**Supplementary materials**

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**sFig 3**. Subgroup percent changes (95% CIs) in the odds of stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by three subtypes. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 4**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by disability levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 5**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by severity levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 6**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in moving average air pollutants by severity levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 7**. Percent changes (95% CIs) in the odds of overall stroke events in each interquartile range (IQR) increase in lag 5-6 and 0-6 days of air pollutants modified by sex. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 8**. Percent changes (95% CIs) in the odds of daily overall stroke events in each interquartile range (IQR) increase in lag 5-6 and 0-6 days of air pollutants modified by seasons. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 9**. Percent changes (95% CIs) in the odds of daily overall stroke events in each interquartile range (IQR) increase in lag 5-6 and 0-6 days of air pollutants modified by 5-year periods. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

**sFig 10**. The exposure-response analysis between seven air pollutants and the odds of overall stroke events at lag 5-6 days using the restricted cubic splines.

**sTable 1**. Seasons-stratified summary of daily ambient air pollutants and meteorological parameters in Augsburg, Germany, from 2006 to 2020.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Mean ± SD** | **Min** | **P25** | **P50** | **P75** | **Max** | **IQR** |
| **Warm seasons a** | | | | | | | |
| PM2.5 (μg/m3) | 14.7±7.8 | 0.0 | 9.2 | 13.4 | 18.7 | 86.7 | 9.5 |
| PM10 (μg/m3) | 10.1±5.8 | 0.0 | 6.0 | 9.1 | 12.7 | 48.3 | 6.7 |
| PMcoarse (μg/m3) | 4.6±3.3 | 0.0 | 2.4 | 4.1 | 6.2 | 48.7 | 3.8 |
| O3 (μg/m3) | 54.2±21.6 | 2.2 | 39.2 | 56.5 | 68.9 | 127.8 | 29.7 |
| NO (μg/m3) | 7.6±10.1 | 0.0 | 2.2 | 4.2 | 8.6 | 112.6 | 6.4 |
| NO2 (μg/m3) | 26.1±10.2 | 3.8 | 18.3 | 25.2 | 32.9 | 66.2 | 14.6 |
| Air temperature (°C) | 16.4±5.2 | 0.0 | 12.9 | 16.5 | 20.3 | 30.3 | 7.4 |
| Relative humidity (%) | 70.8±11.1 | 43.0 | 62.2 | 70.4 | 79.2 | 97.9 | 17.0 |
| **Cold seasons b** | | | | | | | |
| PM2.5 (μg/m3) | 19.9±15.0 | 0.0 | 9.4 | 16.6 | 26.1 | 138.7 | 16.7 |
| PM10 (μg/m3) | 16.0±13.2 | 0.0 | 7.0 | 12.9 | 20.7 | 126.4 | 13.7 |
| PMcoarse (μg/m3) | 3.9±4.1 | 0.0 | 1.2 | 2.8 | 5.2 | 50.6 | 4.0 |
| O3 (μg/m3) | 37.8±21.9 | 0.6 | 19.0 | 37.4 | 55.1 | 106.7 | 36.1 |
| NO (μg/m3) | 16.3±23.7 | 0.0 | 3.0 | 8.3 | 19.4 | 238.8 | 16.4 |
| NO2 (μg/m3) | 32.2±14.5 | 3.6 | 22.1 | 30.5 | 40.9 | 113.3 | 18.8 |
| Air temperature (°C) | 4.3±5.4 | -13.9 | 0.8 | 4.0 | 7.8 | 22.2 | 7.0 |
| Relative humidity (%) | 77.6±11.7 | 38.4 | 69.8 | 79.5 | 87.0 | 99.0 | 17.2 |

**Abbreviations**: SD, Standard deviation; IQR, interquartile range; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: Ambient air pollutants and meteorology were measured consecutively between 2006 and 2020. a Warm seasons: May to October; b Cold seasons: November to April.

**sTable 2**. Spearman correlation coefficients between daily air pollutants and meteorological parameters in Augsburg, Germany, from 2006 to 2020.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PM2.5 | PM10 | PMcoarse | O3 | NO | NO2 | Air temperature | Relative humidity |
| PM2.5 (μg/m3) | 1.00 |  |  |  |  |  |  |  |
| PM10 (μg/m3) | 0.95 | 1.00 |  |  |  |  |  |  |
| PMcoarse (μg/m3) | 0.34 | 0.59 | 1.00 |  |  |  |  |  |
| O3 (μg/m3) | -0.33 | -0.25 | 0.09 | 1.00 |  |  |  |  |
| NO (μg/m3) | 0.57 | 0.55 | 0.25 | -0.70 | 1.00 |  |  |  |
| NO2 (μg/m3) | 0.65 | 0.67 | 0.38 | -0.44 | 0.81 | 1.00 |  |  |
| Air temperature (°C) | -0.22 | -0.09 | 0.36 | 0.59 | -0.36 | -0.22 | 1.00 |  |
| Relative humidity (%) | 0.06 | -0.07 | -0.38 | -0.64 | 0.27 | 0.06 | -0.60 | 1.00 |

**Abbreviations**: PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: Ambient air pollutants and meteorology were consecutively measured between 2006 and 2020.

**sTable 3**.Percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in single-day lagged ambient air pollutant concentrations over lag 0 to lag 6 days.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Percent changes (95%CIs) in the odds of overall stroke events** | | | | | |
| **PM2.5** | **PM10** | **PMcoarse** | **O3** | **NO** | **NO2** |
| **Lag0** | -0.81 (-2.69; 1.11) | -0.93 (-2.89; 1.08) | -0.77 (-2.91; 1.41) | -4.85 (-8.95; -0.56)\*\* | 0.69 (-0.34; 1.72) | 1.54 (-1.18; 4.34) |
| **Lag1** | 0.57 (-1.34; 2.52) | 0.13 (-1.86; 2.16) | -1.34 (-3.49; 0.86) | -1.00 (-5.29; 3.48) | 0.40 (-0.64; 1.45) | 1.22 (-1.52; 4.04) |
| **Lag2** | 0.44 (-1.46; 2.37) | 0.27 (-1.74; 2.32) | -0.43 (-2.54; 1.74) | -2.59 (-6.74; 1.75) | 0.37 (-0.66; 1.42) | 1.90 (-0.88; 4.75) |
| **Lag3** | 1.55 (-0.39; 3.53) | 1.33 (-0.71; 3.41) | -0.16 (-2.30; 2.02) | -3.24 (-7.37; 1.07) | 0.83 (-0.20; 1.86) | 2.56 (-0.22; 5.42)\* |
| **Lag4** | 1.82 (-0.15; 3.83)\* | 1.92 (-0.14; 4.03)\* | 1.07 (-1.07; 3.26) | -1.95 (-6.10; 2.39) | 0.59 (-0.47; 1.66) | 1.68 (-1.10; 4.52) |
| **Lag5** | 1.94 (-0.04; 3.95)\* | 2.36 (0.30; 4.46)\*\* | 2.22 (0.10; 4.39)\*\* | -0.92 (-5.13; 3.47) | 0.25 (-0.79; 1.31) | 2.88 (0.07; 5.77)\*\* |
| **Lag6** | 1.93 (-0.02; 3.92)\* | 2.28 (0.21; 4.40)\*\* | 1.88 (-0.25; 4.06)\* | -4.28 (-8.36; -0.02)\*\* | 0.54 (-0.51; 1.60) | 3.35 (0.54; 6.24)\*\* |

**Abbreviations**: CIs, confidence intervals; IQR, interquartile range; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

**sTable 4**. Percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in moving average lagged ambient air pollutant concentrations over lag 0 to lag 6 days.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Percent changes (95%CIs) in the odds of overall stroke events** | | | |
| **Lag 0-1** | **Lag 2-4** | **Lag 5-6** | **Lag 0-6** |
| PM2.5 | -0.20 (-2.11; 1.76) | 1.48 (-0.53; 3.53) | 2.11 (0.09; 4.17)\*\* | 1.77 (-0.50; 4.08) |
| PM10 | -0.51 (-2.52; 1.54) | 1.37 (-0.76; 3.55) | 2.55 (0.43; 4.71)\*\* | 1.69 (-0.65; 4.08) |
| PMcoarse | -1.35 (-3.62; 0.97) | 1.45 (-0.79; 3.74) | 2.50 (0.23; 4.82)\*\* | 0.63 (-2.17; 3.51) |
| O3 | -3.58 (-8.14; 1.21) | -3.80 (-8.71; 1.38) | -2.93 (-7.48; 1.84) | -6.19 (-12.30; 0.36)\* |
| NO | 0.66 (-0.48; 1.82) | 0.91 (-0.41; 2.25) | 0.46 (-0.70; 1.63) | 1.51 (-0.36; 3.42) |
| NO2 | 1.55 (-1.25; 4.42) | 2.60 (-0.33; 5.62)\* | 3.48 (0.61; 6.44)\*\* | 4.33 (0.92; 7.87)\*\* |

**Abbreviations**: CIs, confidence intervals; IQR, interquartile range; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

**sTable 5**. Subgroup percent changes and 95% CIs in the odds of stroke events associated with each IQR increase in single-day lagged ambient air pollutant concentrations over lag 4 to lag 6 days by three subtypes.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Percent changes (95%CIs) in the odds of specific stroke events** | | |
| **Lag 4** | **Lag 5** | **Lag 6** |
| **Transient ischemic attack** |  |  |  |
| PM2.5 | 2.44 (-1.41; 6.44) | 1.53 (-2.31; 5.52) | 4.85 (1.00; 8.83)\*\* |
| PM10 | 2.50 (-1.53; 6.70) | 1.69 (-2.29; 5.83) | 5.27 (1.19; 9.51)\*\* |
| PMcoarse | 1.21 (-3.00; 5.60) | 1.24 (-3.05; 5.71) | 3.21 (-1.09; 7.69) |
| O3 | -1.43 (-9.52; 7.38) | -3.33 (-11.29; 5.34) | -12.49 (-19.73; -4.60)\*\* |
| NO | 0.28 (-1.81; 2.40) | 0.52 (-1.55; 2.63) | 1.79 (-0.25; 3.88)\* |
| NO2 | -1.66 (-6.94; 3.93) | 1.95 (-3.52; 7.73) | 5.78 (0.25; 11.60)\*\* |
| **Hemorrhagic stroke** |  |  |  |
| PM2.5 | 4.67 (-3.13; 13.10) | 9.00 (0.89; 17.75)\*\* | 11.78 (3.36; 20.89)\*\* |
| PM10 | 3.95 (-4.12; 12.74) | 7.77 (-0.59; 16.83)\* | 11.64 (2.73; 21.33)\*\* |
| PMcoarse | -0.67 (-8.90; 8.29) | -0.14 (-7.91; 8.29) | 3.63 (-4.95; 12.97) |
| O3 | -8.89 (-23.45; 8.44) | -7.18 (-22.50; 11.16) | -0.98 (-16.76; 17.79) |
| NO | 2.20 (-1.80; 6.36) | -0.36 (-4.49; 3.96) | 1.59 (-2.68; 6.03) |
| NO2 | 13.19 (1.30; 26.47)\*\* | 13.06 (0.72; 26.92)\*\* | 10.68 (-1.09; 23.84)\* |
| **Ischemic stroke** |  |  |  |
| PM2.5 | 1.43 (-0.95; 3.87) | 1.52 (-0.86; 3.96) | 0.06 (-2.28; 2.47) |
| PM10 | 1.64 (-0.87; 4.21) | 2.21 (-0.29; 4.77)\* | 0.43 (-2.05; 2.98) |
| PMcoarse | 1.24 (-1.34; 3.89) | 2.86 (0.30; 5.48)\*\* | 1.24 (-1.33; 3.86) |
| O3 | -1.53 (-6.55; 3.76) | 0.55 (-4.59; 5.96) | -1.24 (-6.33; 4.12) |
| NO | 0.58 (-0.71; 1.88) | 0.21 (-1.05; 1.49) | -0.03 (-1.29; 1.25) |
| NO2 | 2.10 (-1.25; 5.56) | 2.59 (-0.77; 6.06) | 1.90 (-1.47; 5.38) |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

**sTable 6**. Subgroup percent changes and 95% CIs in the odds of stroke events associated with each IQR increase in moving average lagged ambient air pollutant concentrations over lag 5 to lag 6 days by three subtypes.

|  |  |  |
| --- | --- | --- |
|  | **Percent changes (95%CIs) in the odds of specific stroke events** | |
| **Lag 5-6** | **Lag 0-6** |
| **Transient ischemic attack** |  |  |
| PM2.5 | 3.56 (-0.36; 7.63)\* | 3.17 (-1.22; 7.75) |
| PM10 | 3.92 (-0.24; 8.24)\* | 3.11 (-1.40; 7.82) |
| PMcoarse | 2.79 (-1.82; 7.61) | 1.56 (-3.95; 7.38) |
| O3 | -9.62 (-17.76; -0.67)\*\* | -9.72 (-21.01; 3.20) |
| NO | 1.47 (-0.82; 3.81) | 3.92 (0.13; 7.86)\*\* |
| NO2 | 4.38 (-1.31; 10.39) | 5.95 (-0.83; 13.20)\* |
| **Hemorrhagic stroke** |  |  |
| PM2.5 | 11.37 (2.90; 20.54)\*\* | 5.59 (-3.74; 15.81) |
| PM10 | 10.50 (1.79; 19.96)\*\* | 5.05 (-4.39; 15.43) |
| PMcoarse | 1.95 (-6.69; 11.40) | 0.91 (-9.97; 13.11) |
| O3 | -6.01 (-22.59; 14.12) | -6.49 (-28.78; 22.79) |
| NO | 0.81 (-3.97; 5.84) | -0.68 (-8.19; 7.45) |
| NO2 | 13.83 (1.16; 28.09)\*\* | 9.05 (-4.96; 25.12) |
| **Ischemic stroke** |  |  |
| PM2.5 | 0.84 (-1.59; 3.34) | 0.84 (-1.89; 3.64) |
| PM10 | 1.44 (-1.12; 4.06) | 0.80 (-2.02; 3.71) |
| PMcoarse | 2.49 (-0.23; 5.29)\* | 0.30 (-3.05; 3.77) |
| O3 | -0.01 (-5.66; 5.98) | -4.79 (-12.27; 3.33) |
| NO | 0.07 (-1.33; 1.49) | 0.82 (-1.42; 3.10) |
| NO2 | 2.51 (-0.91; 6.05) | 3.40 (-0.63; 7.60)\* |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

**sTable 7**. Stratified percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in single-day lagged ambient air pollutant concentrations over lag 4 to lag 6 days by disability due to strokes or stroke severity.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Stratified percent changes (95%CIs) in the odds of overall stroke events** | | |
| **Lag 4** | **Lag 5** | **Lag 6** |
| **Disability due to strokes** |  | | |
| **No symptoms to slight disability a** |  | | |
| PM2.5 | -0.41 (-3.81; 3.12) | -0.94 (-4.36; 2.60) | 1.20 (-2.32; 4.85) |
| PM10 | -0.23 (-3.87; 3.54) | -0.41 (-4.01; 3.33) | 1.90 (-1.84; 5.77) |
| PMcoarse | 0.40 (-3.33; 4.27) | 1.24 (-2.45; 5.07) | 2.55 (-1.20; 6.44) |
| O3 | -4.37 (-11.73; 3.60) | -3.29 (-10.71; 4.75) | -6.57 (-13.80; 1.27)\* |
| NO | 1.69 (-0.15; 3.56)\* | 1.19 (-0.66; 3.07) | 1.06 (-0.77; 2.93) |
| NO2 | 2.67 (-2.36; 7.97) | 3.29 (-1.78; 8.62) | 4.84 (-0.34; 10.30)\* |
| **Moderate disability to death b** |  | | |
| PM2.5 | 2.31 (-1.11; 5.85) | 4.91 (1.38; 8.56)\*\* | 2.74 (-0.74; 6.35) |
| PM10 | 2.46 (-1.19; 6.23) | 5.46 (1.73; 9.32)\*\* | 2.66 (-1.05; 6.50) |
| PMcoarse | 1.35 (-2.43; 5.28) | 3.74 (-0.03; 7.66)\* | 0.74 (-2.94; 4.56) |
| O3 | 0.22 (-7.15; 8.16) | 0.43 (-6.95; 8.40) | 1.26 (-6.32; 9.46) |
| NO | 0.17 (-1.71; 2.08) | -0.02 (-1.86; 1.86) | 0.30 (-1.59; 2.23) |
| NO2 | 1.94 (-2.93; 7.05) | 5.93 (0.87; 11.25)\*\* | 4.37 (-0.66; 9.64)\* |
| **Stroke severity** |  | | |
| **No to minor stroke c** |  | | |
| PM2.5 | 1.76 (-1.20; 4.81) | 1.45 (-1.52; 4.50) | 1.44 (-1.55; 4.52) |
| PM10 | 1.94 (-1.22; 5.20) | 1.81 (-1.34; 5.07) | 1.73 (-1.44; 5.00) |
| PMcoarse | 1.21 (-2.01; 4.53) | 1.67 (-1.51; 4.95) | 1.44 (-1.78; 4.76) |
| O3 | -2.88 (-9.19; 3.86) | -4.35 (-10.54; 2.28) | -5.56 (-11.72; 1.04)\* |
| NO | 1.48 (-0.12; 3.10)\* | 0.90 (-0.67; 2.49) | 0.16 (-1.41; 1.75) |
| NO2 | 1.52 (-2.73; 5.95) | 2.54 (-1.73; 6.99) | 2.17 (-2.11; 6.64) |
| **Moderate to severe stroke d** |  | | |
| PM2.5 | 0.50 (-3.17; 4.31) | 2.73 (-1.00; 6.60) | 1.16 (-2.55; 5.01) |
| PM10 | 0.45 (-3.45; 4.51) | 3.38 (-0.54; 7.45)\* | 1.34 (-2.59; 5.42) |
| PMcoarse | 0.02 (-4.03; 4.23) | 3.25 (-0.77; 7.44) | 0.98 (-2.94; 5.06) |
| O3 | 0.51 (-7.33; 9.02) | 4.12 (-4.16; 13.11) | 3.68 (-4.62; 12.69) |
| NO | -0.01 (-2.04; 2.05) | 0.02 (-1.99; 2.07) | 0.98 (-1.07; 3.07) |
| NO2 | 0.75 (-4.35; 6.12) | 4.03 (-1.24; 9.57) | 4.21 (-1.09; 9.80) |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity. a the mRS score of 0-2 is “no symptoms to slight disability”; b mRS 3-6 is “moderate disability to death”. c NIHSS score of 0-3 is “no to minor stroke”; d NIHSS score of 4-42 is “moderate to severe stroke”.

**sTable 8**. Stratified percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in moving average lagged ambient air pollutant concentrations over lag 5 to lag 6 days by disability due to strokes or stroke severity.

|  |  |  |
| --- | --- | --- |
|  | **Stratified percent changes (95%CIs) in the odds of overall stroke events** | |
| **Lag 5-6** | **Lag 0-6** |
| **Disability due to strokes** |  | |
| **No symptoms to slight disability a** |  | |
| PM2.5 | 0.06 (-3.49; 3.73) | -1.12 (-4.96; 2.88) |
| PM10 | 0.76 (-2.96; 4.61) | -1.18 (-5.27; 3.09) |
| PMcoarse | 2.38 (-1.61; 6.50) | -0.77 (-5.68; 4.39) |
| O3 | -5.63 (-13.54; 2.99) | -13.60 (-23.76; -2.08)\*\* |
| NO | 1.32 (-0.71; 3.39) | 3.91 (0.56; 7.37)\*\* |
| NO2 | 4.62 (-0.64; 10.16)\* | 5.87 (-0.28; 12.40)\* |
| **Moderate disability to death b** |  | |
| PM2.5 | 4.33 (0.68; 8.12)\*\* | 1.73 (-2.27; 5.89) |
| PM10 | 4.62 (0.77; 8.62)\*\* | 1.46 (-2.70; 5.80) |
| PMcoarse | 2.77 (-1.19; 6.89) | -0.14 (-4.97; 4.93) |
| O3 | 1.58 (-6.68; 10.58) | -2.38 (-13.38; 10.00) |
| NO | 0.13 (-1.93; 2.23) | -0.09 (-3.27; 3.20) |
| NO2 | 5.82 (0.67; 11.22)\*\* | 2.73 (-3.08; 8.89) |
| **Stroke severity** |  |  |
| **No to minor stroke c** |  | |
| PM2.5 | 1.57 (-1.52; 4.75) | -0.45 (-3.77; 3.00) |
| PM10 | 1.93 (-1.29; 5.25) | -0.12 (-3.64; 3.53) |
| PMcoarse | 1.95 (-1.47; 5.49) | 1.16 (-3.07; 5.57) |
| O3 | -5.86 (-12.55; 1.34) | -10.60 (-19.55; -0.66)\*\* |
| NO | 0.62 (-1.11; 2.38) | 2.21 (-0.70; 5.21) |
| NO2 | 2.68 (-1.71; 7.27) | 3.44 (-1.64; 8.79) |
| **Moderate to severe stroke d** |  | |
| PM2.5 | 2.15 (-1.65; 6.11) | 0.54 (-3.71; 4.98) |
| PM10 | 2.64 (-1.37; 6.81) | 0.04 (-4.35; 4.64) |
| PMcoarse | 2.61 (-1.61; 7.02) | -1.81 (-6.97; 3.63) |
| O3 | 5.60 (-3.68; 15.78) | 2.40 (-9.75; 16.17) |
| NO | 0.57 (-1.69; 2.88) | 0.71 (-2.67; 4.20) |
| NO2 | 4.63 (-0.78; 10.33)\* | 2.08 (-4.03; 8.57) |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; The model was adjusted for the corresponding lagged days of air temperature and relative humidity. a the mRS score of 0-2 is “no symptomstoslight disability”; b mRS 3-6 is “moderate disabilitytodeath”. c NIHSS score of 0-3 is “notominor stroke”; d NIHSS score of 4-42 is “moderatetosevere stroke”.

**sTable 9**. The effect modification on the overall stroke events associated with each IQR increase in ambient air pollutant concentrations.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Single-day lagged model** | | | | **Moving average lagged model** | | | |
| **Lag 5** | | **Lag 6** | | **Lag 5-6** | | **Lag 0-6** | |
| **Estimates a** | ***P* b** | **Estimates a** | ***P* b** | **Estimates a** | ***P* b** | **Estimates a** | ***P* b** |
| **Sex** |  |  |  |  |  |  |  |  |
| **PM2.5** |  |  |  |  |  |  |  |  |
| Men | -0.10 (-3.24; 3.14) | 1(Ref) | -0.20 (-3.30; 3.01) | 1(Ref) | -0.21 (-3.38; 3.07) | 1(Ref) | 0.35 (-3.10; 3.91) | 1(Ref) |
| Women | 2.36 (-0.48; 5.29) | 0.235 | 3.12 (0.28; 6.05) | 0.107 | 2.97 (0.06; 5.96) | 0.129 | 2.45 (-0.76; 5.77) | 0.343 |
| **PM10** |  |  |  |  |  |  |  |  |
| Men | -0.14 (-3.42; 3.25) | 1(Ref) | 0.17 (-3.12; 3.57) | 1(Ref) | -0.01 (-3.35; 3.44) | 1(Ref) | 0.67 (-2.95; 4.43) | 1(Ref) |
| Women | 3.69 (0.71; 6.76) | 0.078 | 3.88 (0.86; 6.99) | 0.090 | 4.14 (1.08; 7.30) | 0.060 | 2.90 (-0.44; 6.34) | 0.343 |
| **PMcoarse** |  |  |  |  |  |  |  |  |
| Men | -0.19 (-3.68; 3.42) | 1(Ref) | 1.17 (-2.9; 4.74) | 1(Ref) | 0.66 (-3.00; 4.46) | 1(Ref) | 1.85 (-2.72; 6.63) | 1(Ref) |
| Women | 5.41 (2.32; 8.60) | **0.015** | 3.74 (0.60; 6.98) | 0.263 | 5.60 (2.29; 9.02) | **0.041** | 3.26 (-0.74; 7.41) | 0.629 |
| **O3** |  |  |  |  |  |  |  |  |
| Men | 0.96 (-6.03; 8.48) | 1(Ref) | -4.16 (-10.82; 2.99) | 1(Ref) | -1.67 (-9.09; 6.37) | 1(Ref) | -8.33 (-17.56; 1.94) | 1(Ref) |
| Women | -0.68 (-6.59; 5.62) | 0.716 | -5.50 (-11.15; 0.51) | 0.755 | -3.40 (-9.70; 3.34) | 0.714 | -4.51 (-12.98; 4.77) | 0.523 |
| **NO** |  |  |  |  |  |  |  |  |
| Men | 0.60 (-1.18; 2.42) | 1(Ref) | 1.27 (-0.48; 3.05) | 1(Ref) | 1.14 (-0.82; 3.14) | 1(Ref) | 4.40 (1.20; 7.71) | 1(Ref) |
| Women | 0.48 (-1.08; 2.07) | 0.924 | 0.71 (-0.88; 2.31) | 0.642 | 0.71 (-1.03; 2.48) | 0.749 | 0.53 (-2.31; 3.44) | 0.078 |
| **NO2** |  |  |  |  |  |  |  |  |
| Men | 0.76 (-3.89; 5.63) | 1(Ref) | 4.39 (-0.39; 9.40) | 1(Ref) | 2.89 (-1.91; 7.93) | 1(Ref) | 4.08 (-1.65; 10.13) | 1(Ref) |
| Women | 5.59 (1.40; 9.95) | 0.129 | 4.62 (0.48; 8.94) | 0.942 | 5.79 (1.54; 10.22) | 0.372 | 5.41 (0.41; 10.67) | 0.729 |
| **Age, years** |  |  |  |  |  |  |  |  |
| **PM2.5** |  |  |  |  |  |  |  |  |
| <67.0 | 3.80 (0.63; 7.08) | 1(Ref) | 3.97 (0.83; 7.21) | 1(Ref) | 4.22 (1.01; 7.52) | 1(Ref) | 1.45 (-1.99; 5.02) | 1(Ref) |
| 67.0-78.0 | 1.66 (-1.61; 5.03) | 0.345 | 0.99 (-2.22; 4.31) | 0.185 | 1.41 (-1.87; 4.81) | 0.220 | 2.40 (-1.16; 6.10) | 0.695 |
| ≥78.0 | 0.39 (-2.68; 3.55) | 0.120 | 0.76 (-2.30; 3.92) | 0.142 | 0.62 (-2.51; 3.86) | 0.105 | 1.48 (-1.98; 5.05) | 0.993 |
| **PM10** |  |  |  |  |  |  |  |  |
| <67.0 | 3.72 (0.39; 7.16) | 1(Ref) | 4.21 (0.87; 7.67) | 1(Ref) | 4.33 (0.95; 7.83) | 1(Ref) | 1.06 (-2.55; 4.80) | 1(Ref) |
| 67.0-78.0 | 1.87 (-1.52; 5.38) | 0.436 | 0.91 (-2.49; 4.43) | 0.166 | 1.51 (-1.94; 5.08) | 0.240 | 2.15 (-1.58; 6.01) | 0.669 |
| ≥78.0 | 1.51 (-1.69; 4.80) | 0.336 | 1.64 (-1.60; 4.98) | 0.268 | 1.74 (-1.55; 5.13) | 0.267 | 1.89 (-1.70; 5.61) | 0.738 |
| **PMcoarse** |  |  |  |  |  |  |  |  |
| <67.0 | 1.20 (-2.27; 4.79) | 1(Ref) | 2.18 (-1.29; 5.77) | 1(Ref) | 2.06 (-1.60; 5.86) | 1(Ref) | -1.09 (-5.48; 3.51) | 1(Ref) |
| 67.0-78.0 | 1.39 (-2.09; 4.99) | 0.938 | 0.04 (-3.48; 3.70) | 0.388 | 0.91 (-2.77; 4.73) | 0.656 | 0.02 (-4.45; 4.71) | 0.721 |
| ≥78.0 | 3.88 (0.55; 7.33) | 0.265 | 3.17 (-0.16; 6.60) | 0.683 | 4.25 (0.74; 7.89) | 0.386 | 2.65 (-1.60; 7.09) | 0.216 |
| **O3** |  |  |  |  |  |  |  |  |
| <67.0 | -3.91 (-10.40; 3.05) | 1(Ref) | -6.80 (-13.13; -0.02) | 1(Ref) | -6.23 (-13.13; 1.22) | 1(Ref) | -7.49 (-16.55; 2.56) | 1(Ref) |
| 67.0-78.0 | 1.80 (-5.08; 9.18) | 0.230 | -2.32 (-8.96; 4.79) | 0.331 | -0.13 (-7.47; 7.79) | 0.226 | -5.83 (-15.07; 4.42) | 0.795 |
| ≥78.0 | -0.59 (-7.05; 6.31) | 0.471 | -3.73 (-9.97; 2.94) | 0.490 | -2.41 (-9.29; 5.00) | 0.432 | -5.30 (-14.29; 4.63) | 0.728 |
| **NO** |  |  |  |  |  |  |  |  |
| <67.0 | 0.79 (-1.04; 2.64) | 1(Ref) | 1.14 (-0.66; 2.98) | 1(Ref) | 1.18 (-0.83; 3.23) | 1(Ref) | 1.29 (-1.95; 4.63) | 1(Ref) |
| 67.0-78.0 | 0.94 (-0.94; 2.86) | 0.907 | 0.53 (-1.39; 2.49) | 0.652 | 0.88 (-1.23; 3.04) | 0.843 | 1.37 (-2.02; 4.88) | 0.973 |
| ≥78.0 | -0.79 (-2.50; 0.96) | 0.221 | 0.01 (-1.69; 1.74) | 0.375 | -0.51 (-2.40; 1.41) | 0.233 | 1.82 (-1.19; 4.92) | 0.816 |
| **NO2** |  |  |  |  |  |  |  |  |
| <67.0 | 4.49 (-0.29; 9.50) | 1(Ref) | 6.50 (1.68; 11.56) | 1(Ref) | 6.20 (1.30; 11.33) | 1(Ref) | 4.09 (-1.58; 10.07) | 1(Ref) |
| 67.0-78.0 | 3.07 (-1.69; 8.07) | 0.682 | 2.87 (-1.85; 7.82) | 0.294 | 3.30 (-1.52; 8.36) | 0.410 | 3.63 (-2.08; 9.67) | 0.912 |
| ≥78.0 | 1.27 (-3.16; 5.91) | 0.334 | 0.96 (-3.45; 5.56) | 0.096 | 1.21 (-3.28; 5.90) | 0.141 | 5.19 (-0.29; 10.97) | 0.785 |
| **Seasons** c |  |  |  |  |  |  |  |  |
| **PM2.5** |  |  |  |  |  |  |  |  |
| Warm seasons | 8.55 (2.01; 15.51) | 1(Ref) | 3.53 (-2.75; 10.21) | 1(Ref) | 6.62 (-0.05; 13.74) | 1(Ref) | 1.37 (-5.56; 8.81) | 1(Ref) |
| Cold seasons | 2.48 (0.09; 4.93) | 0.089 | 2.15 (-0.19; 4.53) | 0.692 | 2.65 (0.21; 5.14) | 0.280 | 2.79 (0.01; 5.65) | 0.720 |
| **PM10** |  |  |  |  |  |  |  |  |
| Warm seasons | 8.43 (2.58; 14.60) | 1(Ref) | 4.68 (-1.07; 10.76) | 1(Ref) | 7.46 (1.36; 13.93) | 1(Ref) | 2.84 (-3.64; 9.76) | 1(Ref) |
| Cold seasons | 3.16 (0.58; 5.82) | 0.109 | 2.41 (-0.16; 5.05) | 0.489 | 3.20 (0.54; 5.92) | 0.215 | 2.61 (-0.37; 5.68) | 0.951 |
| **PMcoarse** |  |  |  |  |  |  |  |  |
| Warm seasons | 4.60 (0.55; 8.80) | 1(Ref) | 3.59 (-0.39; 7.73) | 1(Ref) | 5.23 (0.82; 9.83) | 1(Ref) | 4.22 (-1.39; 10.14) | 1(Ref) |
| Cold seasons | 3.74 (0.66; 6.92) | 0.744 | 1.65 (-1.49; 4.89) | 0.458 | 3.40 (0.09; 6.82) | 0.520 | -0.03 (-4.22; 4.35) | 0.242 |
| **O3** |  |  |  |  |  |  |  |  |
| Warm seasons | -0.59 (-8.38; 7.85) | 1(Ref) | -10.79 (-17.78; -3.20) | 1(Ref) | -7.80 (-15.97; 1.16) | 1(Ref) | -10.33 (-21.43; 2.34) | 1(Ref) |
| Cold seasons | -1.95 (-7.55; 3.99) | 0.786 | -1.14 (-6.74; 4.80) | **0.041** | -1.45 (-7.54; 5.04) | 0.237 | -5.54 (-13.74; 3.45) | 0.514 |
| **NO** |  |  |  |  |  |  |  |  |
| Warm seasons | 2.55 (-2.86; 8.27) | 1(Ref) | 8.26 (2.59; 14.24) | 1(Ref) | 7.42 (0.98; 14.27) | 1(Ref) | 11.28 (0.43; 23.30) | 1(Ref) |
| Cold seasons | 0.13 (-0.97; 1.24) | 0.397 | 0.29 (-0.81; 1.40) | **0.006** | 0.24 (-0.97; 1.46) | **0.031** | 1.30 (-0.65; 3.30) | 0.078 |
| **NO2** |  |  |  |  |  |  |  |  |
| Warm seasons | 2.52 (-3.56; 8.98) | 1(Ref) | 12.27 (5.63; 19.32) | 1(Ref) | 9.12 (2.29; 16.39) | 1(Ref) | 5.78 (-1.90; 14.06) | 1(Ref) |
| Cold seasons | 3.04 (-0.66; 6.88) | 0.889 | 2.09 (-1.54; 5.85) | **0.009** | 2.84 (-0.85; 6.67) | 0.117 | 5.00 (0.51; 9.69) | 0.867 |
| **Air** **temperature d, °C** |  |  |  |  |  |  |  |  |
| **PM2.5** |  |  |  |  |  |  |  |  |
| T1 | 1.13 (-0.96; 3.26) | 1(Ref) | 1.56 (-0.50; 3.67) | 1(Ref) | 1.43 (-0.66; 3.56) | 1(Ref) | 0.72 (-1.45; 2.94) | 1(Ref) |
| T2 | 1.23 (-2.47; 5.07) | 0.961 | -0.23 (-3.90; 3.58) | 0.412 | 0.03 (-3.69; 3.89) | 0.525 | 1.46 (-2.60; 5.68) | 0.749 |
| T3 | 2.94 (-3.16; 9.43) | 0.590 | 3.78 (-2.34; 10.29) | 0.510 | 4.80 (-1.58; 11.59) | 0.333 | 2.62 (-4.02; 9.73) | 0.600 |
| **PM10** |  |  |  |  |  |  |  |  |
| T1 | 1.37 (-0.95; 3.75) | 1(Ref) | 1.83 (-0.50; 4.22) | 1(Ref) | 1.64 (-0.69; 4.03) | 1(Ref) | 0.48 (-1.90; 2.92) | 1(Ref) |
| T2 | 1.71 (-1.86; 5.40) | 0.879 | 0.17 (-3.43; 3.91) | 0.454 | 0.77 (-2.84; 4.52) | 0.694 | 1.29 (-2.63; 5.36) | 0.726 |
| T3 | 2.95 (-1.96; 8.11) | 0.576 | 4.20 (-0.84; 9.50) | 0.410 | 4.56 (-0.66; 10.06) | 0.324 | 3.63 (-2.08; 9.67) | 0.323 |
| **PMcoarse** |  |  |  |  |  |  |  |  |
| T1 | 1.78 (-1.74; 5.43) | 1(Ref) | 1.74 (-1.73; 5.33) | 1(Ref) | 1.67 (-1.97; 5.44) | 1(Ref) | -1.93 (-5.87; 2.17) | 1(Ref) |
| T2 | 1.98 (-1.24; 5.32) | 0.934 | 0.87 (-2.40; 4.25) | 0.720 | 1.98 (-1.36; 5.43) | 0.900 | 0.36 (-3.57; 4.45) | 0.399 |
| T3 | 2.02 (-1.26; 5.41) | 0.925 | 3.06 (-0.26; 6.50) | 0.592 | 3.08 (-0.48; 6.78) | 0.589 | 3.78 (-0.80; 8.57) | 0.062 |
| **O3** |  |  |  |  |  |  |  |  |
| T1 | -0.82 (-6.29; 4.97) | 1(Ref) | -2.66 (-8.01; 3.00) | 1(Ref) | -1.48 (-7.33; 4.74) | 1(Ref) | -5.46 (-12.90; 2.62) | 1(Ref) |
| T2 | -2.07 (-8.13; 4.38) | 0.740 | -6.54 (-12.37; -0.33) | 0.289 | -4.74 (-11.07; 2.05) | 0.407 | -3.90 (-11.91; 4.85) | 0.735 |
| T3 | 1.03 (-5.80; 8.36) | 0.678 | -0.08 (-6.82; 7.14) | 0.555 | -0.03 (-7.39; 7.92) | 0.762 | -3.77 (-12.95; 6.37) | 0.775 |
| **NO** |  |  |  |  |  |  |  |  |
| T1 | 0.04 (-1.17; 1.28) | 1(Ref) | 0.42 (-0.79; 1.64) | 1(Ref) | 0.35 (-1.01; 1.72) | 1(Ref) | 1.32 (-0.83; 3.51) | 1(Ref) |
| T2 | 0.89 (-1.03; 2.86) | 0.458 | 0.51 (-1.47; 2.53) | 0.938 | 0.43 (-1.68; 2.57) | 0.952 | 0.94 (-2.29; 4.28) | 0.844 |
| T3 | -2.25 (-7.97; 3.82) | 0.459 | 1.48 (-4.36; 7.67) | 0.734 | 1.17 (-5.62; 8.46) | 0.821 | 10.19 (-1.59; 23.38) | 0.152 |
| **NO2** |  |  |  |  |  |  |  |  |
| T1 | 1.89 (-1.82; 5.74) | 1(Ref) | 1.66 (-2.00; 5.46) | 1(Ref) | 1.90 (-1.79; 5.74) | 1(Ref) | 3.18 (-1.09; 7.63) | 1(Ref) |
| T2 | 4.96 (0.54; 9.58) | 0.285 | 3.35 (-1.00; 7.88) | 0.552 | 3.92 (-0.52; 8.55) | 0.483 | 4.01 (-1.09; 9.37) | 0.799 |
| T3 | -0.28 (-5.63; 5.39) | 0.523 | 6.54 (0.81; 12.59) | 0.163 | 4.72 (-1.05; 10.84) | 0.424 | 5.57 (-1.20; 12.81) | 0.561 |
| **5-year periods** |  |  |  |  |  |  |  |  |
| **PM2.5** |  |  |  |  |  |  |  |  |
| 2006-2010 | 0.31 (-2.32; 3.01) | 1(Ref) | -0.59 (-3.18; 2.07) | 1(Ref) | -0.10 (-2.72; 2.58) | 1(Ref) | 0.48 (-2.34; 3.37) | 1(Ref) |
| 2011-2015 | 2.84 (-0.51; 6.30) | 0.229 | 3.41 (0.11; 6.82) | 0.053 | 3.51 (0.04; 7.10) | 0.089 | 2.22 (-1.55; 6.14) | 0.438 |
| 2016-2020 | 4.56 (0.55; 8.74) | 0.076 | 6.07 (1.97; 10.34) | **0.006** | 6.01 (1.81; 10.38) | **0.013** | 5.09 (0.35; 10.05) | 0.089 |
| **PM10** |  |  |  |  |  |  |  |  |
| 2006-2010 | 0.75 (-2.07; 3.65) | 1(Ref) | -0.14 (-2.97; 2.77) | 1(Ref) | 0.37 (-2.46; 3.27) | 1(Ref) | 0.67 (-2.35; 3.79) | 1(Ref) |
| 2011-2015 | 2.83 (-0.70; 6.48) | 0.353 | 3.69 (0.14; 7.36) | 0.087 | 3.70 (0.00; 7.52) | 0.146 | 1.90 (-2.08; 6.04) | 0.612 |
| 2016-2020 | 4.84 (0.99; 8.84) | 0.086 | 5.32 (1.36; 9.43) | **0.025** | 5.70 (1.69; 9.87) | **0.029** | 3.79 (-0.65; 8.43) | 0.240 |
| **PMcoarse** |  |  |  |  |  |  |  |  |
| 2006-2010 | 2.05 (-1.36; 5.57) | 1(Ref) | 1.95 (-1.47; 5.48) | 1(Ref) | 2.41 (-1.16; 6.11) | 1(Ref) | 1.87 (-2.48; 6.41) | 1(Ref) |
| 2011-2015 | 1.02 (-2.75; 4.94) | 0.684 | 2.14 (-1.67; 6.11) | 0.939 | 1.98 (-2.07; 6.19) | 0.871 | -0.36 (-5.17; 4.69) | 0.482 |
| 2016-2020 | 3.14 (-0.05; 6.42) | 0.643 | 1.66 (-1.55; 4.97) | 0.902 | 2.90 (-0.47; 6.37) | 0.844 | 0.18 (-3.94; 4.47) | 0.574 |
| **O3** |  |  |  |  |  |  |  |  |
| 2006-2010 | 0.16 (-6.57; 7.38) | 1(Ref) | -1.26 (-7.90; 5.87) | 1(Ref) | -0.53 (-7.77; 7.29) | 1(Ref) | -3.32 (-12.52; 6.85) | 1(Ref) |
| 2011-2015 | 1.26 (-5.41; 8.39) | 0.818 | -4.92 (-11.18; 1.78) | 0.422 | -2.02 (-9.04; 5.56) | 0.766 | -2.28 (-11.40; 7.79) | 0.869 |
| 2016-2020 | -4.19 (-10.65; 2.75) | 0.357 | -6.56 (-12.90; 0.24) | 0.253 | -6.21 (-13.11; 1.23) | 0.258 | -14.20 (-23.17; -4.18) | 0.091 |
| **NO** |  |  |  |  |  |  |  |  |
| 2006-2010 | 0.04 (-1.63; 1.74) | 1(Ref) | 0.84 (-0.85; 2.56) | 1(Ref) | 0.50 (-1.39; 2.43) | 1(Ref) | 2.31 (-0.80; 5.52) | 1(Ref) |
| 2011-2015 | -0.82 (-2.72; 1.12) | 0.512 | -0.52 (-2.46; 1.46) | 0.305 | -0.85 (-2.96; 1.31) | 0.356 | -0.22 (-3.53; 3.21) | 0.281 |
| 2016-2020 | 1.52 (-0.32; 3.40) | 0.246 | 1.12 (-0.69; 2.95) | 0.827 | 1.58 (-0.42; 3.62) | 0.446 | 2.26 (-0.96; 5.57) | 0.980 |
| **NO2** |  |  |  |  |  |  |  |  |
| 2006-2010 | 1.04 (-3.43; 5.72) | 1(Ref) | 1.88 (-2.58; 6.55) | 1(Ref) | 1.52 (-2.99; 6.25) | 1(Ref) | 4.57 (-0.80; 10.22) | 1(Ref) |
| 2011-2015 | 2.63 (-2.11; 7.59) | 0.634 | 2.18 (-2.50; 7.07) | 0.928 | 2.79 (-2.04; 7.86) | 0.706 | 2.60 (-3.12; 8.65) | 0.623 |
| 2016-2020 | 5.11 (0.34; 10.11) | 0.224 | 6.13 (1.31; 11.18) | 0.206 | 6.27 (1.40; 11.37) | 0.162 | 5.76 (-0.05; 11.91) | 0.770 |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios using conditional logistic regression; aEstimates of interaction analyses; b *P* for interaction; c Seasons: warm seasons: May to October; cold seasons: November to April; d Air temperature: was divided by the tertiles values of air temperature.

**sTable 10**. Percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in single-day lagged ambient air pollutant concentrations (over lag 5 and lag 6 days) in the two-pollutant models.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Percent changes (95%CIs) in the odds of overall stroke events** | | | | | |
| **PM2.5** | **PM10** | **PMcoarse** | **O3** | **NO** | **NO2** |
| **Lag 5** |  |  |  |  |  |  |
| Single | 1.94 (-0.04; 3.95)\* | 2.36 (0.30; 4.46)\*\* | 2.22 (0.10; 4.39)\*\* | -0.92 (-5.13; 3.47) | 0.251 (-0.79; 1.31) | 2.88 (0.07; 5.77)\*\* |
| Adj. PM2.5 | - | - | 1.66 (-0.62; 4.00) | 1.06 (-3.66; 6.01) | -0.26 (-1.42; 0.92) | 1.97 (-1.32; 5.36) |
| Adj. PM10 | -2.72 (-9.07; 4.07) | - | 1.12 (-1.53; 3.91) | 1.59 (-3.21; 6.62) | -0.43 (-1.62; 0.77) | 1.53 (-1.84; 5.02) |
| Adj. PMcoarse | 1.34 (-0.78; 3.51) | 1.67 (-0.97; 4.37) | - | 0.38 (-4.06; 5.03) | -0.16 (-1.28; 0.97) | 2.03 (-1.01; 5.16) |
| Adj. O3 | 2.14 (-0.04; 4.36)\* | 2.69 (0.40; 5.04)\*\* | 2.28 (0.06; 4.54)\*\* | - | 0.19 (-1.02; 1.41) | 4.39 (0.63; 8.29)\*\* |
| Adj. NO | 2.15 (-0.05; 4.41)\* | 2.78 (0.42; 5.19)\* | 2.34 (0.07; 4.66)\*\* | - | - | 4.21 (0.50; 8.05)\*\* |
| Adj. NO2 | 1.19 (-1.12; 3.56) | 1.71 (-0.78; 4.26) | 1.60 (-0.70; 3.96) | 3.54 (-2.24; 9.66) | - | - |
| **Lag 6** |  |  |  |  |  |  |
| Single | 1.93 (-0.02; 3.92)\* | 2.28 (0.21; 4.40)\*\* | 1.88 (-0.25; 4.06)\* | -4.28 (-8.36; -0.02)\*\* | 0.54 (-0.51; 1.60) | 3.35 (0.54; 6.24)\*\* |
| Adj. PM2.5 | - | - | 1.26 (-1.03; 3.61) | -3.07 (-7.62; 1.70) | 0.10 (-1.07; 1.28) | 2.61 (-0.67; 6.01) |
| Adj. PM10 | -1.63 (-8.08; 5.28) | - | 0.66 (-2.05; 3.44) | -2.76 (-7.37; 2.08) | -0.03 (-1.22; 1.18) | 2.35 (-1.04; 5.84) |
| Adj. PMcoarse | 1.49 (-0.61; 3.64) | 1.88 (-0.77; 4.59) | - | -3.51 (-7.80; 0.97) | 0.23 (-0.89; 1.37) | 2.81 (-0.25; 5.95)\* |
| Adj. O3 | 1.33 (-0.81; 3.53) | 1.68 (-0.62; 4.04) | 1.38 (-0.84; 3.65) | - | 0.02 (-1.19; 1.24) | 2.62 (-1.04; 6.41) |
| Adj. NO | 1.84 (-0.33; 4.07)\* | 2.31 (-0.05; 4.73)\* | 1.71 (-0.58; 4.05) | - | - | 4.15 (0.47; 7.97)\*\* |
| Adj. NO2 | 0.95 (-1.34; 3.29) | 1.28 (-1.22; 3.84) | 1.01 (-1.31; 3.38) | -1.71 (-7.18; 4.09) | - | - |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios calculated using conditional logistic regression; The two-pollutant models were conducted for air pollutants with a correlation coefficient <0.7. The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

**sTable 11**. Percent changes and 95% CIs in the odds of overall stroke events associated with each IQR increase in moving average lagged ambient air pollutant concentrations (over lag 5-6 and lag 0-6 days) in the two-pollutant models.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **percent changes (95%CIs) in the odds of overall stroke events** | | | | | |
| **PM2.5** | **PM10** | **PMcoarse** | **O3** | **NO** | **NO2** |
| **Lag 5-6** |  |  |  |  |  |  |
| Single | 2.11 (0.09; 4.17)\*\* | 2.55 (0.43; 4.71)\*\* | 2.50 (0.23; 4.82)\*\* | -2.93 (-7.48; 1.84) | 0.46 (-0.70; 1.63) | 3.48 (0.61; 6.44)\*\* |
| Adj. PM2.5 | - | - | 1.83 (-0.64; 4.36) | -0.97 (-6.12; 4.46) | -0.13 (-1.45; 1.19) | 2.62 (-0.82; 6.19) |
| Adj. PM10 | -3.15 (-10.09; 4.32) | - | 1.26 (-1.64; 4.25) | -0.45 (-5.67; 5.07) | -0.33 (-1.67; 1.02) | 2.19 (-1.35; 5.86) |
| Adj. PMcoarse | 1.44 (-0.75; 3.69) | 1.79 (-0.93; 4.58) | - | -1.56 (-6.38; 3.50) | -0.05 (-1.30; 1.23) | 2.61 (-0.54; 5.85) |
| Adj. O3 | 1.93 (-0.31; 4.21)\* | 2.46 (0.08; 4.89)\*\* | 2.28 (-0.09; 4.70)\* | - | 0.11 (-1.25; 1.49) | 4.10 (0.27; 8.09)\*\* |
| Adj. NO | 2.22 (-0.06; 4.54)\* | 2.86 (0.40; 5.38)\*\* | 2.53 (0.07; 5.054)\*\* | - | - | 4.91 (1.03; 8.93)\*\* |
| Adj. NO2 | 1.05 (-1.37; 3.53) | 1.56 (-1.07; 4.25) | 1.61 (-0.88; 4.16) | 1.55 (-4.74; 8.25) | - | - |
| **Lag 0-6** |  |  |  |  |  |  |
| Single | 1.77 (-0.50; 4.08) | 1.69 (-0.65; 4.08) | 0.63 (-2.17; 3.51) | -6.19 (-12.30; 0.36)\* | 1.51 (-0.36; 3.42) | 4.33 (0.92; 7.87)\*\* |
| Adj. PM2.5 | - | - | -0.46 (-3.57; 2.75) | -4.92 (-11.88; 2.59) | 1.03 (-1.15; 3.26) | 4.33 (0.04; 8.81)\*\* |
| Adj. PM10 | 3.11 (-6.05; 13.16) | - | -1.22 (-4.85; 2.54) | -5.14 (-12.16; 2.44) | 1.10 (-1.14; 3.39) | 4.73 (0.27; 9.39)\*\* |
| Adj. PMcoarse | 1.93 (-0.61; 4.54) | 2.37 (-0.74; 5.57) | - | -6.40 (-12.86; 0.53)\* | 1.64 (-0.44; 3.77) | 5.14 (1.24; 9.18)\*\* |
| Adj. O3 | 0.98 (-1.56; 3.57) | 0.80 (-1.85; 3.52) | -0.29 (-3.23; 2.74) | - | 0.77 (-1.44; 3.04) | 3.81 (-0.54; 8.35)\* |
| Adj. NO | 1.12 (-1.50; 3.81) | 0.93 (-1.86; 3.79) | -0.44 (-3.52; 2.74) | - | - | 4.60 (-0.03; 9.45)\* |
| Adj. NO2 | 0.00 (-2.80; 2.88) | -0.41 (-3.40; 2.67) | -1.37 (-4.49; 1.81) | -1.62 (-9.79; 7.29) | - | - |

**Abbreviations**: CIs, confidence intervals; PM2.5, particulate matter with an aerodynamic diameter below 2.5 μm; PM10, particulate matter with an aerodynamic diameter below 10 μm; PMcoarse, coarse particulate matter with an aerodynamic diameter between 2.5 and 10 μm; O3, ozone; NO, Nitric oxide; NO2, nitrogen dioxide.

**Note**: \*, *P*<0.10; \*\*, *P*<0.05; Percent changes were estimated based on the odds ratios calculated using conditional logistic regression; The two-pollutant models were conducted for air pollutants with a correlation coefficient <0.7. The model was adjusted for the corresponding lagged days of air temperature and relative humidity.

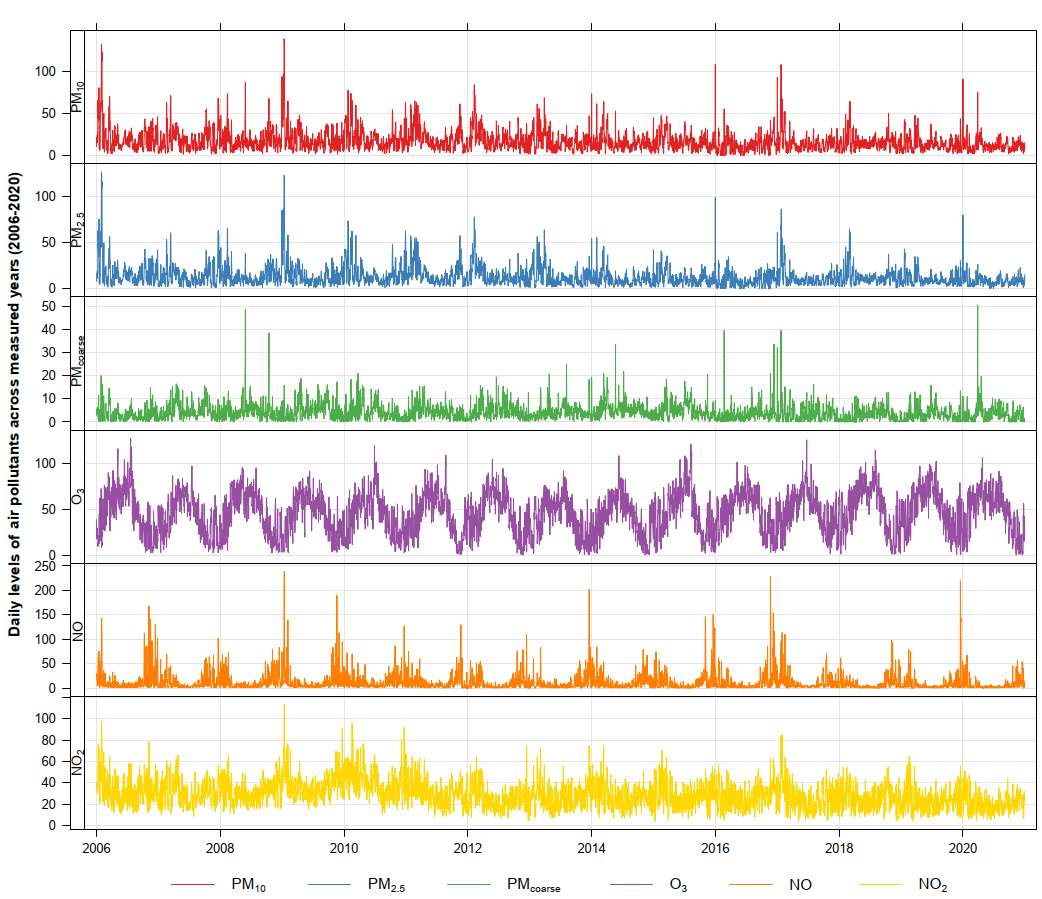
**sTable 12**. Summary of cited epidemiological evidence on the associations between air pollution and strokes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Years** | **First author** | **Titles** | **Study design** | **Air pollutants** | **Exposure windows** | **Outcomes** | **Findings** |
| **Systematic reviews / Meta-analysis** | | | | | | | |
| 2023 | Erin R Kulick | Ambient Air Pollution and Stroke: An Updated Review | Systematic review | Short and long-term exposure to ambient air pollution | 1 -24 hours | Stroke | Reduction in air pollutant concentrations represents a significant population-level opportunity to reduce risk of cerebrovascular disease |
| 2022 | Jeroen de Bont | Ambient air pollution and cardiovascular diseases: An umbrella review of systematic reviews and meta-analyses | Umbrella review | PM2.5, PM10, NOx | Short-term (no data) | Cardiovascular disease (CVDs) | Short-term exposures to PM2.5, PM10 and NOx were consistently associated with increased risks of stroke (fatal and nonfatal). |
| 2023 | Wenjian Lin | Short-term Exposure to Air Pollution and the Incidence and Mortality of Stroke: A Meta-Analysis | Meta-analysis | PM10, PM2.5, NO2, SO2, CO, and O3 | Short-term | Incidence and mortality of strokes | Short-term exposure to PM10, PM2.5, NO2, SO2, and O3 was associated with increased stroke incidence;  Short-term exposures to PM10, PM2.5, NO2, SO2 were correlated with increased mortality from stroke. |
| **Original study** | | | | | | | |
| 2018 | Andrew F W Ho (Singapore) | The Relationship Between Ambient Air Pollution and Acute Ischemic Stroke: A Time-Stratified Case-Crossover Study in a City-State With Seasonal Exposure to the Southeast Asian Haze Problem | Time-stratified case-crossover study | Pollutant Standards Index | Maximum of lag 5 days | Ischemic stroke | A short-term elevated risk of ischemic stroke after exposure to air pollution |
| 2017 | B K Butland (UK) | Air pollution and the incidence of ischaemic and haemorrhagic stroke in the South London Stroke Register: a case-cross-over analysis | Time-stratified case-cross-over study | PM10, PM2.5, NO2, NOx, and O3 | Maximum of lag 6 days | Ischemic and hemorrhagic stroke | No evidence of a positive association between outdoor air pollution and incident stroke or its subtypes;  A negative association with PM10 suggestive of a 14.6% fall in risk of hemorrhagic stroke per 10 µg/m3 increase in PM10 |
| 2023 | Britney Gaines (Israel) | Particulate Air Pollution Exposure and Stroke among Adults in Israel | Retrospective cohort study | PM2.5 | Lag 0,1,2 days | Ischemic stroke, intracerebral hemorrhage or transient ischemic attack (TIA) | PM2.5 exposure was associated with a higher ischemic stroke risk, with larger effect estimates at higher exposure levels. Vulnerability to the air pollution effects differed by age, sex, ethnicity, and comorbidities. |
| 2020 | Cai Chen (China) | Effect of air pollution on hospitalization for acute exacerbation of chronic obstructive pulmonary disease, stroke, and myocardial infarction | Generalized additive models (GAM) | PM2.5, PM10, SO2, NO2, and O3 | Maximum of lag 5 days | Hospitalization for acute exacerbation of chronic obstructive pulmonary disease, stroke, and MI. | The hospitalization risk for stroke with hypertension due to SO2 and NO2 was greater than that of stroke without hypertension.  The risk of hospitalization for stroke with hypertension as a comorbidity due to O3 was lower than without hypertension.  SO2 and O3 appeared protective for stroke patients with coronary atherosclerosis. |
| 2024 | Dongxia Jiang (China) | Short-term effects of ambient oxidation, and its interaction with fine particles on first-ever stroke: A national case-crossover study in China | Case-crossover study | NO2, O3, and their combined oxidation (Owt) | Maximum of lag 7 days | First-ever stroke | A significant association between ambient NO2 exposure at lag0 day with first-ever stroke;  A significant interaction between NO2 and PM2.5;  Physical inactivity enhanced the detrimental effects of O3 and Owt exposure, while smoking and TIA history enhanced the detrimental effects of NO2 exposure; However, TIA history appeared to mitigate the adverse effects of O3 exposure. |
| 2017 | Fangfang Huang (China) | Gaseous Air Pollution and the Risk for Stroke Admissions: A Case-Crossover Study in Beijing, China | Bidirectional case-crossover study | NO2, SO2, CO, PM2.5, O3 | Maximum of lag 2 days | Hospital admissions for stroke | NO₂ and SO₂ were positively associated with stroke admissions, with stronger effects in warm seasons and with patients >65 years.  The associations of CO and O3 with stroke admissions differed across seasons |
| 2022 | Hao Chen (China) | Ambient Air Pollution and Hospitalizations for Ischemic Stroke: A Time Series Analysis Using a Distributed Lag Nonlinear Model in Chongqing, China | Original study:  DLNM | PM2.5, PM10, SO2, NO2, O3 | Maximum of lag 7 days | Ischemic Stroke | Short-term exposure to PM2.5, PM10, SO2, NO2, O3 contributes to more ischemic stroke hospitalization |
| 2017 | Hui Liu (China) | Association between ambient air pollution and hospitalization for ischemic and hemorrhagic stroke in China: A multicity case-crossover study | Time-stratified case-crossover analysis | PM10, NO2, SO2, CO, and O3 | Maximum of lag 5 days | Ischemic stroke and hemorrhagic stroke hospitalizations | Air pollution was positively associated with ischemic stroke (6-day average levels).  For hemorrhagic stroke, we observed the only significant association in relation to nitrogen dioxide on the current day |
| 2023 | Iván Gutiérrez-Avila (Mexico) | Short-term exposure to PM2.5 and 1.5 million deaths: a time-stratified case-crossover analysis in the Mexico City Metropolitan Area | Case-crossover study | PM2.5 | Maximum of lag 6 days | Broad-category and cause-specific mortality outcomes hemorrhagic stroke | A 10-μg/m3 PM2.5 higher cumulative exposure over one week (lag0-6) was associated with higher cause-specific mortality outcomes: hemorrhagic stroke;  No differences in effect size of associations were observed between age, sex and SES strata |
| 2023 | Jamie L Humphrey (US) | Disentangling impacts ofmultiple pollutants on acute cardiovascular events in New York city: A case-crossover analysis | Case-crossover study | NO2, PM2.5, SO2, and O3 | Maximum of lag 6 days | Acute CVD event, ischemic heart disease, heart failure, stroke, ischemic stroke, acute myocardial infarction | Our results indicate immediate, robust effects of combustion-related pollution on CVD risk (stroke), by sub-diagnosis.  Though acute impacts differed minimally by age, sex, or race, the much younger age-at-event for Black New Yorkers calls attention to cumulative social susceptibility |
| 2017 | Jeffrey J Wing (US) | Short-term exposures to ambient air pollution and risk of recurrent ischemic stroke | Time-stratified case-crossover study | PM2.5, O3 | Lag 2 and lag 3 days | Recurrent ischemic stroke | No evidence of associations between previous-day air pollution levels and recurrent ischemic stroke |
| 2022 | Kohei Hasegawa (Japan) | Short-term associations of ambient air pollution with hospital admissions for ischemic stroke in 97 Japanese cities | GAM with a quasi-Poisson regression | SO2, NO2, Ox, CO, and PM2.5 | Maximum of lag 2 days | Hospital admissions for ischemic stroke | Short-term exposure to ambient air pollution was associated with increased hospital admissions for ischemic stroke, and medication use and season may modify the association |
| 2024 | Kun Fang (China) | Hourly effect of atmospheric reactive nitrogen species on the onset of acute ischemic stroke: Insight from the Shanghai Stroke Service System Database | Time-stratified case-crossover study | Hourly concentrations of PM10, PM2.5, O3, SO2, CO, NO2, and nitrous acid (HONO) | Maximum of 72 lag hours | Acute ischemic stroke | Acute exposure to PM10, PM2.5, SO2, NO2, and HONO was found to be associated with acute ischemic stroke onset, respectively. |
| 2008 | Lynda D Lisabeth (US) | Ambient air pollution and risk for ischemic stroke and transient ischemic attack | Poisson regression | PM2.5, O3 | Maximum of lag 5 days | Ischemic strokes/TIAs | Borderline associations between recent PM2.5 and O3 exposure and ischemic stroke/TIA risk, even in this community with relatively low pollutant levels |
| 2023 | Meijun Li (China) | Air pollution and stroke hospitalization in the Beibu Gulf Region of China: A case-crossover analysis | Time-stratified case-crossover study | PM2.5, PM10, NO2, SO2, O3 and CO | Lag 0-1 days | Hospitalizations of stroke and its subtypes | Short-term increase in NO2, SO2, and PM10 might be important triggers of stroke hospitalization. All seven air pollutants were associated with ischemic stroke hospitalization, while only CO was associated with hemorrhagic stroke hospitalization |
| 2023 | Panumas Surit (Thailand) | Association between air quality index and effects on emergency department visits for acute respiratory and cardiovascular diseases | Retrospective study | Air Quality Index (AQI) of PM2.5 | Maximum of lag 6 days | Emergency Department visits, and hospitalizations, and unexpected deaths due to acute respiratory disease, acute coronary syndrome, acute heart failure, and stroke | No positive association between PM-related quality index and stroke was found, though positive associations were found for other CVDs |
| 2012 | Paul J Villeneuve (Canada) | Short-term effects of ambient air pollution on stroke: who is most vulnerable? | Time-stratified case-crossover study | NO2, PM2.5, CO, O3, and SO2 | Lag 0, 1, and 3 days | Ischemic or hemorrhagic stroke, TIAs | Positive associations were observed between ischemic stroke and air pollution during the 'warm' season (April through September), but no associations were evident with the other stroke subtypes.  Air pollution was not associated with hemorrhagic stroke or transient ischemic attacks |
| 2023 | Peng Wang (China) | Cleaner outdoor air diminishes the overall risk of intracerebral hemorrhage but brings differential benefits to subpopulations: a time-stratified case-crossover study | Time-stratified case-crossover study | PM2.5, PM10, SO2, NO2, CO, and O3 | Maximum of lag 5 days | Intracerebral hemorrhage | The elevation of daily PM2.5, SO2, and CO was associated with increased Intracerebral hemorrhage risk in the first group and was not positively associated with risk escalation in the second group. |
| 2017 | Pi Guo (China) | Ambient Air Pollution and Risk for Ischemic Stroke: A Short-Term Exposure Assessment in South China | Time-series Poisson regression model | PM2.5, SO2, NO2, O3 | Maximum of lag 5 days | Ischemic Stroke | A borderline significant association between NO₂ exposure, modeled as an averaged lag effect, and ischemic stroke risk. |
| 2024 | Radosław Czernych (Poland) | Air Pollution Increases Risk of Occurrence of Intracerebral Haemorrhage but Not of Subarachnoid Haemorrhage: Time-Series Cross-Sectional Study | Time-Series Cross-Sectional Study | SO2, NO, NO2, NOx, CO, PM2.5, PM10, and O3 | Maximum of lag 3 days | hemorrhagic stroke | Transient elevations in ambient NO2, NO, and CO are associated with a higher relative risk of intracerebral but not subarachnoid hemorrhage |
| 2012 | Ravi Maheswaran (UK) | Outdoor air pollution and incidence of ischemic and hemorrhagic stroke: a small-area level ecological study | A small-area level ecological study design | PM10, NOx | Maximum of lag 2 days | Ischemic and hemorrhagic strokes | Although there was no significant association between outdoor air pollutants and ischemic stroke incidence for all ages combined, there was a suggestion of increased risk among people aged 65 to 79 years.  There was no evidence of increased incidence in hemorrhagic stroke. |
| 2018 | Rosa Maria Vivanco-Hidalgo (Spain) | Short-term exposure to traffic-related air pollution and ischemic stroke onset in Barcelona, Spain | Time-stratified case-crossover study | PM2.5, Black Carbon (BC) | Maximum of lag 3 days | Ischemic stroke | No association was found between PM2.5 and BC exposure and acute ischemic stroke risk.  By stroke subtype, large-artery atherosclerotic stroke could be triggered by daily increases in BC |
| 2021 | Runhua Zhang (China) | Association between short-term exposure to ambient air pollution and hospital admissions for transient ischemic attacks in Beijing, China | Time-series study | PM2.5, PM10, CO, SO2, NO2, and O3 | Maximum of lag 2 days | Hospital admissions for TIAs | This research contributes evidence on the association between air pollution and admissions for TIA in the low- and middle-income countries and may promote related public health policy development |
| 2019 | Shengzhi Sun (China) | Short-term exposure to air pollution and incidence of stroke in the Women's Health Initiative | Original study:  time-stratified case-crossover | PM2.5, PM10, NO2, NOx, SO2, and O3 | Maximum of lag 6 days | Ischemic or hemorrhagic stroke | Daily NO2 and NOx were associated with higher risk of hemorrhagic stroke, but ambient levels of four other air pollutants were not associated with higher risk of total stroke, ischemic stroke, or ischemic stroke subtypes |
| 2022 | So Young Kim  (South Korea) | Short- and long-term exposure to air pollution increases the risk of stroke | Population cohort study | SO2, NO2, O3, CO, and PM10 | Maximum of lag 7 days (short-term) | Stroke hospitalizations | Both short- and long-term exposure to CO were related to stroke |
| 2023 | Tao Liu (China) | Joint Associations of Short-Term Exposure to Ambient Air  Pollutants with Hospital Admission of Ischemic Stroke | Time-stratified case-crossover study | PM2.5, NO2, SO2, O3 and CO | Maximum of lag 3 days | Ischemic stroke | Short-term exposures to PM2.5, maximum day 8 hour- O3, NO2, SO2, and CO were positively associated with increased risks of hospital admission for ischemic stroke.  The joint associations of air pollutants with ischemic stroke might be overestimated using single-pollutant models |
| 2018 | Wei Zeng (China) | Ambient fine particulate pollution and daily morbidity of stroke in Chengdu, China | Time series analysis-GAM | PM2.5, PMcoarse and PM10 | Maximum of lag 5 days | Daily morbidity of stroke | Short-term exposure to PM2.5 within 1 day is associated with the onset of stroke.  The younger people (age<65) and females are more sensitive than older people and males. |
| 2024 | Xin Lv (China) | Hourly Air Pollution Exposure and Emergency Hospital Admissions for Stroke: A Multicenter Case-Crossover Study | Case-Crossover Study | PM10, PM2.5, NO2, SO2, CO, and O3 | Maximum of lag 2 days | Emergency hospital admissions for stroke | Hourly exposure to PM10, PM2.5, NO2, SO2 was associated with an increased risk of hospital admissions for total stroke and ischemic stroke.  The risk was more pronounced among male patients or those aged <65 years old. |
| 2020 | Yanfang Guo (China) | Short-term associations between ambient air pollution and stroke hospitalizations: time-series study in Shenzhen, China | Time-series analysis | PM2.5, NO2 and O3 | Maximum of lag 3 days | Stroke hospitalizations | Short-term exposure to PM2.5, NO2 and O3 may induce stroke morbidity |
| 2018 | Yaohua Tian (China) | Association between ambient air pollution and daily hospital admissions for ischemic stroke: A nationwide time-series analysis | Poisson time-series regression models | PM2.5, O3, NO2, SO2, CO | Maximum of lag 2 days | Daily hospital admissions for ischemic stroke | A transient increase in air pollution levels may increase the risk of ischemic stroke |
| 2022 | Yuhan Zhao (China) | Associations between ambient air pollution, meteorology, and daily hospital admissions for ischemic stroke: a time-stratified case-crossover study in Beijing | Time-stratified case-crossover study | PM2.5, PM10, SO2, NO2, CO, O3 | Maximum of lag 21 days | Daily hospital admissions for ischemic stroke | Particulate pollutants could increase the risk of ischemic stroke, and the elderly were more sensitive to it, while the results of gaseous pollutants are still discordant |

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**sFig 1**. The time series of annual cases of overall stroke events from Augsburg, Germany, from 2006 to 2020. Note: The red dashed line represents the smooth curve of stroke cases across years.



**sFig 2**. The daily average concentrations of six air pollutants from Augsburg, Germany, from 2006 to 2020.

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**sFig 3**. Subgroup percent changes (95% CIs) in the odds of stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by three subtypes. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

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**sFig 4**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by disability levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

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**sFig 5**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in single-day lagged air pollutants by severity levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

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**sFig 6**. Stratified percent change (95% CI) in the overall stroke events in each interquartile range (IQR) increase in moving average air pollutants by severity levels. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

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**sFig 7**. Percent changes (95% CIs) in the odds of overall stroke events in each interquartile range (IQR) increase in lag5-6 and 0-6 days of air pollutants modified by sex. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.



**sFig 8**. Percent changes (95% CIs) in the odds of daily overall stroke events in each interquartile range (IQR) increase in lag5-6 and 0-6 days of air pollutants modified by seasons. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

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**sFig 9**. Percent changes (95% CIs) in the odds of daily overall stroke events in each interquartile range (IQR) increase in lag5-6 and 0-6 days of air pollutants modified by 5-year periods. **Note**: \*, *P*<0.10; \*\*, *P*<0.05.

A group of graphs showing the results of a graph

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**sFig 10**. The exposure-response analysis between six air pollutants and the odds of overall stroke events at lag5-6 days using the restricted cubic splines.