Ethnic disparities in psychotic experiences explained by area-level syndemic effects

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Background
Ethnic inequalities in health outcomes are often explained by socioeconomic status and concentrated poverty. However, ethnic disparities in psychotic experiences are not completely attenuated by these factors.

Aims
We investigated whether disparities are better explained by interactions between individual risk factors and place-based clustering of disadvantage, termed a syndemic.

Method
We performed a cross-sectional survey of 3750 UK men, aged 18–34 years, oversampling Black and minority ethnic (BME) men nationally, together with men residing in London Borough of Hackney. Participants completed questionnaires covering psychotic symptoms, substance misuse, crime and violence, and risky sexual health behaviours. We included five psychotic experiences and a categorical measure of psychosis based on the Psychosis Screening Questionnaire.

Results
At national level, more Black men reported psychotic experiences but disparities disappeared following statistical adjustment for social position. However, large disparities for psychotic experiences in Hackney were not attenuated by adjustment for social factors in Black men (adjusted odds ratio, 3.24; 95% CI 2.14–4.91; P < 0.002), but were for South Asian men. A syndemic model of joint effects, adducing a four-component latent variable model of joint effects, adducing a four-component latent variable measuring psychotic experiences in non-clinical samples is important.

Conclusions
Syndemic effects result in higher rates of non-affective psychosis among BME persons in certain inner-Urban settings. Further research should investigate how syndemics raise levels of psychotic experiences and related health conditions in Black men in specific places with multiple deprivations.

Declaration of interest
K.B. is Editor in Chief of the British Journal of Psychiatry but played no part in the review and decision process.

Keywords
Psychotic experiences; syndemic; ethnic/racial disparities; area-level effects; multiple morbidity.

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Syndemic theory
A syndemic is defined by Singer et al11 as an aggregation of two or more diseases or other health conditions in a population in which there is some level of deleterious biological or behavioural interface that exacerbates the negative health effects of any or all of the diseases involved. Syndemics involve adverse interaction between diseases and health conditions of all types, including psychiatric morbidity and behavioural conditions, and are most likely to emerge under conditions of health inequality caused by poverty, stigmatisation, stress or structural violence.12 These factors show synergy, are mutually causative, and studies need to reconsider how to assess causality. The cumulative effect of experiencing these co-occurring problems is therefore greater than experiencing each constituent problem in isolation.11–13

Diseases co-occur in particular temporal or geographical contexts because of harmful social conditions (disease concentration) and can interact at the level of populations and individuals, with...
mutually enhancing deleterious consequences (disease interaction). Substantive theory would imply that BME persons living in areas not subject to syndemic effects will not show substantial disparities from the majority White population, and such disparities as emerge will not be attenuated by adjustment for socioeconomic deprivation.

To test this hypothesis, we conducted surveys of young adult men from a representative sample of the UK population and a sample from an area characterised by socioeconomic deprivation. Our aims were to (a) compare ethnic disparities in the prevalence of psychotic experiences in the general population of the UK with those from a specific deprived area of inner-urban London (BME males compared with the majority White male population); (b) compare BME with White men on a range of mental health and high-risk behaviours; (c) when focussing on psychotic experiences as outcome, investigate whether other health conditions had synergistic effects on their prevalence; and (d) investigate the potential synergistic effects between ethnicity and location on the prevalence of a syndemic comprising four health conditions (including psychotic experiences).

### Method

#### Study participants

The Second Men’s Modern Lifestyles Survey was carried out in 2011, using random location sampling, an advanced form of quota sampling shown to reduce potential biases introduced when interviewers are able to choose locations to sample from. Individual sampling units (census areas of 150 households) were randomly selected within British regions in proportion to population. The main survey derived a representative sample of young men aged 18–34 years from England, Scotland and Wales. There were two boost surveys: young BME men selected from output areas with a minimum of 5% BME inhabitants, and output areas in the London Borough of Hackney. Hackney was selected for comparison with the general population because of its ethnic diversity and exceptionally high levels of recorded health and social problems. Identical sampling principles were used for each survey type.

A self-administered questionnaire piloted in a previous survey was adapted. Informed consent was obtained from survey respondents who completed pencil and paper questionnaire in privacy and were paid £5 for participation (see Supplementary material for survey script). The study was approved by Queen Mary University London Ethics Committee.

The unweighted sample included 3725 men and the weighted sample included 3750 men, all aged 18–34 years; 1999 (53.3%) were from the representative survey, 991 (26.4%) were from the BME sample and 760 (20.3%) were from Hackney. Because most BME persons in the UK are of Black African or Caribbean origin or from the Indian subcontinent (Indian, Pakistani or Bangladeshi — referred to subsequently as South Asian), we excluded other, smaller BME subgroups from analyses.

#### Health-related and other measures

We evaluated 19 health-related measures from 4 different domains: sexual health/risks, defined as ≥10 sexual partners in the past year, contraceptive use rare/never, sex with prostitutes, anal sex, sex with men, forced sex on partners or sexually transmitted infection; substance dependence, defined as alcohol or drug dependence; psychiatric morbidity, defined as anxiety disorder, depressive disorder or psychosis; and violence and criminality, defined as repeated assaults/attacks, intimate partner violence, fear of violent victimisation, weapon carrying, gang membership, friends encouraging criminal activity, or imprisonment.

The Psychosis Screening Questionnaire (PSQ) covers hypomania, thought interference, paranoid ideation, strange experiences and auditory and visual hallucinations in the past year. A positive screening for psychosis was recorded if three or more criteria were met, as in previous surveys.

The Hospital Anxiety and Depression Scale defined anxiety and depression based on scores ≥11 in the past week. Scores ≥20 on the Alcohol Use Disorders Identification Test and scores ≥25 on the Drug Use Identification Test were used to identify alcohol or drug dependence, respectively.

Participants were asked if they had ever seen a psychologist or psychiatrist or had ever been admitted to a psychiatric hospital.

#### Statistical analysis

Associations between demography and ethnicity were established through logistic regression analyses. Adjusted models were fitted to study relationships between ethnicity and each health outcome, allowing for differential effects by survey. BME subgroups were contrasted with White men in the main survey. Adjustments were made for age, single status, non-UK birthplace and Index of Multiple Deprivation Rank. We also compared prevalences of health outcomes among ethnic minority groups in the main and Hackney surveys.

To validate the structure of the health domains and derive domain factor scores, we performed confirmatory factor analysis (CFA). A weighted least square mean–variance-adjusted estimator was used to account for bias in estimates owing to non-linearity of binary indicators. For identification of the CFA model, item variances were allowed to be estimated freely. The model was standardized by fixing factor variances at 1. Model fit was assessed by root-mean-square error of approximation (RMSEA), the comparative fit index (CFI) and the Tucker–Lewis index (TLI). Values of ≤0.06 for RMSEA, and ≥0.95 for CFI and TLI, indicate very good model fit.

The CFA model showed strong correlations among four health dimensions. To investigate potential syndemic effects, the model was extended to allow for a higher-order latent variable representing a general syndemic dimension, modelled in terms of ethnicity, survey type and their interaction (second-order factor model).

Having used CFA to identify substance misuse, sexual health and violence and crime factors, factor scores derived from this CFA model were then used to examine associations with indicators of psychiatric morbidity (i.e. three or more PSQ criteria and anxiety disorder; prevalence 15%), and their possible interactions. To avoid issues related to collinearity, we examined associations/interactions using two factors at a time (i.e. pairwise): sexual health with substance misuse, and sexual health with violence and crime.

Appropriate non-response weights were used throughout. We used robust s.e. to account for correlations within survey areas owing to clustering within postcodes. A significance level of 0.05 was adopted throughout.

Statistical analyses were performed using Stata version 13 for Windows and Mplus version 7.1 for Windows (Muthén LK and Muthén BO, Los Angeles, USA; see https://www.statmodel.com/).

#### Results

### Disparities in psychotic experiences

BME and White men in Hackney differed in sociodemographic characteristics from White men in the general British population...
Because first-order syndemic factors were highly correlated, we followed standard SEM modelling practice by developing a second-order CFA, thereby generating a general syndemic factor that linked first-order health factor domains. Supplementary Figure 2 confirms that a second-order syndemic factor should be included in the model (fit indices: RMSEA = 0.025, 95% CI 0.022–0.027, CFI = 0.959, TLI = 0.951).

Table 4 shows evidence of syndemic effect (i.e. positive interaction) between high-risk sexual behaviour and violence/criminality factors in the association with psychotic experiences and anxiety. Similarly, there was evidence of a syndemic effect between the substance misuse and sexual health on the psychotic experiences and anxiety outcome. In the presence of both pairs of factors (substance misuse × sexual health; sexual health × violence and criminality), their combined associations with psychotic experiences and anxiety were significantly increased.

Supplementary Table 2 compares BME groups defined by location for the general syndemic factor. In the main national survey, there were no significant differences in factor scores between Black and White men. However, scores for South Asian men were significantly lower (P < 0.001) than the White group.

Scores for White, Black and South Asian subgroups in Hackney were significantly higher compared with White men in the main national survey (P < 0.001). We estimated the effect of location (i.e. moderation) on ethnic differences in the latent syndemic score. Supplementary Table 2 shows evidence of significant moderation by location on BME group differences from White men. More specifically, being in Hackney significantly increased the latent syndemic score by 0.834 (P < 0.001) among Black men, and by 0.376 (P < 0.05) among South Asian men.

Discussion

Our findings are new and describe a syndemic of four health conditions: psychotic experiences and anxiety, substance dependence, high-risk sexual behaviour and crime and violence. After selecting psychotic experiences as outcome of interest, we demonstrated synergy between other components on prevalence of men reporting three or more psychotic experiences and severe anxiety. We additionally showed important area-level effects on psychotic experiences. Most significantly, BME in the national population did not show disparities in psychotic experiences observed in previous population studies after adjusting for both social status and neighbourhood effects. This corresponds to US studies of other health outcomes. In addition, they did not report more substance dependence, high-risk sexual behaviour, crime/violence or poorer mental health, with the exception being anxiety disorder among South Asian men. In marked contrast, Black men in Hackney showed higher number of psychotic experiences, more had putative diagnoses of psychosis and all had higher levels of all psychotic experiences, except hallucinations. We also demonstrated an interaction between Black ethnicity and living in Hackney on prevalence of the syndemic (comprising all four health conditions) to indicate location and that Black men were affected most severely by the syndemic.

To the best of our knowledge, the prevalence of Black men in Hackney reporting psychotic experiences was the highest reported among studies using the PSQ. They were also more likely to have consulted a psychiatrist or psychologist and been admitted to a psychiatric hospital. South Asian men were more likely to have experienced thought insertion and hypomania, and to have been admitted to hospital. Anxiety and depressive disorder, alcohol dependence, high-risk sexual behaviour and gang membership were also more prevalent among Black and South Asian men in Hackney, and
Black men reported more violence and criminality. White men in Hackney also reported more anxiety and depression, alcohol dependence and more sexual partners than their counterparts in the general population, showing that all ethnic groups are vulnerable to area effects, and that area × ethnicity interactions should be studied in future research.

We identified a four-component syndemic that explained our findings. First, we used an aggregation of four health conditions by factor analysis. Second, we examined the interactions between these health conditions, which included substance dependence, high-risk sexual behaviour and violence and criminality on psychotic experiences and anxiety disorder. Although each component represented different domains and pathways, the clustering of multiple risk factors increased the prevalence of psychotic experiences, and vice versa. These analyses correspond to recommendations that multiplicative effects should be demonstrated if the aim is to confirm synergy between hypothesised components of a syndemic. Third, we examined an additional interaction analysis showing strong area-level effects, which located the syndemic primarily in Hackney and severely affected Black and, to a lesser extent, young South Asian men.

Although social inequality plays a crucial role in the clustering of syndemic factors, neither social status nor neighbourhood deprivation attenuated the disparities we observed in Hackney. Furthermore, because BME and White subgroups in Hackney were more likely to be employed than their counterparts in the general population, syndemic effects were not simply related to low socioeconomic status.

### Ethnic disparities and syndemic effects

An alternative explanation for previously recorded disparities in psychosis is that syndemic effects differentially affect BME and other socially segregated and excluded subgroups, but in a relatively small number of inner-urban areas characterised by extreme socioeconomic deprivation. These may have disproportionate effects on recorded levels of clinical psychosis in these areas explained by synergy between psychotic experiences and anxiety and severe substance misuse, but also between health-related sexual behaviours and violent/criminal behaviour. The demographic characteristics of Hackney and its level of health problems are seen only in a very small number of inner-urban UK areas. Our findings suggest that BME persons in these areas are unrepresentative of BME persons in national samples and those located elsewhere in the UK, being subject to an excess of risk factors that remain unknown and require further investigation.

The components of the syndemic we identified largely correspond to risk factors previously identified for psychotic experiences, including alcohol and cannabis misuse, same-sex behavioural aspects, anxiety disorder, traumatic experiences and stress, low social cohesion and crime victimisation. Bi-directionality between psychotic experiences and risk factors has been specifically demonstrated in alcohol misuse and anxiety disorders (including post-traumatic stress disorder), as well as for psychotic illness. However, most studies investigate single risk factors which, although strongly associated with psychosis, are not by themselves sufficient to explain a large excess of either psychotic experiences or clinical psychosis in a population.

### Pathways and mechanisms

Further research is required into specific pathways through which the psychiatric morbidity and health conditions we have described interact both in individuals and populations to allow multiplication of adverse health effects. Being exposed to violence, both as victim and perpetrator in violent neighbourhoods, particularly in the context of gang membership, is strongly associated with the specific association between psychotic symptoms and anxiety. The pathway of this relationship is believed to be stress-promoted immune system deregulation caused by living in a pervasive atmosphere of fear and the perceived threat of ever-present violence. Sexual health and high-risk sexual behaviour correspond to other components of the syndemic. Sexually transmitted diseases, particularly HIV, are associated with anxiety and depression together with substance misuse and non-sexual violence. Furthermore, recent research into addictions and addictive behaviours has identified underlying similarities between sexual behaviours (which have features of impulsivity, compulsivity, negative emotional states and craving) and substance use disorders, suggesting common causes and possible pathways to other psychiatric and cognitive disorders, constituting a basis for dual-diagnosis disorders. This interpretation fits the notion that syndemic effects lead to illnesses, that these are a manifestation of individual risks and area effects and that multiple disadvantages are pathways to multiple illnesses, which mutually increase risks.

### Limitations

Our study has several limitations. First, our hypothesis that a multi-component syndemic may explain high rates of psychotic experiences is currently based on results from a single geographical location (Hackney). However, there are a small number of other UK inner-urban areas with similar levels of socioeconomic deprivation together with...
Table 2 Adjusted effects at psychotic experience according to BME group and survey

<table>
<thead>
<tr>
<th>Psychosis measures</th>
<th>Asian</th>
<th>Hackney</th>
<th>Hackney</th>
<th>Hackney</th>
<th>Hackney</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of symptoms (mean, s.d.)</td>
<td>0.21 (0.62)</td>
<td>0.38 (0.82)</td>
<td>1.49 (1.11–2.56)*</td>
<td>0.70 (0.21)</td>
<td>0.70 (0.21)</td>
</tr>
<tr>
<td>PSQ 1+</td>
<td>71 (9.3)</td>
<td>31 (4.0)</td>
<td>1.57 (1.06–2.32)**</td>
<td>27 (9.0)</td>
<td>27 (9.0)</td>
</tr>
<tr>
<td>PSQ 2+</td>
<td>11 (1.4)</td>
<td>13 (1.7)</td>
<td>1.42 (0.90–2.23)</td>
<td>11 (1.4)</td>
<td>11 (1.4)</td>
</tr>
<tr>
<td>PSQ 3+</td>
<td>31 (4.0)</td>
<td>31 (4.0)</td>
<td>1.49 (1.06–2.32)*</td>
<td>27 (9.0)</td>
<td>27 (9.0)</td>
</tr>
<tr>
<td>Hallucinations</td>
<td>16 (2.2)</td>
<td>16 (2.2)</td>
<td>1.56 (1.06–2.32)*</td>
<td>11 (3.5)</td>
<td>11 (3.5)</td>
</tr>
<tr>
<td>Thought insertion</td>
<td>31 (1.8)</td>
<td>12 (4.6)</td>
<td>3.16 (1.61–6.21)**</td>
<td>29 (6.0)</td>
<td>29 (6.0)</td>
</tr>
<tr>
<td>Paranoid ideation</td>
<td>77 (4.5)</td>
<td>10 (4.0)</td>
<td>0.99 (0.51–1.89)</td>
<td>31 (6.5)</td>
<td>31 (6.5)</td>
</tr>
<tr>
<td>Strange experiences</td>
<td>99 (5.8)</td>
<td>21 (8.2)</td>
<td>1.51 (0.86–2.29)</td>
<td>42 (16.9)</td>
<td>42 (16.9)</td>
</tr>
<tr>
<td>Hallucinations+Psychosis+</td>
<td>38 (5.3)</td>
<td>31 (4.0)</td>
<td>1.58 (1.06–2.32)</td>
<td>16 (4.2)</td>
<td>16 (4.2)</td>
</tr>
<tr>
<td>Admission to psychiatric hospital and PSQ+</td>
<td>5 (0.3)</td>
<td>3 (0.2)</td>
<td>2.36 (0.42–13.20)</td>
<td>2 (0.2)</td>
<td>2 (0.2)</td>
</tr>
</tbody>
</table>

All data are weighted frequencies, percentages and estimates (AOR, 95% CI). Adjusted for age, being single, non-UK born, social class and IMDR. With Bonferroni correction (based on five estimates for each outcome).

BME, Black and minority ethnic; AOR, adjusted odds ratio; PSQ, Psychosis Screening Questionnaire; IMDR, Index of Multiple Deprivation Rank.

a. In reference to White men in the main survey.

*P < 0.05, **P < 0.01, ***P < 0.0001.

Implications

Our study suggests a new theoretical explanation for ethnic disparities in psychosis observed in UK inner-urban areas. It corresponds to research emphasising social factors in the study of psychosis and urbanicity, indicating effects of social adversity and exclusion in relation to observed geographical variation. Although the study is primarily from the perspective of psychotic experiences as the primary outcome, bi-directionality with anxiety, drug and alcohol misuse, violence and criminality, substance misuse and sexual behaviour. The alternative would be to rely on a method requiring statistical weighting to adjust for attrition, which may be particularly high among this subgroup of the population. However, statistical power and effect calculations assume probability sampling and do not technically apply to quota samples like this (see Supplementary material).
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sensitivity, to schizophrenia. Hyperactivity of the hypothalamic-pituitary-adrenal axis and increased sensitivity to stress promote emergence of psychotic experiences.\textsuperscript{28} Transitory developmental expression of psychotic experiences may persist and progress to clinical impairment depending on the degree of environmental risk the person is additionally exposed to.\textsuperscript{38} The syndemic effects we identified would therefore imply exceptional risks, further magnified by synergy between these risk factors. However, because these risks are substantially increased by specific health-related behaviours, interventions are needed to discourage progression from psychotic experiences to clinical psychosis by encouraging reduction of these behaviours in vulnerable populations.

A key finding was that most BME men in the UK function as well as their White counterparts despite being more likely to live in lower income households. Young BME men can therefore clearly overcome adverse factors contributing to mental health disparities. However, syndemic effects have a differential impact. It may thus be difficult for BME men to avoid these adverse outcomes when living in areas of concentrated poverty and ethnic density high-risk behaviours may be condemned and encouraged within socially isolated and excluded population subgroups. Moreover, such behaviours are partly determined by multiple political, economic and social challenges beyond the control of these populations. Interventions that promote mental health equality by reducing the gap between the most and least deprived have been identified would imply exceptional risks, further magnified by synergy between these risk factors. However, because these risks are substantially increased by specific health-related behaviours, interventions are needed to discourage progression from psychotic experiences to clinical psychosis by encouraging reduction of these behaviours in vulnerable populations.
require a public mental health approach to prevention and control, not only of the syndemic components, but the forces that originally determined and now tie these components together.\

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Supplementary material
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