**Supplemental Material**

**Particulate Matter and Traffic-related Exposures in Relation to Breast Cancer Survival**

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**Table S1.** AdjustedaHRs (95% CI) of breast cancer specific death comparing women who live closer to major roadways to women who live farther away

|  |  |  |
| --- | --- | --- |
|  | ***Proximity to A1-A3*** | ***Events/Person-years*** |
| ***NHS***  |  |  |
| *≥250 meters*  | Referent | 430/39,995 |
| *150-249 meters* | 0.97 (0.80, 1.17) | 161/13,136 |
| *50-149 meters* | 0.88 (0.73, 1.06) | 159/14,706 |
| *<50 meters* | 0.89 (0.74, 1.08) | 149/13,605 |
| ***NHSII***  |  |  |
| *≥250 meters*  | Referent | 171/15,409 |
| *150-249 meters* | 0.93 (0.65, 1.33) | 40/4,064 |
| *50-149 meters* | 1.00 (0.73, 1.38) | 55/4,884 |
| *<50 meters* | 1.10 (0.78, 1.55) | 46/3,545 |
| ***Pooled Estimates*** |  |  |
| *≥250 meters*  | Referent | 601/55,404 |
| *150-249 meters* | 0.96 (0.81, 1.14) | 201/17,200 |
| *50-149 meters* | 0.91 (0.77, 1.07) | 214/19,590 |
| *<50 meters* | 0.94 (0.79, 1.12) | 195/17,150 |

Abbreviations: HR, hazard ratio; ER, estrogen receptor

a Adjusted for age, diagnosis date, race/ethnicity, region of residence at diagnosis, Census-tract median income, stage, ER status, treatments, hormones, grade, pre- to post-diagnosis weight change categories, post-diagnostic physical activity, and post-diagnostic aspirin use.

**Table S2.** HRs (95% CI) of breast cancer recurrence for a 10 μg/m3 increase in post-diagnosis PM among Stage I-III participants (n=6,499 for NHS and n=2,437 for NHSII)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***PM2.5*** | ***PM2.5-10*** | ***PM10*** | ***Events/*** ***Person-years*** |
| ***NHS***  |  |  |  |  |
| *Model 3a* | 1.14 (0.91, 1.44) | 0.93 (0.77, 1.11) | 1.00 (0.89, 1.13) | 974/79,484 |
| *Model 4b* | 1.08 (0.86, 1.36) | 0.93 (0.77, 1.11) | 0.99 (0.88, 1.12) | 974/79,484 |
| *p-value for interactionb* | *0.11* | *0.58* | *0.51* |  |
| *Stage 1b* | 1.60 (1.08, 2.38) | 0.94 (0.67, 1.31) | 1.12 (0.90, 1.38) | 331/52,018 |
| *Stage 2b* | 0.85 (0.57, 1.27) | 0.83 (0.60, 1.14) | 0.88 (0.71, 1.09) | 356/21,754 |
| *Stage 3b* | 0.98 (0.63, 1.53) | 1.01 (0.72, 1.41) | 1.00 (0.79, 1.25) | 287/5,713 |
| ***NHSII***  |  |  |  |  |
| *Model 3a* | 1.18 (0.79, 1.78) | 1.02 (0.75, 1.39) | 1.06 (0.86, 1.31) | *353/27,114* |
| *Model 4b* | 1.19 (0.79, 1.79) | 1.04 (0.77, 1.41) | 1.07 (0.86, 1.33) | *353/27,114* |
| *p-value for interactionb* | *0.18* | *0.47* | *0.24* |  |
| *Stage 1b* | 1.38 (0.62, 3.07) | 1.01 (0.57, 1.80) | 1.10 (0.73, 1.65) | 106/14,748 |
| *Stage 2b* | 0.95 (0.45, 1.98) | 1.03 (0.62, 1.72) | 1.00 (0.69, 1.45) | 130/9,196 |
| *Stage 3b* | 1.37 (0.60, 3.10) | 1.18 (0.61, 2.27) | 1.18 (0.76, 1.84) | 117/3,159 |
| ***p-value for cohort heterogeneityb*** | *0.70* | *0.52* | *0.53* |  |
| ***Pooled Estimates*** |  |  |  |  |
| *Model 3a* | 1.15 (0.94, 1.41) | 0.95 (0.81, 1.11) | 1.02 (0.92, 1.13) | 1,327/106,598 |
| *Model 4b* | 1.11 (0.91, 1.35) | 0.96 (0.82, 1.12) | 1.01 (0.91, 1.12) | 1,327/106,598 |
|  |  |  |  |  |
| *Stage 1b* | 1.56 (1.09, 2.22) | 0.95 (0.72, 1.27) | 1.11 (0.92, 1.34) | 437/66,766 |
| *Stage 2b* | 0.87 (0.61, 1.24) | 0.88 (0.67, 1.16) | 0.91 (0.76, 1.09) | 486/30,950 |
| *Stage 3b* | 1.06 (0.71, 1.56) | 1.04 (0.77, 1.41) | 1.03 (0.84, 1.27) | 404/8,872 |

Abbreviations: HR, hazard ratio; PM, Particulate matter; NHS, Nurses’ Health Study; BMI, body mass index; MET, metabolic equivalent; ER, estrogen receptor

a Model 3 adjusted for age, diagnosis date, race/ethnicity, region of residence at diagnosis, Census-tract median income as well as pre-diagnostic physical activity and BMI, and the following clinical factors: ER status, treatment, hormones, grade and stage for the models not stratified by stage.

b Model 4 adjusted for age, diagnosis date, race/ethnicity, region of residence at diagnosis, Census-tract median income, as well as pre- to post-diagnosis weight change categories, post-diagnostic physical activity, post-diagnostic aspirin use and the following clinical factors: ER status, treatments, hormones, grade, and stage for the models not stratified by stage.

**Table S3** HRs (95% CI) of breast cancer specific death for 10 μg/m3 increases in post-diagnosis PM among Stage I-III participants who did not move states (n=5,926 for NHS; n=2,229 for NHSII)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***PM2.5*** | ***PM2.5-10*** | ***PM10*** | ***Events/ Person-years*** |
| ***NHS***  |  |  |  | *847/72,515* |
| *Model 3c* | 1.08 (0.84, 1.40) | 1.00 (0.81, 1.23) | 1.02 (0.89, 1.17) |  |
| *Model 4d* | 1.00 (0.77, 1.30) | 0.98 (0.79, 1.21) | 0.99 (0.86, 1.14) |  |
|  |  |  |  |  |
| *Stage 1 d* | 1.61 (1.03, 2.52) | 0.98 (0.67, 1.44) | 1.14 (0.89, 1.45) | *278/46,947* |
| *Stage 2 d* | 0.75 (0.47, 1.19) | 0.85 (0.58, 1.23) | 0.86 (0.68, 1.10)  | *317/20,116* |
| *Stage 3 d* | 0.82 (0.47, 1.42) | 0.99 (0.65, 1.50) | 0.94 (0.71, 1.26) | *252/5,451* |
| ***NHSII***  |  |  |  | *283/25,009* |
| *Model 3c* | 1.22 (0.76, 1.95) | 1.17 (0.83, 1.65) | 1.14 (0.89, 1.45) |  |
| *Model 4d* | 1.24 (0.76, 2.02) | 1.18 (0.84, 1.68) | 1.15 (0.90, 1.48) |  |
|  |  |  |  |  |
| *Stage 1 d* | 2.39 (0.89, 6.45) | 1.71 (0.89, 3.27) | 1.68 (1.03, 2.74) | 82/13,407 |
| *Stage 2 d* | 1.13 (0.48, 2.61) | 1.06 (0.59, 1.90) | 1.06 (0.70, 1.62) | 101/8,504 |
| *Stage 3 d* | 1.85 (0.67, 5.16) | 1.22 (0.57, 2.60) | 1.31 (0.77, 2.22) | 100/3,098 |

Abbreviations: HR, hazard ratio; PM, Particulate matter; NHS, Nurses’ Health Study; BMI, body mass index; MET, metabolic equivalent; ER, estrogen receptor

c Model 3 adjusted for the same covariates as model 2 and also includes stage (I, II, III), ER status (ER+, ER-, missing), treatment (radiotherapy only, chemotherapy only, radiation and chemotherapy, missing), hormones (yes, no, missing), and grade (1, 2, 3, missing).

*d* Model 4 adjusted for age, diagnosis date, race/ethnicity, region of residence at diagnosis, Census-tract median income, stage, ER status, treatments, hormones, grade, pre- to post-diagnosis weight change categories (stable, moderate gain, large gain, moderate loss, large loss, missing), post-diagnostic physical activity (<3, 3 to <9, 9 to <15, 15 to <24, 24+ MET-hours/week, missing), and post-diagnostic aspirin use (nonuser, current user, unknown).

**Table S4** HRs (95% CI) of breast cancer specific death for 10 μg/m3 increases in post-diagnosis PM2.5 among Stage I-III participants by grade, ER, region, aspirin use, and pre-diagnosis BMI adjusting for Model 4d covariates

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **NHS** | **Events/ Person-years** | **NHSII** | **Events/ Person-years** |
| Grade 1 | 2.71 (0.63, 11.7) | 46/12,867 | -- | 16/4,420 |
| Grade 2 | 1.24 (0.75, 2.04) | 236/24,914 | 0.40 (0.16, 0.99) | 87/10,512 |
| Grade 3 | 1.08 (0.72, 1.64) | 342/17,432 | 2.32 (1.18, 4.56) | 162/9,013 |
| P-value for interaction | 0.66 |  | 0.03 |  |
| ER+ | 1.04 (0.75, 1.44) | 547/61,231 | 1.38 (0.72, 2.66) | 158/19,935 |
| ER- | 1.05 (0.61, 1.78) | 219/13,748 | 1.18 (0.48, 2.91) | 101/6,257 |
| P-value for interaction | 0.09 |  | 0.48 |  |
| Northeast | 1.08 (0.70, 1.64) | 452/40,863 | 1.64 (0.63, 4.26) | 107/9,810 |
| Midwest | 1.06 (0.50, 2.26) | 161/13,225 | 0.64 (0.24, 1.70) | 98/8,611 |
| West | 0.91 (0.58, 1.41) | 149/13,066 | 2.67 (0.89, 8.00) | 43/4,541 |
| South | 0.82 (0.35, 1.93) | 137/14,289 | 1.44 (0.30, 6.99) | 64/4,940 |
| P-value for interaction | 0.89 |  | 0.21 |  |
| Non-aspirin users | 1.04 (0.73, 1.49) | 444/41,041 | 1.33 (0.78, 2.27) | 230/20,440 |
| Current aspirin users | 1.53 (0.96, 2.43) | 290/33,255 | 0.70 (0.15, 3.29) | 49/5,839 |
| P-value for interaction | 0.15 |  | 0.18 |  |
| BMI <25 | 1.12 (0.75, 1.65) | 337/36,451 | 1.32 (0.66, 2.61) | 167/15,160 |
| BMI 25-30 | 1.08 (0.67, 1.74) | 300/26,210 | 1.04 (0.32, 3.36) | 71/6,943 |
| BMI >30 | 0.97 (0.51, 1.83) | 179/15,293 | 0.94 (0.30, 2.90) | 67/5,358 |
| P-value for interaction | 0.84 |  | 0.83 |  |

Abbreviations: HR, hazard ratio; PM, Particulate matter; NHS, Nurses’ Health Study; BMI, body mass index; ER, estrogen receptor; MET, metabolic equivalent

-- Too few events for the model to converge. ­

*d* Model 4 adjusted for age, diagnosis date, race/ethnicity, region of residence at diagnosis, Census-tract median income, stage, ER status, treatments, hormones, grade, pre- to post-diagnosis weight change categories (stable, moderate gain, large gain, moderate loss, large loss, missing), post-diagnostic physical activity (<3, 3 to <9, 9 to <15, 15 to <24, 24+ MET-hours/week, missing), and post-diagnostic aspirin use (nonuser, current user, unknown).