

Supplemental Material

Winter Temperature Inversions and Emergency Department Visits for Asthma in Salt Lake County, Utah, 2003-2008

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Supplemental Material, Table S1. Distributions of daily ambient air quality and weather for Salt Lake County, Utah, December-February, 2003-2004 to 2007-2008.

Variable ^a	Mean ± SD	Percentiles						
		Min	5th	25th	50th	75th	95th	Max
CO (ppm)	1.35 ± 0.70	0.30	0.40	0.90	1.20	1.70	2.70	5.20
NO ₂ (ppb)	49.08 ± 12.88	2.00	32.00	41.00	47.00	55.00	75.00	100.00
O ₃ ^b (ppb)	23.09 ± 10.14	2.00	6.00	15.00	25.00	31.00	38.00	43.00
PM _{2.5} (µg/m ³)	21.04 ± 18.21	0.80	2.60	7.40	14.25	31.10	60.50	94.20
PM ₁₀ (µg/m ³)	36.02 ± 24.31	2.00	7.00	16.00	30.00	52.00	82.00	122.00
SO ₂ (ppb)	5.72 ± 5.35	0.00	1.00	2.00	4.00	8.00	16.00	40.00
Dew point temperature (°C)	-5.33 ± 4.12	-17.56	-12.72	-8.28	-5.00	-1.89	0.56	3.61
Maximum temperature (°C)	4.28 ± 5.26	-7.78	-4.00	0.00	3.89	8.28	12.78	19.00
Mean temperature (°C)	-0.93 ± 4.65	-12.89	-8.56	-4.28	-0.72	2.39	6.56	14.72
Relative humidity ^c (%)	73.05 ± 10.81	20.26	54.74	66.68	73.28	80.66	89.35	96.41

Min = minimum; Max = maximum.

a The daily 1-hour maximum was used for CO, NO₂, O₃, SO₂, and maximum temperature and the 24-hour average was used for PM_{2.5}, PM₁₀, dew point temperature, and mean temperature. b Data on O₃ were available only for January 1, 2006, and later. c Relative humidity was derived from dew point temperature and mean temperature using Magnus' formula (equation (8) in Lawrence 2005), but solved for relative humidity, with the constants suggested by Alduchov and Eskridge (1996): a = 17.625, b = 243.04.

Supplemental Material, Table S2. ORs and 95% CIs from unconstrained distributed lag and moving average models for Salt Lake County, Utah, December-February, 2003-2004 to 2007-2008.

Variable	Model 1 OR ^{a, b} (95% CI)	Model 2 OR ^{a, c} (95% CI)	Model 1 OR ^{a, b, d} (95% CI)	Model 3 OR ^{a, e, f} (95% CI)
Inversions				
Unconstrained distributed lag models				
Lag 0				
No	Reference	Reference	Reference	Reference
Yes	1.09 (0.98, 1.21)	1.08 (0.97, 1.21)	1.14 (0.97, 1.33)	1.21 (1.03, 1.43)
Lag 1				
No	Reference	Reference	Reference	Reference
Yes	0.95 (0.84, 1.07)	0.95 (0.84, 1.07)	0.96 (0.80, 1.15)	1.00 (0.83, 1.20)
Lag 2				
No	Reference	Reference	Reference	Reference
Yes	1.09 (0.97, 1.23)	1.09 (0.96, 1.23)	1.12 (0.94, 1.34)	1.15 (0.96, 1.38)
Lag 3				
No	Reference	Reference	Reference	Reference
Yes	1.01 (0.91, 1.12)	1.00 (0.90, 1.12)	1.00 (0.86, 1.17)	1.02 (0.87, 1.18)
Overall				
No	Reference	Reference	Reference	Reference
Yes	1.14 (1.00, 1.30)	1.12 (0.93, 1.33)	1.23 (1.01, 1.49)	1.42 (1.12, 1.80)
Moving average: lags 0-3	1.13 (0.99, 1.29)	1.11 (0.93, 1.32)	1.22 (1.00, 1.47)	1.37 (1.09, 1.73)

a The daily 1-hour maximum was used for O₃ and the 24-hour average was used for PM_{2.5}, dew point temperature, and mean temperature. b Adjusted for dew point temperature and mean temperature. c Adjusted for dew point temperature, mean temperature, and PM_{2.5}. d Restricted to January 1, 2006, and later. e Adjusted for dew point temperature, mean temperature, and O₃. f Data on O₃ were available only for January 1, 2006, and later.

Supplemental Material, Table S3. ORs and 95% CIs for ED visits for asthma and inversions for Salt Lake County, Utah, January-February 2006 and December-February, 2006-2007 to 2007-2008.

Variable	Model 1 OR ^{a, b} (95% CI)	Model 2 OR ^{a, c} (95% CI)
Constrained quadratic polynomial distributed lag models		
Inversion		
Lag 0		
No	Reference	Reference
Yes	1.09 (0.95, 1.26)	1.17 (1.00, 1.36)
Lag 1		
No	Reference	Reference
Yes	1.05 (0.95, 1.15)	1.09 (0.98, 1.21)
Lag 2		
No	Reference	Reference
Yes	1.03 (0.93, 1.13)	1.05 (0.95, 1.16)
Lag 3		
No	Reference	Reference
Yes	1.04 (0.91, 1.19)	1.06 (0.92, 1.21)
Overall		
No	Reference	Reference
Yes	1.23 (1.01, 1.49)	1.42 (1.12, 1.80)
No. of inversion days during lag 0-3		
0	Reference	Reference
1	1.11 (0.94, 1.31)	1.14 (0.97, 1.35)
2	0.91 (0.77, 1.08)	0.97 (0.80, 1.18)
3	1.13 (0.92, 1.40)	1.22 (0.97, 1.54)
4	1.38 (1.11, 1.71)	1.50 (1.17, 1.92)
Trend ^d	1.05 (1.00, 1.10)	1.08 (1.02, 1.15)
Day of inversion		
Not an inversion	Reference	Reference
1 st -3 rd	1.05 (0.91, 1.23)	1.13 (0.96, 1.34)
4 th -6 th	1.45 (1.16, 1.81)	1.59 (1.25, 2.02)
7 th -12 th	0.99 (0.62, 1.57)	1.04 (0.66, 1.66)
> 12 th	NA ^e	NA ^e
Trend ^f	1.04 (1.01, 1.08)	1.06 (1.02, 1.10)

Supplemental Material, Table S3. cont.

Variable	Model 1 OR ^{a, b} (95% CI)	Model 2 OR ^{a, c} (95% CI)
Inversion length (days)		
Not an inversion	Reference	Reference
1-3	1.08 (0.91, 1.29)	1.16 (0.95, 1.41)
4-6	1.10 (0.89, 1.36)	1.16 (0.93, 1.45)
7-8	1.26 (1.02, 1.56)	1.34 (1.07, 1.67)
> 8	NA ^e	NA ^e
Trend ^g	1.03 (1.00, 1.05)	1.03 (1.01, 1.06)

a The daily 1-hour maximum was used for O₃ and the 24-hour average was used for dew point temperature, and mean temperature. b Adjusted for dew point temperature and mean temperature. c Adjusted for dew point temperature, mean temperature, and O₃.d OR for ordinal variable coded as 0, 1, 2, 3, 4. e No inversion occurring after January 1, 2006 (when data on O₃ were available), lasted longer than 8 days. f OR for ordinal variable coded using median category scores: 0, 2, 5, 8, 15. g OR for ordinal variable coded using median category scores: 0, 2, 5, 8, 18.

References

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Lawrence MG. 2005. The relationship between relative humidity and the dewpoint temperature in moist air: a simple conversion and applications. *Bull Am Meteor Soc* 86:225-233.