



APPENDIX AVAILABLE ON REQUEST

Research Report 97

**Identifying Subgroups of the General Population That May Be
Susceptible to Short-Term Increases in Particulate Air Pollution:
A Time-Series Study in Montreal, Quebec**

**Appendix K Summary Estimates of Effects of Pollutants
on Specific Causes of Death**

**Mark S Goldberg, John C Bailar III, Richard T Burnett, Jeffrey R Brook,
Robyn Tamblyn, Yvette Bonvalot, Pierre Ernst, Kenneth M Flegel,
Ravinder K Singh, and Marie-France Valois**

Although this document was produced with partial funding by the United States Environmental Protection Agency under Assistance Award R824835 to the Health Effects Institute, it has not been subjected to the Agency's peer and administrative review and therefore may not necessarily reflect the views of the Agency, and no official endorsement by it should be inferred. The contents of this document also have not been reviewed by private party institutions, including those that support the Health Effects Institute; therefore, it may not reflect the views or policies of these parties, and no endorsement by them should be inferred.

This document was reviewed by the HEI Health Review Committee but did not undergo the HEI scientific editing and production process.

Copyright © 2000 Health Effects Institute, Cambridge MA

Table K.1 Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Three Selected Measures of Particulate Air Pollution, Evaluated at the 3-Day Mean, Montreal, 1984-1993^a

Cause of death	Coefficient of Haze			Predicted PM _{2.5}			Sutton Sulfate		
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	
Nonaccidental deaths	1.98	1.07 - 2.90	2.17	1.26 - 3.08	1.29	0.68 - 1.90			
Neoplasms	2.34	0.77 - 3.93	1.40	-0.14 - 2.96	0.75	-0.28 - 1.78			
Lung cancer	3.05	0.04 - 6.15	1.82	-1.13 - 4.85	0.39	-1.60 - 2.41			
Cardiovascular diseases	0.19	-1.15 - 1.54	1.31	-0.06 - 2.70	1.31	0.37 - 2.26			
Coronary artery disease	0.94	-0.80 - 2.72	1.68	-0.12 - 3.51	1.50	0.28 - 2.74			
Respiratory diseases	5.98	3.01 - 9.03	7.73	4.74 - 10.81	3.86	1.81 - 5.95			
65 years old and older	6.90	3.69 - 10.21	9.03	5.83 - 12.33	4.64	2.46 - 6.86			
Digestive diseases	-1.28	-5.40 - 3.02	1.90	-2.19 - 6.15	0.67	-2.12 - 3.54			
Accidents	3.38	-0.45 - 7.37	2.04	-1.77 - 6.00	1.73	-0.68 - 4.20			
Other nonaccidental causes	5.14	2.62 - 7.71	3.93	1.51 - 6.40	2.04	0.41 - 3.69			
AIDS	7.43	-0.29 - 15.75	3.40	-3.41 - 10.69	0.51	-4.06 - 5.30			
Diabetes	7.50	1.96 - 13.34	7.59	2.36 - 13.09	4.48	1.08 - 7.99			
Renal diseases	0.25	-6.65 - 7.66	-1.66	-8.39 - 5.56	-0.10	-4.62 - 4.63			
Neurological conditions	1.98	-3.01 - 7.23	0.66	-3.78 - 5.30	0.12	-2.84 - 3.17			

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.2. Mean Percent Change in Daily Mortality for Three Selected Measures of Particulate Air Pollution, Evaluated at the 3-Day Mean, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Coefficient of Haze				
Nonaccidental deaths	0.30	-1.45 - 2.09	2.57	1.51 - 3.63
Neoplasms	0.33	-2.28 - 3.01	3.28	1.31 - 5.29
Lung cancer	5.22	0.37 - 10.30	1.74	-2.08 - 5.71
Cardiovascular diseases	-2.08	-5.12 - 1.06	0.76	-0.71 - 2.26
Coronary artery disease	-3.92	-7.62 - -0.06	2.03	0.09 - 4.00
Other nonaccidental causes	4.25	-0.42 - 9.14	5.35	2.39 - 8.40
Predicted PM_{2.5}				
Nonaccidental deaths	1.03	-0.74 - 2.83	2.68	1.65 - 3.73
Neoplasms	0.51	-2.05 - 3.13	1.80	-0.08 - 3.72
Lung cancer	0.50	-4.13 - 5.36	2.59	-1.19 - 6.52
Cardiovascular diseases	0.54	-2.72 - 3.91	1.41	-0.07 - 2.92
Coronary artery disease	1.50	-2.62 - 5.80	1.74	-0.22 - 3.73
Other nonaccidental causes	3.98	-0.39 - 8.54	3.84	1.02 - 6.75
Sutton Sulfate				
Nonaccidental deaths	0.04	-1.16 - 1.25	1.77	1.08 - 2.48
Neoplasms	-0.36	-2.08 - 1.40	1.32	0.05 - 2.60
Lung cancer	-3.19	-6.33 - 0.05	2.51	-0.03 - 5.12
Cardiovascular diseases	0.59	-1.68 - 2.90	1.43	0.41 - 2.46
Coronary artery disease	1.93	-0.90 - 4.85	1.42	0.09 - 2.77
Other nonaccidental causes	1.77	-1.16 - 4.78	2.15	0.22 - 4.11

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.3. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to the Extinction Coefficient, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1		3-day mean	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.05	0.43 - 1.68	0.86	0.23 - 1.48	1.67	0.82 - 2.53
Neoplasms	1.16	0.09 - 2.24	0.81	-0.26 - 1.89	2.01	0.55 - 3.50
Lung cancer	1.71	-0.31 - 3.76	-0.42	-2.50 - 1.70	2.19	-0.60 - 5.07
Cardiovascular diseases	0.86	-0.08 - 1.80	0.60	-0.34 - 1.54	0.72	-0.55 - 2.02
Coronary artery disease	1.10	-0.12 - 2.33	1.25	0.04 - 2.48	1.89	0.22 - 3.58
Respiratory diseases	0.95	-0.99 - 2.92	2.32	0.41 - 4.27	4.03	1.37 - 6.75
65 years old and older	0.99	-1.09 - 3.10	2.89	0.87 - 4.96	4.33	1.49 - 7.25
Digestive diseases	2.71	-0.07 - 5.57	1.29	-1.52 - 4.19	1.81	-2.06 - 5.84
Accidents	0.07	-2.67 - 2.87	-0.19	-2.90 - 2.60	-1.37	-5.03 - 2.44
Other nonaccidental causes	1.42	-0.23 - 3.09	0.89	-0.80 - 2.60	2.63	0.35 - 4.96
AIDS	4.02	-0.08 - 8.30	-4.17	-8.79 - 0.68	2.92	-3.00 - 9.21
Diabetes	4.33	0.83 - 7.96	2.93	-0.59 - 6.58	5.52	0.60 - 10.67
Renal diseases	0.57	-4.21 - 5.60	0.40	-4.50 - 5.56	-1.30	-7.91 - 5.78
Neurological diseases	0.60	-2.62 - 3.92	-2.04	-5.31 - 1.35	0.07	-4.29 - 4.64

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.4. Mean Percent Change in Daily Mortality for the Extinction Coefficient, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	1.16	-0.06 - 2.39	1.04	0.32 - 1.77
Neoplasms	0.56	-1.26 - 2.41	1.43	0.10 - 2.78
Lung cancer	-0.05	-3.33 - 3.33	2.74	0.17 - 5.36
Cardiovascular diseases	0.71	-1.52 - 2.98	0.88	-0.15 - 1.92
Coronary artery disease	1.26	-1.47 - 4.07	1.03	-0.31 - 2.38
Other nonaccidental causes	3.40	0.42 - 6.48	0.58	-1.38 - 2.58
Lag 1				
Nonaccidental deaths	0.29	-0.94 - 1.54	1.05	0.33 - 1.77
Neoplasms	0.93	-0.89 - 2.79	0.70	-0.62 - 2.05
Lung cancer	1.01	-2.28 - 4.41	-1.30	-3.98 - 1.45
Cardiovascular diseases	0.42	-1.80 - 2.68	0.62	-0.41 - 1.65
Coronary artery disease	0.72	-2.03 - 3.55	1.38	0.05 - 2.72
Other nonaccidental causes	-0.43	-3.58 - 2.83	1.39	-0.58 - 3.40
3-day mean				
Nonaccidental deaths	0.88	-0.79 - 2.59	1.96	0.98 - 2.95
Neoplasms	0.83	-1.66 - 3.39	2.52	0.70 - 4.37
Lung cancer	0.93	-3.51 - 5.59	2.98	-0.61 - 6.69
Cardiovascular diseases	0.75	-2.26 - 3.85	0.81	-0.59 - 2.22
Coronary artery disease	2.16	-1.57 - 6.03	1.77	-0.05 - 3.63
Other nonaccidental causes	2.46	-1.75 - 6.85	2.68	-0.01 - 5.44

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.5. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Total Suspended Particles, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.86	0.00 - 3.76	1.04	-0.80 - 2.93
Neoplasms	1.53	-1.50 - 4.64	-0.26	-3.44 - 3.04
Lung cancer	6.13	0.19 - 12.41	6.17	-0.05 - 12.78
Cardiovascular diseases	1.86	-0.91 - 4.71	-0.26	-3.01 - 2.56
Coronary artery disease	2.58	-1.09 - 6.38	-0.25	-3.86 - 3.50
Respiratory diseases	1.61	-4.03 - 7.59	3.70	-2.34 - 10.10
65 years old and older	1.83	-4.25 - 8.30	5.59	-0.85 - 12.45
Digestive diseases	9.35	1.39 - 17.94	2.20	-6.46 - 11.65
Accidents	-4.14	-11.71 - 4.08	-5.09	-12.30 - 2.70
Other nonaccidental causes	1.27	-3.55 - 6.32	3.55	-1.65 - 9.02
AIDS	1.31	-11.44 - 15.90	-5.93	-20.58 - 11.43
Diabetes	0.99	-9.31 - 12.45	5.92	-5.01 - 18.10
Renal diseases	5.71	-8.59 - 22.26	-7.69	-20.97 - 7.83
Neurological conditions	2.29	-7.32 - 12.90	12.35	2.00 - 23.76

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.6. Mean Percent Change in Daily Mortality for Total Suspended Particles, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	1.59	-2.10 - 5.42	1.98	-0.18 - 4.18
Neoplasms	-0.10	-5.43 - 5.52	2.38	-1.41 - 6.31
Lung cancer	5.95	-3.27 - 16.04	6.20	-1.44 - 14.43
Cardiovascular diseases	1.97	-4.22 - 8.57	1.85	-1.22 - 5.02
Coronary artery disease	3.40	-4.52 - 11.98	2.48	-1.54 - 6.67
Other nonaccidental causes	1.04	-7.85 - 10.80	1.20	-4.47 - 7.21
Lag 1				
Nonaccidental deaths	-2.92	-6.25 - 0.52	2.29	0.09 - 4.53
Neoplasms	-1.56	-6.51 - 3.65	0.45	-3.53 - 4.59
Lung cancer	2.66	-6.27 - 12.43	8.57	0.21 - 17.63
Cardiovascular diseases	-3.83	-9.65 - 2.36	0.49	-2.53 - 3.59
Coronary artery disease	-1.14	-8.52 - 6.83	-0.09	-4.02 - 4.00
Other nonaccidental causes	-2.16	-11.15 - 7.74	5.51	-0.66 - 12.07

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.7. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to PM₁₀, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.43	-0.33 - 3.22	0.80	-0.93 - 2.56
Neoplasms	1.44	-1.61 - 4.58	-2.96	-6.03 - 0.21
Lung cancer	2.34	-3.04 - 8.01	3.01	-2.81 - 9.17
Cardiovascular diseases	1.54	-1.20 - 4.35	1.92	-0.70 - 4.62
Coronary artery disease	0.13	-3.31 - 3.69	2.68	-0.74 - 6.23
Respiratory diseases	3.32	-2.56 - 9.54	1.50	-4.14 - 7.48
65 years old and older	3.16	-2.98 - 9.69	3.05	-2.98 - 9.46
Digestive diseases	N/C		1.29	-6.48 - 9.70
Accidents	-6.46	-13.34 - 0.98	3.18	-4.17 - 11.10
Other nonaccidental causes	-0.18	-4.85 - 4.70	4.75	-0.27 - 10.02
AIDS	N/C		N/C	
Diabetes	N/C		13.20	2.69 - 24.79
Renal diseases	-2.86	-16.00 - 12.35	-6.94	-19.96 - 8.19
Neurological conditions	N/C		9.75	0.41 - 19.97

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.8. Mean Percent Change in Daily Mortality for PM₁₀, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	3.66	0.11 - 7.33	0.77	-1.29 - 2.88
Neoplasms	1.87	-3.20 - 7.20	N/C	
Lung cancer	2.89	-5.54 - 12.08	1.81	-5.30 - 9.46
Cardiovascular diseases	N/C		0.65	-2.34 - 3.73
Coronary artery disease	N/C		-1.18	-4.90 - 2.68
Other nonaccidental causes	N/C		0.57	-5.00 - 6.48
Lag 1				
Nonaccidental deaths	-1.95	-5.31 - 1.54	1.65	-0.38 - 3.72
Neoplasms	-2.73	-7.60 - 2.41	-2.96	-6.74 - 0.97
Lung cancer	N/C		N/C	
Cardiovascular diseases	-1.78	-7.81 - 4.66	2.58	-0.25 - 5.49
Coronary artery disease	1.61	-6.19 - 10.06	2.90	-0.74 - 6.66
Other nonaccidental causes	-0.18	-8.37 - 8.75	6.48	0.50 - 12.81

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range. N/C, convergence of model not obtained.

Table K.9. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to PM_{2.5}, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	0.77	-0.76 - 2.32	1.45	-0.04 - 2.97
Neoplasms	1.12	-1.50 - 3.81	-0.35	-3.07 - 2.45
Lung cancer	2.77	-1.90 - 7.66	3.14	-1.89 - 8.42
Cardiovascular diseases	0.69	-1.69 - 3.13	1.68	-0.58 - 3.99
Coronary artery disease	0.85	-2.16 - 3.96	2.80	-0.13 - 5.82
Respiratory diseases	1.96	-3.25 - 7.45	5.80	0.77 - 11.09
65 years old and older	2.11	-3.38 - 7.92	6.35	0.97 - 12.02
Digestive diseases	4.50	-1.95 - 11.38	-3.18	-9.91 - 4.06
Accidents	N/C		3.01	-3.33 - 9.76
Other nonaccidental causes	-0.39	-4.44 - 3.83	3.66	-0.67 - 8.18
AIDS	N/C		N/C	
Diabetes	N/C		12.03	3.01 - 21.84
Renal diseases	6.90	-5.15 - 20.47	-11.19	-22.55 - 1.83
Neurological conditions	-2.51	-10.28 - 5.94	N/C	

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.10. Mean Percent Change in Daily Mortality for PM_{2.5}, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	2.53	-0.57 - 5.71	0.21	-1.59 - 2.04
Neoplasms	1.38	-3.03 - 6.00	N/C	
Lung cancer	5.02	-2.42 - 13.04	1.16	-4.91 - 7.61
Cardiovascular diseases	3.25	-2.40 - 9.23	0.16	-2.44 - 2.84
Coronary artery disease	N/C		-0.19	-3.45 - 3.19
Other nonaccidental causes	N/C		0.56	-4.30 - 5.66
Lag 1				
Nonaccidental deaths	0.78	-2.17 - 3.82	1.63	-0.12 - 3.41
Neoplasms	-0.61	-4.89 - 3.86	-0.21	-3.57 - 3.27
Lung cancer	3.19	-4.31 - 11.28	2.84	-3.76 - 9.89
Cardiovascular diseases	-1.05	-6.30 - 4.50	2.04	-0.39 - 4.53
Coronary artery disease	1.08	-5.51 - 8.14	3.15	0.02 - 6.38
Other nonaccidental causes	3.06	-4.29 - 10.97	3.67	-1.41 - 9.02

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.11. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Predicted PM_{2.5}, Montreal, 1986-1993^a

Cause of death	Lag 0		Lag 1		3-day mean	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.86	1.11 - 2.61	1.48	0.74 - 2.24	2.17	1.26 - 3.08
Neoplasms	1.55	0.29 - 2.83	1.15	-0.11 - 2.42	1.40	-0.14 - 2.96
Lung cancer	1.56	-0.82 - 3.99	0.71	-1.70 - 3.17	1.82	-1.13 - 4.85
Cardiovascular diseases	0.97	-0.15 - 2.10	0.77	-0.36 - 1.91	1.31	-0.06 - 2.70
Coronary artery disease	1.04	-0.42 - 2.52	1.17	-0.30 - 2.67	1.68	-0.12 - 3.51
Respiratory diseases	3.58	1.14 - 6.08	4.80	2.37 - 7.29	7.73	4.74 - 10.81
65 years old and older	4.24	1.63 - 6.92	6.01	3.41 - 8.67	9.03	5.83 - 12.33
Digestive diseases	4.47	1.08 - 7.98	0.88	-2.54 - 4.42	1.90	-2.19 - 6.15
Accidents	1.08	-2.15 - 4.41	3.06	-0.08 - 6.30	2.04	-1.77 - 6.00
Other nonaccidental causes	3.01	1.05 - 5.01	2.76	0.78 - 4.77	3.93	1.51 - 6.40
AIDS	4.88	-0.69 - 10.75	0.09	-5.47 - 5.98	3.40	-3.41 - 10.69
Diabetes	5.48	1.24 - 9.91	5.94	1.69 - 10.36	7.59	2.36 - 13.09
Renal diseases	-0.12	-5.62 - 5.70	-0.96	-6.57 - 5.00	-1.66	-8.39 - 5.56
Neurological conditions	1.51	-2.15 - 5.31	-0.03	-3.66 - 3.73	0.66	-3.78 - 5.30

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.12. Mean Percent Change in Daily Mortality for Predicted PM_{2.5}, by Age Group, Montreal, 1986-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	1.83	0.37 - 3.30	1.91	1.05 - 2.77
Neoplasms	1.12	-0.98 - 3.27	1.74	0.18 - 3.31
Lung cancer	0.68	-3.07 - 4.56	2.07	-1.01 - 5.24
Cardiovascular diseases	0.82	-1.86 - 3.58	1.02	-0.19 - 2.26
Coronary artery disease	0.77	-2.57 - 4.23	1.05	-0.54 - 2.67
Other nonaccidental causes	3.39	-0.17 - 7.07	2.80	0.50 - 5.16
Lag 1				
Nonaccidental deaths	0.93	-0.53 - 2.42	1.75	0.89 - 2.61
Neoplasms	0.62	-1.49 - 2.77	1.38	-0.17 - 2.97
Lung cancer	1.09	-2.74 - 5.08	0.49	-2.59 - 3.66
Cardiovascular diseases	1.62	-1.09 - 4.41	0.58	-0.64 - 1.83
Coronary artery disease	2.19	-1.23 - 5.72	0.96	-0.65 - 2.59
Other nonaccidental causes	1.85	-1.77 - 5.60	3.08	0.75 - 5.46
3-day mean				
Nonaccidental deaths	1.03	-0.74 - 2.83	2.68	1.65 - 3.73
Neoplasms	0.51	-2.05 - 3.13	1.80	-0.08 - 3.72
Lung cancer	0.50	-4.13 - 5.36	2.59	-1.19 - 6.52
Cardiovascular diseases	0.54	-2.72 - 3.91	1.41	-0.07 - 2.92
Coronary artery disease	1.50	-2.62 - 5.80	1.74	-0.22 - 3.73
Other nonaccidental causes	3.98	-0.39 - 8.54	3.84	1.02 - 6.75

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.13. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Sulfate measured at the Sutton Acid Rain Monitoring Station, Montreal, 1986-1993^a

Cause of death	Lag 0		Lag 1		3-day mean	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	0.71	0.22 - 1.20	0.95	0.47 - 1.43	1.29	0.68 - 1.90
Neoplasms	0.88	0.07 - 1.70	0.59	-0.21 - 1.41	0.75	-0.28 - 1.78
Lung cancer	0.34	-1.22 - 1.93	0.60	-0.95 - 2.19	0.39	-1.60 - 2.41
Cardiovascular diseases	0.41	-0.32 - 1.14	0.97	0.23 - 1.72	1.31	0.37 - 2.26
Coronary artery disease	0.85	-0.12 - 1.83	1.21	0.25 - 2.18	1.50	0.28 - 2.74
Respiratory diseases	0.87	-0.75 - 2.52	3.22	1.61 - 4.85	3.86	1.81 - 5.95
65 years old and older	1.28	-0.44 - 3.02	3.62	1.92 - 5.34	4.64	2.46 - 6.86
Digestive diseases	3.00	0.88 - 5.16	-0.63	-2.86 - 1.66	0.67	-2.12 - 3.54
Accidents	1.02	-0.93 - 3.01	1.37	-0.57 - 3.34	1.73	-0.68 - 4.20
Other nonaccidental causes	0.69	-0.58 - 1.97	1.16	-0.12 - 2.45	2.04	0.41 - 3.69
AIDS	0.02	-3.51 - 3.67	0.95	-2.62 - 4.65	0.51	-4.06 - 5.30
Diabetes	3.06	0.43 - 5.76	2.39	-0.28 - 5.13	4.48	1.08 - 7.99
Renal diseases	0.35	-3.24 - 4.06	-2.16	-5.87 - 1.69	-0.10	-4.62 - 4.63
Neurological conditions	-0.61	-2.95 - 1.78	0.38	-1.96 - 2.78	0.12	-2.84 - 3.17

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables.

CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.14. Mean Percent Change in Daily Mortality for Sulfate measured at the Sutton Acid Rain Monitoring Station, by Age Group, Montreal, 1986-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	0.34	-0.62 - 1.30	0.87	0.32 - 1.43
Neoplasms	-0.25	-1.62 - 1.14	1.46	0.46 - 2.47
Lung cancer	-1.71	-4.20 - 0.84	1.55	-0.46 - 3.59
Cardiovascular diseases	0.49	-1.25 - 2.26	0.39	-0.40 - 1.19
Coronary artery disease	1.91	-0.31 - 4.17	0.59	-0.46 - 1.66
Other nonaccidental causes	0.33	-1.97 - 2.69	0.79	-0.71 - 2.32
Lag 1				
Nonaccidental deaths	0.67	-0.27 - 1.62	1.06	0.51 - 1.61
Neoplasms	0.40	-0.95 - 1.77	0.68	-0.32 - 1.68
Lung cancer	-0.99	-3.49 - 1.58	1.53	-0.46 - 3.56
Cardiovascular diseases	1.14	-0.64 - 2.95	0.92	0.11 - 1.73
Coronary artery disease	2.38	0.18 - 4.62	0.96	-0.08 - 2.02
Other nonaccidental causes	1.75	-0.56 - 4.12	0.89	-0.62 - 2.43
3-day mean				
Nonaccidental deaths	0.04	-1.16 - 1.25	1.77	1.08 - 2.48
Neoplasms	-0.36	-2.08 - 1.40	1.32	0.05 - 2.60
Lung cancer	-3.19	-6.33 - 0.05	2.51	-0.03 - 5.12
Cardiovascular diseases	0.59	-1.68 - 2.90	1.43	0.41 - 2.46
Coronary artery disease	1.93	-0.90 - 4.85	1.42	0.09 - 2.77
Other nonaccidental causes	1.77	-1.16 - 4.78	2.15	0.22 - 4.11

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.15. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Sulfates estimated from Total Suspended Particles, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	2.26	0.73 - 3.81	2.20	0.73 - 3.70
Neoplasms	2.72	0.27 - 5.22	-2.78	-5.24 - -0.26
Lung cancer	4.49	-0.14 - 9.35	-0.54	-5.40 - 4.56
Cardiovascular diseases	2.33	0.07 - 4.65	3.22	0.97 - 5.51
Coronary artery disease	3.49	0.47 - 6.59	4.54	1.62 - 7.56
Respiratory diseases	-0.39	-5.12 - 4.59	7.80	2.77 - 13.07
65 years old and older	-1.40	-6.41 - 3.89	8.58	3.18 - 14.25
Digestive diseases	5.51	-0.69 - 12.09	-0.98	-7.78 - 6.32
Accidents	0.90	-5.13 - 7.32	-1.42	-7.38 - 4.92
Other nonaccidental causes	-0.25	-4.05 - 3.70	5.11	0.85 - 9.55
AIDS	-1.59	-12.06 - 10.13	0.53	-11.96 - 14.80
Diabetes	7.23	-1.13 - 16.29	8.42	-0.12 - 17.70
Renal diseases	2.33	-8.98 - 15.04	-6.21	-17.40 - 6.50
Neurological conditions	-0.13	-7.73 - 8.10	7.12	-0.75 - 15.61

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.16. Mean Percent Change in Daily Mortality for Sulfates estimated from Total Suspended Particles, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	4.03	0.99 - 7.15	1.64	-0.12 - 3.43
Neoplasms	6.93	2.51 - 11.55	0.46	-2.55 - 3.56
Lung cancer	10.78	3.26 - 18.85	0.57	-5.24 - 6.73
Cardiovascular diseases	1.33	-3.71 - 6.63	2.60	0.09 - 5.18
Coronary artery disease	6.03	-0.54 - 13.04	2.88	-0.44 - 6.32
Other nonaccidental causes	-5.49	-12.26 - 1.79	1.59	-2.93 - 6.33
Lag 1				
Nonaccidental deaths	-0.64	-3.32 - 2.11	3.09	1.34 - 4.87
Neoplasms	-2.69	-6.59 - 1.37	-2.85	-5.91 - 0.32
Lung cancer	-0.92	-7.95 - 6.66	-0.35	-6.84 - 6.59
Cardiovascular diseases	1.17	-3.69 - 6.28	3.60	1.15 - 6.11
Coronary artery disease	5.77	-0.37 - 12.29	4.22	1.05 - 7.50
Other nonaccidental causes	-0.88	-8.17 - 7.00	7.54	2.43 - 12.91

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.17. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Sulfates Estimated from PM₁₀, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.89	0.32 - 3.48	1.58	0.12 - 3.08
Neoplasms	3.02	0.54 - 5.56	-1.85	-4.42 - 0.79
Lung cancer	1.00	-3.53 - 5.74	-0.01	-5.01 - 5.25
Cardiovascular diseases	1.85	-0.52 - 4.28	2.64	0.42 - 4.91
Coronary artery disease	0.95	-2.14 - 4.14	2.04	-0.73 - 4.89
Respiratory diseases	-2.41	-7.49 - 2.94	5.02	-0.22 - 10.53
65 years old and older	-3.00	-8.44 - 2.77	6.30	0.65 - 12.28
Digestive diseases	9.28	3.12 - 15.81	N/C	
Accidents	-0.25	-5.79 - 5.63	5.55	-0.14 - 11.57
Other nonaccidental causes	-1.01	-4.89 - 3.04	2.95	-1.34 - 7.43
AIDS	N/C		2.57	-9.35 - 16.07
Diabetes	5.77	-2.22 - 14.42	N/C	
Renal diseases	N/C		-10.35	-22.21 - 3.32
Neurological conditions	N/C		3.36	-3.96 - 11.24

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.18. Mean Percent Change in Daily Mortality for Sulfates estimated from PM₁₀, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	3.85	0.86 - 6.92	1.22	-0.64 - 3.11
Neoplasms	4.27	0.04 - 8.68	2.35	-0.74 - 5.54
Lung cancer	N/C		N/C	
Cardiovascular diseases	2.30	-3.03 - 7.92	1.81	-0.83 - 4.53
Coronary artery disease	N/C		0.58	-2.81 - 4.10
Other nonaccidental causes	N/C		-0.84	-5.51 - 4.05
Lag 1				
Nonaccidental deaths	-0.06	-2.71 - 2.67	2.15	0.40 - 3.93
Neoplasms	-0.32	-4.36 - 3.89	-2.68	-5.89 - 0.63
Lung cancer	-1.11	-8.26 - 6.60	N/C	
Cardiovascular diseases	-0.69	-5.83 - 4.74	3.16	0.75 - 5.63
Coronary artery disease	2.86	-3.56 - 9.70	1.85	-1.10 - 4.88
Other nonaccidental causes	-0.87	-7.77 - 6.54	4.55	-0.64 - 10.02

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.19. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Sulfates Estimated from PM_{2.5}, Montreal, 1984-1993^a

Cause of death	Lag 0		Lag 1	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.86	0.40 - 3.35	1.62	0.25 - 3.02
Neoplasms	2.82	0.51 - 5.19	-1.28	-3.68 - 1.19
Lung cancer	0.46	-3.81 - 4.92	0.54	-4.19 - 5.51
Cardiovascular diseases	2.07	-0.16 - 4.35	2.32	0.23 - 4.44
Coronary artery disease	1.01	-1.92 - 4.02	1.99	-0.61 - 4.66
Respiratory diseases	-2.88	-7.68 - 2.16	6.18	1.19 - 11.41
65 years old and older	-3.20	-8.33 - 2.21	6.87	1.50 - 12.52
Digestive diseases	8.65	2.89 - 14.74	N/C	
Accidents	-0.34	-5.60 - 5.22	N/C	
Other nonaccidental causes	-0.94	-4.60 - 2.87	2.51	-1.57 - 6.76
AIDS	N/C		4.36	-7.06 - 17.18
Diabetes	N/C		7.71	-0.66 - 16.79
Renal diseases	5.76	-5.35 - 18.17	N/C	
Neurological conditions	N/C		N/C	

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.20. Mean Percent Change in Daily Mortality for Sulfates Estimated from PM_{2.5}, by Age Group, Montreal, 1984-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	3.20	0.41 - 6.07	1.39	-0.35 - 3.17
Neoplasms	3.78	-0.19 - 7.90	N/C	
Lung cancer	N/C		0.24	-5.37 - 6.17
Cardiovascular diseases	N/C		2.21	-0.28 - 4.77
Coronary artery disease	0.41	-5.98 - 7.23	1.00	-2.22 - 4.33
Other nonaccidental causes	N/C		-0.73	-5.13 - 3.87
Lag 1				
Nonaccidental deaths	0.22	-2.29 - 2.79	2.10	0.46 - 3.76
Neoplasms	-0.20	-4.01 - 3.76	-1.87	-4.90 - 1.25
Lung cancer	-1.14	-7.87 - 6.08	1.58	-4.81 - 8.39
Cardiovascular diseases	-0.26	-5.11 - 4.84	2.75	0.50 - 5.06
Coronary artery disease	2.50	-3.52 - 8.90	1.88	-0.88 - 4.72
Other nonaccidental causes	-1.42	-8.02 - 5.65	4.28	-0.60 - 9.40

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval. N/C, convergence of model not obtained. N/C, convergence of model not obtained.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.21. Summary Estimates of Mean Percent Change in Daily Mortality across the Interquartile Range of Lagged Exposure to Predicted Sulfates from PM_{2.5}, Montreal, 1986-1993^a

Cause of death	Lag 0		Lag 1		3-day mean	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Nonaccidental deaths	1.15	0.59 - 1.72	1.15	0.59 - 1.71	1.59	0.90 - 2.28
Neoplasms	1.27	0.33 - 2.21	0.82	-0.12 - 1.76	0.97	-0.18 - 2.15
Lung cancer	0.81	-0.99 - 2.64	0.76	-1.06 - 2.61	1.11	-1.13 - 3.40
Cardiovascular diseases	0.62	-0.23 - 1.47	0.93	0.07 - 1.79	1.30	0.24 - 2.37
Coronary artery disease	0.89	-0.23 - 2.02	1.29	0.18 - 2.42	1.62	0.24 - 3.02
Respiratory diseases	1.75	-0.10 - 3.63	3.51	1.66 - 5.40	5.24	2.94 - 7.59
65 years old and older	2.33	0.37 - 4.33	4.20	2.24 - 6.19	6.25	3.80 - 8.76
Digestive diseases	3.79	1.30 - 6.33	0.22	-2.34 - 2.86	1.29	-1.84 - 4.52
Accidents	1.24	-1.10 - 3.64	1.90	-0.40 - 4.26	1.69	-1.13 - 4.59
Other nonaccidental causes	1.26	-0.20 - 2.75	1.74	0.25 - 3.25	2.49	0.66 - 4.36
AIDS	1.82	-2.23 - 6.05	-0.26	-4.40 - 4.06	0.99	-4.11 - 6.37
Diabetes	3.77	0.67 - 6.95	3.79	0.69 - 6.98	4.98	1.10 - 9.00
Renal diseases	-0.12	-4.31 - 4.24	-1.52	-5.83 - 2.99	-0.55	-5.74 - 4.93
Neurological conditions	-0.12	-2.84 - 2.68	0.01	-2.70 - 2.80	0.35	-3.00 - 3.81

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.

Table K.22. Mean Percent Change in Daily Mortality for Predicted Sulfates from PM_{2.5}, by Age Group, Montreal, 1986-1993^a

Cause of death	Age <65 years		Age ≥ 65 years	
	Mean percent change ^b	95% CI	Mean percent change ^b	95% CI
Lag 0				
Nonaccidental deaths	0.88	-0.22 - 1.98	1.28	0.63 - 1.93
Neoplasms	0.21	-1.38 - 1.83	1.76	0.59 - 2.94
Lung cancer	-1.50	-4.34 - 1.43	2.18	-0.14 - 4.56
Cardiovascular diseases	0.56	-1.48 - 2.63	0.66	-0.26 - 1.58
Coronary artery disease	1.56	-1.02 - 4.20	0.71	-0.51 - 1.94
Other nonaccidental causes	1.74	-0.91 - 4.47	1.01	-0.72 - 2.78
Lag 1				
Nonaccidental deaths	0.72	-0.37 - 1.82	1.34	0.70 - 1.98
Neoplasms	0.70	-0.88 - 2.29	0.85	-0.30 - 2.02
Lung cancer	0.18	-2.70 - 3.16	1.10	-1.22 - 3.48
Cardiovascular diseases	1.15	-0.90 - 3.25	0.87	-0.06 - 1.81
Coronary artery disease	2.05	-0.51 - 4.69	1.14	-0.07 - 2.36
Other nonaccidental causes	1.52	-1.19 - 4.30	1.82	0.07 - 3.60
3-day mean				
Nonaccidental deaths	0.27	-1.08 - 1.64	2.11	1.32 - 2.90
Neoplasms	0.06	-1.90 - 2.05	1.46	0.03 - 2.91
Lung cancer	-1.85	-5.39 - 1.81	2.88	0.00 - 5.84
Cardiovascular diseases	0.39	-2.15 - 2.99	1.44	0.30 - 2.60
Coronary artery disease	1.59	-1.60 - 4.88	1.64	0.14 - 3.17
Other nonaccidental causes	2.19	-1.11 - 5.60	2.58	0.42 - 4.79

^a The statistical model was $E(\log(y_i)) = \alpha + \text{loess}(i, \text{span}=x) + \text{loess}(\text{year}) + \text{multiple meteorological variables} + \beta * \text{pollutant}$, where i is an indicator for day and x is the selected span (percent) (Appendix D). See Appendix D for the included meteorological variables. CI, confidence interval.

^b MPCs calculated for an increase of exposure equal to the interquartile range.