

Online Supplementary

Road Traffic Noise and incidence of primary hypertension: a prospective analysis in UK Biobank

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Online Table 1. The Spearman correlations between weight average 24-h road traffic noise (L_{den}), night-time road traffic noise (L_{night}), and air pollution

| Variables | L_{den} | L_{night} | PM_{2.5} | NO₂ |
|-------------------|-----------------------------|-------------------------------|-------------------------|-----------------------|
| L_{den} | 1.00 | | | |
| L_{night} | 1.00 | 1.00 | | |
| PM _{2.5} | 0.24 | 0.24 | 1.00 | |
| NO ₂ | 0.23 | 0.23 | 0.86 | 1.00 |

L_{den} : weighted average 24-h road traffic noise level;

L_{night} : average night-time road traffic noise level from 23:00 to 7:00;

PM_{2.5}, fine particles; NO₂, nitrogen dioxide.

Online Table 2. Combined effects of night-time road traffic noise (L_{night}) and air pollution in relation to risk of incidence of primary hypertension

| Air pollution | | The influence of night road traffic noise exposure (L_{night}) | | | |
|-------------------|--------------------------------------|--|--------------------------|--------------------------|--------------------------|
| | | <i>Low</i> | <i>Low-medium</i> | <i>Medium-high</i> | <i>High</i> |
| | | (≤ 45 dB[A]) | (>45 to ≤ 50 dB[A]) | (>50 to ≤ 55 dB[A]) | (>55 dB[A]) |
| PM _{2.5} | ≤ 9.9 $\mu\text{g}/\text{m}^3$ | ref | 1.01 (0.94, 1.08) | 1.08 (0.94, 1.25) | 1.00 (0.84, 1.19) |
| | 9.9~10.6 $\mu\text{g}/\text{m}^3$ | 0.99 (0.91, 1.08) | 1.02 (0.94, 1.11) | 0.98 (0.80, 1.21) | 1.26 (1.02, 1.55) |
| | >10.6 $\mu\text{g}/\text{m}^3$ | 1.06 (0.95, 1.18) | 1.05 (0.96, 1.14) | 1.08 (0.93, 1.26) | 1.22 (1.06, 1.40) |
| NO ₂ | ≤ 26.0 $\mu\text{g}/\text{m}^3$ | ref | 1.02 (0.96, 1.09) | 1.05 (0.93, 1.19) | 0.98 (0.82, 1.18) |
| | 26.0-31.1 $\mu\text{g}/\text{m}^3$ | 1.02 (0.94, 1.11) | 1.07 (0.99, 1.16) | 1.07 (0.90, 1.29) | 1.21 (0.98, 1.49) |
| | >31.1 $\mu\text{g}/\text{m}^3$ | 1.01 (0.91, 1.13) | 0.96 (0.88, 1.05) | 1.14 (0.97, 1.35) | 1.19 (1.05, 1.35) |

PM_{2.5} and NO₂ concentrations were divided by $\leq P_{50}$, P_{50} and P_{75} , and $> P_{75}$.

PM_{2.5}, fine particles; NO₂, nitrogen dioxide. Bold represents significance at $P < 0.05$.

Online Table 3. The associations between exposure to weight average 24-h road traffic noise (L_{den}) and incidence of primary hypertension stratified by personal characteristics

| Variables | Low | | Low-medium | | Medium-high | | High | |
|------------------------|--------------------|-------------------|--------------------------|-------------------|--------------------------|-------------------|--------------------------|-------------------|
| | (≤ 55 dB[A]) | | (>55 to ≤ 60 dB[A]) | | (>60 to ≤ 65 dB[A]) | | (>65 dB[A]) | |
| | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ |
| Age | | | | | | | | |
| <65 years | ref | ref | 0.97 (0.94, 1.01) | ref | 1.01 (0.94, 1.09) | ref | 1.03 (0.96, 1.11) | ref |
| ≥ 65 years | ref | ref | 1.02 (0.95, 1.09) | 0.308 | 0.96 (0.84, 1.10) | 0.350 | 1.07 (0.94, 1.22) | 0.546 |
| Sex | | | | | | | | |
| Female | ref | ref | 0.97 (0.91, 1.04) | ref | 1.12 (0.98, 1.30) | ref | 1.07 (0.93, 1.24) | ref |
| Male | ref | ref | 1.07 (1.00, 1.14) | 0.068 | 1.00 (0.88, 1.14) | 0.652 | 1.19 (1.04, 1.35) | 0.613 |
| Economic status | | | | | | | | |

| | | | | | | | | |
|------------------------------------|-----|-----|-------------------|-------|-------------------|-------|--------------------------|-------|
| Inactive | ref | ref | 1.03 (0.96, 1.10) | ref | 1.04 (0.91, 1.19) | ref | 1.17 (1.01, 1.34) | ref |
| Active | ref | ref | 1.02 (0.96, 1.10) | 0.957 | 1.07 (0.93, 1.22) | 0.771 | 1.11 (0.97, 1.27) | 0.839 |
| Townsend deprivation index | | | | | | | | |
| 1 (least deprived) | ref | ref | 0.94 (0.81, 1.10) | ref | 1.07 (0.77, 1.49) | ref | 0.94 (0.66, 1.34) | ref |
| 2 | ref | ref | 1.13 (0.96, 1.33) | 0.065 | 1.10 (0.80, 1.53) | 0.913 | 1.19 (0.81, 1.73) | 0.076 |
| 3 | ref | ref | 0.99 (0.84, 1.17) | 0.638 | 1.03 (0.72, 1.47) | 0.932 | 1.16 (0.83, 1.62) | 0.243 |
| 4 | ref | ref | 1.06 (0.89, 1.28) | 0.344 | 1.01 (0.70, 1.45) | 0.787 | 1.31 (0.94, 1.83) | 0.051 |
| 5 (most deprived) | ref | ref | 1.06 (0.87, 1.28) | 0.086 | 0.95 (0.68, 1.33) | 0.769 | 1.31 (0.94, 1.82) | 0.020 |
| Length of time at residence | | | | | | | | |
| <10 years | ref | ref | 1.08 (0.96, 1.20) | ref | 1.08 (0.87, 1.33) | ref | 1.25 (1.01, 1.53) | ref |
| ≥10 years | ref | ref | 1.01 (0.96, 1.07) | 0.728 | 1.05 (0.94, 1.17) | 0.456 | 1.11 (0.99, 1.23) | 0.731 |
| Salt intake | | | | | | | | |

| | | | | | | | | |
|--------------------------------|-----|-----|-------------------|-------|--------------------------|-------|--------------------------|-------|
| Never/rarely | ref | ref | 1.00 (0.93, 1.08) | ref | 1.19 (1.02, 1.39) | ref | 1.15 (0.98, 1.35) | ref |
| Sometimes | ref | ref | 0.99 (0.87, 1.12) | 0.109 | 0.85 (0.66, 1.11) | 0.183 | 1.07 (0.82, 1.40) | 0.244 |
| Usually | ref | ref | 1.14 (0.87, 1.49) | 0.234 | 1.37 (0.83, 2.23) | 0.834 | 1.15 (0.69, 1.92) | 0.535 |
| Always | ref | ref | 0.52 (0.21, 1.27) | 0.518 | 0.91 (0.14, 5.87) | 0.843 | 0.39 (0.04, 3.63) | 0.725 |
| Sedentary time | | | | | | | | |
| ≤4.5 hours | ref | ref | 0.98 (0.91, 1.06) | ref | 0.96 (0.82, 1.12) | ref | 1.12 (0.96, 1.31) | ref |
| >4.5 hours | ref | ref | 1.06 (0.98, 1.16) | 0.153 | 1.10 (0.92, 1.30) | 0.193 | 1.33 (1.12, 1.59) | 0.614 |
| Physical activity level | | | | | | | | |
| Low | ref | ref | 0.96 (0.76, 1.21) | ref | 0.79 (0.48, 1.29) | ref | 1.25 (0.75, 2.07) | ref |
| Moderate | ref | ref | 1.00 (0.90, 1.11) | 0.480 | 0.89 (0.72, 1.09) | 0.071 | 1.07 (0.85, 1.34) | 0.958 |
| High | ref | ref | 1.05 (0.94, 1.17) | 0.991 | 1.18 (0.94, 1.47) | 0.432 | 1.16 (0.93, 1.45) | 0.433 |

Bold represents significance at $P < 0.05$.

Online Table 4. The association between exposure to night-time road traffic noise (L_{night}) and incidence of first occurrence of primary hypertension stratified by personal characteristics

| Variables | Low | | Low-medium | | Medium-high | | High | |
|------------------------|--------------------|-------------------|--------------------------|-------------------|--------------------------|-------------------|--------------------------|-------------------|
| | (≤ 45 dB[A]) | | (>45 to ≤ 50 dB[A]) | | (>50 to ≤ 55 dB[A]) | | (>55 dB[A]) | |
| | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ | HR (95%CI) | $P_{interaction}$ |
| Age | | | | | | | | |
| <65 years | ref | ref | 0.98 (0.94, 1.01) | ref | 0.99 (0.92, 1.06) | ref | 1.03 (0.96, 1.11) | ref |
| ≥ 65 years | ref | ref | 1.01 (0.95, 1.08) | 0.365 | 1.01 (0.89, 1.15) | 0.981 | 1.08 (0.95, 1.24) | 0.550 |
| Sex | | | | | | | | |
| Female | ref | ref | 0.98 (0.92, 1.06) | ref | 1.12 (0.98, 1.28) | ref | 1.09 (0.95, 1.25) | ref |
| Male | ref | ref | 1.03 (0.97, 1.10) | 0.164 | 1.04 (0.92, 1.17) | 0.564 | 1.16 (1.03, 1.32) | 0.821 |
| Economic status | | | | | | | | |

| | | | | | | | | |
|------------------------------------|-----|-----|-------------------|-------|-------------------|-------|--------------------------|-------|
| Inactive | ref | ref | 1.02 (0.95, 1.09) | ref | 1.07 (0.94, 1.21) | ref | 1.15 (1.01, 1.32) | ref |
| Active | ref | ref | 1.01 (0.94, 1.08) | 0.479 | 1.08 (0.95, 1.23) | 0.963 | 1.11 (0.98, 1.27) | 0.890 |
| Townsend deprivation index | | | | | | | | |
| 1 (least deprived) | ref | ref | 0.91 (0.78, 1.05) | ref | 1.06 (0.78, 1.45) | ref | 0.91 (0.65, 1.29) | ref |
| 2 | ref | ref | 1.16 (0.99, 1.36) | 0.150 | 1.12 (0.82, 1.53) | 0.904 | 1.16 (0.81, 1.67) | 0.072 |
| 3 | ref | ref | 1.02 (0.86, 1.21) | 0.979 | 1.01 (0.73, 1.41) | 0.883 | 1.17 (0.84, 1.64) | 0.226 |
| 4 | ref | ref | 0.99 (0.82, 1.20) | 0.822 | 1.02 (0.73, 1.44) | 0.798 | 1.26 (0.90, 1.75) | 0.092 |
| 5 (most deprived) | ref | ref | 1.08 (0.88, 1.32) | 0.057 | 1.10 (0.80, 1.53) | 0.858 | 1.33 (0.96, 1.85) | 0.006 |
| Length of time at residence | | | | | | | | |
| <10 years | ref | ref | 1.01 (0.90, 1.13) | ref | 1.03 (0.84, 1.26) | ref | 1.23 (1.00, 1.50) | ref |
| ≥10 years | ref | ref | 1.01 (0.96, 1.07) | 0.782 | 1.08 (0.98, 1.20) | 0.099 | 1.10 (0.99, 1.23) | 0.811 |
| Salt intake | | | | | | | | |

| | | | | | | | | |
|--------------------------------|-----|-----|-------------------|-------|--------------------------|-------|--------------------------|-------|
| Never/rarely | ref | ref | 1.00 (0.93, 1.08) | ref | 1.18 (1.02, 1.37) | ref | 1.16 (0.99, 1.35) | ref |
| Sometimes | ref | ref | 0.98 (0.86, 1.12) | 0.960 | 0.88 (0.69, 1.12) | 0.328 | 1.13 (0.87, 1.47) | 0.371 |
| Usually | ref | ref | 1.04 (0.80, 1.36) | 0.889 | 1.11 (0.68, 1.80) | 0.559 | 1.14 (0.68, 1.90) | 0.796 |
| Always | ref | ref | 0.62 (0.26, 1.50) | 0.874 | 0.33 (0.06, 1.95) | 0.769 | 0.46 (0.05, 4.24) | 0.599 |
| Sedentary time | | | | | | | | |
| ≤4.5 hours | ref | ref | 0.99 (0.92, 1.07) | ref | 1.02 (0.88, 1.18) | ref | 1.10 (0.94, 1.28) | ref |
| >4.5 hours | ref | ref | 1.04 (0.96, 1.13) | 0.490 | 1.07 (0.91, 1.26) | 0.632 | 1.33 (1.12, 1.58) | 0.363 |
| Physical activity level | | | | | | | | |
| Low | ref | ref | 1.01 (0.80, 1.28) | ref | 0.80 (0.51, 1.26) | ref | 1.17 (0.71, 1.93) | ref |
| Moderate | ref | ref | 0.99 (0.89, 1.10) | 0.340 | 0.91 (0.74, 1.11) | 0.026 | 1.06 (0.85, 1.33) | 0.839 |
| High | ref | ref | 1.03 (0.92, 1.15) | 0.764 | 1.20 (0.97, 1.48) | 0.381 | 1.14 (0.91, 1.42) | 0.381 |

Bold represents significance at $P < 0.05$.

Online Table 5. Sensitivity analysis of estimated associations between exposure to road traffic noise (L_{den} and L_{night}) and incidence of primary hypertension

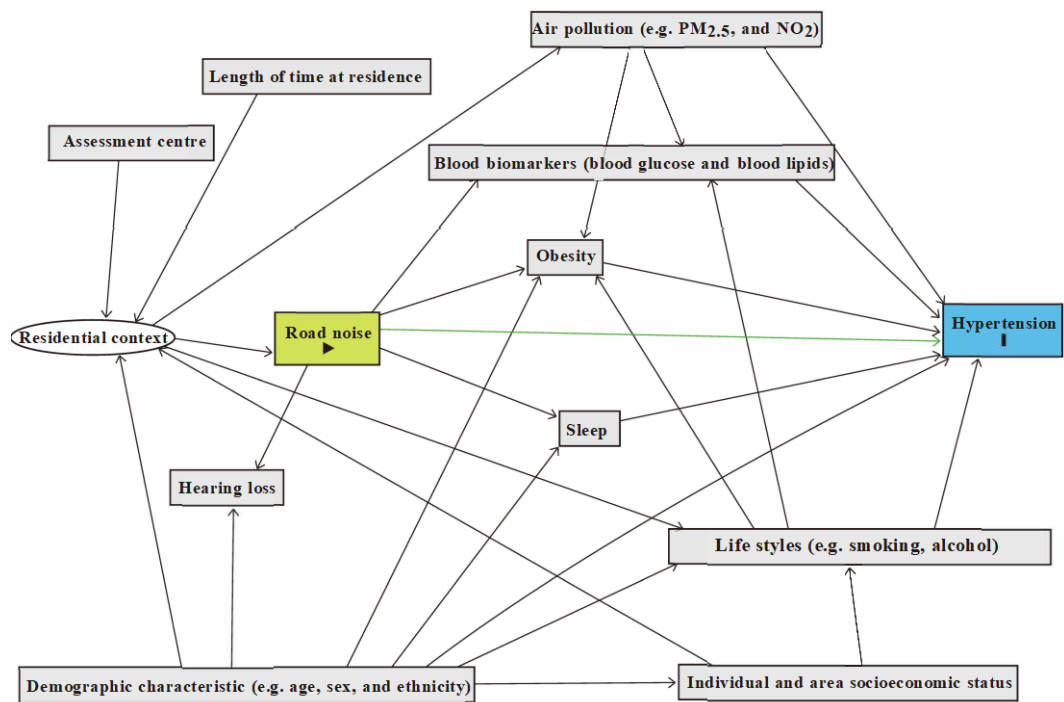
| | Model 1, | Model 2, | Model 3, |
|---|--------------------------|--------------------------|--------------------------|
| | HR (95% CI) | HR (95% CI) | HR (95% CI) |
| <i>L_{den}</i> | | | |
| Low (≤ 55 dB[A]) | ref | ref | ref |
| Low-medium (>55 to ≤ 60 dB[A]) | 1.00 (0.95, 1.06) | 1.03 (0.98, 1.08) | 1.02 (0.97, 1.07) |
| Medium-high (>60 to ≤ 65 dB[A]) | 1.05 (0.94, 1.17) | 1.06 (0.96, 1.17) | 1.06 (0.96, 1.18) |
| High (>65 dB[A]) | 1.17 (1.05, 1.31) | 1.14 (1.04, 1.26) | 1.14 (1.03, 1.27) |
| <i>P</i> for trend | 0.006 | 0.004 | 0.009 |
| Continuous (per 10 dB[A] increase) | 1.09 (1.02, 1.16) | 1.08 (1.03, 1.14) | 1.07 (1.02, 1.13) |
| <i>L_{night}</i> | | | |
| Low (≤ 45 dB[A]) | ref | ref | ref |
| Low-medium (>45 to ≤ 50 dB[A]) | 0.99 (0.94, 1.05) | 1.02 (0.97, 1.07) | 1.00 (0.95, 1.06) |
| Medium-high (>50 to ≤ 55 dB[A]) | 1.07 (0.96, 1.18) | 1.09 (0.99, 1.19) | 1.09 (0.99, 1.21) |
| High (>55 dB[A]) | 1.17 (1.05, 1.30) | 1.14 (1.04, 1.26) | 1.14 (1.02, 1.26) |
| <i>P</i> for trend | 0.003 | 0.002 | 0.005 |
| Continuous (per 10 dB[A] increase) | 1.09 (1.02, 1.16) | 1.08 (1.03, 1.14) | 1.07 (1.02, 1.13) |

Model 1: fully adjusted model plus adjusted for central obesity status and physical activity level.

Model 2: fully adjusted model plus adjusted for sedentary time and sleep duration.

Model 3: exclude those who were identified primary hypertension within two year during the follow-up period based on the fully adjusted model.

Bold represents significance at $P < 0.05$.



Online Figure 1. Directed Acyclic Graph displaying the relationship between road traffic noise, hypertension and other variables