

Table S1 Correlation matrix for beta values measured by five monitors in the Greater Boston area (Pearson Correlation)

| Location of monitors | Boston, Ma | Concord, Nh | Hartford, Ct | Providence, Ri | Worcester, Ma |
|-----------------------------|-------------------|--------------------|---------------------|-----------------------|----------------------|
| Boston, Ma | 1 | | | | |
| Concord, Nh | 0.611 | 1 | | | |
| Hartford, Ct | 0.533 | 0.632 | 1 | | |
| Providence, Ri | 0.536 | 0.329 | 0.455 | 1 | |
| Worcester, Ma | 0.736 | 0.579 | 0.642 | 0.553 | 1 |

All coefficients have a p-value <0.05

Table S2 Associations between average particle radioactivity levels and the relative odds of chronic kidney diseases (CKD)

| Particle radioactivity levels | | Odds of CKD (N _{case} =746) | |
|-------------------------------|----|--------------------------------------|---------|
| | | Odds ratio (95% CI) | p-value |
| Exposure window (days) | 1 | 1.02 (0.88 – 1.18) | 0.788 |
| | 7 | 1.11 (0.95 – 1.29) | 0.194 |
| | 14 | 1.09 (0.94 – 1.26) | 0.277 |
| | 21 | 1.12 (0.96 – 1.30) | 0.143 |
| | 28 | 1.15 (0.99 – 1.34) | 0.062 |

Model adjusted for age (years), total cholesterol, triglycerides, HDL, SBP, DBP, season of medical visits (spring/ summer/ fall/ winter), temperature (°C), relative humidity (%), BMI (underweight or normal weight/ overweight/ obese), smoking status (current/ former/ never smoker), alcohol intake (<2 drinks per day versus 2+ drinks per day), hypertension, stroke, coronary heart disease (CHD), and diabetes diagnosed by physicians (yes/no)

Table S3 Associations of particle reactivity and air pollutants with renal function (eGFR) in the exposure window of 28 days as estimated by CKD-EPI and MDRD

| 1) eGFR (CKD-EPI) | | | | | | | | |
|------------------------|------------------------|----------------|----------------|---------|----------------|----------------|---------|--|
| Exposure window (days) | Included air pollutant | PR | | | Air pollutant | | | |
| | | Change per IQR | Standard error | p-value | Change per IQR | Standard error | p-value | |
| 1 | \ | -0.84 | 0.2887 | 0.0037 | | | | |
| 7 | \ | -0.9051 | 0.3081 | 0.0034 | | | | |
| 14 | \ | -0.6439 | 0.3217 | 0.0455 | | | | |
| 21 | \ | -0.7267 | 0.3297 | 0.0277 | | | | |
| 28 | \ | -0.8298 | 0.3232 | 0.0104 | | | | |
| 1 | PM _{2.5} | -0.7814 | 0.3114 | 0.0122 | -0.565 | 0.4512 | 0.2109 | |
| 7 | PM _{2.5} | -0.6358 | 0.3824 | 0.0966 | -1.0108 | 0.5331 | 0.0584 | |
| 14 | PM _{2.5} | -0.4369 | 0.3886 | 0.2611 | -1.3536 | 0.6082 | 0.0264 | |
| 21 | PM _{2.5} | -0.4673 | 0.3931 | 0.2348 | -1.3822 | 0.6416 | 0.0316 | |
| 28 | PM _{2.5} | -0.5718 | 0.3893 | 0.1421 | -1.5108 | 0.6613 | 0.0227 | |
| 1 | BC | -0.7502 | 0.3266 | 0.0218 | -0.5006 | 0.308 | 0.1044 | |
| 7 | BC | -0.9507 | 0.3563 | 0.0077 | -0.4032 | 0.4029 | 0.3171 | |
| 14 | BC | -0.6043 | 0.3678 | 0.1007 | -0.2316 | 0.4108 | 0.573 | |
| 21 | BC | -0.5194 | 0.3779 | 0.1695 | -0.1043 | 0.4066 | 0.7976 | |
| 28 | BC | -0.5863 | 0.3682 | 0.1116 | -0.08463 | 0.4171 | 0.8393 | |
| 2) eGFR (MDRD) | | | | | | | | |
| Exposure window (days) | Included air pollutant | PR | | | Air pollutant | | | |
| | | Change per IQR | Standard error | p-value | Change per IQR | Standard error | p-value | |
| 1 | \ | -1.027 | 0.3331 | 0.0021 | | | | |
| 7 | \ | -1.0189 | 0.355 | 0.0042 | | | | |
| 14 | \ | -0.6472 | 0.3706 | 0.0809 | | | | |
| 21 | \ | -0.7741 | 0.3798 | 0.0417 | | | | |
| 28 | \ | -0.9324 | 0.3722 | 0.0124 | | | | |
| 1 | PM _{2.5} | -0.9856 | 0.3595 | 0.0062 | -0.599 | 0.5197 | 0.2495 | |
| 7 | PM _{2.5} | -0.6561 | 0.4406 | 0.1367 | -1.3431 | 0.6096 | 0.0279 | |
| 14 | PM _{2.5} | -0.3585 | 0.4478 | 0.4235 | -1.5362 | 0.6967 | 0.0278 | |
| 21 | PM _{2.5} | -0.4499 | 0.4532 | 0.321 | -1.7964 | 0.7335 | 0.0146 | |
| 28 | PM _{2.5} | -0.5871 | 0.4486 | 0.1908 | -1.9939 | 0.7552 | 0.0085 | |
| 1 | BC | -0.949 | 0.3754 | 0.0116 | -0.5775 | 0.3529 | 0.1021 | |
| 7 | BC | -1.0062 | 0.409 | 0.014 | -0.5212 | 0.4598 | 0.2573 | |
| 14 | BC | -0.597 | 0.4223 | 0.1577 | -0.2008 | 0.4691 | 0.6686 | |
| 21 | BC | -0.5731 | 0.4338 | 0.1868 | -0.03627 | 0.4642 | 0.9377 | |
| 28 | BC | -0.6999 | 0.4227 | 0.098 | 0.00144 | 0.4761 | 0.9976 | |

PR = particle radioactivity; BC = black carbon

Table S4 Associations of particle radioactivity levels with renal function (eGFR) and the relative odds of chronic kidney diseases (CKD) stratified by CRP and fibrinogen levels (same-day to 21-day average levels)

1) Same-day exposure

| Exposures | | eGFR (CKD-EPI) | | eGFR (MDRD) | | Odds of CKD | | |
|---------------------------|------------------|---------------------|---------|-------------------|---------|---------------------------------------|---------------------|---------|
| | | Change per IQR (SE) | p-value | Coefficients (SE) | p-value | N _{case} /N _{Total} | Odds ratio (95% CI) | p-value |
| CRP (mg/L) | | | | | | | | |
| | 1 (<0.91) | -0.592 (0.515) | 0.251 | -0.956 (0.616) | 0.121 | 189/810 | 1.02 (0.76 – 1.38) | 0.887 |
| Tertile | 2 (0.91 ~ <2.25) | -0.678 (0.581) | 0.244 | -0.902 (0.639) | 0.159 | 247/809 | 1.16 (0.86 – 1.57) | 0.321 |
| | 3 (≥2.25) | -1.376 (0.581) | 0.019 | -1.333 (0.689) | 0.002 | 298/808 | 1.17 (0.79 – 1.36) | 0.834 |
| Fibrinogen (mg/dL) | | | | | | | | |
| | 1 (<302) | -0.022 (0.667) | 0.973 | -0.089 (0.731) | 0.904 | 179/679 | 0.93 (0.73 – 1.19) | 0.567 |
| Tertile | 2 (302 ~ <362) | -1.113 (0.542) | 0.041 | -1.536 (0.649) | 0.019 | 203/675 | 1.08 (0.84 – 1.40) | 0.535 |
| | 3 (≥362) | -1.507 (0.593) | 0.012 | -1.854 (0.705) | 0.009 | 258/677 | 1.23 (0.92 – 1.65) | 0.159 |

2) 7-day cumulative exposure

| Exposures | | eGFR (CKD-EPI) | | eGFR (MDRD) | | Odds of CKD | | |
|---------------------------|------------------|---------------------|---------|-------------------|---------|---------------------------------------|---------------------|---------|
| | | Change per IQR (SE) | p-value | Coefficients (SE) | p-value | N _{case} /N _{Total} | Odds ratio (95% CI) | p-value |
| CRP (mg/L) | | | | | | | | |
| | 1 (<0.91) | 0.405 (0.558) | 0.468 | 0.185 (0.669) | 0.783 | 189/810 | 0.99 (0.71 – 1.38) | 0.96 |
| Tertile | 2 (0.91 ~ <2.25) | -1.246 (0.623) | 0.046 | -1.139 (0.739) | 0.124 | 247/809 | 1.21 (0.95 – 1.53) | 0.121 |
| | 3 (≥2.25) | -1.756 (0.601) | 0.004 | -1.914 (0.661) | 0.004 | 298/808 | 1.24 (0.90 – 1.74) | 0.191 |
| Fibrinogen (mg/dL) | | | | | | | | |
| | 1 (<302) | -1.072 (0.570) | 0.061 | -1.491 (0.680) | 0.029 | 179/679 | 1.06 (0.78 – 1.45) | 0.697 |
| Tertile | 2 (302 ~ <362) | -1.295 (0.685) | 0.06 | -1.571 (0.711) | 0.041 | 203/675 | 1.10 (0.83 – 1.45) | 0.512 |
| | 3 (≥362) | -1.345 (0.707) | 0.059 | -1.611 (0.774) | 0.039 | 258/677 | 1.39 (1.02 – 1.88) | 0.036 |

3) 14-day cumulative exposure

| Exposures | eGFR (CKD-EPI) | | eGFR (MDRD) | | Odds of CKD | | | |
|---------------------------|---------------------|----------------|-------------------|----------------|---------------------------------------|---------------------|--------------------|-------|
| | Change per IQR (SE) | p-value | Coefficients (SE) | p-value | N _{case} /N _{Total} | Odds ratio (95% CI) | p-value | |
| CRP (mg/L) | | | | | | | | |
| Tertile | 1 (<0.91) | 0.328 (0.557) | 0.556 | 0.004 (0.669) | 0.995 | 189/810 | 1.02 (0.74 – 1.41) | 0.906 |
| | 2 (0.91 ~ <2.25) | -0.918 (0.627) | 0.144 | -0.761 (0.743) | 0.306 | 247/809 | 1.20 (0.93 – 1.56) | 0.167 |
| | 3 (≥2.25) | -1.913 (0.680) | 0.005 | -2.016 (0.746) | 0.007 | 298/808 | 1.27 (0.94 – 1.74) | 0.121 |
| Fibrinogen (mg/dL) | | | | | | | | |
| Tertile | 1 (<302) | -0.741 (0.603) | 0.22 | -1.027 (0.721) | 0.155 | 179/679 | 1.09 (0.83 – 1.44) | 0.524 |
| | 2 (302 ~ <362) | -1.176 (0.687) | 0.089 | -1.431 (0.816) | 0.081 | 203/675 | 1.08 (0.81 – 1.46) | 0.591 |
| | 3 (≥362) | -1.472 (0.764) | 0.055 | -1.769 (0.836) | 0.036 | 258/677 | 1.39 (1.02 – 1.90) | 0.039 |

4) 21-day cumulative exposure

| Exposures | eGFR (CKD-EPI) | | eGFR (MDRD) | | Odds of CKD | | | |
|---------------------------|---------------------|----------------|-------------------|----------------|---------------------------------------|---------------------|--------------------|-------|
| | Change per IQR (SE) | p-value | Coefficients (SE) | p-value | N _{case} /N _{Total} | Odds ratio (95% CI) | p-value | |
| CRP (mg/L) | | | | | | | | |
| Tertile | 1 (<0.91) | 0.309 (0.567) | 0.586 | -0.534 (0.727) | 0.986 | 189/810 | 1.05 (0.77 – 1.44) | 0.749 |
| | 2 (0.91 ~ <2.25) | -1.105 (0.639) | 0.085 | -0.972 (0.758) | 0.201 | 247/809 | 1.20 (0.92 – 1.58) | 0.186 |
| | 3 (≥2.25) | -2.070 (0.702) | 0.003 | -2.351 (0.769) | 0.002 | 298/808 | 1.35 (1.01 – 1.81) | 0.043 |
| Fibrinogen (mg/dL) | | | | | | | | |
| Tertile | 1 (<302) | -0.460 (0.609) | 0.451 | -0.534 (0.727) | 0.464 | 179/679 | 1.14 (0.87 – 1.50) | 0.334 |
| | 2 (302 ~ <362) | -0.894 (0.659) | 0.177 | -1.106 (0.785) | 0.161 | 203/675 | 1.09 (0.82 – 1.45) | 0.545 |
| | 3 (≥362) | -1.861 (0.792) | 0.02 | -2.326 (0.867) | 0.008 | 258/677 | 1.38 (1.01 – 1.89) | 0.041 |

CRP = C-reactive protein;

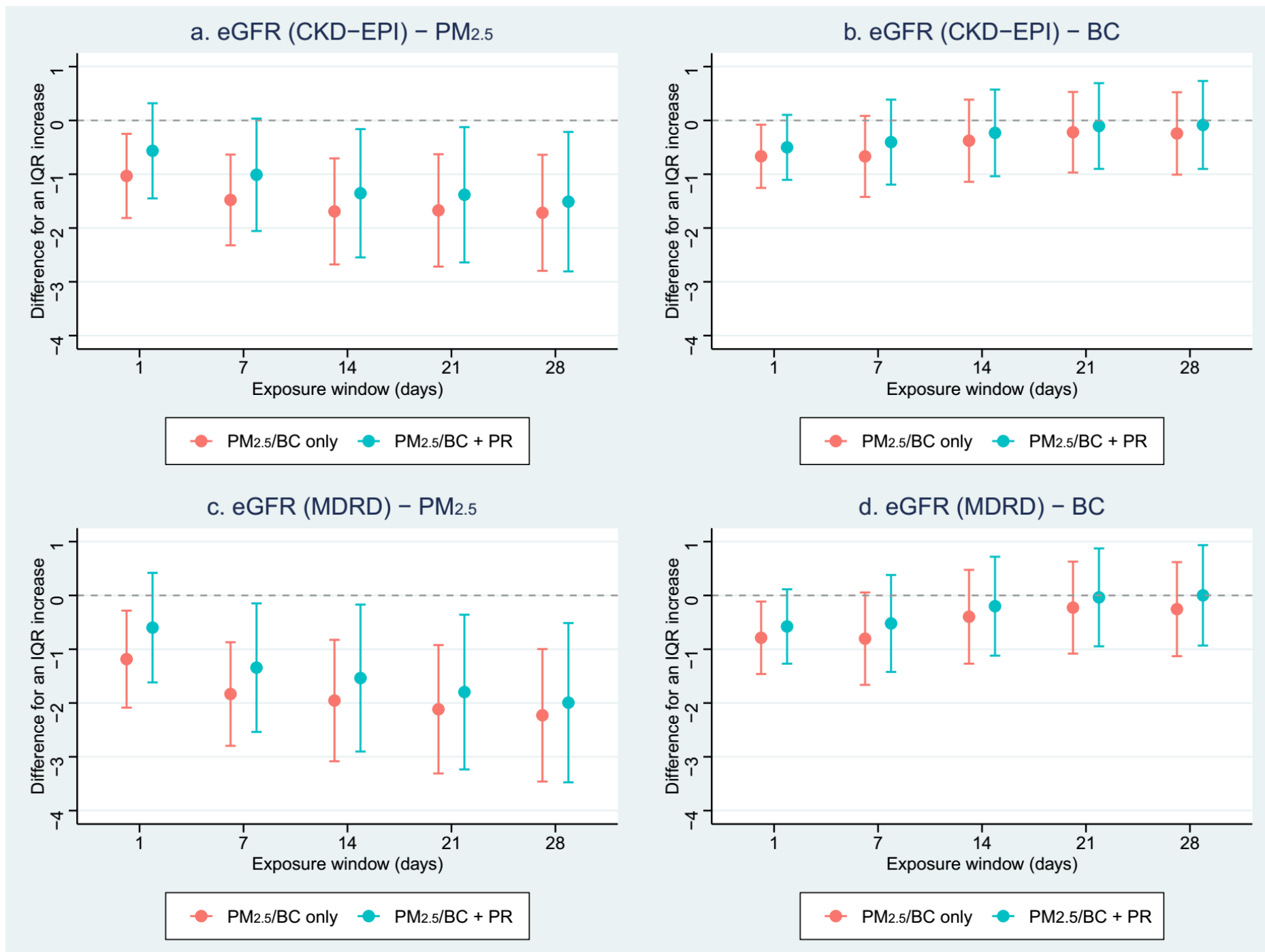


Figure S1 Associations of air pollution with kidney function in the exposure window of 28 days with and without controlling for particle radioactivity

Figure legend

PR: particle radioactivity; BC: black carbon; eGFR: estimated glomerular filtration rate

Dots: Point estimates; Error bars: Confidence intervals;

Red: Model with PM_{2.5} or black carbon only;

Blue: Model with particle radioactivity and PM_{2.5}/black carbon;