**Supplementary materials**



Fig.1 The distribution of built environment factors of the studying areas in AHLS

(A) Median distance to the nearest supermarket, restaurant, hospital and park, by cities (m)

(B) Proportions of the people with or without green/blue space within 800m buffers, by cities (%)

100

50

0

50

100

Fig. 2 Distributions of the built environmental factors across the four studying cities

 Table 1. Basic characteristics of the environmental factors by MCI categories

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Normal cognitive function（n=3682） | *MCI*（n=1986） | *χ2* | *p* |
| **Noise** |  |  |  |  |
| Yes | 486 | 222 | 2.430 | 0.119 |
| No | 3376 | 1764 |
| **Dust** |  |  |  |  |
| Yes | 358 | 214 | 3.369 | 0.006 |
| No | 3504 | 1772 |
| **Space** |  |  |  |  |
| Yes | 2464 | 1019 | 84.972 | <0.001 |
| No | 1398 | 967 |
| **Supermarket** |  |  |  |  |
| Q1 | 1170 | 508 | 51.582 | <0.001 |
| Q2 | 944 | 478 |
| Q3 | 970 | 441 |
| Q4 | 778 | 559 |
| **Restaurant** |  |  |  |  |
| Q1 | 979 | 507 | 7.057 | 0.070 |
| Q2 | 1143 | 554 |
| Q3 | 747 | 439 |
| Q4 | 993 | 486 |
| **Hospital** |  |  |  |  |
| Q1 | 1007 | 475 | 15.192 | 0.002 |
| Q2 | 971 | 445 |
| Q3 | 921 | 553 |
| Q4 | 963 | 513 |
| **Park** |  |  |  |  |
| Q1 | 1028 | 480 | 43.016 | <0.001 |
| Q2 | 1105 | 479 |
| Q3 | 736 | 518 |
| Q4 | 993 | 509 |
| **Green Space** |  |  |  |  |
| Any | 1489 | 694 | 7.308 | 0.007 |
| None | 2373 | 1292 |
| **Blue Space** |  |  | 20.820 | <0.001 |
| Any | 1162 | 485 |
| None | 2700 | 1501 |

Table 2. The associations between living environment, built environment factors and cognitive function by sexes: Coefficients and 95% CIs for MMSE and Odds Ratios for MCI (by multi-level regression models).

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Both sexes*** | ***Male*** | ***Female*** |
|  | ***MMSE a*** | ***P adjusted*** | ***MCI a*** | ***P adjusted*** | ***MMSE b*** | ***P adjusted*** | ***MCI b*** | ***P adjusted*** | ***MMSE b*** | ***P adjusted*** | ***MCI b*** | ***P adjusted*** |
| **Living environment** |  |  |  |  |  |  |  |  |  |  |  |  |
| Noise (No)(Ref: yes) | -0.011(- 0.390, 0.368) | 1 | 0.957(0.798 ,1.148) | 1 | -0.083(-0.617, 0.451) | 1 | 0.879(0.671, 1.152) | 1 | 0.170(-0.360, 0.702) | 1 | 0.982(0.769, 1.254) | 1 |
| Dust (No)(Ref: yes) | 0.351(-0.064, 0.765) | 0.882 | 0.813(0.671, 0.985) | 0.315 | 0.812(0.223, 1.401)  | 0.063 | **0.649****(0.487, 0.865)**  | **0.027** | 0.012(-0.567, 0.591) | 1 | 0.942(0.728, 1.219) | 1 |
| Recreational space (No)(Ref: yes) | **-0.589****(-0.892, -0.285)**  | **<0.001** | 1.144( 0.993,1.317)  | 0.558 | **-1.111****(-1.532,-0.689)**  | **<0.001** | **1.407****(1.137, 1.742)** | **0.018** | -0.288(-0.708, 0.131) | 1 | 0.994(0.827, 1.196) | 1 |
| **Built environment** |  |  |  |  |  |  |  |  |  |  |  |  |
| Supermarket Ref: Q1 | - |  |  |  | - |  |  |  | - |  |  |  |
| Q2 | -0.159(-0.561, 0.242)  | 1 | 1.191(1.010, 1.404) | 0.333 | -0.199(-0.731, 0.332) | 1 | 1.204(0.938, 1.545) | 1 | -0.428(-0.942, 0.087)  | 0.936 | 1.179(0.946, 1.469) | 1 |
| Q3 | -0.147(-0.584, 0.291)  | 1 | 1.111(0.932, 1.324) | 1 | 0.103(-0.451, 0.658) | 1 | 0.902(0.690, 1.178) | 1 | -0.597(-1.164, -0.029) | 0.351 | 1.282(1.012, 1.624)  | 0.351 |
| Q4 | -0.648(-1.159, -0.137) | 0.117 | 1.204(1.001, 1.448) | 0.441 | -0.434(-1.053, 0.187) | 1 | 1.034(0.784, 1.362) | 1 | **-0.972****(-1.613, -0.332)** | **0.027** | 1.338(1.040, 1.720)  | 0.207 |
| Restaurant Ref: Q1 | - |  |  |  | - |  |  |  | - |  |  |  |
| Q2 | 0.283(-0.078, 0.645)  | 1 | 0.868(0.722, 1.043) | 1 | 0.103(-0.412, 0.618) | 1 | 0.950(0.734, 1.231) | 1 | 0.468(-0.021, 0.957) | 0.549 | 0.803(0.644, 1.003) | 0.729 |
| Q3 | -0.280(-0.720, 0.159) | 1 | 1.095(0.902, 1.329) | 1 | -0.510(-1.112, 0.093) | 0.882 | 1.307(0.974, 1.753) | 0.675 | -0.187(-0.778, 0.403) | 1 | 0.944(0.731, 1.218) | 1 |
| Q4 | -0.040 (-0.529, 0.448) | 1 | 1.007(0.837, 1.210) | 1 | -0.072(-.666, 0.523) | 1 | 0.981(0.740, 1.299) | 1 | -0.046(-0.671, 0.578) | 1 | 1.011(0.793, 1.290) | 1 |
| Park Ref: Q1 | - |  |  |  | - |  |  |  | - |  |  |  |
| Q2 | 0.043(-0.480, 0.566) | 1 | 0.939(0.749, 1.178) | 1 | -0.202(-0.846, 0.442) | 1 | 1.066(0.785, 1.447) | 1 | 0.344(-0.332, 1.020) | 1 | 0.824(0.626, 1.085) | 1 |
| Q3 | -0.063(-0.694, 0.568) | 1 | 0.961(0.761, 1.214) | 1 | -0.314(-1.042, 0.415) | 1 | 0.993(0.725, 1.359) | 1 | 0.198(-0.583, 0.979) | 1 | 0.913(0.700, 1.189) | 1 |
| Q4 | -0.561(-1.210, 0.088) | 0.810 | 1.169(0.923, 1.479) | 1 | -0.457(-1.155, 0.241) | 1 | 1.137(0.841, 1.537) | 1 | -0.423(-1.209, 0.364) | 1 | 1.134(0.863, 1.492) | 1 |
| Hospital Ref: Q1 | - |  |  |  | - |  |  |  | - |  |  |  |
| Q2 | -0.120(-0.520, 0.279) | 1 | 0.977(0.804, 1.187) | 1 | -0.229(-0.783, 0.324) | 1 | 0.982(0.739, 1.304) | 1 | -0.132(-0.672, 0.408) | 1 | 1.036(0.803, 1.336) | 1 |
| Q3 | -0.080(-0.524, 0.363) | 1 | 1.045(0.850, 1.284) | 1 | -0.185(-0.789, 0.418) | 1 | 0.976(0.721, 1.319) | 1 | 0.058(-0.531, 0.646) | 1 | 1.035(0.804, 1.331) | 1 |
| Q4 | 0.340(-0.127, 0.808) | 1 | 0.845(0.673, 1.062) | 1 | 0.322(-0.302, 0.945) | 1 | 0.853(0.603, 1.207) | 1 | 0.062(-0.553, 0.676) | 1 | 0.962(0.735, 1.259) | 1 |
| Green space within 800m buffers (Any) (Ref: none) | 0.144(-0.198, 0.485) | 1 | 0.960(0.825, 1.117) | 1 | 0.136(-0.295, 0.567) | 1 | 0.922(0.750, 1.134) | 1 | 0.187(-0.272, 0.647) | 1 | 1.001(0.837, 1.198) | 1 |
| Blue space within 800m buffers (Any) (Ref: none) | 0.347(-0.146, 0.840)  | 1 | 0.882(0.718, 1.084) | 1 | 0.311(-0.222, 0.843) | 1 | 0.934(0.721, 1.210) | 1 | 0.619(-0.062, 1.300)  | 0.676 | 0.840(0.660, 1.707) | 1 |

a: The model adjusted sex (male and female), age (continuous), location (urban and rural), city (Chuzhou, Lu’an, Xuancheng and Fuyang), education (0, 0–6 years and more than 6 years), marital status (married and not married), income (lower than 6500 RMB and 6500 RMB or higher), diabetes (yes and no), hypertension (yes and no), drinking status (never, former and current), smoking (current smoker, noncurrent smoker), depression (yes and no), overweight (yes and no), sleep quality (very good, good, bad and very bad), and sedentary hours (continuous).

b: The model adjusted age (continuous), location (urban and rural), city (Chuzhou, Lu’an, Xuancheng and Fuyang), education (0, 0–6 years and more than 6 years), marital status (married and not married), income (lower than 6500 RMB and 6500 RMB or higher), diabetes (yes and no), hypertension (yes and no), drinking status (never, former and current), smoking (current smoker, noncurrent smoker), depression (yes and no), overweight (yes and no), sleep quality (very good, good, bad and very bad), and sedentary hours (continuous).

Table 3. The associations between multiple environments factors and cognitive function among males: Coefficients and 95% CIs for MMSE and Odds Ratios for MCI (by multi-level regression models).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***MMSE*** | ***p***  | ***MCI*** | ***p*** |
| **Living environment** |  |  |  |  |
| Dust (No)(Ref: yes) | 0.828(0.243, 1.413) | 0.006 | 0.651(0.488, 0.868)  | 0.003 |
| Recreational space (No)(Ref: yes) | -1.107(-1.529, -0.686) | <0.001 | 1.403(1.134, 1.737)  | 0.002 |

The model adjusted age (continuous), location(urban and rural), city (Chuzhou, Lu’an, Xuancheng and Fuyang), education (0, 0–6 years and more than 6 years), marital status (married and not married), income (lower than 6500 RMB and 6500 RMB or higher), diabetes (yes and no), hypertension (yes and no), drinking status (never, former and current), smoking (current smoker, noncurrent smoker), depression (yes and no), overweight (yes and no), sleep quality (very good, good, bad and very bad), and sedentary hours (continuous).