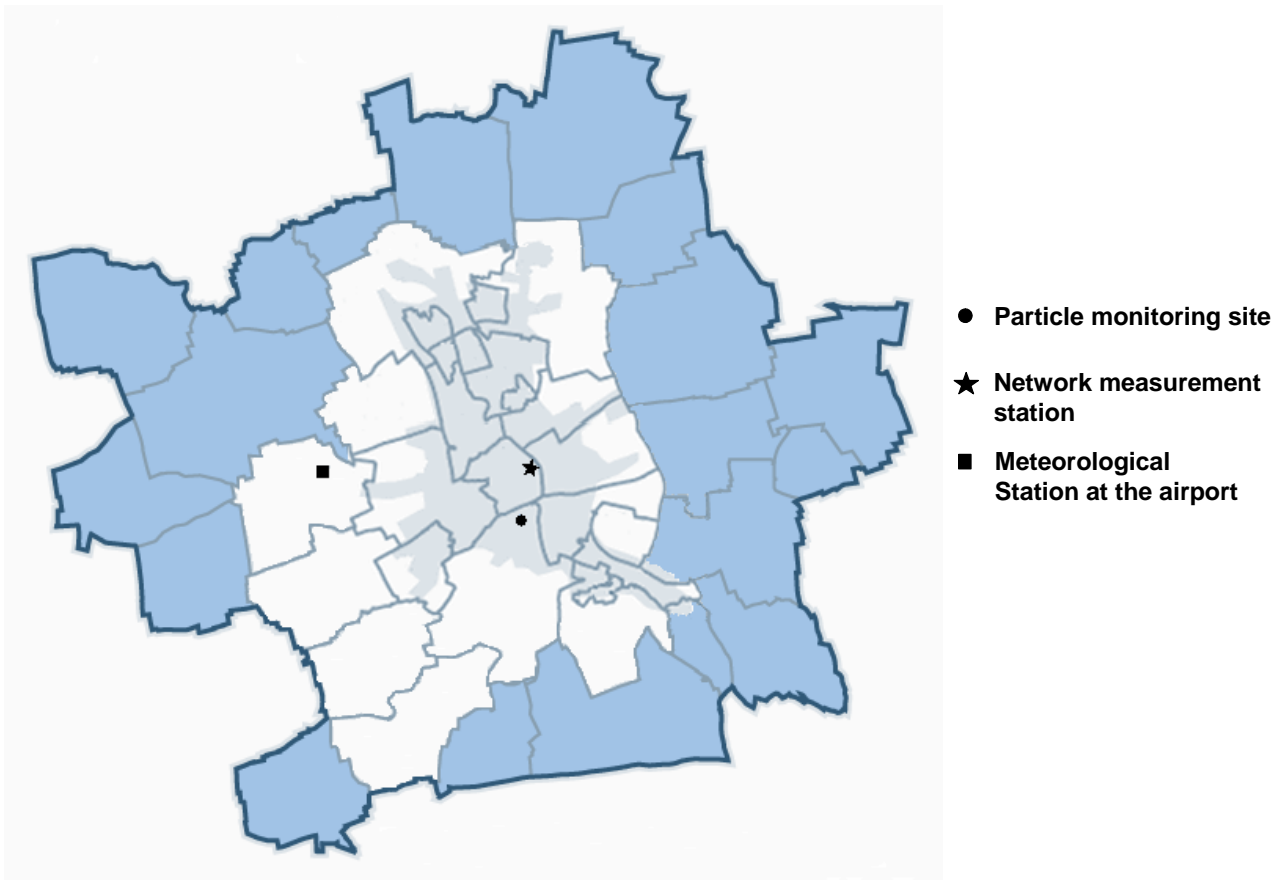
Supplemental Material, Table 5. Effects of UFP, NO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub> on daily mortality in two-pollutant models <sup>a</sup>.

Pollutant	Analysis period	6-day IQR	Cumulative 6-day RR (CI)	15-day IQR	Cumulative 15-day RR (CI)
			per IQR – mean of lag 0-5		per IQR – mean of lag 0-14
UFP (cm <sup>-3</sup> ) <sup>b</sup>	1995-2002	8439	1.039 (0.995 ; 1.085)	7649	1.063 (1.012 ; 1.117)
NO <sub>2</sub> (µg/m <sup>3</sup> )		12.7	0.988 (0.952 ; 1.025)	11.0	0.990 (0.945 ; 1.034)
UFP (cm <sup>-3</sup> ) <sup>b</sup>	1995-2002	8439	1.034 (0.988 ; 1.082)	7649	1.060 (1.007 ; 1.116)
CO (mg/m <sup>3</sup> )		0.31	0.996 (0.962 ; 1.031)	0.31	0.992 (0.951; 1.035)
UFP (cm <sup>-3</sup> ) <sup>b</sup>	1995-2002	8439	1.049 (1.006 ; 1.095)	7649	1.066 (1.014 ; 1.120)
PM <sub>10</sub> (µg/m <sup>3</sup> ) <sup>b</sup>		17.2	0.979 (0.951 ; 1.008)	14.5	0.987 (0.950 ; 1.022)
UFP (cm <sup>-3</sup> ) <sup>b</sup>	1995-2002	8439	1.040 (0.996 ; 1.086)	7649	1.057 (1.004 ; 1.113)
PM <sub>2.5</sub> (µg/m <sup>3</sup> ) <sup>b</sup>		13.3	0.989 (0.962 ; 1.016)	11.5	0.998 (0.963 ; 1.033)

<sup>a</sup> Relative risks were estimated for mortality within new city limits.

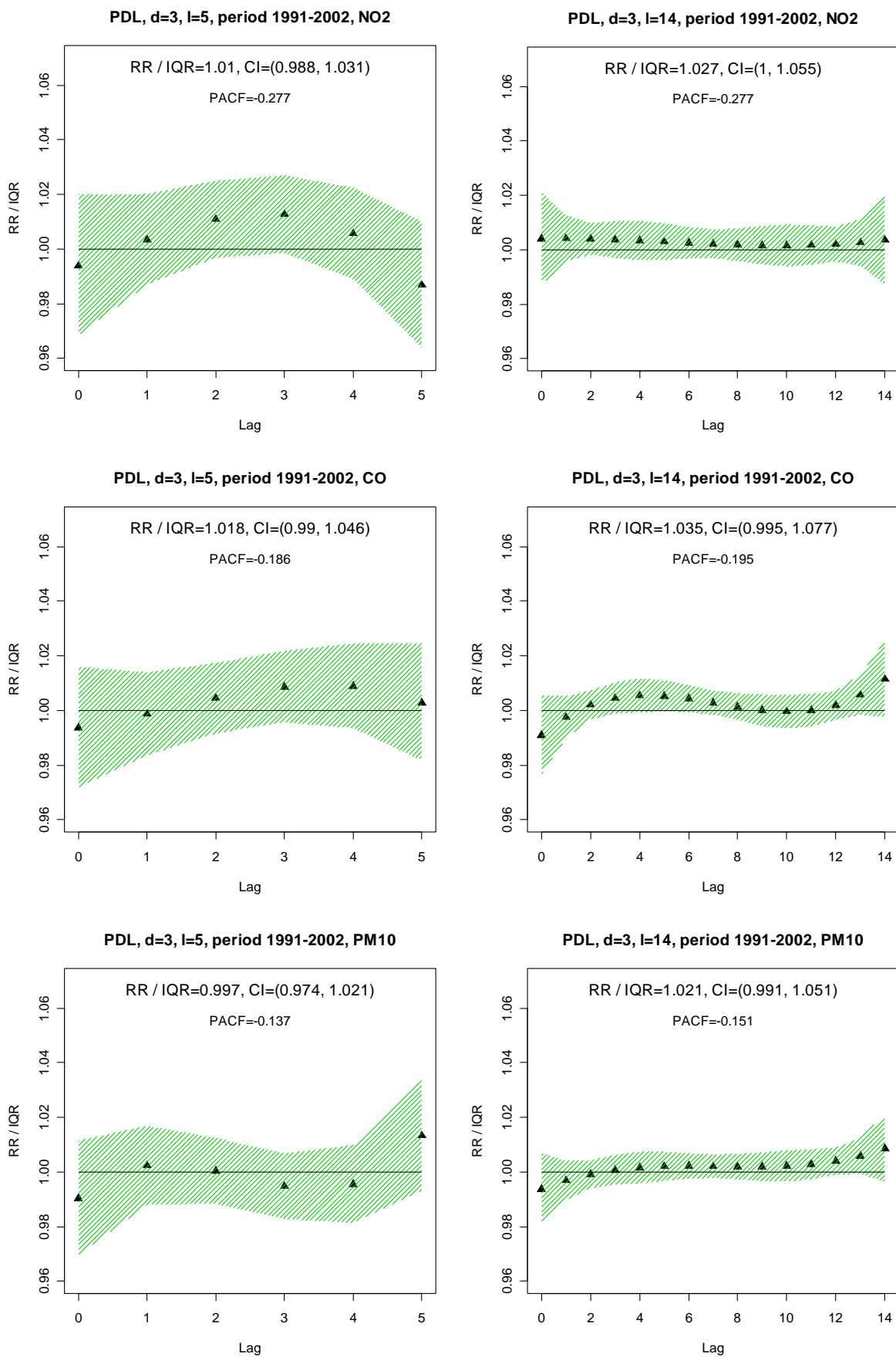
<sup>b</sup> Imputed time series.

Supplemental Material, Figure 1. Districts of the city of Erfurt together with monitoring stations used in the analyses.

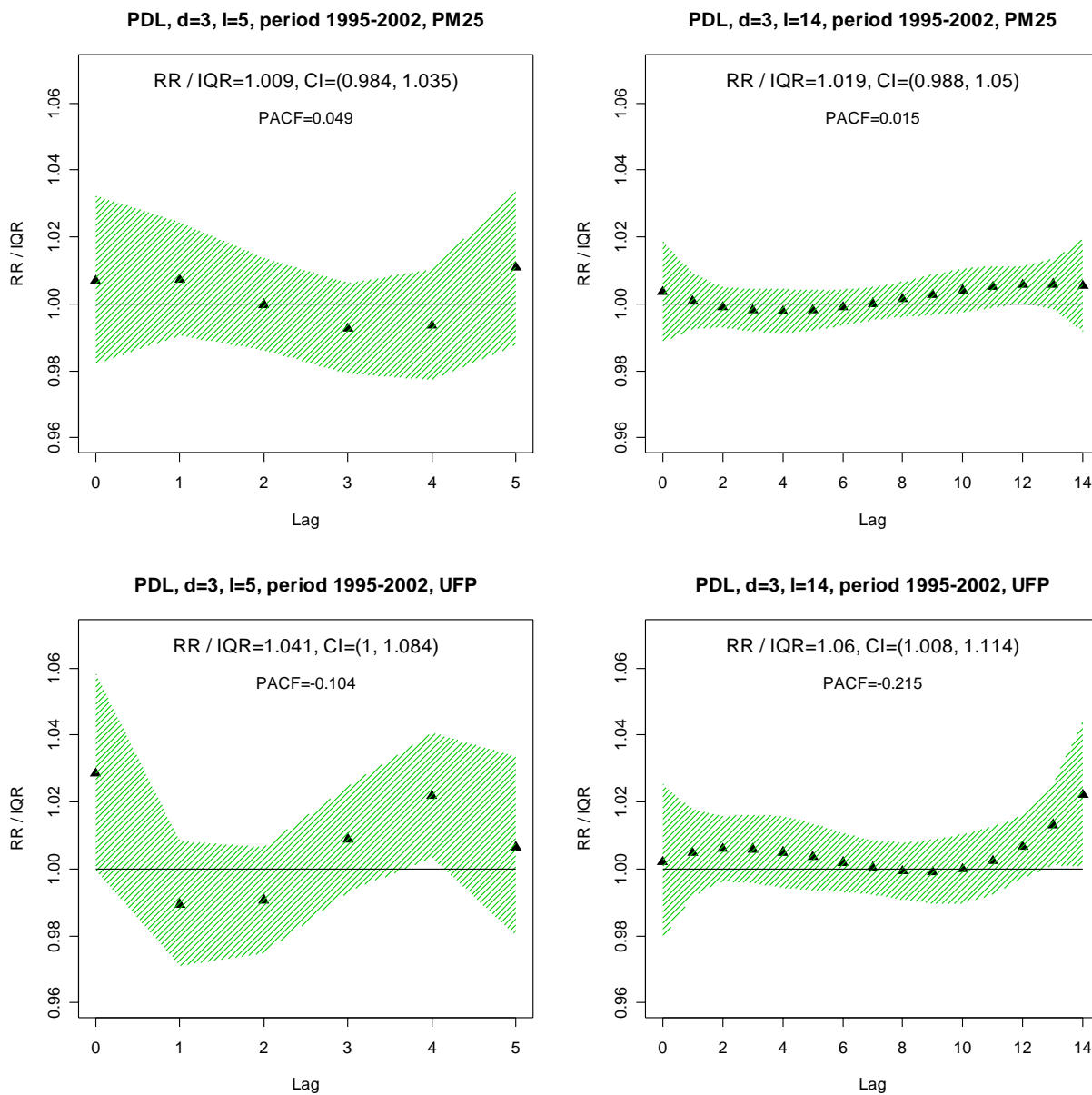


The white colored districts depict the 'old city area' (before 1994); the blue colored districts are the incorporated communities (since 1994). The grey shaded part denotes the densely populated areas of Erfurt.

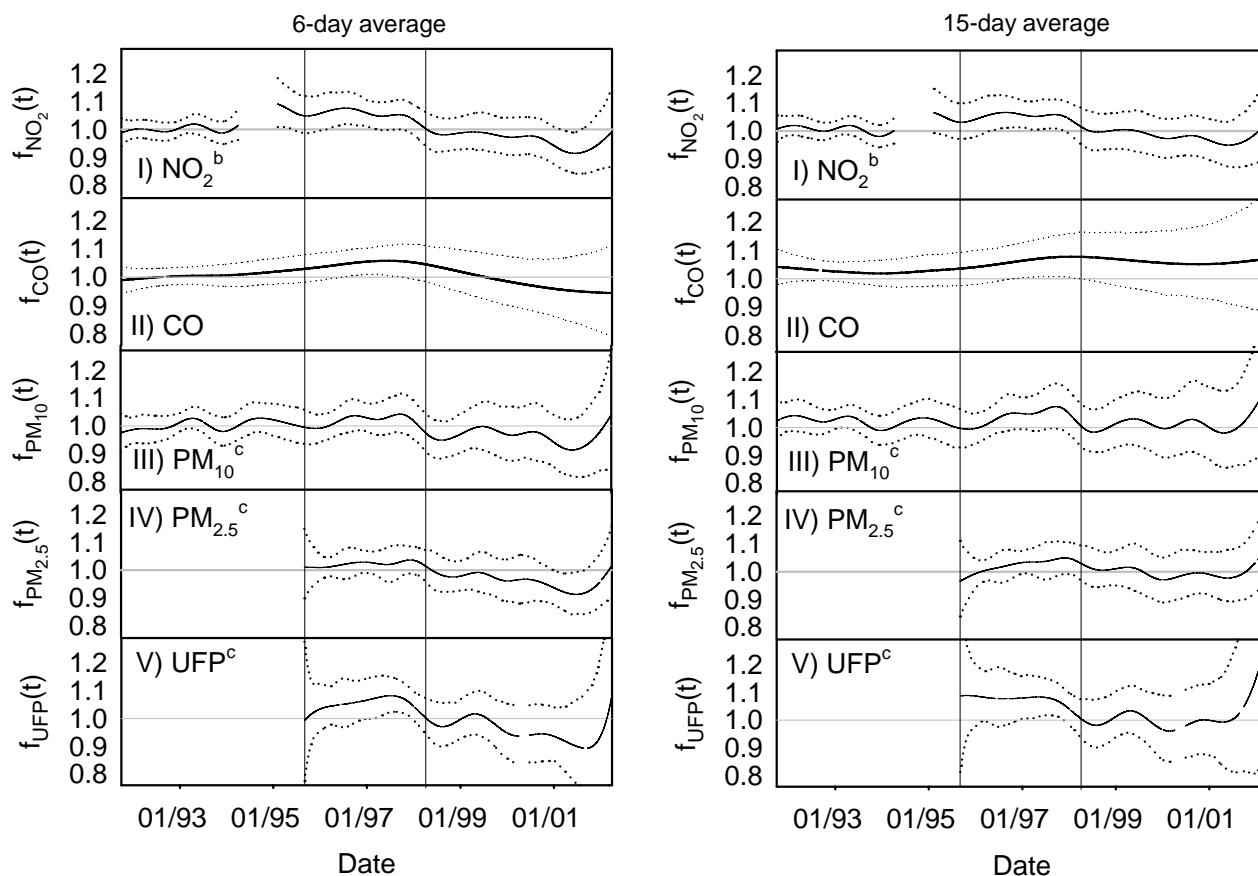
Supplemental Material, Figure 2. Polynomial distributed lag analysis of NO<sub>2</sub>, CO, and PM<sub>10</sub> versus mortality. Relative risks for mortality for each interquartile range (IQR) increase in air pollution for lags 0-5 days (left) and for lags 0-14 days (right) fitted with a third-degree polynomial.



Supplemental Material, Figure 3. Polynomial distributed lag analysis of PM<sub>2.5</sub> and UFP versus mortality. Relative risks for mortality for each interquartile range (IQR) increase in air pollution for lags 0-5 days (left) and for lags 0-14 days (right) fitted with a third-degree polynomial.



Supplemental Material, Figure 4. Time-varying associations of daily mortality (together with 95% credible intervals) and NO<sub>2</sub> (I), CO (II), PM<sub>10</sub> (III), PM<sub>2.5</sub> (IV) and UFP (V) in Erfurt, Germany, between 1991 and 2002<sup>a</sup>.

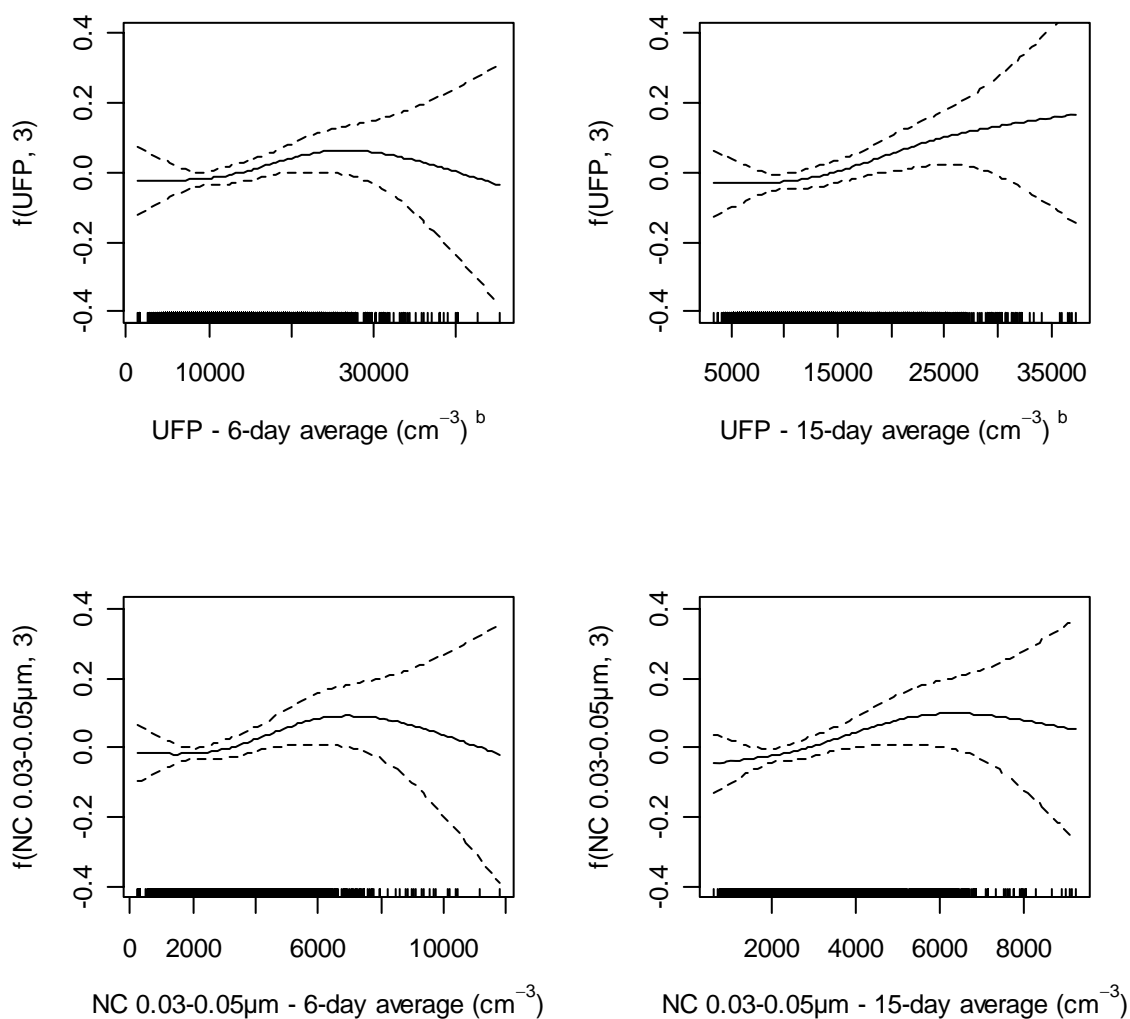


<sup>a</sup> Time-varying associations for NO<sub>2</sub>, CO and PM<sub>10</sub> were estimated for mortality within old city limits, time-varying associations for UFP and PM<sub>2.5</sub> for mortality within new city limits.

<sup>b</sup> Plausible data only, period from April 1, 1994 to January 31, 1995 omitted.

<sup>c</sup> Imputed time series.

Supplemental Material, Figure 5. Exposure–response curves of UFP, NC 0.03-0.05  $\mu\text{m}$ , and daily mortality in Erfurt <sup>a</sup>.



The horizontal axes show air pollutant concentrations, the vertical axes show relative mortality rates (on a log scale) as a function of air pollutants. Dashed lines represent 95% confidence intervals.

<sup>a</sup> Exposure-response curves were estimated for mortality within new city limits.

<sup>b</sup> Imputed time series.