

Understanding the effect of ethnic density on mental health: multi-level investigation of survey data from England

Jayati Das-Munshi, MRC training fellow in health services and health of public research,¹ Laia Becares, research fellow,² Michael E Dewey, professor of statistical epidemiology,¹ Stephen A Stansfeld, professor of psychiatry,³ Martin J Prince, professor of psychiatric epidemiology¹

¹Institute of Psychiatry, King's College London, London SE5 8AF, UK

²Department of Epidemiology and Public Health, University College London, UK

³Centre for Psychiatry, Queen Mary, University of London, Barts and the London School of Medicine, UK

Correspondence to: J Das-Munshi
jayati.das-munshi@kcl.ac.uk

Cite this as: *BMJ* 2010;341:c5367
doi:10.1136/bmj.c5367

ABSTRACT

Objectives To determine if living in areas where higher proportions of people of the same ethnicity reside is protective for common mental disorders, and associated with a reduced exposure to discrimination and improved social support. Finally, to determine if any protective ethnic density effects are mediated by reduced exposure to racism and improved social support.

Design Multi-level logistic regression analysis of national survey data, with area-level, own-group ethnic density modelled as the main exposure.

Participants and setting 4281 participants of Irish, black Caribbean, Indian, Pakistani, Bangladeshi, and white British ethnicity, aged 16–74 years, randomly sampled from 892 “middle layer super output areas” in England.

Main outcome measures Common mental disorders (assessed via structured interviews); discrimination (assessed via structured questionnaire); and social support and social networks (assessed via structured questionnaire).

Results Although the most ethnically dense areas were also the poorest, for each 10 percentage point increase in own-group ethnic density, there was evidence of a decreased risk of common mental disorders, for the full ethnic minority sample (odds ratio 0.94 (95% confidence interval 0.89 to 0.99); $P=0.02$, trend), for the Irish group (odds ratio 0.21 (0.06 to 0.74); $P=0.01$, trend), and for the Bangladeshi group (odds ratio 0.75 (0.62 to 0.91); $P=0.005$, trend), after adjusting for a priori confounders. For some groups, living in areas of higher own-group density was associated with a reduction in the reporting of discrimination and with improved social support and improved social networks. However, none of these factors mediated ethnic density effects.

Conclusions A protective effect of living in areas of higher own-group ethnic density was present for common mental disorders for some minority groups. People living in areas of higher own-group density may report improved social support and less discrimination, but these associations did not fully account for density effects.

INTRODUCTION

There is a dearth of research into factors that might account for varying rates of common mental disorders

among ethnic minority groups living in Britain. Compared with white British people, the prevalence of common mental disorders may be reduced among Bangladeshi people, increased among Irish people, and similar among black Caribbean, Pakistani, and Indian people.¹ The ethnic density hypothesis suggests that living in areas of higher own-group density may be protective for mental health.^{2,3} Protective ethnic density effects may operate through a buffering effect for residents living in high own-group ethnic density areas through improved social support and social networks, or by reducing the frequency of adverse experiences such as racism.^{4–6} However, empirical research on these mechanisms remains scant.

We conducted a multi-level analysis of cross sectional survey data to address whether living in areas of higher own-group density would be associated with a reduced risk of common mental disorders, after adjusting for a number of a priori confounders. These effects were examined for five of the main ethnic minority groups living in England—Irish, black Caribbean, Indian, Pakistani, and Bangladeshi people—as well as a white British group. We hypothesised that the odds of reporting discrimination would decline with rising own-group ethnic density, and that the odds of reporting improved social support and more extensive social networks would increase with increasing own-group ethnic density. Finally we assessed whether discrimination, improved social support, and more extensive social networks might mediate any observed ethnic density effects.

METHODS

Survey design

For this analysis, we used data from the Ethnic Minorities Psychiatric Illness Rates in the Community Survey (EMPIRIC), a cross sectional, nationally representative survey of adults (aged 16–74) undertaken in England in 2000.⁷ The survey was a follow-up of two representative, community based surveys conducted in England (the Health Survey for England 1998 and 1999).⁸ Weights were used in the Health Survey for England 1999 to account for the differing probability of selection—by postcode sector, for

households within sectors, and for the selection of adults from within households.⁸

Of the 7009 individuals who took part in the original surveys and were contacted for follow-up interview in 2000, 738 (10.5%) had died, were older than 75 years, or had moved out of the survey area.⁸ Of the 6271 respondents from the original survey who were eligible for re-interview, 1473 (23%) refused and 517 (8%) could not be contacted.⁸ This resulted in 4281 achieved interviews (68.2% of those eligible for re-interview), which comprised the dataset for our present analysis.⁸

We used regression models based on data from the Health Survey for England to derive non-response weights.⁸ Wherever possible, we have retained these survey weights for non-response in our analyses, as well as any weights to account for differing probabilities of selection in the original surveys.⁸ Further details on the survey are available in the main report.^{7,8}

Structured interviews were conducted in individuals' homes, with a trained lay interviewer matched wherever possible to the respondent's sex.⁷ When survey respondents could not complete the interview in English an interviewer who was fluent in their mother tongue was provided.⁷ Surveys were translated into Hindi, Gujarati, Bengali, Punjabi, and Urdu by a professional interpreter service.⁷

Individual-level measures

Ethnicity for all people, except for Irish respondents, was defined according to self report criteria as used in previous UK censuses.⁹ Irish ethnicity was determined according to country of parents' birth.⁷ Social class was determined according to the Registrar General's Social Class, and was classified into I/II (professional or managerial); III (skilled non-manual or skilled manual); IV (semi-skilled manual); V (unskilled manual); full time student or never worked. Respondents were asked about their highest educational qualification, these were classified into four groups: higher education (degree or equivalent), secondary (A level, GCSE, or equivalent), foreign qualifications, or none. Respondents were also asked their age, sex, and marital status (in four groups: married or cohabiting, divorced or separated, widowed, and single or never married).

All respondents were asked if, within the past 12 months, they had been physically attacked or had experienced deliberate damage to property which belonged to them. If they responded in the affirmative, they were asked: "Do you think you were attacked for reasons to do with your ethnicity?" or "Do you think any of these attacks on your property were for reasons to do with your ethnicity?" Respondents were also asked: "In the last 12 months, has anyone insulted you for reasons to do with your ethnicity? By insulted, I mean verbally abused, threatened, or been a nuisance to you?"

We used a binary summary variable which comprised affirmative responses to any of the above three questions in our analyses.

Respondents were asked about any experiences of workplace based discrimination: "Have you yourself

ever been refused a job for reasons which you think were to do with your race, colour, or religious or ethnic background?" and "Have you yourself ever been treated unfairly at work with regard to promotion or a move to a better position for reasons which you think were to do with your religious or ethnic background (I don't mean when applying for a new job)?"

We created a binary summary response variable which comprised an affirmative response to either of these two questions.

Two measures from the Close Person's Questionnaire were used to assess social support.¹⁰ Respondents were also asked to report how many people they felt close to, and were asked to nominate the person who they felt closest to.¹⁰ Respondents were asked to rate how far their nominated closest person provided them with practical support and confiding or emotional support.¹⁰

Neighbourhood-level measures

All area level measures were provided by the National Centre for Social Research and matched to anonymised participant records. In order to protect the confidentiality of respondents, the lowest geographical area at which measures were available was at the level of middle layer super output area (MSOA).¹¹ Such areas have a minimum population of 5000, and a mean population of about 7200 people.¹¹

We used the Index of Multiple Deprivation from 2000, in fifths, as a measure of area-level deprivation, matched to MSOA level.¹² Ethnic density was defined as the percentage of ethnic minority people living within each MSOA and was supplied by the National Centre for Social Research as a continuous variable with "random noise" added per case, in order to protect confidentiality of respondents. This meant that the correlation between the true ethnic density value and the values provided were 0.975.

To determine cut points, we examined the total range for each ethnic density variable and divided it into equal widths along its measurement scale. The "random noise" added to each variable resulted in density ranges which were at times less than 0 (for example, for the Bangladeshi group the resultant range was from -1.87% to 61.54%). With this approach, the resultant cut points for each of the ethnic density variables were: Bangladeshi 14%, 30%, 46%; black Caribbean 5%, 11%, 18% (range -1.63% to 24.09%); Indian 15%, 33%, 51% (range: -2.71% to 68.53%); Pakistani 16%, 35%, 53% (range -3.07% to 72.20%). For Irish ethnic density (range -0.33% to 14.14%) and white British population density (range 7.35% to 107.24%), the extreme positive and negative skew of the two distributions respectively, led us to take a pragmatic approach whereby we used cut points at 1%, 2%, and 5% for Irish ethnic density and at 75%, 90%, and 95% for white British population density.

Tests for trend and departure from linear trend were performed with likelihood ratio tests. We retained the categorisations as described above of the ethnic density

variables when statistical tests did not suggest a straightforward linear relationship between ethnic density and dependent variable. When tests for trend or departure from linear trend suggested that the relationship of ethnic density with outcome variables was linear, we divided the original density variable by 10 so that we could estimate the association with common mental disorders for every 10 percentage point increase in own-group density.

Outcome: common mental disorders

A structured validated diagnostic tool, the clinical interview schedule-revised (CIS-R) was used to assess common mental disorders (anxiety and depression).¹³ Initial filter questions focus on symptoms experienced in the previous month, with more detailed questions asking about the previous week. We considered common mental disorder to be present if the CIS-R total score was >11.¹³

Analysis

All analyses were performed in STATA 10.¹⁴ Age, social class, educational level, sex, marital status, and area-level deprivation were analysed as a priori confounders. Interpersonal racism, social support, and social networks were analysed as potential mediators in the association between ethnic density and common mental disorders. For analyses not involving area-level measures, data were weighted and took into account survey structure, and we used the design based Wald test to assess the strength of associations.

To account for intra-cluster correlation, and to enable the modelling of variance at both area level and individual level, we performed a multi-level analysis of unweighted data, with the middle layer super output area specified as the grouping variable and individuals nested within these areas. Two-level multi-level models with random intercepts and fixed effects for each predictor variable were specified. Each model assumed that common mental disorders varied by neighbourhood, and the models were run separately for each ethnic minority group.

Sensitivity analyses comparing these analyses with approaches using robust standard errors with survey weightings retained confirmed <5% variation in odds ratios using either approach.

Assessment of mediation

To assess for mediation, we took the following steps¹⁵:

1. The association between own-group density and all mediators was assessed for significance
2. The association between own-group density and common mental disorders was assessed for significance in the absence of mediators
3. The association of each mediator on common mental disorders was assessed for significance
4. The effect of ethnic density on common mental disorders was assessed after the addition of each of the

mediators and then all of the mediators added together, to check for a sizeable shrinkage in the association.

Each of these conditions had to be met for mediation to be considered present.¹⁵ We also checked for interactions between each mediating variable and each ethnic density variable.¹⁶

RESULTS

The weighted prevalence of common mental disorders was: white British 16% (n=837), Irish 19% (n=733), black Caribbean 17% (n=694), Bangladeshi 13% (n=650), Indian 18% (n=643), and Pakistani 20% (n=724).

Table 1 shows key demographic features for the sample. In general, Irish people in the sample had a similar demographic profile to the white British group on age, social class, education, and marital status. Other ethnic minority groups were more likely to be of lower social class than the white British group and tended to be younger; this was especially stark for the Bangladeshi group. The Bangladeshi and Pakistani groups also had the highest proportion of people reporting no educational qualifications.

Ethnic density and area-level deprivation

In total there were 892 middle layer super output areas. Increasing ethnic density was associated with increasing area-level deprivation (Spearman's correlation coefficient: Irish 0.08, black Caribbean 0.37, Indian 0.07, Bangladeshi 0.50, Pakistani 0.40; $P < 0.001$ in each instance). The trend was reversed for increasing white British population density (correlation coefficient -0.58 ; $P < 0.001$).

Racism and discrimination

In all, 450 respondents (10%) reported interpersonal racism within the previous year, and 649 (15%) reported lifetime experiences of workplace based discrimination. The black Caribbean group reported the highest prevalence of interpersonal racism, at 13% (compared with white British and Irish groups at 6%, Indians and Pakistanis at 10%, and Bangladeshis at 7%). The black Caribbean group also reported the highest prevalence of lifetime workplace based discrimination at 36% (versus white British 4%, Irish 7%, Bangladeshis 8%, Indians 19%, and Pakistanis 16%).

Table 2 displays the associations between own-group ethnic density and the odds of reporting workplace based discrimination or interpersonal racism. With each unit increase in own-group density, the data suggested a reduction in the reporting of interpersonal experiences of racism over the previous year for all groups except the Irish and black Caribbean group. Per unit increase in own-group density, the risk of reporting lifetime workplace based discrimination seemed to decrease in the white British group, with weaker effects for the Bangladeshi group. For the black Caribbean group, the trend for this association was reversed (table 2).

Table 1 | Demographic features of 4281 participants by ethnic group (values are numbers (percentages) of participants*)

	Total (n=4281)	White British (n=835)	Irish (n=733)	Black Caribbean (n=691)	Indian (n=648)	Bangladeshi (n=650)	Pakistani (n=724)
Age (years):							
16–34	1772 (41)	260 (31)	209 (28)	269 (39)	248 (38)	378 (58)	412 (57)
35–54	1648 (38)	355 (43)	345 (47)	251 (36)	280 (43)	187 (29)	229 (32)
55–74	861 (20)	221 (26)	179 (24)	171 (25)	120 (19)	88 (13)	83 (11)
Sex:							
Male	1950 (46)	365 (44)	323 (44)	280 (40)	316 (49)	321 (49)	345 (48)
Female	2331 (54)	471 (56)	410 (56)	412 (60)	331 (51)	329 (51)	379 (52)
Social class:							
Professional or managerial	915 (21)	264 (32)	230 (31)	162 (23)	153 (24)	47 (7)	118 (16)
Skilled non-manual	717 (17)	222 (27)	146 (20)	185 (27)	160 (25)	79 (12)	124 (17)
Skilled manual	841 (20)	147 (18)	143 (19)	125 (18)	88 (14)	102 (16)	113 (16)
Semi-skilled manual	194 (5)	129 (15)	159 (22)	118 (17)	160 (25)	133 (20)	142 (20)
Unskilled manual	523 (12)	54 (6)	42 (6)	51 (7)	13 (2)	19 (3)	15 (2)
Student or never worked	973 (23)	10 (1)	6 (1)	25 (4)	61 (9)	240 (37)	181 (25)
Missing data	119 (3)	10 (1)	7 (1)	26 (4)	13 (2)	31 (5)	32 (4)
Educational attainment†:							
Higher	952 (22)	213 (26)	195 (27)	172 (25)	187 (29)	62 (10)	122 (17)
Secondary	1548 (36)	356 (43)	294 (40)	272 (39)	221 (34)	172 (26)	234 (33)
Foreign qualification, other	173 (4)	32 (4)	35 (5)	30 (4)	29 (5)	17 (3)	29 (4)
None	1428 (33)	202 (24)	183 (25)	188 (27)	189 (29)	365 (56)	301 (42)
Missing data	180 (4)	32 (4)	26 (4)	29 (4)	21 (3)	34 (5)	38 (5)
Marital status:							
Married or cohabiting	2674 (62)	518 (62)	461 (63)	279 (40)	464 (72)	446 (69)	506 (70)
Separated or divorced	314 (7)	75 (9)	78 (11)	84 (12)	32 (5)	18 (3)	26 (4)
Widowed	142 (3)	36 (4)	25 (3)	18 (3)	19 (3)	28 (4)	16 (2)
Single or never married	1150 (27)	205 (25)	169 (23)	310 (45)	132 (20)	157 (24)	176 (24)

*All values are adjusted for non-response weightings, discrepancies in totals are due to rounding errors.

†Higher education=degree or equivalent, secondary education=A level, GCSE, or equivalent.

Social support and social networks

In total, 2035 respondents (48%) reported that their nominated closest person provided high levels of practical support, 1399 (33%) reported that their closest person provided high levels of emotional or confiding support, and 3325 (78%) reported that they felt close to three or more people.

Table 2 shows the association of own-group density with social support measures. Living in areas of higher own-group density was associated with greater practical support from the nominated closest person for the Bangladeshi group and for the combined ethnic minority sample. Also, higher ethnic density was associated with reporting being close to three or more people for the Bangladeshi group.

Ethnic density and common mental disorders

Table 3 shows the association of increasing own-group ethnic density with common mental disorders for each of the groups in the study. (Web extra tables 1–7 on [bmj.com](http://www.bmj.com) show the associations by individual a priori confounders and potential mediators). Likelihood ratio tests did not support a departure from a linear trend for either ethnic density or index of multiple deprivation variables for any of the groups analysed in the association with common mental disorders. We

therefore present the models in table 3 (and the web extra tables) with these as continuous variables.

After adjusting for all a priori confounders, there was evidence of an association between a 10 percentage point increase in own-group density and reduced risk of common mental disorders for all ethnic minority groups combined (odds ratio 0.94 (95% confidence interval 0.89 to 0.99); $P=0.02$), for Bangladeshi people (odds ratio 0.75 (0.62 to 0.91); $P=0.005$), and for Irish people (odds ratio 0.21 (0.06 to 0.74); $P=0.01$) (see web extra tables 1, 3, and 5). For all of the other groups except the white British group, there seemed to be a protective effect of living in areas of higher own-group density, but the evidence was very weak.

Across all of the groups except the black Caribbean group, each quintile increase in area-level deprivation was associated with an increased odds of common mental disorders (see web extra tables). Also, across all of the groups, experiences of racism and discrimination were associated with a roughly twofold increase in common mental disorders (see web extra tables).

Final models—whether racism, social support, or social networks mediate ethnic density associations

When each of the variables for interpersonal racism, social support, and social networks were individually

Table 2 | Association of increasing own-group ethnic density with discrimination, social support, and social network measures. Values are relative odds (95% confidence intervals) unless stated otherwise

	White British (n=835)	Irish (n=733)	Black Caribbean (n=691)	Bangladeshi (n=650)	Indian (n=648)	Pakistani (n=724)	All minority groups (n=3446)
Experienced interpersonal racism in the previous year							
No (%) of group replying yes*	58 (7)	49 (7)	102 (15)	56 (9)	82 (13)	94 (13)	383 (11)
Odds per unit increase in own-group density†:							
1 (least dense)‡	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	0.24 (0.06 to 0.95)	1.78 (0.73 to 4.32)	1.06 (0.61 to 1.84)	0.35 (0.11 to 1.06)	0.81 (0.31 to 2.10)	0.97 (0.52 to 1.78)	0.74 (0.53 to 1.01)
3	0.78 (0.26 to 2.36)	1.38 (0.55 to 3.42)	1.14 (0.59 to 2.19)	0.37 (0.11 to 1.25)	0.36 (0.08 to 1.59)	0.73 (0.37 to 1.43)	0.66 (0.47 to 0.94)
4 (most dense)	0.25 (0.07 to 0.86)	2.54 (0.73 to 8.90)	0.72 (0.25 to 2.08)	0.36 (0.13 to 0.97)	0.17 (0.01 to 2.06)	0.74 (0.23 to 2.39)	0.91 (0.53 to 1.57)
P value of trend§	0.11	0.27	0.90	0.04	0.06	0.36	0.11
Ever experienced workplace based discrimination							
No (%) of group replying yes*	36 (4)	50 (7)	251 (36)	50 (8)	125 (19)	113 (16)	589 (17)
Odds per unit increase in own-group density†:							
1 (least dense)‡	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	0.19 (0.05 to 0.75)	0.68 (0.30 to 1.57)	1.01 (0.61 to 1.68)	0.51 (0.16 to 1.63)	0.67 (0.33 to 1.38)	1.01 (0.54 to 1.87)	1.15 (0.85 to 1.55)
3	0.09 (0.02 to 0.43)	1.04 (0.49 to 2.25)	2.01 (1.08 to 3.72)	0.37 (0.12 to 1.20)	1.31 (0.59 to 2.90)	0.91 (0.45 to 1.84)	1.17 (0.83 to 1.64)
4 (most dense)	0.07 (0.02 to 0.34)	0.45 (0.09 to 2.38)	2.06 (0.81 to 5.27)	0.43 (0.16 to 1.15)	0.21 (0.05 to 0.92)	1.29 (0.36 to 4.68)	1.37 (0.77 to 2.42)
P value of trend§	0.001	0.74	0.02	0.06	0.20	0.98	0.22
High practical support from person you feel closest to							
No (%) of group replying yes*	334 (40)	318 (44)	244 (36)	443 (69)	303 (48)	371 (52)	1679 (50)
Odds per unit increase in own-group density†:							
1 (least dense)‡	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	0.92 (0.54 to 1.58)	0.87 (0.57 to 1.33)	0.61 (0.40 to 0.94)	4.06 (1.99 to 8.32)	2.19 (1.24 to 3.85)	1.19 (0.68 to 2.09)	1.03 (0.82 to 1.31)
3	1.09 (0.66 to 1.81)	0.89 (0.58 to 1.36)	1.10 (0.67 to 1.81)	5.15 (2.27 to 11.68)	1.59 (0.81 to 3.11)	1.53 (0.81 to 2.87)	1.60 (1.24 to 2.08)
4 (most dense)	1.04 (0.64 to 1.68)	1.13 (0.55 to 2.31)	0.84 (0.40 to 1.76)	4.26 (2.17 to 8.38)	0.73 (0.28 to 1.87)	1.27 (0.35 to 4.65)	1.33 (0.87 to 2.03)
P value of trend§	0.69	0.90	0.82	<0.001	0.22	0.23	0.002
High confiding or emotional support from person you feel closest to							
No (%) of group replying yes*	303 (37)	287 (40)	210 (31)	174 (27)	203 (32)	227 (32)	1102 (33)
Odds per unit increase in own-group density†:							
1 (least dense)‡	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	1.20 (0.66 to 2.17)	0.96 (0.65 to 1.43)	0.71 (0.43 to 1.19)	1.38 (0.61 to 3.09)	2.79 (1.45 to 5.39)	0.69 (0.38 to 1.26)	0.92 (0.72 to 1.18)
3	1.87 (1.07 to 3.27)	0.66 (0.44 to 1.00)	1.10 (0.61 to 1.99)	1.48 (0.60 to 3.63)	1.21 (0.53 to 2.78)	0.95 (0.49 to 1.82)	1.04 (0.80 to 1.36)
4 (most dense)	1.21 (0.70 to 2.07)	0.78 (0.41 to 1.51)	0.73 (0.28 to 1.90)	0.98 (0.43 to 2.24)	0.94 (0.28 to 3.18)	1.67 (0.47 to 5.87)	0.91 (0.58 to 1.43)
P value of trend§	0.53	0.07	0.75	0.81	0.29	0.90	0.99
Feeling close to three or more people							
No (%) of group replying yes*	663 (80)	618 (84)	538 (78)	586 (80)	460 (71)	536 (74)	2673 (78)
Odds per unit increase in own-group density†:							
1 (least dense)‡	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	0.91 (0.26 to 3.21)	0.96 (0.45 to 2.05)	0.87 (0.51 to 1.49)	2.32 (0.98 to 5.54)	0.57 (0.24 to 1.36)	1.00 (0.49 to 2.04)	0.88 (0.63 to 1.24)
3	0.21 (0.06 to 0.69)	1.33 (0.60 to 2.96)	0.66 (0.35 to 1.26)	2.55 (0.96 to 6.76)	1.06 (0.35 to 3.19)	0.93 (0.42 to 2.05)	1.35 (0.92 to 1.97)
4 (most dense)	0.57 (0.19 to 1.76)	1.13 (0.29 to 4.51)	0.74 (0.29 to 1.91)	5.85 (2.31 to 14.81)	0.77 (0.13 to 4.52)	0.70 (0.15 to 3.27)	0.68 (0.38 to 1.23)
P value of trend§	0.14	0.54	0.23	<0.001	0.64	0.71	0.79

*Numbers and percentages take account of survey weightings for non-response.

†Odds are derived from multi-level random effects models, adjusted for area level deprivation, age, sex, marital status, education, and social class.

‡Reference value.

§P values derived through likelihood ratio tests for trend.

added into final models and then added in together, none of the effects for ethnic density on common mental disorders risk were attenuated, suggesting that these variables were not on the causal pathway between

ethnic density and common mental disorders (model 3 in table 3 and web extra tables). There were no interactions noted between any of the mediating variables and own-group ethnic density.

Table 3 | Association of common mental disorders in ethnic groups with own-group ethnic density*

Ethnic group	Median (interquartile range) of own-group ethnic density	Model 1†		Model 2‡		Model 3§	
		Odds ratio (95% CI)	P value for trend	Odds ratio (95% CI)	P value for trend	Odds ratio (95% CI)	P value for trend
White British	93.1 (84.6 to 96.9)	1.09 (0.95 to 1.24)	0.23	1.13 (0.97 to 1.30)	0.10	1.16 (1.00 to 1.36)	0.05
Irish	1.7 (0.92 to 3.01)	0.21 (0.06 to 0.73)	0.01	0.21 (0.06 to 0.74)	0.01	0.19 (0.05 to 0.72)	0.01
Black Caribbean	6.9 (2.55 to 11.61)	0.91 (0.62 to 1.36)	0.65	0.92 (0.61 to 1.40)	0.71	0.82 (0.52 to 1.28)	0.37
Bangladeshi	28.9 (10.5 to 46.8)	0.77 (0.66 to 0.92)	0.004	0.75 (0.62 to 0.91)	0.005	0.80 (0.65 to 0.99)	0.04
Indian	6.5 (3.39 to 16.31)	0.89 (0.73 to 1.07)	0.21	0.89 (0.73 to 1.10)	0.28	0.91 (0.74 to 1.10)	0.33
Pakistani	19.3 (5.99 to 38.71)	0.92 (0.83 to 1.02)	0.12	0.92 (0.81 to 1.04)	0.20	0.93 (0.82 to 1.06)	0.30
Combined ethnic minority density	36.1 (14.40 to 59.74)	0.94 (0.89 to 0.98)	0.009	0.94 (0.89 to 0.99)	0.02	0.93 (0.88 to 0.98)	0.007

*Own-group density assessed as change per 10 percentage points.

†Model 1 adjusted for area-level deprivation.

‡Model 2 adjusted as for model 1 plus social class, education, marital status, age, and sex.

§Model 3 adjusted as for model 2 plus all hypothesised mediators (discrimination and social support measures).

DISCUSSION

Principal findings

Despite the fact that areas densely populated by ethnic minority groups are also the most deprived, our findings suggest that, for some ethnic minority groups (in particular Irish and Bangladeshi people), living in areas of higher own-group density may be associated with a reduced odds of common mental disorders.

The Bangladeshi group seemed to show the most consistent associations between increasing own-group ethnic density and reports of decreased discrimination, higher practical support, and better social networks. Although there was good evidence to suggest protective ethnic density effects for the Irish group, the data did not support a mediational association between increasing Irish ethnic density and any of the measures for racism, social support, or social networks. The latter finding highlights that “ethnic density” mechanisms are likely to be heterogeneous and may not operate in the same way across groups.

Our analyses did not confirm our hypothesis that the protective effects of ethnic density for common mental disorders might be mediated by reduced exposure to racism or improved exposure to social support or social networks, although increase in ethnic density was associated with a decrease in the frequency of racist experiences and improved social support for some groups.

Limitations of study

The findings of this analysis relate to a dataset which was collected in 2000. The landscape of migration in England and the settlement of ethnic minority communities has changed over this time,¹⁷ and it is possible that the effects reported here may no longer be relevant to the groups included in this study, or to some of the more recent migrant groups to England.

Previous research has indicated that the measure used in this analysis for individual-level socioeconomic position (Registrar General’s Social Class) may not truly capture equivalent levels of deprivation in ethnic minority groups compared with white British people.¹⁸ The measure for area-level deprivation may have also inadequately assessed poverty for ethnically

dense neighbourhoods. It is possible that the residual confounding effects of socioeconomic position or area-level deprivation may have masked or minimised potential ethnic density effects. Related to this was the assumption underlying our analysis that there were no other unmeasured confounding variables in the association between ethnic density and any of the mediating variables (racism and social support), or between mediating variables and common mental disorders.^{16,19} Although we have attempted to adjust for confounders, any residual confounding effects may have biased estimates of mediation.¹⁹

As this was a secondary analysis of an English dataset in a relatively novel area where effect sizes are not established, it was not possible to determine study power before analysis. Insufficient power may have accounted for the apparent lack of an effect for some of the ethnic groups. This is supported by the observation that effect estimates for all the ethnic minority groups tended to suggest a protective effect on the odds of common mental disorders among people living in areas of higher own-group density, and corresponding 95% confidence intervals were in some cases wide.

Other weaknesses of this study relate to the cross sectional design. Reverse causality could have accounted for findings; it is plausible that people with common mental disorders may choose to isolate themselves and move away from their communities. Recall bias is also a concern, as people with common mental disorders may be more likely to recall negative events such as racism or negative aspects of relationships.

Finally, aspects of this study highlight some of the challenges to understanding health effects among ethnic minorities. The psychometric properties of the questions around racism are not established, and it is possible that some of the groups may have under-reported experiences of discrimination as this was a sensitive area of inquiry. Nonetheless, measures such as these have been used in other studies exploring the impact of racism on health.²⁰⁻²²

Although the questions around social support have been validated, this was in a British population of civil servants,¹⁰ and they may have been less valid for the

ethnic minority groups surveyed in our study. Previous research has suggested that people may derive support outside of their immediate locale which may include support through culturally specific organisations not based in the same neighbourhood.⁵ We included a measure to assess for social networks, but we were not able to assess the nature of these networks. It is therefore possible that the measures used in this analysis did not fully assess important support derived through other sources.

Strengths of study

To our knowledge this is the first study to examine the association of ethnic density with common mental disorders as determined through structured, validated instruments and using appropriate statistical methods to account for geographical clustering and non-independence of observations. By using multi-level models in analysis, we avoided the problem of ecological fallacy (where erroneous conclusions are made about individuals on the basis of area-level data) as we were able to model random effects simultaneously at both individual and area levels.

A further advantage of the current study was in the use of data from a nationally representative survey of England, which we believe would make the findings highly generalisable to the experiences of ethnic minority groups living throughout England, albeit with the caveat that this dataset was representative of population composition in 2000. Finally, much previous research examining ethnic density associations has tended to use service contact data to determine rates of severe mental disorders.²³⁻²⁶ Our study avoided the selection biases inherent in such approaches by systematically assessing mental health outcomes using structured clinical assessments on population-level data.

Implications and comparison with other studies

In keeping with previous research,²⁷ we found, for most groups, at least a twofold increase in the odds of common mental disorders among people who reported experiencing racism in the previous year or discrimination at work. Conversely, living in areas of higher own-group density was associated with a reduction in the reporting of racist and discriminatory experiences for some groups. One other study has suggested that ethnic density may buffer against interpersonal racism among ethnic minority groups living in England,⁴ which has been further supported through qualitative work.⁵ These findings, alongside the observation that for some groups living in areas of higher own-group density was associated with improved social support, serve to underline the potential “psychic shelter”²⁵ function of ethnically dense neighbourhoods, although these specific factors did not translate into the mechanism by which the beneficial mental health effects of ethnic density were mediated, in our analyses.

The measure we used to assess ethnicity (self ascribed descriptors based on the UK census in 2000)

helps comparability with other research but has limitations.²⁸ People may not define themselves as being in the same ethnic group over time,²⁹ so self ascribed ethnicity should be viewed as a proxy for how people view their membership of an ethnic grouping^{28,30} and does not necessarily tap into notions of “cultural identity.”²⁸ Recent research has, for example, suggested that cultural practices associated with cultural identity could be associated with mental health benefits³¹ and could “govern forms of social support, gender disadvantage and access to employment”²⁸; therefore future research could examine how far cultural identity may mediate ethnic density effects, although attempting to assess “identity” may present additional challenges.

Our finding of an ethnic density effect in some of the groups should not obscure the converse finding that area-level deprivation was associated with common mental disorders for most of the groups, and areas densely populated by ethnic minority groups were also the poorest. The association of neighbourhood-level poverty with common mental disorders has been broadly confirmed in one recent systematic review,³² although described as less consistent in another.³³

An ecological study of antidepressant prescribing in primary care suggested that in areas of higher ethnic density, prescribing for some minority groups was reduced.³⁴ The findings from the present study may support the assertion that such differences are a result of geographical differences in the prevalence of common mental disorders (as opposed to health seeking differences per se), although it is likely that area-level associations with common mental disorders will be complex, given associations with area-level deprivation.

We did not have the necessary data to assess “social capital.” Previous research has suggested that social capital effects on mental health are complex,³⁵ not always consistent,³⁵ and may have interactional effects with area-level and individual-level poverty³⁶ or play a lesser role in patterning geographical mental health variations than compositional factors.³⁷ However, it has also been suggested that people living in areas of lower own-group density may feel marginalised as a result “of a high degree of cohesion among the majority group”³⁸ and this could result in adverse mental health. The role of social capital and cohesion in accounting for ethnic density effects could be examined in future research. Related to this, we asked about discrete episodes of racism and discrimination, but we were unable to assess aspects of “everyday racism”³⁹ or the effect of belonging to a stigmatised group living in areas of lower own-group density.⁴⁰ This may be a more potent mechanism for accounting for group density effects than the effects examined here, and could be explored in future research.

To our knowledge, no other research has examined the effect of ethnic density on mental health in Irish people. Irish people living in Britain have a longer history of migration, and so the levels of ethnic density reached for this group were not as high as for some

other ethnic minority groups. It is therefore noteworthy that protective density effects were still seen for this group. Given previous findings that Irish people living in Britain experience a higher prevalence of common mental disorders,¹⁴¹ future research should aim to uncover factors at the contextual level associated with living in areas of higher own-group density which could be protective for this (as well as for other) groups' mental health.

There were also a few unexpected findings. For example, we noted that even the white British group reported less discrimination if they lived in areas of higher own-group density. The discrimination measure covered forms of discrimination other than race, such as discrimination due to religious beliefs, which may still be an issue for this group. For the black Caribbean group, ethnic density effects were also not as expected. Compared with the other groups, the black Caribbean group reported the highest prevalence of discrimination. However, black Caribbean people living in areas of higher own-group density reported more employment related discrimination than those living in areas of lower own-group density. We did not have information on the participants' location of employment, which may not have been the same as place of residence. It is also possible that experiences of discrimination at work for the black Caribbean group may have been high even if workplaces were located in ethnically dense areas if employment involved contact with people outside of their community. Our findings around work related discrimination are consistent with another study conducted in east London, which suggested a higher prevalence of work related racial discrimination among black African-Caribbean people, which was associated with higher levels of psychological distress among female respondents.⁴² In addition, our findings are consistent with another analysis also using community-level data, which suggested that living in areas of higher own-

group density was associated with a number of poorer health and social outcomes among black Caribbean people.⁶

Unanswered questions and future research

There were no neat conclusions from our analyses: ethnic density effects were present for some of the ethnic minority groups, but—despite attempting to examine the role of racism, social support, or social networks in mediating these effects—we were not able to definitively unpack the meaning of ethnic density. Future research could focus on factors that we did not address, such as interactional effects with poverty, social capital, cultural identity, and acculturation, and the role of social support not limited to immediate personal relationships.

Use of a longitudinal design in future research may deal with the issue of reverse causality and recall bias. In addition, future work may benefit from qualitative approaches to aid understanding of the role of “community” and “neighbourhood” in protecting health, from the point of view of residents.

Conclusions

Our results provide compelling evidence in support of the notion that ethnically dense areas may be protective of mental health for some ethnic minority groups, despite these areas also tending to be the poorest. There was some evidence that experiences of discrimination and social support varied according to the ethnic mix of areas, for some groups. The findings suggest that psychosocial factors related to contextual effects may be important for the mental health of ethnic minority groups living in England.

We thank Sally McManus, Emily Diment, and Claire Deverill (National Centre for Social Research) for assisting with retrieval and matching of area-level measures to the dataset; and Professor James Nazroo (University of Manchester) and Dr Mai Stafford (University College London) for advice in the planning and early stages of analysis of the study. JD thanks Professor Ian Roberts (London School of Hygiene and Tropical Medicine) for lively discussion around the social determinants of health and for helpful comments on earlier analyses.

Contributors: JD and MJP had the original idea for the study and developed the study design with LB and SAS. MED advised on statistical aspects of the study design in planning, analysis stages, and in responding to queries raised by peer reviewers. All authors were involved in discussion and interpretation of results. JD conducted all analyses and wrote the first draft. All authors contributed to the writing of further drafts. JD is guarantor for the study.

Funding: The Institute of Social Psychiatry provided a small funds grant to enable retrieval of area-level data, which was then matched to individual records by the National Centre for Social Research. JD is supported by an MRC fellowship. LB was partially supported by the Economic and Social Research Council (ESRC). None of the funding bodies played a part in the research protocol, data analyses, data interpretation, or writing of the report.

Competing interests: All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: no support from any organisation for the submitted work other than the funding grant; no financial relationships with any organisations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

Ethical approval: Ethical approval was obtained from relevant approval bodies in the UK at the time of data collection. Access to the dataset for the purposes of secondary analysis was subject to the terms of an end user license agreement, and further ethical approval was not needed.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Experiences of discrimination are associated with adverse mental health, whereas social support and social networks are protective for mental health

When people live in areas of higher own-group ethnic density they seem to experience less racism and discrimination

Living in areas of higher own-group ethnic density is associated with a decreased risk of mental and physical health problems for some ethnic minority groups living in Britain

WHAT THIS STUDY ADDS

In this survey of Irish, black Caribbean, Indian, Pakistani, Bangladeshi, and white British ethnic groups in England, living in areas of higher own-group ethnic density was associated with a significantly reduced risk of common mental disorders for all ethnic minority groups combined, and for the Bangladeshi and Irish groups

Living in areas of higher own-group density was associated with improved social support for some groups, while the protective effects on experiences of discrimination varied by ethnicity and the type of discrimination experienced

Although for some ethnic groups, living in areas of higher own-group density was associated with reduced experiences of discrimination and improved social support, these did not seem to mediate the observed ethnic density effects

Area-level data provided by the National Centre for Social Research was subject to approval by its data release committee.

Data sharing: The technical appendix and statistical code are available from JD at jayati.das-munshi@kcl.ac.uk. The data are available from the Economic and Social Data Service (<http://www.esds.ac.uk>) subject to an end-user license agreement.

- 1 Weich S, Nazroo J, Sproston K, McManus S, Blanchard M, Erens B, et al. Common mental disorders and ethnicity in England: the EMPIRIC study. *Psychol Med* 2004;34:1543-51.
- 2 Faris R, Dunham HW. *Mental disorders in urban areas*. University of Chicago Press, 1939.
- 3 Halpern D. Minorities and mental health. *Soc Sci Med* 1993;36:597-607.
- 4 Bécares L, Nazroo J, Stafford M. The buffering effects of ethnic density on experienced racism and health. *Health Place* 2009;15:670-8.
- 5 Whitley R, Prince M, McKenzie K, Stewart R. Exploring the ethnic density effect: a qualitative study of a London electoral ward. *Int J Soc Psychiatry* 2006;52:376-91.
- 6 Stafford M, Bécares L, Nazroo J. Racial discrimination and health: exploring the possible protective effects of ethnic density. In: Stillwell J, Ham M, eds. *Ethnicity and integration: understanding population trends and processes*. Vol 3. Springer, 2010.
- 7 Sproston J, Nazroo J. Ethnic minority psychiatric illness rates in the community (EMPIRIC): quantitative report. Stationery Office, 2002.
- 8 UKDA. Ethnic minority psychiatric illness rates in the community (EMPIRIC): user guide for UK data archive. www.data-archive.ac.uk/doc/4685%5Cmrdoc%5Cpdf%5C4685userguide.pdf.
- 9 OPCS. Census definitions Great Britain. HMSO, 1992.
- 10 Stansfeld S, Marmot M. Deriving a survey measure of social support: the reliability and validity of the close persons questionnaire. *Soc Sci Med* 1992;35:1027-35.
- 11 Office of National Statistics. Beginners' guide to UK geography—super output areas (SOAs). www.statistics.gov.uk/geography/beginners_guide.asp.
- 12 Noble M, Wright G, Smith G, Dibben C. Measuring multiple deprivation at the small-area level. *Environment Planning A* 2006;38:169-85.
- 13 Lewis G, Pelosi AJ, Araya R, Dunn G. Measuring psychiatric disorder in the community: a standardized assessment for use by lay interviewers. *Psychol Med* 1992;22:465-86.
- 14 StataCorp. *Stata statistical software: release 10*. 2007.
- 15 UCLA Academic Technology Services. How to perform Sobel-Goodman mediation tests in Stata? www.ats.ucla.edu/stat/stata/faq/sgmediation.htm.
- 16 Petersen ML, Sinisi SE, van der Laan MJ. Estimation of direct causal effects. *Epidemiol* 2006;17:276-84.
- 17 Office for National Statistics. Migration statistics: quarterly report. No. 4: February 2010. www.statistics.gov.uk/pdffdir/mig0210.pdf.
- 18 Nazroo JY, Williams DR. The social determinants of ethnic/racial inequalities in health. In: Marmot M, Wilkinson RG, eds. *Social determinants of health*. 2nd ed. Oxford University Press, 2006.
- 19 Cole SR, Hernan MA. Fallibility in estimating direct effects. *Int J Epidemiol* 2002;31:163-5.
- 20 Karlsen S, Nazroo JY. Relation between racial discrimination, social class, and health among ethnic minority groups. *Am J Public Health* 2002;92:624-31.
- 21 Karlsen S, Nazroo J, McKenzie K, Bhui K, Weich S. Racism, psychosis and common mental disorder among ethnic minority groups in England. *Psychol Med* 2005;35:1795-803.
- 22 Harris R, Tobias M, Jeffreys M, Waldegrave K, Karlsen S, Nazroo J. Effects of self-reported racial discrimination and deprivation on Maori health and inequalities in New Zealand: cross-sectional study. *Lancet* 2006;367:2005-09.
- 23 Veling W, Susser E, Van Os J, Mackenbach JP, Selten J-P, Hoek HW. Ethnic density of neighborhoods and incidence of psychotic disorders among immigrants. *Am J Psychiatry* 2008;165:66-73.
- 24 Boydell J, van Os J, McKenzie K, Allardyce J, Goel R, McCreadie RG, et al. Incidence of schizophrenia in ethnic minorities in London: ecological study into interactions with environment. *BMJ* 2001;323:1336-8.
- 25 Neeleman J, Wessely S. Ethnic minority suicide: a small area geographic study in south London. *Psycho Med* 1999;29:429-36.
- 26 Neeleman J, Wilson-Jones C, Wessely S. Ethnic density and deliberate self harm: a small area study in south east London. *J Epidemiol Community Health* 2001;55:85-90.
- 27 Paradies Y. A systematic review of empirical research on self-reported racism and health. *Int J Epidemiol* 2006;35:888-901.
- 28 Bhui K. The new science of cultural epidemiology to tackle ethnic health inequalities. *J Public Health* 2009;31:322-3.
- 29 Platt L, Simpson L, Akinwale B. Stability and change in ethnic groups in England and Wales. *Population Trends* 2005;121(Autumn):35-46.
- 30 Office for National Statistics. *Ethnic group statistics: a guide for the classification of ethnicity data*. Stationery Office, 2003.
- 31 Bhui K, Khatib Y, Viner R, Klineberg E, Clark C, Head J, et al. Cultural identity, clothing and common mental disorder: a prospective school-based study of white British and Bangladeshi adolescents. *J Epidemiol Community Health* 2008;62:435-41.
- 32 Kim D. Blues from the neighborhood? Neighborhood characteristics and depression. *Epidemiol Rev* 2008;30:101-17.
- 33 Mair C, Roux DAV, Galea S. Are neighbourhood characteristics associated with depressive symptoms? A review of evidence. *J Epidemiol Community Health* 2008;62:940-94.
- 34 Walters P, Ashworth M, Tylee A. Ethnic density, physical illness, social deprivation and antidepressant prescribing in primary care: ecological study. *Br J Psychiatry* 2008;193:235-9.
- 35 De Silva MJ, McKenzie K, Harpham T, Huttly SRA. Social capital and mental illness: a systematic review. *J Epidemiol Community Health* 2005;59:619-27.
- 36 Stafford M, De Silva M, Stansfeld S, Marmot M. Neighbourhood social capital and common mental disorder: testing the link in a general population sample. *Health Place* 2008;14:394-405.
- 37 Whitley R, Prince M. Is there a link between rates of common mental disorder and deficits in social capital in Gospel Oak, London? Results from a qualitative study. *Health Place* 2005;11:237-48.
- 38 McKenzie K, Whitley R, Weich S. Social capital and mental health. *Br J Psychiatry* 2002;181:280-3.
- 39 Essed P. *Understanding everyday racism: an interdisciplinary theory*. Sage, 1991.
- 40 Pickett K, Wilkinson R. People like us: ethnic group density effects on health. *Ethnicity Health* 2008;13:321-34.
- 41 Ryan L, Leavey G, Golden A, Blizard R, King M. Depression in Irish migrants living in London: case-control study. *Br J Psychiatry* 2006;188:560-6.
- 42 Wadsworth E, Dhillon K, Shaw C, Bhui K, Stansfeld S, Smith A. Racial discrimination, ethnicity and work stress. *Occup Med (Lond)* 2007;57:18-24.

Accepted: 3 August 2010