

## Supplementary Online Content

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**eAppendix.** Online-only text.

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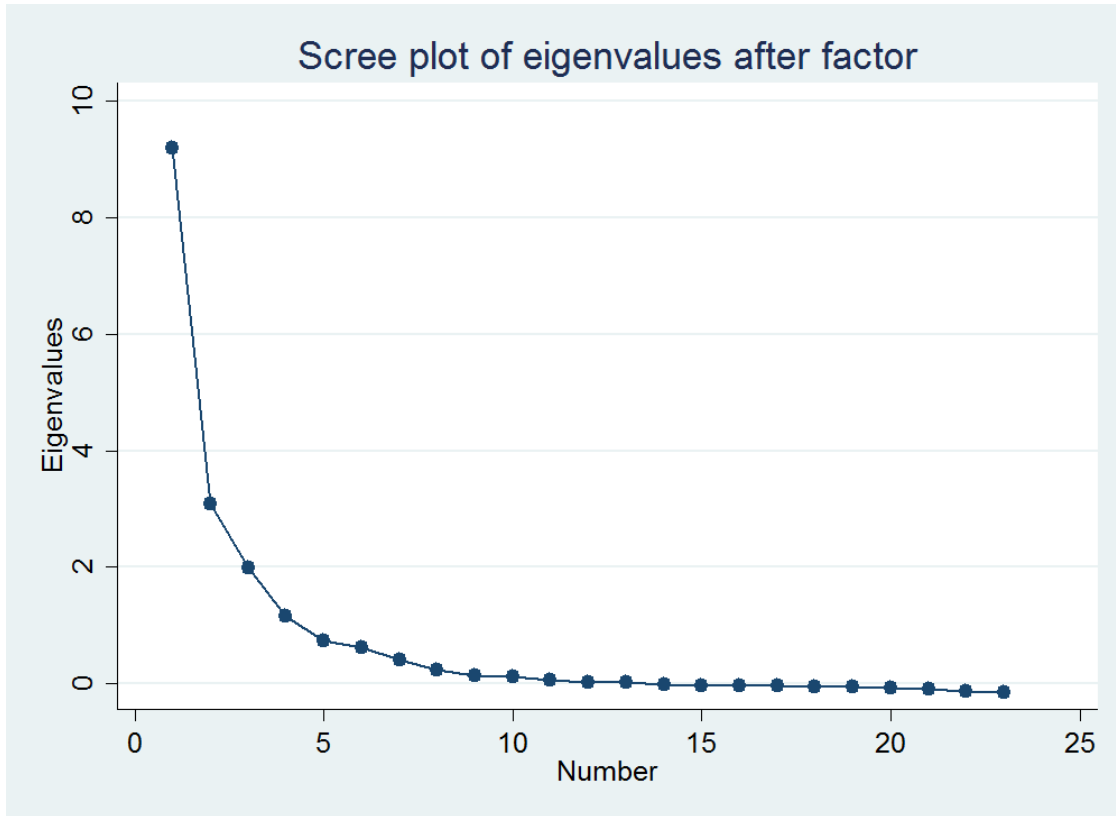
**eTable 4.** Rotated factor loadings following EFA.

This supplementary material has been provided by the authors to give readers additional information about their work.

## **eAppendix. Online-Only text**

Neighborhood-level exposure constructs of the social and built environment were derived from 29 items entered into an exploratory factor analysis. We obtained 24 items from the UK 2011 census related to neighborhood ethnic and social composition, residential stability, social isolation, housing tenure, household composition, population density, deprivation and inequality. Multiple deprivation was measured as the proportion of households per neighborhood deprived on 2 or more of 4 domains in the UK 2011 Census (employment, education, living environment, health), as previously described<sup>4</sup>. We calculated two measures of inequality. First, we estimated multiple deprivation in smaller geographical units known as “lower super output area” [LSOA] (N=1475), nested within each statistical ward (median: 3; IQR: 1-7). Inequality in deprivation across the LSOA within each neighborhood was estimated using a Gini-like methodology, ranging from 0 (perfect equality) to 100 (perfect inequality). Second, similarly, we estimated socioeconomic inequality in each statistical ward, based on the population distribution across SES categories, as described above. We also included three measures of the built environment (% green space, % blue space, % non-residential buildings) from the Office of National Statistics (ONS) Generalized Land Use Database<sup>26</sup>, and two measures of accessibility to services, via data from the ONS Journey Time Statistics Collection<sup>27</sup> (mean journey time to the nearest town, weighted from LSOA-level data to each statistical ward, based on population size) and the UK 2011 Census (mean distance to nearest workplace).

**eFigure. Scree plot following exploratory factor analysis**



Legend: Following EFA, a scree plot suggested a four-factor solution led to the optimum trade-off between number of factors and variance explained. These four factors explained 90% of the variance in neighborhood-level items.

**eTable 1 Variables included in the exploratory factor analysis**

| No. | Variable label              | Description  | Source - Table number                           | Excluded from EFA?                   |
|-----|-----------------------------|--|---|--------------------------------------|
| 1   | Population density          | Population density (people per square mile)  | 2011 Census – PHP01                             |                                      |
| 2   | People per household        | Number of people per household   | 2011 Census – PHP01                             | Yes: poor KMO in EFA (0.58)          |
| 3   | % age 16-35 density         | % population aged 16-35 years  | 2011 Census – QS103EW                           |                                      |
| 4   | % single household          | % people living alone without dependent children   | 2011 Census – KS105EW                           |                                      |
| 5   | % single parent household   | % single parent households with dependent children                                       | 2011 Census – KS105EW                           |                                      |
| 6   | % Non-cohabiting adults     | % people 16+ years not cohabiting  | 2011 Census – KS104EW                           |                                      |
| 7   | % multiple deprivation      | % households deprived on 2+ (of 4) Census domains  | 2011 Census – QS119EW                           |                                      |
| 8   | % Inequality                | % deprivation inequality within electoral wards (Gini method)                            | 2011 Census – QS119EW                           |                                      |
| 9   | % SES inequality            | % inequality in SES, 16-74 years, excluding students (Gini method)                       | 2011 Census – QS607EW                           | Yes – poor KMO in EFA (0.57)         |
| 10  | % Socially rented housing   | % people living in social rented housing   | 2011 Census – QS403EW                           |                                      |
| 11  | % Privately rented housing  | % people living in private rented housing  | 2011 Census – QS403EW                           |                                      |
| 12  | % No car ownership          | % households with no car   | 2011 Census – KS404EW                           |                                      |
| 13  | % No central heating        | % households with no central heating   | 2011 Census – QS415EW                           |                                      |
| 14  | % BME                       | % population of BME status   | 2011 Census – KS201EW                           | Yes: 0.98 correlation with #15 & #16 |
| 15  | % Ethnic diversity          | Ethnic diversity across 18 ethnic groups (Reciprocal Diversity Index)                    | 2011 Census – KS201EW                           |                                      |
| 16  | % non-UK born               | % population not born in the UK  | 2011 Census – QS803EW                           | Yes: 0.99 correlation with #17       |
| 17  | % non-UK identity           | % population not self-identifying as from UK   | 2011 Census – KS202EW                           |                                      |
| 18  | % Recent migrants (mb)      | % of immigrants who arrived in last 2 years (migrant base)                               | 2011 Census – QS803EW                           |                                      |
| 19  | % Recent migrants (UKb)     | % of immigrants who arrived in last 2 years (UK population base)                         | 2011 Census – QS803EW                           | Yes: 0.95 correlation with #18       |
| 20  | % Poor English              | % people aged 3+ years with English rated as poor  | 2011 Census – DC2803EW                          |                                      |
| 21  | % In-migration (total)      | % population who moved into neighborhood in previous 12 months                           | 2011 Census – MM01CUK                           |                                      |
| 22  | % In-migration (overseas)   | % total population who moved into the neighborhood from outside UK in previous 12 months | 2011 Census – MM01CUK                           |                                      |
| 23  | % Out-migration             | % population who moved out of neighborhood in previous 12 months                         | 2011 Census – MM01CUK                           |                                      |
| 24  | Rural-Urban category        | ONS Rural-urban classification (urban/town&fringe/rural)                                 | 2014 Rural-Urban Classification                 | Yes: no substantial factor loading   |
| 25  | Mean distance to work       | Mean distance (km) travelled to work by working population                               | 2011 Census – QS702EW                           |                                      |
| 26  | Journey time to town        | Average journey time in minutes to nearest town center by car                            | ONS Journey Time Statistics <sup>27</sup>       |                                      |
| 27  | Area non-domestic buildings | Area of non-domestic buildings (km <sup>2</sup> )  | ONS Generalized Land Use Database <sup>26</sup> |                                      |
| 28  | Area greenspace             | Area of greenspace (km <sup>2</sup> )  | ONS Generalized Land Use                        |                                      |

|  |            |                                  |   |                                    |
|--|------------|----------------------------------|---|------------------------------------|
|  |            |                                  | Database <sup>26</sup>                          |                                    |
| 29   | Area water | Area of water (km <sup>2</sup> ) | ONS Generalized Land Use Database <sup>26</sup> | Yes: no substantial factor loading |
| <b>Abbreviations:</b> EFA, Exploratory Factor Analysis; BME, Black Ethnic Minority. KMO: Kaiser-Meyer-Olkin sampling adequacy. Census data accessed from <a href="http://www.nomisweb.co.uk/census/2011">http://www.nomisweb.co.uk/census/2011</a> |            |                                  |   |                                    |

**eTable 2: Over-dispersion data for each outcome**

| <b>Outcome</b>                   | <b>N</b> | <b>Mean</b> | <b>Variance</b> |
|----------------------------------|----------|-------------|-----------------|
| All psychoses (F20-33)           | 61,803   | 0.01        | 0.01            |
| Non-affective psychoses (F20-29) | 61,803   | 0.01        | 0.01            |
| Affective psychoses (F30-33)     | 61,803   | <0.01       | <0.01           |

Legend: For all outcomes, there was no evidence that variance in the outcome, exceeded the mean, suggesting data did not violate this Poisson assumption

**eTable 3: Neighborhood-level descriptive characteristics of ethnic density, fragmentation and diversity, by ethnic group**

| Neighborhood-level exposure                               | Median          | IQR         | Correlation with:           |
|---|-----------------|-------------|-----------------------------|
| <b>Ethnic density (%)</b>                                 |                 |             | <i>Ethnic fragmentation</i> |
| White British   | 94.5            | 88.9 – 96.5 | -0.12*                      |
| White other   | 2.9             | 2.0 – 5.3   | -0.18*                      |
| Mixed White and Black Caribbean                           | 0.3             | 0.2 – 0.5   | -0.60*                      |
| Mixed other   | 0.8             | 0.5 – 1.2   | -0.56*                      |
| Indian  | 0.4             | 0.2 – 0.9   | -0.67*                      |
| Pakistani   | 0.2             | 0.1 – 0.4   | -0.42*                      |
| Bangladeshi   | 0.2             | 0.1 – 0.3   | -0.67*                      |
| Black African   | 0.3             | 0.1 – 0.6   | -0.72*                      |
| Black Caribbean   | 0.2             | 0.1 – 0.3   | -0.56*                      |
| Arabic  | 0.1             | 0.1 – 0.2   | -0.68*                      |
| Any other ethnic group                                    | 0.8             | 0.4 – 1.4   | -0.47*                      |
| <i>Kruskal-Wallis <math>\chi^2</math> 10d.f.; p-value</i> | 2955.6; p<0.001 |             |                             |
| <b>Ethnic fragmentation (%)</b>                           |                 |             | <i>Ethnic diversity</i>     |
| White British   | 19.8            | 15.9 – 24.4 | 0.12*                       |
| White other   | 22.6            | 18.1 – 27.2 | -0.23*                      |
| Mixed White and Black Caribbean                           | 53.4            | 44.3 – 63.8 | -0.35*                      |
| Mixed other   | 34.6            | 28.0 – 42.6 | -0.43*                      |
| Indian  | 59.9            | 46.4 – 72.7 | -0.51*                      |
| Pakistani   | 78.4            | 64.7 – 87.2 | -0.60*                      |
| Bangladeshi   | 82.8            | 70.9 – 89.6 | -0.47*                      |
| Black African   | 65.4            | 51.0 – 77.6 | -0.55*                      |
| Black Caribbean   | 65.1            | 53.0 – 71.2 | -0.42*                      |
| Arabic  | 79.7            | 66.6 – 88.7 | -0.64*                      |
| Any other ethnic group                                    | 39.9            | 31.8 – 49.5 | -0.43*                      |
| <i>Kruskal-Wallis <math>\chi^2</math> 10d.f.; p-value</i> | 3027.2; p<0.001 |             |                             |
| <b>Ethnic diversity (z-score)</b>                         |                 |             | <i>Ethnic density</i>       |
| White British   | -0.3            | -0.6 – 0.2  | -0.87*                      |
| White other   | -0.3            | -0.6 – 0.2  | 0.87*                       |
| Mixed White and Black Caribbean                           | -0.3            | -0.6 – 0.4  | 0.21*                       |
| Mixed other   | -0.3            | -0.6 – 0.3  | 0.82*                       |
| Indian  | -0.2            | -0.5 – 0.5  | 0.51*                       |
| Pakistani   | 0.1             | -0.4 – 0.9  | 0.36*                       |
| Bangladeshi   | 0.0             | -0.5 – 0.8  | 0.26*                       |
| Black African   | -0.2            | -0.5 – 0.5  | 0.56*                       |
| Black Caribbean   | -0.1            | -0.4 – 0.7  | 0.25*                       |
| Arabic  | 0.0             | -0.4 – 0.9  | 0.52*                       |
| Any other ethnic group                                    | -0.3            | -0.6 – 0.3  | 0.84*                       |
| <i>Kruskal-Wallis <math>\chi^2</math> 10d.f.; p-value</i> | 109.4; p<0.001  |             |                             |

**Footnote:** Median values of ethnic density, fragmentation & diversity by ethnic group, across 530 neighborhoods in the SEPEA catchment area. [Ethnic fragmentation describes own-group ethnic fragmentation and is the % of an ethnic group which would have to move to another part of the neighbourhood to achieve perfect ethnic integration: higher values indicate lower own-group fragmentation/higher segregation from the remainder of the population.](#) Data confirms higher own-group ethnic density and lower fragmentation in the white British group than ethnic minority groups. White British, white other and people of mixed ethnic groups tended to live in less ethnically diverse neighborhoods than other ethnic groups. For all ethnic groups, higher own-group ethnic density was negatively correlated with ethnic fragmentation (i.e. positively correlated with ethnic segregation), though the magnitude of this effect varied. Own-group ethnic fragmentation was also correlated with neighborhood-level ethnic diversity. Here, for the white British group, greater fragmentation was associated with greater ethnic diversity, for all other groups greater fragmentation (i.e. lower segregation) was associated with greater neighborhood ethnic diversity. Finally, greater own-group ethnic density was strongly negatively correlated with neighborhood-level ethnic diversity in the white British group, but strongly positively correlated with ethnic diversity for all other ethnic groups.  
d.f.: degrees of freedom; \*p<0.05

**eTable 4: Rotated factor loadings following EFA<sup>a</sup>**

| Variable                    | Factor             |               |              |                    |
|-----------------------------|--------------------|---------------|--------------|--------------------|
|                             | 1 Ethnic diversity | 2 Deprivation | 3 Urbanicity | 4 Social isolation |
| % non-UK identity           | 0.92               |               |              |                    |
| % In-migration (overseas)   | 0.91               |               |              |                    |
| % In-migration (total)      | 0.83               |               |              | 0.43               |
| % Ethnic diversity          | 0.81               |               |              |                    |
| % Age 16-35 density         | 0.78               |               |              |                    |
| % Out-migration             | 0.74               |               |              | 0.48               |
| % Recent migrants (mb)      | 0.74               |               |              |                    |
| % Privately rented housing  | 0.71               |               |              | 0.48               |
| % Multiple deprivation      |                    | 0.82          |              |                    |
| % Poor English              | 0.53               | 0.64          |              |                    |
| % Single parent household   |                    | 0.63          |              |                    |
| % Socially rented housing   |                    | 0.61          |              |                    |
| % No car ownership          |                    | 0.58          |              | 0.60               |
| % Non-Cohabiting adults     | 0.41               | 0.51          |              | 0.64               |
| % Inequality                |                    | -0.41         |              |                    |
| Area greenspace             |                    |               | -0.82        |                    |
| Area non-domestic buildings |                    |               | -0.68        |                    |
| Mean distance to work       |                    |               | -0.67        |                    |
| Journey time to town        |                    |               | -0.61        |                    |
| Population density          |                    |               | 0.50         | 0.41               |
| % No central heating        |                    |               |              | 0.49               |
| % Single household          |                    |               |              | 0.77               |

<sup>a</sup>For clarity, only loadings  $\geq \pm 0.4$  are displayed. Varimax rotation used.