**SUPPLEMENTAL MATERIAL**

**Short-Term Effects of Ambient Air Pollution and Outdoor Temperature on Biomarkers of Myocardial Damage, Inflammation and Oxidative Stress in Healthy Adults**

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**eFigure 1. Histograms of health outcomes (A**-**C) and ambient 24**-**hour mean concentrations of air pollutants before clinical visits (D-L).**

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Abbreviations: hs-cTnI, high-sensitivity cardiac troponin I; GDF-15, growth differentiation factor-15; 8-OHdG, 8-hydroxy-2′-deoxyguanosine; Cr, creatinine; PM2.5, fine particulate matter; PNCx, particulate number concentrations in given size ranges (nm); BC, black carbon; CO, carbon monoxide, NOx, nitrogen oxides; SO2, sulfur dioxide; O3, ozone.

**eTable 1. Characteristics for participants with and without detectable levels of hs**-**cTnI.**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Participants with  hs-cTnI levels≥LoD | Participants with  hs-cTnI levels<LoD | *p*-value |
| SBP, mm Hg | 113.8 (11.2) | 108.6 (10.5) | 0.001 |
| DBP, mm Hg | 64.7 (8.9) | 64.5 (7.6) | 0.943 |
| Heart rate, bpm | 65.3 (12.3) | 71.9 (9.8) | <0.0001 |
| Urinary cotinine, ng/mg Cr | 3.3 (172.4) | 2.6 (55.0) | 0.966 |
| Urinary cortisol, ng/mg Cr | 1.2 (6.9) | 1.3 (3.4) | 0.974 |
| HDL-C, mg/dL | 1.3 (0.3) | 1.4 (0.3) | 0.246 |
| LDL-C, mg/dL | 2.1 (0.6) | 2.3 (0.6) | 0.093 |
| Triglycerides, mg/dL | 0.8 (0.7) | 0.7 (0.4) | 0.034 |
| eGFR, mL·min-1·1.73 m-2 | 107.2 (15.7) | 106.7 (19.1) | 0.688 |
| GDF-15, pg/mL | 221 (122) | 207 (75) | 0.301 |
| 8-OHdG, ng/mg Cr | 1.3 (4.2) | 1.5 (3.0) | 0.362 |

Mann-Whitney U test was applied to test the statistical significance of the difference in measured variables between participants with and without detectable levels of hs-cTnI. Abbreviations: LoD, limit of detection; hs-cTnI, high-sensitivity cardiac troponin I; SBP, systolic blood pressure; DBP, diastolic blood pressure; Cr, creatinine; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; eGFR, estimated glomerular filtration rate; GDF-15, growth differentiation factor-15, 8-OHdG, 8-hydroxy-2′-deoxyguanosine.

**eFigure 2.** **Characteristics of health outcomes (A-C) and environmental factors (D-N) across all clinical visits.** E:\2018\JI 投稿\hs-TnI\EE\PDL\ER R2\Figure\R2\Final\Online Figures\eFigure 2a.TIF

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Visit 1: November 24, 2014, to January 8, 2015; visit 2: April 22, 2015, to June 1, 2015; visit 3: September 20, 2015, to November 9, 2015; visit 4: December 27, 2015, to January 18, 2016. Abbreviations: LoD, limit of detection; hs-cTnI, high-sensitivity cardiac troponin I; GDF-15, growth differentiation factor-15; 8-OHdG, 8-hydroxy-2′-deoxyguanosine; PM2.5, fine particulate matter; PNCX, particulate number concentrations in given size ranges (nm); BC, black carbon; NOx, nitrogen oxides; CO, carbon monoxide; SO2, sulfur dioxide; O3, ozone; Temp, ambient temperature; AT, apparent temperature.

**eFigure 3. Exposure**-**response relationship curves between air pollutants and hs-cTnI (A-F), GDF-15 (G-L), and 8-OHdG (M-R) at different lag periods.**

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Linear mixed-effects models coupled with distributed lag nonlinear models, with adjustments for covariates (body mass index, low-density lipoprotein cholesterol, and urinary cortisol selected for hs-cTnI; body mass index and urinary cotinine for GDF-15; sex, high-density lipoprotein cholesterol, and day of week of clinical visits for 8-OHdG), season, temperature, and relative humidity, were used to model exposure-response relationship curves between air pollution and each outcome. The estimate effect is shown by the black line, and the red regions represent the 95% confidence intervals. Abbreviations: lag 0, averaged pollutant concentrations over the last 24 h before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-13; hs-cTnI, high-sensitivity cardiac troponin I; GDF-15, growth differentiation factor-15; 8-OHdG, 8-hydroxy-2′-deoxyguanosine; PM2.5, fine particulate matter; PNCX, particulate number concentrations in given size ranges (nm); BC, black carbon; and SO2, sulfur dioxide.

**eFigure 4. Exposure**-**response relationship curves and the lag structures in the relative risks of GDF-15 in low (5th percentile) and high (95th percentile) Temp exposures (H) over cumulative lags of 0 to 6 days.**

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The black lines indicate mean effect estimates, and red regions are 95% confidence intervals. Blue reference line indicates the Temp breakpoints. The lagged association estimates of Temp are presented as relative risks (a 1 °C change) of 5th percentile (-2.5 °C) or 95th percentile (24.8 °C) relative to the referent level (50th percentile, 6.9 °C). Error bars indicate 95% confidence intervals. Significant associations (*p*-value <0.05) are shown in red. Linear mixed-effects models coupled with distributed lag nonlinear models, with adjustments for body mass index, urinary cotinine, season, relative humidity and corresponding exposure periods of fine particulate matter and ozone, were used to model exposure-response relationship curves between Temp and GDF-15. Abbreviations: lag 0, averaged levels of Temp over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; GDF-15, growth differentiation factor-15; Temp, ambient temperature.

**eFigure 5. Exposure-response relationship curves (A-G) and the lag structures in the relative risks of hs-cTnI in low (5th percentile) and high (95th percentile) AT exposures (H) over cumulative lags of 0 to 6 days.**

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The black lines indicate mean effect estimates, and red regions are 95% confidence intervals. Blue reference line indicates the AT breakpoints. The lagged association estimates of AT are presented as relative risks (a 1 °C change) of 5th percentile (-3.1 °C) or 95th percentile (24.9 °C) relative to the referent level (AT breakpoint at lag 0-6, 11.0 °C). Error bars indicate 95% confidence intervals. Significant associations (*p*-value <0.05) are shown in red. Linear mixed-effects models coupled with distributed lag nonlinear models, with adjustments for body mass index, urinary cortisol, low-density lipoprotein cholesterol, season, corresponding exposure periods of fine particulate matter and ozone. Abbreviations: lag 0, averaged levels of AT over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; hs-cTnI, high-sensitivity cardiac troponin I; AT, apparent temperature.

**eFigure 6. Exposure-response relationship curves (A-G) and the lag structures in the relative risks of 8-OHdG in low (5th percentile) and high (95th percentile) AT exposures over cumulative lags of 0 to 6 days (H).**

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The black lines indicate mean effect estimates, and red regions are 95% confidence intervals. Blue reference line indicates the AT breakpoints. The lagged association estimates of AT are presented as the relative risks (a 1 °C change) of 5th percentile (-3.1 °C) or 95th percentile (24.9 °C) relative to the referent level (AT breakpoint at lag 0-6, 0 °C). Error bars indicate 95% confidence intervals. Significant associations (*p*-value <0.05) are shown in red. Linear mixed-effects models coupled with distributed lag nonlinear models, with adjustments for sex, high-density lipoprotein cholesterol, day of week of clinical visits, season, corresponding exposure periods of fine particulate matter and ozone. Abbreviations: lag 0, averaged levels of AT over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; 8-OHdG, 8-hydroxy-2′-deoxyguanosine; AT, apparent temperature.

**eFigure 7. Exposure**-**response relationship curves (A-G) and the lag structures in the relative risks of GDF-15 in low (5th percentile) and high (95th percentile) AT exposures (H) over cumulative lags of 0 to 6 days.**

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The black lines indicate mean effect estimates, and red regions are 95% confidence intervals. Blue reference line indicates the AT breakpoints. The lagged association estimates are presented as relative risks (a 1 °C change) of 5th percentile (-3.1 °C) or 95th percentile (24.9 °C) relative to the referent level (50th percentile, 6.1 °C). Error bars indicate 95% confidence intervals. Significant associations (*p*-value <0.05) are shown in red. Linear mixed-effects models coupled with distributed lag nonlinear models, with adjustments for body mass index, urinary cotinine, season, corresponding exposure periods of fine particulate matter and ozone. Abbreviations: lag 0, averaged levels of AT over the last 24 h before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; GDF-15, growth differentiation factor-15; AT, apparent temperature.

**eTable 2. Results from sensitivity analyses of hs-cTnI.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pollutants** | **Lag**  **days** | **Main models** | |  | **Sensitivity analyses** | | | | | | | |
|  | Log-transformed  pollutant concentrations | |  | Excluding individuals living  beyond 1 km from monitoring station | |  | Excluding individuals with  cotinine levels >75th | |
| IQR | % changes  in hs-cTnI |  | IQR | % changes  in hs-cTnI |  | IQR | % changes  in hs-cTnI |  | IQR | % changes  in hs-cTnI |
| PM2.5 | 0 | 64.8 | 22.5 (-1.5, 46.6) |  | 0.58 | 42.5 (4.7, 80.2)\* |  | 64.8 | 29.5 (-0.1, 59.0) |  | 64.8 | 16.4 (-11.8, 44.5) |
|  | 0-1 | 54.3 | 25.1 (0.4, 49.7)\* |  | 0.43 | 43.1 (7.1, 79.1)\* |  | 54.3 | 33.0 (2.6, 63.4)\* |  | 54.3 | 22.3 (-7.5, 52.1) |
|  | 0-2 | 55.9 | 30.2 (2.2, 58.3)\* |  | 0.42 | 50.3 (9.9, 90.7)\* |  | 55.9 | 40.4 (5.5, 75.3)\* |  | 55.9 | 31.5 (-3.7, 66.7) |
|  | 0-3 | 62.9 | 36.9 (3.6, 70.2)\* |  | 0.41 | 54.0 (11.3, 96.7)\* |  | 62.9 | 50.1 (8.2, 92.0)\* |  | 62.9 | 43.5 (-0.2, 87.3) |
|  | 0-4 | 79.1 | 47.7 (4.1, 91.4)\* |  | 0.46 | 65.5 (12.7, 118.3)\* |  | 79.1 | 66.5 (10.7, 122.4)\* |  | 79.1 | 62.3 (1.9, 122.7)\* |
|  | 0-5 | 72.2 | 39.5 (1.4, 77.7)\* |  | 0.41 | 56.5 (9.4, 103.7)\* |  | 72.2 | 55.5 (7.4, 103.6)\* |  | 72.2 | 54.1 (0.1, 108.0)\* |
|  | 0-6 | 70.2 | 33.2 (-2.8, 69.2) |  | 0.40 | 50.7 (5.5, 96.0)\* |  | 70.2 | 47.4 (2.6, 92.2)\* |  | 70.2 | 45.4 (-5.2, 95.9) |
|  | 0-9 | 41.4 | 8.3 (-13.3, 29.9) |  | 0.23 | 19.2 (-6.6, 44.9) |  | 41.4 | 13.9 (-11.3, 39.1) |  | 41.4 | 3.9 (-22.3, 30.0) |
|  | 0-13 | 37.6 | 4.5 (-20.9, 29.8) |  | 0.19 | 14.5 (-12.4, 41.4) |  | 37.6 | 12.6 (-17.6, 42.8) |  | 37.6 | -11.8 (-37.9, 14.3) |
| PNC5-50 | 0 | 5.9 | 61.0 (18.7, 103.3)\* |  | 0.21 | 17.2 (0.2, 34.2)\* |  | 5.9 | 30.6 (-3.3, 64.4) |  | 5.9 | 21.8 (-9.4, 53.0) |
|  | 0-1 | 6.1 | 70.8 (19.0, 122.5)\* |  | 0.20 | 14.6 (-5.8, 35.1) |  | 6.1 | 31.5 (-7.3, 70.3) |  | 6.1 | 23.1 (-12.7, 59.0) |
|  | 0-2 | 5.6 | 60.2 (13.1, 107.3)\* |  | 0.18 | 10.3 (-13.5, 34.1) |  | 5.6 | 24.1 (-11.9, 60.1) |  | 5.6 | 19.1 (-14.9, 53.1) |
|  | 0-3 | 4.5 | 41.1 (5.6, 76.6)\* |  | 0.14 | 6.1 (-17.1, 29.4) |  | 4.5 | 15.3 (-14.5, 45.0) |  | 4.5 | 13.9 (-14.9, 42.7) |
|  | 0-4 | 3.9 | 31.1 (1.2, 60.9)\* |  | 0.13 | 5.2 (-18.7, 29.2) |  | 3.9 | 11.4 (-15.9, 38.6) |  | 3.9 | 12.3 (-14.6, 39.3) |
|  | 0-5 | 3.7 | 28.2 (-0.4, 56.8) |  | 0.12 | 7.0 (-18.6, 32.6) |  | 3.7 | 11.7 (-16.0, 39.4) |  | 3.7 | 14.3 (-13.4, 42.1) |
|  | 0-6 | 4.1 | 34.6 (1.3, 68.0)\* |  | 0.13 | 13.0 (-18.0, 44.0) |  | 4.1 | 17.8 (-15.1, 50.7) |  | 4.1 | 22.3 (-11.1, 55.8) |
|  | 0-9 | 4.0 | 70.8 (28.9, 112.7)\* |  | 0.13 | 45.9 (7.4, 84.5)\* |  | 4.0 | 56.6 (13.4, 99.7)\* |  | 4.0 | 63.4 (19.4, 107.4)\* |
|  | 0-13 | 4.0 | 118.6 (62.4, 174.8)\* |  | 0.13 | 76.6 (31.5, 121.7)\* |  | 4.0 | 107.6 (43.9, 171.2)\* |  | 4.0 | 120 (54.4, 185.6)\* |
| PNC50-100 | 0 | 3.8 | 48.7 (19.5, 77.8)\* |  | 0.34 | 49.0 (20.6, 77.3)\* |  | 3.8 | 30.8 (2.0, 59.5)\* |  | 3.8 | 21.9 (-7.2, 51.0) |
|  | 0-1 | 3.2 | 57.2 (26.0, 88.5)\* |  | 0.33 | 76.2 (36.4, 115.9)\* |  | 3.2 | 44.0 (10.2, 77.9)\* |  | 3.2 | 36.7 (2.7, 70.8)\* |
|  | 0-2 | 3.1 | 70.0 (33.9, 106.2)\* |  | 0.30 | 95.3 (47.6, 142.9)\* |  | 3.1 | 62.0 (19.6, 104.4)\* |  | 3.1 | 58.0 (15.4, 100.7)\* |
|  | 0-3 | 3.0 | 77.5 (38.6, 116.5)\* |  | 0.28 | 115.6 (58.2, 173.1)\* |  | 3.0 | 75.2 (27.1, 123.3)\* |  | 3.0 | 77.8 (28.5, 127.1)\* |
|  | 0-4 | 2.8 | 80.8 (40.7, 120.8)\* |  | 0.27 | 133.0 (67.6, 198.4)\* |  | 2.8 | 81.5 (31.3, 131.7)\* |  | 2.8 | 92.3 (39.3, 145.3)\* |
|  | 0-5 | 2.5 | 80.8 (41.4, 120.2)\* |  | 0.23 | 132.4 (69.9, 194.9)\* |  | 2.5 | 80.6 (32.0, 129.3)\* |  | 2.5 | 99.2 (46.1, 152.3)\* |
|  | 0-6 | 2.9 | 105.9 (54.1, 157.7)\* |  | 0.26 | 182.1 (96.4, 267.9)\* |  | 2.9 | 99.7 (38.5, 161.0)\* |  | 2.9 | 134.8 (63.7, 206)\* |
|  | 0-9 | 2.9 | 137.9 (78.6, 197.2)\* |  | 0.26 | 238.2 (126.4, 350)\* |  | 2.9 | 89.5 (30.0, 149.0)\* |  | 2.9 | 150.6 (72.5, 228.7)\* |
|  | 0-13 | 3.1 | 154.7 (94.4, 215.1)\* |  | 0.27 | 225.7 (96.1, 355.3)\* |  | 3.1 | 109.4 (45.2, 173.6)\* |  | 3.1 | 153.1 (73.8, 232.5)\* |
| PNC100-560 | 0 | 4.4 | 38.6 (8.5, 68.6)\* |  | 0.57 | 21.2 (-2.9, 45.3) |  | 4.4 | 36.2 (2.8, 69.5)\* |  | 4.4 | 39.9 (3.2, 76.6)\* |
|  | 0-1 | 2.4 | 32.4 (12.3, 52.6)\* |  | 0.45 | 24.7 (0.0, 49.4)\* |  | 2.4 | 31.1 (8.8, 53.4)\* |  | 2.4 | 35.9 (11.8, 60.1)\* |
|  | 0-2 | 2.6 | 49.7 (21.8, 77.6)\* |  | 0.44 | 30.7 (2.0, 59.3)\* |  | 2.6 | 48.0 (17.8, 78.2)\* |  | 2.6 | 58.2 (25.1, 91.3)\* |
|  | 0-3 | 2.7 | 63.9 (28.9, 98.9)\* |  | 0.41 | 32.9 (2.3, 63.4)\* |  | 2.7 | 61.8 (24.5, 99.2)\* |  | 2.7 | 78.3 (36.2, 120.5)\* |
|  | 0-4 | 2.3 | 58.4 (26.3, 90.5)\* |  | 0.34 | 27.1 (0.6, 53.5)\* |  | 2.3 | 56.4 (22.3, 90.6)\* |  | 2.3 | 73.5 (34.4, 112.5)\* |
|  | 0-5 | 2.4 | 64.0 (26.7, 101.3)\* |  | 0.34 | 26.0 (-2.2, 54.3) |  | 2.4 | 61.3 (21.8, 100.9)\* |  | 2.4 | 82.7 (36.3, 129.1)\* |
|  | 0-6 | 1.8 | 44.8 (17.1, 72.5)\* |  | 0.30 | 19.4 (-5.6, 44.5) |  | 1.8 | 42.5 (12.9, 72.1)\* |  | 1.8 | 57.9 (24.0, 91.8)\* |
|  | 0-9 | 1.6 | 25.9 (-0.1, 51.9) |  | 0.23 | 3.1 (-16.2, 22.4) |  | 1.6 | 23.1 (-4.9, 51.2) |  | 1.6 | 32.2 (2.5, 61.8)\* |
|  | 0-13 | 1.7 | 20.5 (-11.7, 52.8) |  | 0.23 | -5.8 (-27.2, 15.6) |  | 1.7 | 22.5 (-14.7, 59.6) |  | 1.7 | 12.8 (-19.2, 44.7) |
| BC | 0 | 3.9 | 40.9 (20.7, 61.1)\* |  | 0.53 | 58.5 (25.2, 91.7)\* |  | 3.9 | 40.2 (17.7, 62.8)\* |  | 3.9 | 48.6 (23.8, 73.3)\* |
|  | 0-1 | 3.5 | 51.4 (27.9, 74.9)\* |  | 0.44 | 71.2 (32.9, 109.4)\* |  | 3.5 | 50.6 (24.7, 76.4)\* |  | 3.5 | 61.8 (33.4, 90.2)\* |
|  | 0-2 | 3.9 | 77.5 (42.4, 112.5)\* |  | 0.41 | 87.3 (41.1, 133.4)\* |  | 3.9 | 76.0 (38.4, 113.7)\* |  | 3.9 | 94.9 (52.0, 137.7)\* |
|  | 0-3 | 3.4 | 76.7 (42.7, 110.7)\* |  | 0.36 | 88.2 (41.9, 134.5)\* |  | 3.4 | 75.0 (38.9, 111.1)\* |  | 3.4 | 93.7 (51.9, 135.4)\* |
|  | 0-4 | 3.8 | 99.0 (53.5, 144.6)\* |  | 0.39 | 111.1 (50.4, 171.8)\* |  | 3.8 | 95.9 (48.2, 143.7)\* |  | 3.8 | 121.3 (63.7, 178.8)\* |
|  | 0-5 | 3.4 | 91.5 (48.9, 134.0)\* |  | 0.32 | 90.1 (40.5, 139.8)\* |  | 3.4 | 87.6 (43.3, 132.0)\* |  | 3.4 | 109.7 (55.7, 163.8)\* |
|  | 0-6 | 3.8 | 105.6 (53.9, 157.3)\* |  | 0.36 | 105.6 (43.8, 167.5)\* |  | 3.8 | 99.5 (46.2, 152.8)\* |  | 3.8 | 124.2 (58.2, 190.1)\* |
|  | 0-9 | 2.8 | 66.7 (30.5, 102.9)\* |  | 0.27 | 65.9 (20.4, 111.4)\* |  | 2.8 | 60.0 (23.0, 96.9)\* |  | 2.8 | 67.7 (25.5, 109.9)\* |
|  | 0-13 | 2.6 | 66.2 (28.0, 104.4)\* |  | 0.23 | 51.2 (8.8, 93.5)\* |  | 2.6 | 62.2 (22.6, 101.7)\* |  | 2.6 | 56.2 (16.6, 95.9)\* |
| CO | 0 | 0.58 | 22.9 (6.4, 39.4)\* |  | 0.34 | 33.5 (10.3, 56.7)\* |  | 0.58 | 21.1 (1.5, 40.6)\* |  | 0.58 | 24.0 (4.9, 43.0)\* |
|  | 0-1 | 0.54 | 32.3 (12.2, 52.5)\* |  | 0.30 | 44.6 (16.7, 72.6)\* |  | 0.54 | 30.9 (7.1, 54.6)\* |  | 0.54 | 38.5 (14.8, 62.3)\* |
|  | 0-2 | 0.68 | 55.8 (23.6, 88.0)\* |  | 0.35 | 71.2 (28.7, 113.6)\* |  | 0.68 | 55.0 (17.5, 92.5)\* |  | 0.68 | 74.8 (34.9, 114.8)\* |
|  | 0-3 | 0.71 | 70.3 (31.8, 108.9)\* |  | 0.33 | 81.0 (34.4, 127.5)\* |  | 0.71 | 71.2 (26.4, 116.0)\* |  | 0.71 | 103.6 (52.9, 154.4)\* |
|  | 0-4 | 0.68 | 74.3 (34.9, 113.7)\* |  | 0.30 | 84.7 (37.2, 132.2)\* |  | 0.68 | 76.8 (31.0, 122.5)\* |  | 0.68 | 116.7 (62.5, 171.0)\* |
|  | 0-5 | 0.88 | 110.5 (50.2, 170.8)\* |  | 0.37 | 121.1 (51.3, 190.9)\* |  | 0.88 | 116.3 (46.2, 186.3)\* |  | 0.88 | 190.2 (97.7, 282.7)\* |
|  | 0-6 | 0.86 | 107.0 (48.7, 165.3)\* |  | 0.36 | 122 (51.6, 192.4)\* |  | 0.86 | 113.6 (45.7, 181.5)\* |  | 0.86 | 187.9 (96.7, 279.0)\* |
|  | 0-9 | 0.76 | 70.6 (27.0, 114.3)\* |  | 0.32 | 98.7 (36.2, 161.2)\* |  | 0.76 | 73.5 (23.1, 123.9)\* |  | 0.76 | 108.5 (48.2, 168.8)\* |
|  | 0-13 | 0.85 | 77.1 (11.1, 143.1)\* |  | 0.35 | 126.4 (27.1, 225.8)\* |  | 0.85 | 75.8 (2.6, 148.9)\* |  | 0.85 | 78.3 (6.3, 150.4)\* |
| NOX | 0 | 85.0 | 37.6 (11.0, 64.1)\* |  | 0.35 | 37.1 (8.0, 66.3)\* |  | 85.0 | 36.7 (7.1, 66.4)\* |  | 85.0 | 35.4 (1.5, 69.3)\* |
|  | 0-1 | 60.7 | 42.3 (16.6, 68.0)\* |  | 0.28 | 47.0 (14.3, 79.7)\* |  | 60.7 | 44.5 (15.1, 73.9)\* |  | 60.7 | 46.0 (12.4, 79.6)\* |
|  | 0-2 | 58.2 | 56.9 (24.8, 89.1)\* |  | 0.25 | 59.7 (20.9, 98.5)\* |  | 58.2 | 63.2 (25.6, 100.7)\* |  | 58.2 | 68.5 (25.6, 111.3)\* |
|  | 0-3 | 55.9 | 69.5 (31.5, 107.4)\* |  | 0.22 | 66.0 (24.7, 107.3)\* |  | 55.9 | 80.0 (34.9, 125.1)\* |  | 55.9 | 89.7 (38.0, 141.5)\* |
|  | 0-4 | 57.9 | 86.9 (39.6, 134.2)\* |  | 0.22 | 79.2 (30.1, 128.3)\* |  | 57.9 | 102.8 (45.8, 159.9)\* |  | 57.9 | 118.5 (51.9, 185.0)\* |
|  | 0-5 | 55.0 | 91.4 (42.1, 140.7)\* |  | 0.21 | 84.2 (32.3, 136.2)\* |  | 55.0 | 109.4 (49.7, 169.0)\* |  | 55.0 | 127.6 (57.3, 198.0)\* |
|  | 0-6 | 57.9 | 105.3 (47.9, 162.8)\* |  | 0.22 | 100.8 (37.5, 164.2)\* |  | 57.9 | 126.5 (57.1, 195.9)\* |  | 57.9 | 148.8 (65.6, 231.9)\* |
|  | 0-9 | 54.4 | 100.2 (42.2, 158.1)\* |  | 0.20 | 98.9 (32.0, 165.8)\* |  | 54.4 | 111.9 (46.8, 176.9)\* |  | 54.4 | 123.1 (47.5, 198.8)\* |
|  | 0-13 | 58.4 | 149.8 (50.8, 248.8)\* |  | 0.21 | 137.9 (33.2, 242.6)\* |  | 58.4 | 152.5 (49.0, 256.1)\* |  | 58.4 | 132.5 (29.4, 235.6)\* |
| SO2 | 0 | 20.2 | 19.0 (-2.5, 40.6) |  | 0.49 | 50.2 (9.7, 90.6)\* |  | 20.2 | 17.2 (-9.7, 44.1) |  | 20.2 | 21.9 (-4.9, 48.8) |
|  | 0-1 | 21.5 | 25.8 (-3.2, 54.7) |  | 0.49 | 71.2 (18.4, 124)\* |  | 21.5 | 23.4 (-11.7, 58.5) |  | 21.5 | 34.3 (-1.9, 70.6) |
|  | 0-2 | 21.8 | 29.9 (-4.5, 64.2) |  | 0.45 | 79 (23.9, 134.2)\* |  | 21.8 | 27.3 (-13.1, 67.7) |  | 21.8 | 45.3 (1.4, 89.2)\* |
|  | 0-3 | 21.0 | 31.5 (-6.0, 68.9) |  | 0.42 | 82.7 (26.8, 138.6)\* |  | 21.0 | 29.1 (-13.7, 71.9) |  | 21.0 | 52.5 (3.4, 101.7)\* |
|  | 0-4 | 18.0 | 28.8 (-5.9, 63.4) |  | 0.36 | 73.0 (24.4, 121.5)\* |  | 18.0 | 26.9 (-12.1, 65.9) |  | 18.0 | 49.9 (3.7, 96.0)\* |
|  | 0-5 | 18.9 | 34.0 (-5.6, 73.7) |  | 0.37 | 79.3 (25.9, 132.8)\* |  | 18.9 | 32.2 (-11.7, 76.1) |  | 18.9 | 59.5 (4.9, 114.1)\* |
|  | 0-6 | 19.6 | 40.5 (-3.2, 84.2) |  | 0.38 | 84.5 (26.9, 142.0)\* |  | 19.6 | 38.6 (-9.3, 86.5) |  | 19.6 | 67.9 (6.6, 129.2)\* |
|  | 0-9 | 22.0 | 76.9 (17.1, 136.7)\* |  | 0.43 | 106.9 (31.8, 182.1)\* |  | 22.0 | 73.7 (9.3, 138.1)\* |  | 22.0 | 93.8 (16.7, 171)\* |
|  | 0-13 | 23.8 | 139.6 (55.2, 224.1)\* |  | 0.47 | 176.9 (63.9, 289.9)\* |  | 23.8 | 134.0 (40.7, 227.3)\* |  | 23.8 | 113 (34.5, 191.6)\* |
| O3 | 0 | 53.5 | 6.5 (-24.3, 37.2) |  | 0.61 | -13.4 (-34.5, 7.7) |  | 53.5 | 18.2 (-19.9, 56.2) |  | 53.5 | 25.0 (-16.8, 66.8) |
|  | 0-1 | 52.9 | -1.8 (-34.9, 31.3) |  | 0.56 | -22.8 (-43.4, -2.3)\* |  | 52.9 | 5.7 (-33.7, 45.0) |  | 52.9 | 16.7 (-28.9, 62.3) |
|  | 0-2 | 49.5 | -12.3 (-43.5, 18.9) |  | 0.51 | -30.2 (-49.2, -11.2)\* |  | 49.5 | -11.0 (-46.0, 23.9) |  | 49.5 | 1.5 (-40.7, 43.8) |
|  | 0-3 | 51.7 | -24.3 (-55.0, 6.4) |  | 0.54 | -40.4 (-59.5, -21.4)\* |  | 51.7 | -28.2 (-60.4, 3.9) |  | 51.7 | -14.9 (-55.4, 25.6) |
|  | 0-4 | 46.9 | -32.0 (-59.9, -4.0)\* |  | 0.49 | -43.9 (-61.9, -26.0)\* |  | 46.9 | -39.1 (-66.9, -11.3)\* |  | 46.9 | -27.8 (-62.9, 7.3) |
|  | 0-5 | 46.2 | -39.6 (-66.1, -13.1)\* |  | 0.49 | -48.7 (-66.1, -31.3)\* |  | 46.2 | -48.7 (-73.7, -23.6)\* |  | 46.2 | -39.2 (-70.6, -7.8)\* |
|  | 0-6 | 45.6 | -45.4 (-70.6, -20.2)\* |  | 0.48 | -52.0 (-68.8, -35.3)\* |  | 45.6 | -55.3 (-78.3, -32.4)\* |  | 45.6 | -48 (-76.1, -19.9)\* |
|  | 0-9 | 49.5 | -58.9 (-81.9, -35.9)\* |  | 0.50 | -57.6 (-73.3, -42.0)\* |  | 49.5 | -67.8 (-87.6, -48.1)\* |  | 49.5 | -66.9 (-88, -45.8)\* |
|  | 0-13 | 52.0 | -67.7 (-90.8, -44.5)\* |  | 0.55 | -66.9 (-83.0, -50.7)\* |  | 52.0 | -74.4 (-94.0, -54.8)\* |  | 52.0 | -78.1 (-95.2, -60.9)\* |

Estimates with 95% confidence intervals. \**p*-value <0.05. Abbreviations: lag 0, averaged pollutant concentrations over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; IQR, interquartile range; PM2.5, fine particulate matter; PNCx, particulate number concentrations in given size ranges (nm); BC, black carbon; NOx, nitrogen oxides; CO, carbon monoxide; SO2, sulfur dioxide; O3, ozone; hs-cTnI, high-sensitivity cardiac troponin I.

**eTable 3. Results from sensitivity analyses of GDF-15.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pollutants** | **Lag**  **days** | **Main models** | |  | **Sensitivity analyses** | | | | | | | |
|  | Log-transformed  pollutant concentrations | |  | Excluding individuals living  beyond 1 km from monitoring station | |  | Excluding individuals with  cotinine levels >75th | |
| IQR | % changes  in GDF-15 |  | IQR | % changes  in GDF-15 |  | IQR | % changes  in GDF-15 |  | IQR | % changes  in GDF-15 |
| PM2.5 | 0 | 64.8 | 1.8 (-2.9, 6.4) |  | 0.58 | 3.2 (-4.1, 10.5) |  | 64.8 | 3.8 (-1.1, 8.8) |  | 64.8 | 3.3 (-2.7, 9.2) |
|  | 0-1 | 54.3 | 1.7 (-3.0, 6.4) |  | 0.43 | 3.1 (-3.8, 10.0) |  | 54.3 | 3.6 (-1.5, 8.7) |  | 54.3 | 3.3 (-2.7, 9.3) |
|  | 0-2 | 55.9 | 1.8 (-3.5, 7.1) |  | 0.42 | 3.5 (-4.0, 11.0) |  | 55.9 | 3.6 (-2.1, 9.3) |  | 55.9 | 3.7 (-3.1, 10.4) |
|  | 0-3 | 62.9 | 1.9 (-4.2, 8.1) |  | 0.41 | 3.7 (-4.1, 11.6) |  | 62.9 | 3.6 (-3.0, 10.2) |  | 62.9 | 4.1 (-3.6, 11.9) |
|  | 0-4 | 79.1 | 2.2 (-5.6, 10) |  | 0.46 | 4.4 (-4.9, 13.7) |  | 79.1 | 3.9 (-4.5, 12.2) |  | 79.1 | 5.1 (-4.8, 14.9) |
|  | 0-5 | 72.2 | 1.7 (-5.5, 8.9) |  | 0.41 | 4.0 (-4.7, 12.8) |  | 72.2 | 2.9 (-4.8, 10.5) |  | 72.2 | 4.4 (-4.7, 13.5) |
|  | 0-6 | 70.2 | 1.4 (-5.7, 8.4) |  | 0.40 | 3.9 (-4.8, 12.5) |  | 70.2 | 2.3 (-5.2, 9.8) |  | 70.2 | 4.1 (-4.8, 13.0) |
|  | 0-9 | 41.4 | 0.3 (-4.4, 5.1) |  | 0.23 | 1.9 (-3.8, 7.5) |  | 41.4 | 1.1 (-3.9, 6.0) |  | 41.4 | 2.2 (-3.7, 8.1) |
|  | 0-13 | 37.6 | -0.7 (-6.2, 4.8) |  | 0.19 | 0.4 (-5.4, 6.3) |  | 37.6 | 0.1 (-5.6, 5.8) |  | 37.6 | 1.7 (-5.1, 8.5) |
| PNC5-50 | 0 | 5.9 | 4.6 (-2.4, 11.6) |  | 0.21 | 2.7 (-0.7, 6.2) |  | 5.9 | 0.7 (-5.5, 6.8) |  | 5.9 | 3.9 (-76.5, 84.3) |
|  | 0-1 | 6.1 | 6.1 (-2.1, 14.4) |  | 0.20 | 3.8 (-0.4, 8.1) |  | 6.1 | 2.0 (-5.2, 9.2) |  | 6.1 | 6.0 (-84.9, 96.8) |
|  | 0-2 | 5.6 | 6.6 (-1.2, 14.4) |  | 0.18 | 4.7 (-0.4, 9.8) |  | 5.6 | 3.4 (-3.6, 10.4) |  | 5.6 | 7.2 (-86.9, 101.4) |
|  | 0-3 | 4.5 | 5.9 (-0.5, 12.3) |  | 0.14 | 4.6 (-0.6, 9.7) |  | 4.5 | 4.1 (-1.8, 10.0) |  | 4.5 | 7.1 (-84.7, 98.9) |
|  | 0-4 | 3.9 | 5.6 (-0.02, 11.1) |  | 0.13 | 4.7 (-0.6, 10.1) |  | 3.9 | 4.7 (-0.8, 10.1) |  | 3.9 | 7.2 (-83.6, 98.0) |
|  | 0-5 | 3.7 | 5.7 (0.3, 11.1)\* |  | 0.12 | 5.2 (-0.5, 10.9) |  | 3.7 | 5.4 (-0.1, 10.9) |  | 3.7 | 7.7 (-84.7, 100.1) |
|  | 0-6 | 4.1 | 7.0 (0.9, 13.1)\* |  | 0.13 | 6.5 (-0.3, 13.3) |  | 4.1 | 7.0 (0.6, 13.3)\* |  | 4.1 | 9.5 (-89.3, 108.4) |
|  | 0-9 | 4.0 | 9.6 (3.2, 15.9)\* |  | 0.13 | 8.7 (1.8, 15.5)\* |  | 4.0 | 8.9 (2.3, 15.6)\* |  | 4.0 | 11.8 (-92.1, 115.8) |
|  | 0-13 | 4.0 | 13.7 (6.3, 21.2)\* |  | 0.13 | 11.0 (3.9, 18.1)\* |  | 4.0 | 12.7 (4.5, 21.0)\* |  | 4.0 | 14.5 (-93.2, 122.2) |
| PNC50-100 | 0 | 3.8 | 4.7 (-0.4, 9.7) |  | 0.34 | 5.4 (0.5, 10.2)\* |  | 3.8 | 6.4 (0.8, 12.0)\* |  | 3.8 | 7.8 (1.0, 14.7)\* |
|  | 0-1 | 3.2 | 5.7 (0.7, 10.8)\* |  | 0.33 | 8.6 (2.7, 14.6)\* |  | 3.2 | 7.7 (1.6, 13.7)\* |  | 3.2 | 9.3 (2.1, 16.4)\* |
|  | 0-2 | 3.1 | 7.2 (1.7, 12.6)\* |  | 0.30 | 10.9 (4.3, 17.5)\* |  | 3.1 | 9.3 (2.5, 16.2)\* |  | 3.1 | 11.1 (3.3, 19.0)\* |
|  | 0-3 | 3.0 | 8.1 (2.4, 13.8)\* |  | 0.28 | 12.9 (5.4, 20.3)\* |  | 3.0 | 10.2 (2.9, 17.5)\* |  | 3.0 | 12.0 (3.9, 20.2)\* |
|  | 0-4 | 2.8 | 8.6 (2.8, 14.4)\* |  | 0.27 | 14.1 (6.0, 22.2)\* |  | 2.8 | 10.6 (3.1, 18.0)\* |  | 2.8 | 12.1 (4.0, 20.3)\* |
|  | 0-5 | 2.5 | 8.7 (2.9, 14.5)\* |  | 0.23 | 13.6 (5.9, 21.4)\* |  | 2.5 | 10.4 (3.1, 17.7)\* |  | 2.5 | 11.6 (3.8, 19.5)\* |
|  | 0-6 | 2.9 | 10.7 (3.6, 17.7)\* |  | 0.26 | 16.1 (6.9, 25.3)\* |  | 2.9 | 12.5 (3.9, 21.1)\* |  | 2.9 | 13.6 (4.3, 22.8)\* |
|  | 0-9 | 2.9 | 12.3 (4.9, 19.6)\* |  | 0.26 | 15.2 (5.0, 25.4)\* |  | 2.9 | 13.8 (4.9, 22.6)\* |  | 2.9 | 13.5 (4.0, 23.0)\* |
|  | 0-13 | 3.1 | 14.6 (7.2, 22.1)\* |  | 0.27 | 16.3 (3.1, 29.6)\* |  | 3.1 | 17.6 (8.5, 26.6)\* |  | 3.1 | 16.9 (7.6, 26.2)\* |
| PNC100-560 | 0 | 4.4 | 3.3 (-1.9, 8.4) |  | 0.57 | 5.2 (0.0, 10.3)\* |  | 4.4 | 5.8 (0.1, 11.5)\* |  | 4.4 | 4.4 (-2.7, 11.6) |
|  | 0-1 | 2.4 | 3.3 (-0.2, 6.9) |  | 0.45 | 5.7 (0.7, 10.8)\* |  | 2.4 | 4.8 (0.9, 8.6)\* |  | 2.4 | 4.0 (-0.7, 8.6) |
|  | 0-2 | 2.6 | 5.4 (0.8, 9.9)\* |  | 0.44 | 6.8 (1.2, 12.5)\* |  | 2.6 | 6.8 (1.9, 11.6)\* |  | 2.6 | 5.9 (0.3, 11.5)\* |
|  | 0-3 | 2.7 | 7.2 (1.8, 12.6)\* |  | 0.41 | 7.3 (1.3, 13.4)\* |  | 2.7 | 8.3 (2.6, 14.0)\* |  | 2.7 | 7.4 (1.1, 13.8)\* |
|  | 0-4 | 2.3 | 7.2 (2.1, 12.3)\* |  | 0.34 | 6.3 (1.0, 11.7)\* |  | 2.3 | 7.8 (2.5, 13.1)\* |  | 2.3 | 7.1 (1.2, 12.9)\* |
|  | 0-5 | 2.4 | 8.3 (2.4, 14.2)\* |  | 0.34 | 6.5 (0.7, 12.4)\* |  | 2.4 | 8.6 (2.6, 14.7)\* |  | 2.4 | 7.9 (1.3, 14.4)\* |
|  | 0-6 | 1.8 | 6.6 (1.8, 11.3)\* |  | 0.30 | 5.6 (0.2, 11.0)\* |  | 1.8 | 6.7 (1.8, 11.6)\* |  | 1.8 | 6.1 (0.8, 11.3)\* |
|  | 0-9 | 1.6 | 5.5 (0.5, 10.4)\* |  | 0.23 | 3.3 (-1.4, 8.1) |  | 1.6 | 5.8 (0.7, 11.0)\* |  | 1.6 | 4.7 (-0.7, 10.1) |
|  | 0-13 | 1.7 | 6.8 (0.3, 13.3)\* |  | 0.23 | 3.0 (-2.8, 8.8) |  | 1.7 | 7.6 (0.7, 14.5)\* |  | 1.7 | 5.8 (-1.3, 13.0) |
| BC | 0 | 3.9 | 4.4 (0.8, 8.0)\* |  | 0.53 | 8.6 (2.7, 14.5)\* |  | 3.9 | 6.2 (2.4, 10.0)\* |  | 3.9 | 6.6 (1.9, 11.4)\* |
|  | 0-1 | 3.5 | 5.5 (1.6, 9.4)\* |  | 0.44 | 9.9 (3.6, 16.2)\* |  | 3.5 | 7.1 (3.0, 11.2)\* |  | 3.5 | 7.7 (2.7, 12.8)\* |
|  | 0-2 | 3.9 | 8.0 (2.8, 13.2)\* |  | 0.41 | 11.6 (4.6, 18.6)\* |  | 3.9 | 9.6 (4.3, 15.0)\* |  | 3.9 | 10.6 (4.2, 17.0)\* |
|  | 0-3 | 3.4 | 8.3 (3.3, 13.4)\* |  | 0.36 | 11.8 (4.8, 18.7)\* |  | 3.4 | 9.4 (4.3, 14.5)\* |  | 3.4 | 10.5 (4.4, 16.5)\* |
|  | 0-4 | 3.8 | 10.8 (4.6, 17.0)\* |  | 0.39 | 14.3 (5.8, 22.7)\* |  | 3.8 | 11.5 (5.2, 17.8)\* |  | 3.8 | 13.0 (5.6, 20.5)\* |
|  | 0-5 | 3.4 | 10.9 (4.9, 17.0)\* |  | 0.32 | 12.5 (5.1, 19.9)\* |  | 3.4 | 11.2 (5.1, 17.2)\* |  | 3.4 | 12.8 (5.6, 19.9)\* |
|  | 0-6 | 3.8 | 13.2 (6.1, 20.3)\* |  | 0.36 | 14.7 (5.9, 23.6)\* |  | 3.8 | 13.1 (6.0, 20.2)\* |  | 3.8 | 15.2 (6.8, 23.6)\* |
|  | 0-9 | 2.8 | 12.0 (6.0, 17.9)\* |  | 0.27 | 12.0 (4.3, 19.8)\* |  | 2.8 | 11.7 (5.7, 17.6)\* |  | 2.8 | 13.9 (6.9, 20.9)\* |
|  | 0-13 | 2.6 | 12.5 (6.3, 18.7)\* |  | 0.23 | 10.3 (2.7, 17.9)\* |  | 2.6 | 12.5 (6.2, 18.8)\* |  | 2.6 | 15.9 (8.7, 23.1)\* |
| CO | 0 | 0.58 | 2.3 (-1.0, 5.7) |  | 0.34 | 3.6 (-1.1, 8.4) |  | 0.58 | 4.4 (0.7, 8.1)\* |  | 0.58 | 5.2 (0.4, 10.0)\* |
|  | 0-1 | 0.54 | 2.8 (-1.0, 6.6) |  | 0.30 | 4.5 (-0.7, 9.8) |  | 0.54 | 5.0 (0.8, 9.1)\* |  | 0.54 | 5.9 (0.5, 11.2)\* |
|  | 0-2 | 0.68 | 4.1 (-1.2, 9.4) |  | 0.35 | 6.5 (-0.4, 13.5) |  | 0.68 | 6.7 (0.9, 12.4)\* |  | 0.68 | 7.9 (0.5, 15.3)\* |
|  | 0-3 | 0.71 | 4.5 (-1.3, 10.3) |  | 0.33 | 7.2 (0.0, 14.4)\* |  | 0.71 | 6.9 (0.6, 13.2)\* |  | 0.71 | 8.2 (0.1, 16.2)\* |
|  | 0-4 | 0.68 | 4.4 (-1.4, 10.2) |  | 0.30 | 7.5 (0.2, 14.7)\* |  | 0.68 | 6.3 (0.1, 12.5)\* |  | 0.68 | 7.5 (-0.3, 15.3) |
|  | 0-5 | 0.88 | 5.7 (-1.9, 13.3) |  | 0.37 | 9.9 (0.5, 19.2)\* |  | 0.88 | 7.8 (-0.3, 15.9) |  | 0.88 | 9.4 (-0.8, 19.6) |
|  | 0-6 | 0.86 | 5.5 (-2.0, 12.9) |  | 0.36 | 10.2 (0.6, 19.7)\* |  | 0.86 | 7.3 (-0.7, 15.2) |  | 0.86 | 9.0 (-0.9, 19.0) |
|  | 0-9 | 0.76 | 4.5 (-2.2, 11.2) |  | 0.32 | 9.9 (0.4, 19.3)\* |  | 0.76 | 6.5 (-0.6, 13.6) |  | 0.76 | 8.9 (0.0, 17.9)\* |
|  | 0-13 | 0.85 | 5.0 (-4.7, 14.7) |  | 0.35 | 12.8 (-0.3, 25.8) |  | 0.85 | 8.7 (-1.7, 19.1) |  | 0.85 | 13.2 (-0.1, 26.6) |
| NOX | 0 | 85.0 | 1.8 (-3.4, 7.1) |  | 0.35 | 1.2 (-4.6, 7.0) |  | 85.0 | 4.1 (-1.6, 9.9) |  | 85.0 | 6.7 (-1.1, 14.5) |
|  | 0-1 | 60.7 | 2.4 (-2.4, 7.2) |  | 0.28 | 2.3 (-3.9, 8.4) |  | 60.7 | 4.1 (-1.1, 9.3) |  | 60.7 | 6.2 (-0.8, 13.2) |
|  | 0-2 | 58.2 | 3.5 (-2.0, 9.0) |  | 0.25 | 3.5 (-3.4, 10.4) |  | 58.2 | 4.9 (-1.0, 10.8) |  | 58.2 | 6.9 (-1.0, 14.7) |
|  | 0-3 | 55.9 | 4.4 (-1.6, 10.5) |  | 0.22 | 4.4 (-2.8, 11.5) |  | 55.9 | 5.5 (-1.0, 11.9) |  | 55.9 | 7.3 (-1.2, 15.7) |
|  | 0-4 | 57.9 | 5.6 (-1.4, 12.6) |  | 0.22 | 5.6 (-2.5, 13.7) |  | 57.9 | 6.3 (-1.1, 13.7) |  | 57.9 | 8.1 (-1.5, 17.7) |
|  | 0-5 | 55.0 | 6.2 (-1.0, 13.4) |  | 0.21 | 6.3 (-2.1, 14.7) |  | 55.0 | 6.5 (-1.1, 14.1) |  | 55.0 | 8.2 (-1.5, 17.9) |
|  | 0-6 | 57.9 | 7.2 (-0.8, 15.2) |  | 0.22 | 7.6 (-2.1, 17.3) |  | 57.9 | 7.3 (-1.1, 15.6) |  | 57.9 | 9.2 (-1.4, 19.9) |
|  | 0-9 | 54.4 | 7.9 (-0.2, 16.0) |  | 0.20 | 8.0 (-2.2, 18.1) |  | 54.4 | 7.8 (-0.5, 16.2) |  | 54.4 | 11.2 (0.4, 22.0)\* |
|  | 0-13 | 58.4 | 11.3 (0, 22.6)\* |  | 0.21 | 10.2 (-3.3, 23.7) |  | 58.4 | 11.9 (0.4, 23.5)\* |  | 58.4 | 19.1 (3.8, 34.4)\* |
| SO2 | 0 | 20.2 | 0.0 (-4.4, 4.4) |  | 0.49 | 5.2 (-2.5, 12.8) |  | 20.2 | 2.5 (-2.3, 7.4) |  | 20.2 | 0.4 (-5.9, 6.8) |
|  | 0-1 | 21.5 | 0.7 (-4.8, 6.2) |  | 0.49 | 7.9 (-1.1, 16.8) |  | 21.5 | 3.5 (-2.5, 9.5) |  | 21.5 | 0.6 (-7.1, 8.3) |
|  | 0-2 | 21.8 | 1.7 (-4.5, 7.9) |  | 0.45 | 9.6 (0.8, 18.4)\* |  | 21.8 | 4.3 (-2.5, 11.0) |  | 21.8 | 0.9 (-7.4, 9.2) |
|  | 0-3 | 21.0 | 2.9 (-3.8, 9.5) |  | 0.42 | 11.0 (2.5, 19.6)\* |  | 21.0 | 4.8 (-2.3, 11.8) |  | 21.0 | 1.3 (-7.2, 9.9) |
|  | 0-4 | 18.0 | 3.6 (-2.6, 9.8) |  | 0.36 | 10.9 (3.3, 18.4)\* |  | 18.0 | 4.7 (-1.8, 11.1) |  | 18.0 | 1.8 (-6.1, 9.6) |
|  | 0-5 | 18.9 | 5.1 (-2.0, 12.2) |  | 0.37 | 12.5 (4.4, 20.6)\* |  | 18.9 | 5.7 (-1.6, 12.9) |  | 18.9 | 2.8 (-6.0, 11.6) |
|  | 0-6 | 19.6 | 6.6 (-1.0, 14.3) |  | 0.38 | 13.9 (5.2, 22.5)\* |  | 19.6 | 6.8 (-1.0, 14.6) |  | 19.6 | 4.2 (-5.3, 13.7) |
|  | 0-9 | 22.0 | 11.7 (2.3, 21.0)\* |  | 0.43 | 18.1 (7.1, 29.1)\* |  | 22.0 | 12.0 (2.5, 21.4)\* |  | 22.0 | 10.8 (-0.7, 22.3) |
|  | 0-13 | 23.8 | 16.9 (6.8, 27.0)\* |  | 0.47 | 25.5 (12.1, 38.9)\* |  | 23.8 | 19.6 (9.0, 30.3)\* |  | 23.8 | 20.7 (8.3, 33.1)\* |
| O3 | 0 | 53.5 | 1.7 (-6.3, 9.8) |  | 0.61 | -0.3 (-6.3, 5.8) |  | 53.5 | 1.5 (-6.7, 9.8) |  | 53.5 | -0.4 (-9.9, 9.1) |
|  | 0-1 | 52.9 | 2.6 (-7.2, 12.3) |  | 0.56 | -1.2 (-7.9, 5.6) |  | 52.9 | 2.3 (-7.8, 12.3) |  | 52.9 | 0.3 (-11.2, 11.9) |
|  | 0-2 | 49.5 | 2.9 (-7.5, 13.4) |  | 0.51 | -2.2 (-9.2, 4.8) |  | 49.5 | 2.6 (-8.1, 13.4) |  | 49.5 | 1.2 (-11.3, 13.6) |
|  | 0-3 | 51.7 | 3.2 (-9.0, 15.4) |  | 0.54 | -3.8 (-12.3, 4.7) |  | 51.7 | 2.9 (-9.7, 15.5) |  | 51.7 | 2.1 (-12.5, 16.7) |
|  | 0-4 | 46.9 | 2.5 (-9.6, 14.7) |  | 0.49 | -5.0 (-13.5, 3.6) |  | 46.9 | 2.4 (-10.3, 15.0) |  | 46.9 | 2.4 (-12.4, 17.1) |
|  | 0-5 | 46.2 | 1.7 (-11.2, 14.6) |  | 0.49 | -6.5 (-15.5, 2.5) |  | 46.2 | 1.7 (-11.8, 15.1) |  | 46.2 | 2.5 (-13.3, 18.2) |
|  | 0-6 | 45.6 | 0.5 (-12.9, 13.9) |  | 0.48 | -8.1 (-17.2, 1.0) |  | 45.6 | 0.6 (-13.4, 14.6) |  | 45.6 | 2.1 (-14.4, 18.6) |
|  | 0-9 | 49.5 | -4.5 (-20.3, 11.4) |  | 0.50 | -13 (-21.9, -4.2)\* |  | 49.5 | -3.8 (-20.4, 12.9) |  | 49.5 | -0.9 (-20.7, 18.8) |
|  | 0-13 | 52.0 | -5.0 (-27.4, 17.4) |  | 0.55 | -18.9 (-30.0, -7.8)\* |  | 52.0 | -5.0 (-28.3, 18.3) |  | 52.0 | -4.4 (-30.5, 21.8) |

Estimates with 95% confidence intervals. \**p*-value <0.05. Abbreviations: lag 0, averaged pollutant concentrations over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; IQR, interquartile range; PM2.5, fine particulate matter; PNCx, particulate number concentrations in given size ranges (nm); BC, black carbon; NOx, nitrogen oxides; CO, carbon monoxide; SO2, sulfur dioxide; O3, ozone; GDF-15, growth differentiation factor-15.

**eTable 4. Results from sensitivity analyses of 8-OHdG.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pollutants** | **Lag**  **days** | **Main models** | |  | **Sensitivity analyses** | | | | | | | |
|  | Log-transformed  pollutant concentrations | |  | Excluding individuals living  beyond 1 km from monitoring station | |  | Excluding individuals with  cotinine levels >75th | |
| IQR | % changes  in 8-OHdG |  | IQR | % changes  in 8-OHdG |  | IQR | % changes  in 8-OHdG |  | IQR | % changes  in 8-OHdG |
| PM2.5 | 0 | 64.8 | 6.1 (-16.5, 28.7) |  | 0.58 | 19.1 (-16.0, 54.2) |  | 64.8 | 2.7 (-21.0, 26.4) |  | 64.8 | -6.5 (-30.2, 17.3) |
|  | 0-1 | 54.3 | 8.0 (-14.8, 30.8) |  | 0.43 | 21.1 (-12.0, 54.1) |  | 54.3 | 5.2 (-19.4, 29.9) |  | 54.3 | -4.6 (-29.3, 20.1) |
|  | 0-2 | 55.9 | 11.1 (-14.1, 36.3) |  | 0.42 | 26.2 (-9.8, 62.2) |  | 55.9 | 9.0 (-19.2, 37.1) |  | 55.9 | -2.7 (-30.5, 25.1) |
|  | 0-3 | 62.9 | 15.2 (-14.0, 44.4) |  | 0.41 | 29.9 (-7.6, 67.5) |  | 62.9 | 14.1 (-19.3, 47.6) |  | 62.9 | -0.3 (-32.7, 32.1) |
|  | 0-4 | 79.1 | 21.6 (-15.5, 58.7) |  | 0.46 | 38.0 (-7.2, 83.3) |  | 79.1 | 22.5 (-21.1, 66.0) |  | 79.1 | 2.7 (-37.6, 43.0) |
|  | 0-5 | 72.2 | 20.1 (-14.0, 54.2) |  | 0.41 | 35.0 (-6.7, 76.7) |  | 72.2 | 23.0 (-17.6, 63.6) |  | 72.2 | 4.3 (-33.8, 42.3) |
|  | 0-6 | 70.2 | 18.7 (-15.0, 52.4) |  | 0.40 | 32.9 (-8.1, 74.0) |  | 70.2 | 23.3 (-16.5, 63.1) |  | 70.2 | 4.5 (-32.8, 41.8) |
|  | 0-9 | 41.4 | 5.2 (-18.3, 28.7) |  | 0.23 | 12.4 (-13.6, 38.5) |  | 41.4 | 9.3 (-15.8, 34.4) |  | 41.4 | -2.5 (-26.9, 21.9) |
|  | 0-13 | 37.6 | -3.7 (-29.5, 22.0) |  | 0.19 | 0.8 (-25.1, 26.7) |  | 37.6 | -0.9 (-29.0, 27.1) |  | 37.6 | -12.7 (-38.8, 13.4) |
| PNC5-50 | 0 | 5.9 | -13.5 (-39.2, 12.2) |  | 0.21 | -20.3 (-45.3, 4.8) |  | 5.9 | -13.9 (-41.1, 13.4) |  | 5.9 | -7.1 (-38.3, 24.1) |
|  | 0-1 | 6.1 | -20.4 (-47.3, 6.6) |  | 0.20 | -28.5 (-53.5, -3.6)\* |  | 6.1 | -20.0 (-48.4, 8.3) |  | 6.1 | -14.9 (-47.4, 17.6) |
|  | 0-2 | 5.6 | -23.4 (-49.2, 2.5) |  | 0.18 | -33.6 (-58.0, -9.2)\* |  | 5.6 | -22.1 (-49.4, 5.1) |  | 5.6 | -20.3 (-50.5, 10.0) |
|  | 0-3 | 4.5 | -21.4 (-45.5, 2.8) |  | 0.14 | -31.6 (-54.9, -8.2)\* |  | 4.5 | -19.6 (-45.4, 6.3) |  | 4.5 | -20.7 (-47.9, 6.5) |
|  | 0-4 | 3.9 | -18.7 (-43.0, 5.5) |  | 0.13 | -29.7 (-53.4, -6.0)\* |  | 3.9 | -16.6 (-42.9, 9.8) |  | 3.9 | -19.9 (-46.3, 6.5) |
|  | 0-5 | 3.7 | -16.0 (-41.7, 9.7) |  | 0.12 | -27.8 (-52.7, -2.8)\* |  | 3.7 | -13.5 (-41.7, 14.8) |  | 3.7 | -18.6 (-45.8, 8.6) |
|  | 0-6 | 4.1 | -13.6 (-43.4, 16.2) |  | 0.13 | -27.6 (-55.8, 0.6) |  | 4.1 | -10.5 (-43.7, 22.7) |  | 4.1 | -17.7 (-48.5, 13.0) |
|  | 0-9 | 4.0 | 8.7 (-27.1, 44.5) |  | 0.13 | -7.7 (-41.8, 26.4) |  | 4.0 | 11.2 (-27.8, 50.2) |  | 4.0 | 3.4 (-32.9, 39.6) |
|  | 0-13 | 4.0 | 28.3 (-15.3, 72.0) |  | 0.13 | 15.2 (-24.1, 54.5) |  | 4.0 | 25.5 (-20.7, 71.7) |  | 4.0 | 28.3 (-19.4, 76.1) |
| PNC50-100 | 0 | 3.8 | 10.7 (-18.1, 39.5) |  | 0.34 | 11.6 (-16.3, 39.6) |  | 3.8 | 17.4 (-26.8, 61.7) |  | 3.8 | 4.3 (-27.1, 35.7) |
|  | 0-1 | 3.2 | 21.2 (-11.4, 53.8) |  | 0.33 | 23.3 (-13.3, 59.9) |  | 3.2 | 28.6 (-20.3, 77.6) |  | 3.2 | 13.8 (-21.2, 48.9) |
|  | 0-2 | 3.1 | 35.4 (-4.9, 75.7) |  | 0.30 | 34.5 (-7.5, 76.5) |  | 3.1 | 43.9 (-13.3, 101.0) |  | 3.1 | 26.8 (-15.5, 69.1) |
|  | 0-3 | 3.0 | 48.4 (1.4, 95.5)\* |  | 0.28 | 46.6 (-2.0, 95.1) |  | 3.0 | 56.7 (-5.4, 118.8) |  | 3.0 | 39.5 (-9.3, 88.2) |
|  | 0-4 | 2.8 | 57.5 (5.7, 109.2)\* |  | 0.27 | 57.2 (2.7, 111.7)\* |  | 2.8 | 64.6 (0.8, 128.4)\* |  | 2.8 | 48.9 (-4.6, 102.5) |
|  | 0-5 | 2.5 | 60.9 (7.7, 114.1)\* |  | 0.23 | 59.8 (5.6, 114.0)\* |  | 2.5 | 66.2 (4.1, 128.2)\* |  | 2.5 | 53.4 (-2.0, 108.8) |
|  | 0-6 | 2.9 | 77.8 (9.5, 146.1)\* |  | 0.26 | 79.1 (8.6, 149.7)\* |  | 2.9 | 82.5 (6.0, 159.0)\* |  | 2.9 | 69.4 (-1.7, 140.4) |
|  | 0-9 | 2.9 | 64.8 (-2.8, 132.4) |  | 0.26 | 85.7 (3.7, 167.8)\* |  | 2.9 | 63.7 (-6.1, 133.4) |  | 2.9 | 59.8 (-13.4, 133) |
|  | 0-13 | 3.1 | 14.4 (-31.6, 60.5) |  | 0.27 | 41.3 (-26.1, 108.6) |  | 3.1 | 9.0 (-38.3, 56.3) |  | 3.1 | 16.1 (-35.9, 68.0) |
| PNC100-560 | 0 | 4.4 | 12.6 (-20.8, 46.0) |  | 0.57 | 9.0 (-17.9, 36.0) |  | 4.4 | 6.8 (-23.3, 36.8) |  | 4.4 | 6.4 (-26.5, 39.2) |
|  | 0-1 | 2.4 | 15.6 (-8.8, 40.0) |  | 0.45 | 14.3 (-13.3, 41.8) |  | 2.4 | 9.7 (-11.8, 31.3) |  | 2.4 | 9.9 (-13.6, 33.4) |
|  | 0-2 | 2.6 | 29.0 (-4.1, 62.0) |  | 0.44 | 22.1 (-9.6, 53.7) |  | 2.6 | 18.7 (-9.1, 46.5) |  | 2.6 | 19.6 (-10.2, 49.4) |
|  | 0-3 | 2.7 | 43.1 (1.2, 85.0)\* |  | 0.41 | 28.8 (-5.3, 63.0) |  | 2.7 | 27.9 (-5.6, 61.5) |  | 2.7 | 29.9 (-5.6, 65.5) |
|  | 0-4 | 2.3 | 45.1 (4.6, 85.6)\* |  | 0.34 | 28.8 (-1.5, 59.1) |  | 2.3 | 29.3 (-2.5, 61.1) |  | 2.3 | 31.9 (-1.5, 65.4) |
|  | 0-5 | 2.4 | 55.3 (7.1, 103.5)\* |  | 0.34 | 33.9 (0.4, 67.4)\* |  | 2.4 | 35.2 (-1.5, 71.9) |  | 2.4 | 39.2 (0.4, 78.0)\* |
|  | 0-6 | 1.8 | 43.2 (5.8, 80.6)\* |  | 0.30 | 31.7 (1.0, 62.4)\* |  | 1.8 | 27.3 (-1.6, 56.2) |  | 1.8 | 31.0 (0.6, 61.5)\* |
|  | 0-9 | 1.6 | 32.3 (-1.6, 66.3) |  | 0.23 | 21.7 (-4.0, 47.3) |  | 1.6 | 16.7 (-11.4, 44.8) |  | 1.6 | 22.5 (-7.0, 52.0) |
|  | 0-13 | 1.7 | 7.6 (-18.7, 33.9) |  | 0.23 | 5.5 (-22.1, 33.2) |  | 1.7 | -7.2 (-37.3, 23.0) |  | 1.7 | 2.8 (-29.0, 34.6) |
| BC | 0 | 3.9 | 15.3 (-8.2, 38.9) |  | 0.53 | 20.8 (-10.3, 51.8) |  | 3.9 | 10.2 (-14.4, 34.9) |  | 3.9 | 11.9 (-14.9, 38.8) |
|  | 0-1 | 3.5 | 24.0 (-3.1, 51.2) |  | 0.44 | 30.0 (-4.9, 64.9) |  | 3.5 | 18.4 (-9.9, 46.7) |  | 3.5 | 22.3 (-9.2, 53.8) |
|  | 0-2 | 3.9 | 42.3 (3.5, 81.2)\* |  | 0.41 | 42.4 (1.0, 83.8)\* |  | 3.9 | 34.8 (-5.2, 74.8) |  | 3.9 | 43.2 (-2.6, 89.1) |
|  | 0-3 | 3.4 | 49.3 (9.8, 88.8)\* |  | 0.36 | 49.8 (6.7, 93.0)\* |  | 3.4 | 42.8 (1.8, 83.8)\* |  | 3.4 | 53.6 (5.6, 101.7)\* |
|  | 0-4 | 3.8 | 71.8 (18.4, 125.3) |  | 0.39 | 70.7 (13.7, 127.7)\* |  | 3.8 | 64.4 (9.2, 119.6)\* |  | 3.8 | 81.9 (14.9, 149)\* |
|  | 0-5 | 3.4 | 75.0 (22.0, 128.1)\* |  | 0.32 | 66.4 (15.8, 117.1)\* |  | 3.4 | 69.3 (14.0, 124.5)\* |  | 3.4 | 88 (20.1, 155.9)\* |
|  | 0-6 | 3.8 | 95.3 (28.6, 162.1)\* |  | 0.36 | 87.3 (21.8, 152.9)\* |  | 3.8 | 89.8 (20.3, 159.3)\* |  | 3.8 | 114.6 (27.5, 201.6)\* |
|  | 0-9 | 2.8 | 69.4 (18.1, 120.7)\* |  | 0.27 | 71.9 (16.6, 127.3)\* |  | 2.8 | 68.1 (13.8, 122.5)\* |  | 2.8 | 82.7 (18.4, 147.0)\* |
|  | 0-13 | 2.6 | 39.1 (-5.4, 83.6) |  | 0.23 | 38.3 (-7.4, 84.0) |  | 2.6 | 37.1 (-9.8, 84.0) |  | 2.6 | 45.4 (-5.8, 96.6) |
| CO | 0 | 0.58 | 19.2 (-7.2, 45.5) |  | 0.34 | 20.7 (-8.0, 49.4) |  | 0.58 | 11.5 (-16.0, 39.0) |  | 0.58 | 4.6 (-22.3, 31.5) |
|  | 0-1 | 0.54 | 23.9 (-6.2, 54.0) |  | 0.30 | 27.5 (-5.2, 60.1) |  | 0.54 | 16.0 (-15.3, 47.3) |  | 0.54 | 6.4 (-23.4, 36.2) |
|  | 0-2 | 0.68 | 36.7 (-5.8, 79.1) |  | 0.35 | 43.4 (-2.1, 89.0) |  | 0.68 | 26.9 (-16.8, 70.6) |  | 0.68 | 10.7 (-28.4, 49.9) |
|  | 0-3 | 0.71 | 42.4 (-3.8, 88.5) |  | 0.33 | 50.7 (2.2, 99.3)\* |  | 0.71 | 34.0 (-14.1, 82.1) |  | 0.71 | 13.6 (-28.1, 55.3) |
|  | 0-4 | 0.68 | 42.6 (-1.7, 87.0) |  | 0.30 | 55.5 (5.9, 105.1)\* |  | 0.68 | 37.1 (-10.3, 84.4) |  | 0.68 | 15.0 (-25.6, 55.6) |
|  | 0-5 | 0.88 | 60.2 (-0.1, 120.5) |  | 0.37 | 82.0 (11.8, 152.2)\* |  | 0.88 | 55.4 (-9.2, 120.0) |  | 0.88 | 22.0 (-29.8, 73.9) |
|  | 0-6 | 0.86 | 60.1 (1.9, 118.3)\* |  | 0.36 | 88.8 (15.6, 162.1)\* |  | 0.86 | 57.6 (-5.7, 121.0) |  | 0.86 | 23.4 (-27.5, 74.2) |
|  | 0-9 | 0.76 | 55.8 (4.3, 107.3)\* |  | 0.32 | 92.1 (18.7, 165.5)\* |  | 0.76 | 52.4 (-2.4, 107.3) |  | 0.76 | 24.0 (-23.0, 70.9) |
|  | 0-13 | 0.85 | 83.5 (-3.2, 170.2) |  | 0.35 | 106.6 (0.2, 213.0)\* |  | 0.85 | 65.7 (-17.9, 149.2) |  | 0.85 | 38.3 (-35.7, 112.3) |
| NOX | 0 | 85.0 | 14.7 (-17.2, 46.6) |  | 0.35 | 7.5 (-32.0, 47.0) |  | 85.0 | 9.3 (-31.2, 49.7) |  | 85.0 | -2.3 (-41.8, 37.1) |
|  | 0-1 | 60.7 | 14.7 (-14.7, 44.2) |  | 0.28 | 10.9 (-31.3, 53.1) |  | 60.7 | 11.3 (-28.1, 50.6) |  | 60.7 | -1.5 (-39.3, 36.2) |
|  | 0-2 | 58.2 | 18.2 (-15.2, 51.7) |  | 0.25 | 15.5 (-31.5, 62.5) |  | 58.2 | 16.1 (-29.8, 62.0) |  | 58.2 | -0.6 (-42.7, 41.5) |
|  | 0-3 | 55.9 | 21.6 (-15.1, 58.4) |  | 0.22 | 19.3 (-29.6, 68.3) |  | 55.9 | 21.2 (-30.2, 72.7) |  | 55.9 | 1.1 (-44.4, 46.7) |
|  | 0-4 | 57.9 | 27.2 (-15.3, 69.8) |  | 0.22 | 25.7 (-29.9, 81.3) |  | 57.9 | 28.6 (-31.7, 88.8) |  | 57.9 | 3.8 (-47.3, 54.9) |
|  | 0-5 | 55.0 | 30.7 (-13.4, 74.8) |  | 0.21 | 30.7 (-28.4, 89.7) |  | 55.0 | 33.4 (-30.1, 96.9) |  | 55.0 | 7.0 (-46.2, 60.1) |
|  | 0-6 | 57.9 | 38.3 (-11.7, 88.4) |  | 0.22 | 40.2 (-29.5, 109.9) |  | 57.9 | 42.3 (-30.4, 114.9) |  | 57.9 | 11.7 (-47.5, 70.9) |
|  | 0-9 | 54.4 | 53.2 (-3.1, 109.4) |  | 0.20 | 51.7 (-28.2, 131.6) |  | 54.4 | 55.0 (-26.3, 136.2) |  | 54.4 | 25.8 (-42.2, 93.9) |
|  | 0-13 | 58.4 | 67.0 (-16.1, 150.1) |  | 0.21 | 48.2 (-47.2, 143.7) |  | 58.4 | 58.1 (-43.0, 159.3) |  | 58.4 | 38.7 (-52.9, 130.3) |
| SO2 | 0 | 20.2 | 44.3 (-3.0, 91.6) |  | 0.49 | 47.4 (-5.5, 100.3) |  | 20.2 | 55.2 (-3.3, 113.7) |  | 20.2 | 21.9 (-4.9, 48.8) |
|  | 0-1 | 21.5 | 71.7 (2.3, 141.1)\* |  | 0.49 | 69.8 (-0.1, 139.6) |  | 21.5 | 90.1 (2.8, 177.5)\* |  | 21.5 | 34.3 (-1.9, 70.6) |
|  | 0-2 | 21.8 | 96.7 (9.6, 183.7)\* |  | 0.45 | 81.0 (6.5, 155.5)\* |  | 21.8 | 122.0 (11.3, 232.7)\* |  | 21.8 | 45.3 (1.4, 89.2)\* |
|  | 0-3 | 21.0 | 112.2 (16.5, 208.0)\* |  | 0.42 | 88.9 (12.0, 165.9)\* |  | 21.0 | 141.1 (19.4, 262.9)\* |  | 21.0 | 52.5 (3.4, 101.7) |
|  | 0-4 | 18.0 | 103.0 (19.6, 186.5)\* |  | 0.36 | 82.2 (14.3, 150.0)\* |  | 18.0 | 127.5 (22.8, 232.1)\* |  | 18.0 | 49.9 (3.7, 96.0)\* |
|  | 0-5 | 18.9 | 122.0 (26.2, 217.8)\* |  | 0.37 | 93.6 (18.1, 169.0)\* |  | 18.9 | 150.7 (30.3, 271.0)\* |  | 18.9 | 59.5 (4.9, 114.1)\* |
|  | 0-6 | 19.6 | 136.3 (32.3, 240.2)\* |  | 0.38 | 103.4 (21.2, 185.6)\* |  | 19.6 | 167.7 (36.9, 298.5)\* |  | 19.6 | 67.9 (6.6, 129.2)\* |
|  | 0-9 | 22.0 | 157.3 (39.5, 275.1)\* |  | 0.43 | 126.6 (22.1, 231.0)\* |  | 22.0 | 193.8 (44.1, 343.4) |  | 22.0 | 93.8 (16.7, 171.0)\* |
|  | 0-13 | 23.8 | 84.7 (-3.0, 172.3) |  | 0.47 | 79.6 (-17.5, 176.8) |  | 23.8 | 119.9 (-4.6, 244.4) |  | 23.8 | 113.0 (34.5, 191.6)\* |
| O3 | 0 | 53.5 | -15.2 (-48.0, 17.7) |  | 0.61 | -29.0 (-53.1, -5.0)\* |  | 53.5 | -3.8 (-42.4, 34.8) |  | 53.5 | -4.4 (-43.8, 34.9) |
|  | 0-1 | 52.9 | -18.3 (-53.9, 17.3) |  | 0.56 | -32.6 (-56.6, -8.6)\* |  | 52.9 | -8.4 (-49.7, 32.9) |  | 52.9 | -6.1 (-50.1, 37.9) |
|  | 0-2 | 49.5 | -19.4 (-55.1, 16.3) |  | 0.51 | -33.2 (-56.5, -9.8)\* |  | 49.5 | -13.5 (-53.3, 26.4) |  | 49.5 | -7.7 (-52.1, 36.7) |
|  | 0-3 | 51.7 | -22.4 (-60.0, 15.2) |  | 0.54 | -37.7 (-62.3, -13.0)\* |  | 51.7 | -20.8 (-61.0, 19.4) |  | 51.7 | -10.9 (-57.8, 36.0) |
|  | 0-4 | 46.9 | -23.1 (-60.1, 13.9) |  | 0.49 | -37.4 (-62.0, -12.8)\* |  | 46.9 | -25.9 (-63.7, 12.0) |  | 46.9 | -13.5 (-58.6, 31.6) |
|  | 0-5 | 46.2 | -26.2 (-63.6, 11.2) |  | 0.49 | -40.5 (-65.2, -15.8)\* |  | 46.2 | -32.4 (-68.9, 4.1) |  | 46.2 | -17.8 (-62.6, 26.9) |
|  | 0-6 | 45.6 | -30.2 (-67.2, 6.8) |  | 0.48 | -44.3 (-68.2, -20.4)\* |  | 45.6 | -38.8 (-73.5, -4.1)\* |  | 45.6 | -23.0 (-66.6, 20.5) |
|  | 0-9 | 49.5 | -50.5 (-81.7, -19.3)\* |  | 0.50 | -60.3 (-78.7, -42.0)\* |  | 49.5 | -59.8 (-86.7, -33.0)\* |  | 49.5 | -45.7 (-81.8, -9.6)\* |
|  | 0-13 | 52.0 | -73.4 (-93.9, -52.9)\* |  | 0.55 | -76.9 (-90.7, -63.2)\* |  | 52.0 | -77.5 (-95.5, -59.5)\* |  | 52.0 | -72.8 (-94.4, -51.2)\* |

Estimates with 95% confidence intervals. \**p*-value <0.05. Abbreviations: lag 0, averaged pollutant concentrations over the last 24 hours before each participant’s clinic visit; lag 0-1, 1 to 2 days; lag 0-2, 1 to 3 days and so on up to lag 0-6; IQR, interquartile range; PM2.5, fine particulate matter; PNCx, particulate number concentrations in given size ranges (nm); BC, black carbon; NOx, nitrogen oxides; CO, carbon monoxide; SO2, sulfur dioxide; O3, ozone; 8-OHdG, 8-hydroxy-2′-deoxyguanosin.