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**Ethnic variations in mental health among 10–15-year-olds living in England and Wales:
The impact of neighbourhood characteristics and parental behaviour**

32 **Abstract**

33 Several studies indicate that young people from certain ethnic minority groups in Britain have
34 significant mental health advantages over their White majority counterparts, but the reasons
35 for these differences have not been adequately explored. This work analyses the impact of
36 neighbourhood characteristics, measured by socioeconomic deprivation; crime; living
37 conditions; ethnic density and parenting behaviour on the mental health of young people. To
38 determine the impact of these factors on mental health among young people, geocoded data
39 from waves 1, 3 and 5 of the UK Household Longitudinal Study (*UKHLS*) are merged with
40 small area statistics from the 2011 census, and multilevel linear regression models are fitted to
41 the sample of 5,513 (7,302 observations) 10–15-year-olds of varying ethnicity residing in
42 England and Wales. We find that mental health is generally poorer for White British youths,
43 even after accounting for individual/family-level predictors, neighbourhood characteristics
44 and parental behaviour than it is for minority youths. In keeping with results from studies of
45 adult populations, neighbourhoods with high levels of deprivation are associated with poorer
46 mental health. However, some aspects of parenting behaviour appear to have a more
47 significant impact on the mental health of young people from ethnic minority backgrounds
48 than on White British youths. Further research into factors that influence inter-ethnic
49 disparities in mental health among young people is warranted, given that clear differences
50 remain after the models in this study are fully adjusted.

51

52 Keywords: Children/adolescents; Ethnic density; Socioeconomic deprivation; Mental health;

53 Neighbourhood

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57

58 **Introduction**

59 It has been estimated that 20 percent of children and adolescents around the world suffer from
60 some kind of mental disorder (WHO, 2016). The British Child and Adolescent Mental Health
61 Survey 2004 found that one in ten children aged 5–15 had a diagnosable mental disorder
62 (Green et al. 2005). Moreover, studies from the UK have found that some ethnic minority
63 youths report better mental health and have lower prevalence of mental disorders than their
64 White/White British counterparts (Goodman, Patel, and Leon 2010, 2008; Astell-Burt et al.
65 2012; Harding et al. 2015; Maynard, Harding, and Minnis 2007; Fagg et al. 2006; Green et al.
66 2005; Meltzer et al. 2000). The opposite relationship is seen among adults, with both an
67 elevated risk (Breslau et al. 2005) and a higher prevalence (Rees et al. 2016; McManus et al.
68 2016) of mental health disorders in the Black, Asian and ethnic minority (BAME) population.
69 For instance, first-time contact rates for psychotic disorder were three to five times higher for
70 Blacks compared to other ethnic groups (Rees et al., 2016). The causes of this variation are
71 understudied and inadequately explained by existing research on the topic. This work
72 addresses this gap in the literature by providing empirical evidence on the impact of
73 neighbourhood characteristics and parental behaviour on potential ethnic differences in the
74 mental health of children/adolescents aged 10 –15 residing in England and Wales.

75

76 **Previous research and theory**

77 *Neighbourhood characteristics and youth outcomes*

78 A young person's development is significantly shaped by their neighbourhood and family,
79 including forms of parenting and the parent-child relationship. For this reason, the
80 neighbourhood and family are not only relevant but crucial starting points for understanding
81 the factors that may affect young people's mental health during their formative years. The
82 existing scholarship has shown that a person's neighbourhood accounts for 5 to 10 percent of
83 the variance in a range of outcomes related to young people (Roosa et al. 2003). Likewise,

84 several studies have highlighted the potential role of parenting as a mediator and/or moderator
85 of the effects of the neighbourhood (O'Connor and Scott 2007; Katz et al. 2007; Phoenix and
86 Husain 2007). Following the work of Faris and Dunham (1939), the intricately linked factors
87 of neighbourhood ethnic composition and socioeconomic deprivation have been associated
88 with mental health among adults, with the magnitude and nature of the association varying
89 between minority ethnic groups. Similarly, social disorganisation, is a construct that is known
90 to be correlated with the level of crime, general living conditions and socioeconomic
91 deprivation within British neighbourhoods (Markowitz et al. 2001), and has been shown to
92 affect the social and health outcomes of young people (Kawachi, Kennedy, and Wilkinson
93 1999; Edwards and Bromfield 2010; Leventhal and Brooks-Gunn 2000). It is also now well
94 established that ethnic minorities are over-represented in neighborhoods characterised by
95 these factors, and a common finding is that health inequalities are explained by reduced area-
96 level socioeconomic conditions (Bécares et al. 2011; Bécares, Nazroo, et al. 2012; Jonsson
97 and Demireva 2018).

98 It has been suggested that minority group members are protected from adversities by
99 ethnic density, defined as the percentage of the population in the respondent's area of
100 residence that share the respondent's ethnicity, after adjusting for area-level socioeconomic
101 deprivation (Faris and Dunham 1939; Pickett and Wilkinson 2008; Bhugra and Arya 2005;
102 Das-Munshi et al. 2010; Bécares, Nazroo, et al. 2012; Aneshensel 2009). In line with this
103 suggestion, there are several studies that used adult samples to examine ethnically dense
104 neighbourhoods and shown that these residents do indeed enjoy better mental health, at least
105 in the short term (Bécares, Nazroo, et al. 2012; Bécares, Nazroo, and Stafford 2009; Halpern
106 and Nazroo 2000b).

107 However, there is little evidence supporting the ethnic density hypothesis as it relates to
108 young people, and studies of this issue have yielded mixed results. Some researchers observed

109 beneficial effects of ethnic density on some indicators of mental health such as depressive
110 symptoms, psychological distress, behavioural and cognitive problems (Gieling, Vollebergh,
111 and van Dorsselaer 2010; Wickrama and Bryant 2003). But, at least one study indicated that
112 this effect may be negative when the group is too large (Fagg et al. 2006), while another study
113 recorded a generally negative effect (Abada, Hou, and Ram 2007), and others have found no
114 effect of ethnic density on young people's mental health (Xue et al. 2005; Astell-Burt et al.
115 2012).

116 Opponents of the ethnic density hypothesis have argued that ethnic disparities in health
117 are mainly caused by the residential concentration of ethnic minorities in poor socioeconomic
118 circumstances (Williams and Collins 2001; Roland G. Fryer, Pager, and Spenkuch 2013;
119 Wilson 1987). This school of thought suggests that living in 'racially segregated'
120 neighbourhood environments determines access to health-related services and the quality of
121 those services. This is because ethnic concentration correlates strongly with neighbourhood
122 socioeconomic deprivation and adverse neighbourhood conditions such as actual and
123 perceived rates of crime, the number of single parent households, lack of employment
124 opportunities, as well as access to, and the use of social services such as healthcare (Roland
125 G. Fryer, Pager, and Spenkuch 2013; Wilson 1987); all these factors have been shown to be
126 associated with poor health both among adults and young people (Williams and Collins 2001;
127 Leventhal and Brooks-Gunn 2000; Mair et al. 2010).

128

129 *The link between neighbourhoods, parental behaviour and youth outcomes*

130 Parenting behaviour is defined in terms of the parent-child interaction and relationship.
131 According to Baumrind (1970, 1966), factors that distinguish different types of parenting
132 behaviours are: (a) warmth and nurturing; (b) maturity demands; (c) control of the child's
133 behaviour; and (d) communication between parent and child (that is, the extent to which the
134 child's opinion is sought and listened to). There is evidence to support the theory that

135 parenting behaviours influence youth outcomes, but there is also sufficient data indicating that
136 this influence does not act in a vacuum. While parenting behaviour is an important
137 consideration, it is not only influential but is, in and of itself, influenced by wider
138 environmental factors such as the neighbourhood.

139 The theoretical models informing this work generally suggest that neighbourhood effects
140 on parental characteristics and parenting styles are strongest in socioeconomically
141 disadvantaged neighbourhoods. Conger, Conger, and Martin (2010) developed a family stress
142 model to explain the mediating effects of parental behaviour on youth outcomes. This model
143 suggested that common stressors affecting people living in deprived situations may undermine
144 the parent-child relationship and, thus, weaken or eliminate the associated positive effects on
145 the child's mental well-being. This is because parents themselves might experience high
146 levels of distress, leading them to adopt behaviours that are frequently related to negative
147 youth outcomes. Jencks and Mayer (1990) proposed four models to explain how
148 neighbourhood factors might affect parenting: the epidemic/contagion, collective
149 socialisation, competition, and relative deprivation theory models. The competition and
150 relative deprivation explanations state that residing in affluent neighbourhoods may adversely
151 affect young people from more socioeconomically disadvantaged families. Conversely, the
152 contagion and collective socialisation explanations state that neighbourhoods with residents of
153 diverse economic backgrounds are more likely to be healthy and have few behavioural
154 problems.

155 These theoretical frameworks have been used in several studies, particularly from the
156 USA. For the most part, these frameworks implicated parental behaviour (and certain
157 parenting styles) as an influential factor in explaining the healthy development of young
158 people (Maynard and Harding 2010; Lee et al. 2014; Ceballo and McLoyd 2002; Leventhal
159 and Brooks-Gunn 2000; Baumrind 1966, 1971; Conger, Conger, and Martin 2010; Jencks and

160 Mayer 1990). These studies confirmed that the neighbourhood environment is associated with
161 parental behaviour, and that parental behaviour, in turn, influences youth outcomes. Studies
162 have also highlighted socioeconomic deprivation, crime and disorder, and a lack of resources
163 or social support as factors that may undermine effective parenting strategies (Ceballo and
164 McLoyd 2002; Leventhal and Brooks-Gunn 2000; Byrnes and Miller 2012; Wilson 1996;
165 Burton and Jarrett 2000; Furstenberg 1999).

166 Neighbourhoods with high levels of disorder and crime might disrupt both adult and
167 youth behaviours and thereby influence the style of parenting that is adopted. In such areas,
168 parents may adopt a more harsh/controlling parenting style to regulate the interactions of the
169 child/adolescent with their environment (Furstenberg 1999; Burton and Jarrett 2000;
170 Sampson, Morenoff, and Earls 1999). An alternative explanation (Sampson, Morenoff, and
171 Earls 1999) for the adoption of a harsher, more controlling parenting style and ineffective
172 parenting strategies that lack warmth and communication, is that parents residing in areas of
173 high deprivation, and generally poor living conditions, become overwhelmed by these
174 conditions. In these cases, parents may lack the energy to engage warmly with their children,
175 (Byrnes and Miller 2012). The reverse might also be true; that is, parents with effective
176 parenting strategies might be less likely to reside in more problematic neighbourhoods.

177

178 **Research gaps**

179 Notwithstanding the wealth of literature in this area, relatively few studies have focused on
180 the role of ethnicity and/or other potentially relevant factors such as socioeconomic, language,
181 cultural, and religious beliefs and practices on parenting. This has meant that subsequent
182 mental health outcomes related to these factors have remained understudied. Furthermore,
183 among the studies that have explored ethnicity, few have examined “White ethnic groups” or
184 acknowledged that even within this categorisation there are minority and majority groups. For
185 instance, previous studies have shown that health reporting varies among individuals self-

186 identifying as White Irish, Welsh and Gypsy/Irish travellers (ONS 2013; Cemlyn 2009;
187 Becares 2015). These studies have also shown that there are important distinctions between
188 White ethnic groups with respect to health-related measures, such as labour market
189 participation, general socioeconomic conditions, education, and area of residency (ONS 2013;
190 Cemlyn 2009). In addition, the 2011 UK census showed that the proportion of White UK
191 residents born in other European Union (EU) member states has increased over time. If the
192 parenting style of this population differs from that of the White British population, this
193 demographic change could affect the validity of previous parenting studies that simply
194 categorise migrating families from the EU as ‘White. The consequences of these potential
195 differences in parenting styles for youth outcomes deserves greater attention. We therefore
196 sought to determine whether there were significant mental health differences between White
197 British youth and youths from Welsh and other White backgrounds.

198 Further, most research on parenting and its relationship to neighbourhood has been done in
199 the United States (US), and whilst these are interesting and provide relevant insights, they
200 might not be completely applicable in discussions relating to youth outcomes in Britain.
201 Whilst, there are also certain historic similarities between the US and the UK, there are also
202 many differences between the two countries in terms of neighbourhood ethnic, social,
203 economic and cultural make-up. Thus, additional studies from the British context maybe
204 particularly important for increasing our understanding of how the relationship between
205 parenting and neighbourhoods might promote or mitigate the mental health of young people.

206 As they are less mobile than adults, young people are more likely to spend a greater
207 proportion of their time in and around their area of residence, so their neighbourhood context
208 may significantly affect outcomes relating to their health and well-being (Allison et al. 1999).
209 Therefore, to understand properly the mechanisms that contribute to ethnic disparities in
210 young people’s mental health, it is necessary to use an integrated approach that accounts for

211 differences between neighbourhoods in which young people reside. Disentangling the factors
212 influencing the mental health of young people may also reveal pertinent risk factors and
213 important areas of focus for future interventions, as well as inform policy and treatment. As
214 many mental health difficulties among adults begin early in life (Kessler et al. 2005; De
215 Girolamo et al. 2012), early treatment or risk-reducing interventions targeting youths could
216 reduce the individual and societal costs associated with long-term and undiagnosed mental
217 health difficulties (Davies et al. 2013; Health 2011).

218

219 **Research aim**

220 As demonstrated above, the literature indicates that (i) children's mental health outcomes
221 are sensitive to neighbourhood characteristics and vary with ethnicity (Leventhal and Brooks-
222 Gunn 2000; Xue et al. 2005; Edwards and Bromfield 2010; Zhang et al. 2017; Astell-Burt et
223 al. 2012); (ii) parental behaviour influences youth outcomes such as social competency, high
224 risk health behaviours, aggressive behaviour, delinquency, and various measures of mental
225 health (O'Connor and Scott 2007); and (iii) parental behaviour both influences, and is
226 influenced by, neighbourhood characteristics (Ceballo and McLoyd 2002; Leventhal and
227 Brooks-Gunn 2000; Byrnes and Miller 2012; Wilson 1996; Burton and Jarrett 2000;
228 Furstenberg 1999; Sampson, Morenoff, and Earls 1999).

229 However, previous research on neighbourhood effects and ethnic disparities in mental
230 health may have been hampered by the use of small samples and regional data restricted to
231 specific geographic areas. Data sets including large representative samples of young people in
232 the age group considered in this paper are rare (Fagg et al. 2006; Astell-Burt et al. 2012;
233 Harding et al. 2015; Maynard and Harding 2010; Maynard, Harding, and Minnis 2007). To
234 overcome this issue, this study draws on a rich national data source, the UK Household
235 Longitudinal Study (*UKHLS*), which was linked to aggregated geocoded data from the 2011
236 UK census. Using the large resultant data set, we investigate the impact of neighbourhood

237 characteristics and parenting behaviour on mental health difficulties among White British
238 youths, Welsh, other Whites (including Scottish and Northern Irish participants residing in
239 England) and BAME youths aged 10–15 residing in England and Wales. The specific
240 research questions examined are:

- 241 • To what extent can ethnic variations in mental health among youths be attributed to
242 individual and family characteristics?
- 243 • Are ethnic variations in mental health mediated by parental behaviour and
244 neighbourhood characteristics (including ethnic composition, socioeconomic
245 deprivation, the living environment, and levels of crime and disorder)?

246

247 **Material and methods**

248 *Survey*

249 Data for this analysis were drawn from multiple sources. Individual-level data were taken
250 from waves 1, 3, and 5 of *Understanding Society*, the *UKHLS* (University of Essex – Institute
251 for Social and Economic Research 2015), while neighbourhood-level data were based on
252 geocoded administrative data collected in the 2011 UK census (ONS 2017).

253 Individual data: The *UKHLS* is an annual longitudinal household panel survey that started
254 in 2009, with a nationally representative and stratified cluster sample of around 40,000
255 households living in the United Kingdom. Within households where adults were interviewed,
256 oral consent was obtained from parents and/or guardians for household members aged 10–15
257 to complete a self-reported questionnaire. The sample for this study therefore consisted of
258 children of adult panel members, for whom parental consent to participate was granted, and
259 who responded to the questionnaire (Knies 2017).

260 Neighbourhood data: Neighbourhood data were derived from geocoded, census-defined
261 small area statistics at the so-called middle super output area (MSOA) level. MSOAs have a

262 minimum residential size of 5,000 individuals and 3,000 households, with an average
263 population size of 7,500. The use of MSOAs made it possible to link aggregated area-level
264 variables taken from the 2011 census to the *UKHLS*. This was the lowest level of aggregation
265 permissible for this study given issues of identification.

266 The use of the *UKHLS* as a secondary data source and its linkage to administrative data
267 were approved by the University of Essex Ethics Committee.

268

269 *Sample*

270 We investigated the sources of missing values to determine whether the data should be
271 modelled by imputation or handled by listwise deletion. This analysis revealed three major
272 sources of non-response. Notably, several items included in the Townsend deprivation index
273 had missing values for some neighbourhoods. Consequently, there were 211 MSOAs for
274 which this index could not be calculated, this affected 7% of the original sample. In addition,
275 approximately 15% of children did not disclose their ethnicity. Finally, information on length
276 of residence (used as a control variable in this work) was unavailable for children drawn from
277 a sample related to the British Household Panel Survey (BHPS). The BHPS was incorporated
278 into the *UKHLS* during wave 2, so its respondents became part of our samples for waves 3
279 and 5. Length of residence data was unavailable for these sample members because the
280 *UKHLS* only collected this information from participants if they had not previously been
281 interviewed, and BHPS participants were considered to have previously been interviewed.
282 This affected 9.5% of the sample. As the cases with missing values did not differ greatly from
283 the original sample, listwise deletion was not expected to introduce appreciable bias, and was
284 therefore used in preference to imputation. Table SA1 of the supplementary appendix shows
285 the mean values of the main variables used in the analysis for the complete and excluded
286 cases and the proportion of the full sample affected by missing values.

287 After listwise deletion of variables with missing information, attrition, and the inclusion of
 288 new survey participants, the final sample used in this analysis consisted of 5,513 (7,302
 289 observations) 10–15-year-olds of varying ethnicity residing in England and Wales. Attrition
 290 may have occurred due to non-response or a lack of contact with a family that participated in
 291 an earlier wave. The sample also changed when young people aged 15 or younger became
 292 ineligible for the youth survey at age 16, when younger children became eligible for inclusion
 293 upon reaching the age of 10 and thus entered the youth panel, and when children of an
 294 appropriate age joined households participating in the survey. Table 1 below shows the
 295 sample size for each wave before and after listwise deletion, along with the proportion of new
 296 and retained participants for each wave.

297

Table 1. Sample sizes across data waves

Wave	Sample	Sample after listwise deletion	New participants	Participants from previous wave
1 (2009 – 2011)	4366	3366	3366 (100 %)	
3 (2011– 2013)	3711	2138	1093 (51.1%)	1045 (48.9%)
5 (2013 – 2015)	3113	1798	854 (47.5%)	944 (52.5%)

298 *Source:* Understanding Society (2015), Waves 1, 3 and 5, linked with data from the 2011 UK Census.

299

300

301 ***Dependent variable***

302 The dependent variable, *mental health difficulties*, was measured using the responses provided
 303 in waves 1, 3 and 5 of the self-reported version of the Strengths and Difficulties Questionnaire
 304 (SDQ). A copy of this questionnaire is given in appendix SA2. This widely-used and cross-
 305 nationally validated screening instrument includes 25 items and five subscales that are
 306 suggested to capture four areas of potential difficulty (emotional symptoms, conduct
 307 problems, hyperactivity-inattention, peer relationship problems) and one area of strength

308 (prosocial behaviour) (Goodman 1997; Goodman, Meltzer, and Bailey 1998). Responses are
309 based on a three-point scale, ranging from 1 [Not true] to 3 [Certainly true]. A total
310 difficulties score (TDS) ranging from 0 to 40, representing increasing mental health
311 difficulties, is derived by summing the scores on the first four of these subscales. According
312 to Goodman (1997), the absence of prosocial behaviour cannot be equated with the presence
313 of mental health difficulties.

314

315 *Individual and family predictors*

316

317 The key explanatory variable, *self-identified ethnicity*, was measured using the responses to an
318 item asking respondents to select the option most appropriate to themselves from a list of 18
319 ethnic identities defined in the UK census. These remained unchanged throughout the study
320 period. Due to small subsample sizes, we collapsed responses regarding ethnicity into four
321 ethnic categories: White British, Welsh, other Whites (including Scottish and Northern Irish
322 participants residing in England), and BAMEs. The consequences of combining ethnicities
323 into larger groups in this way are addressed in the Discussion.

324 *Parental behaviour* was measured by a series of questions regarding the frequency of
325 certain activities/behaviours undertaken between parents and their children. These were the
326 frequency of time spent doing leisure activities, eating dinner together, talking about
327 important matters, giving praise, cuddling the child, involving the child in setting rules,
328 shouting at the child, and spanking or slapping the child. The correlations between the items
329 ranged from $r = 0.11$ to $r = 0.38$ (between cuddling and praising). The weak correlation
330 between the items implied that there was no underlying latent factor that could be termed
331 parenting behaviour, so the average parental behaviour for each item was examined separately
332 in the model, with the exception of quarrelling, which correlated too strongly with shouting (r
333 $= 0.53$) and was thus omitted from the analysis. This decision did not affect the results. In
334 alternative models with shouting replaced by quarrelling, the effect of quarrelling was

335 marginally but smaller than that of shouting, and differences between ethnicities in its effect
336 were less pronounced but had the same direction.

337 Prior studies have highlighted the importance of accounting for the individual-level and
338 family-level predictors used in this study when assessing neighbourhood variation in young
339 persons' mental health (Fagg et al. 2006; Meltzer et al. 2000). The individual variables used
340 in this study were youth's age and gender. The models also included socioeconomic and
341 demographic characteristics of the parents that may predispose families to live in particular
342 neighbourhoods and/or influence the parent-child relationship. These were: lone parent
343 household, household income (log), parents' age, indicators of whether one or both parents
344 were born abroad, at least one parent in the household working, length of residency in the
345 neighbourhood (entered as a categorical variable), parents' highest level of education, and
346 parents' physical and mental health as measured by the 12-item Short Form Health Survey
347 (SF-12, SA3). All parental variables were averaged between the two parents with the
348 exception of education, for which the result for the parent with the highest level of
349 educational attainment was used. If a child resided in a single parent household, the
350 information for that parent was used. Across all three waves, 92% of the information on single
351 parent households came from households headed by a single mother.

352

353 *Neighbourhood predictors*

354 Neighbourhood own group *ethnic density* was defined as the percentage of individuals living
355 in the respondent's MSOA that belonged to his/her ethnic group (Halpern and Nazroo 2000a;
356 Pickett and Wilkinson 2008). Furthermore, in keeping with previous work on the effects of
357 neighbourhood characteristics on children and adolescents, several measures (socioeconomic
358 status, crime and disorder, and indicators of the indoor and outdoor living environment) found
359 to influence the health and well-being of young people were included in the models

360 (Leventhal and Brooks-Gunn 2000; Astell-Burt et al. 2012; Wilson 1996, 1987). The first of
361 these measures was *Neighbourhood living environment*, which is an indicator of the indoor
362 and outdoor quality of the local environment. This measure was created by combining four
363 indicators (an assessment of social and private housing in poor condition, the proportion of
364 houses without central heating, air quality, and numbers of road traffic accidents involving
365 injury to pedestrians and cyclists). This domain was coded so that higher scores indicated
366 higher levels of deprivation, i.e. a higher probability that the neighbourhood contains, for
367 example, a relatively high proportion of houses without central heating (McLennan et al.
368 2011; Noble et al. 2000). In addition, the *Crime Domain* of the indices of deprivation was
369 used as a proxy for the risk of personal and material victimisation at the small area level. This
370 domain consists of the recorded crime rate for four major types of crime (burglary, theft,
371 criminal damage and violence). This was also coded so that higher scores indicated higher
372 levels of crime (McLennan et al. 2011; Noble et al. 2007; Noble et al. 2000). Finally, the
373 *Townsend Material Deprivation Index*, which was used to further adjust the models for area-
374 level deprivation. This is a measure of socioeconomic disadvantage consisting of four
375 aggregate-level variables gathered in the census: the percentage of households without access
376 to a car or van, the percentage of households with more than one person per room
377 (overcrowding), the percentage of households not owner-occupied (tenure), and the
378 percentage of unemployed economically active residents, excluding students (Townsend,
379 Phillimore, and Beattie 1988). The Pearson correlation matrix, mean (SD), and range of the
380 items measuring parental behaviours and neighbourhood characteristics are given in Tables
381 SA4 and SA5 respectively.

382 Finally, wave (i.e. the year of data collection) was included as a variable in every model to
383 control for, and assess changes in, outcomes over the studied calendar period.

384
385 **Statistical analysis**

386
387 Three-level multilevel linear regression models capturing the nested relationship between the
388 neighbourhood (level 3), individual (level 2) and the three waves of data collection (level 1),
389 were fitted using the lme4 package of the R programming language. The models have the
390 form:

$$391 \quad y_{ijk} = \beta_0 + \beta_1 X_{1ijk} + \beta_2 X_{2jk} + \beta_3 X_{3k} + v_k + u_{jk} + e_{ijk} \quad (1)$$

392 where person-waves ijk are nested in persons jk , which in turn are nested in neighbourhoods k .
393 v_k and u_{jk} are neighbourhood and person random intercepts, which (like the person-wave
394 error term e_{ijk}) are normally distributed with mean 0 and standard deviations σ_v^2 , σ_u^2 , and σ_e^2 ,
395 respectively. Multilevel models of this sort make it possible to partition and explain variation
396 in mental health over time, across individuals and at the neighbourhood level. Moreover, by
397 using a multilevel model, we can account for the fact that the *UKHLS* sampled young people
398 from the same MSOAs, and thus control for the similarities in these neighbourhoods while
399 increasing the precision of the estimates. Modelling was carried out sequentially using a series
400 of nested models. The initial models were pooled in which the factors impacting the mental
401 health of all ethnic groups were examined simultaneously. This was followed by separate
402 sequential analyses for each of the studied ethnic groups using the following five models of
403 young people's mental health.

404 Model 1. A three-level model with individual-level predictor variables for young people in the
405 fixed part of the model. This model was adjusted for gender, age and wave, and was used to
406 identify potential differences in the reporting of mental health among BAMEs, Welsh, or
407 other Whites relative to White British youths.

408 Model 2. Identical to Model 1 except that the fixed part includes all family-level predictors as
409 well as all individual predictors. This model assesses whether and the extent to which family-
410 level predictors explain the difference in mental health among BAMEs, Welsh, or other
411 Whites relative to White British youths.

412 Model 3. Identical to Model 2 except that its fixed part also includes parental behaviour. As
413 such, this model estimates the extent to which parental behaviour explains differences in
414 mental health among the studied groups.

415 Model 4. Identical to Model 2 but in addition to the individual and family-level predictors,
416 this model considers the fixed effect of neighbourhood-level ethnic density and
417 socioeconomic deprivation. As such this model estimates the extent to which these effects
418 explain area-level variation in the mental health of youths from various ethnic groups.

419 Model 5. Identical to Model 2 except that its fixed part includes the effect of neighbourhood-
420 level crime and the living environment. This model thus estimates the extent to which
421 neighbourhood-level ethnic density, crime, and the living environment explain area-level
422 variation in the mental health of youths from various ethnic groups.

423 Beyond the models described above, additional interaction models were tested to evaluate
424 ethnic differences in parental behaviour, to determine whether there was any relationship
425 between neighbourhood ethnic density and parental behaviour, and to see if neighbourhood
426 deprivation had any effect on this relationship.

427 Sensitivity analyses were carried out to investigate possible cross-level effects because 3%
428 (160) of young people had moved between waves and were therefore cross-classified between
429 different MSOAs. The cross-classified models yielded results that did not differ in any
430 significant or substantive way from those obtained with the hierarchical models, so we
431 rejected the cross-classified models in favour of the more parsimonious three-level models
432 described above.

433

434 **Results**

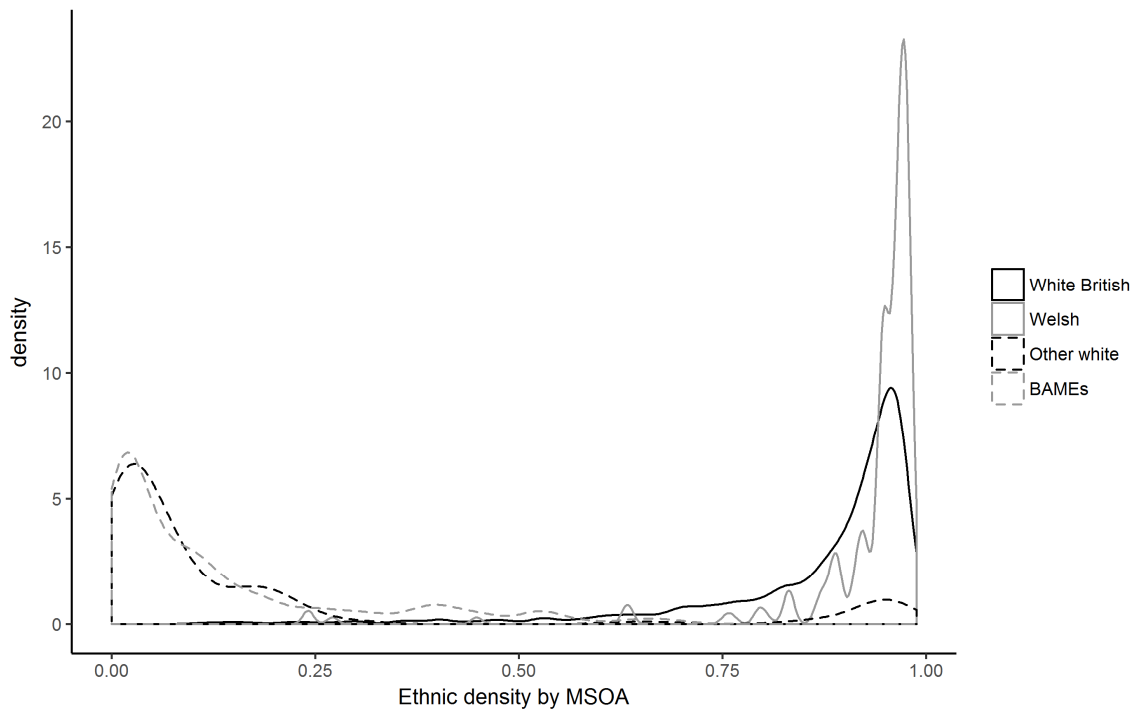
435 *Sample description*

436 A breakdown of the total sample across all three waves indicated that (as expected) White
437 British youths formed the largest group (67% of the study sample), followed by BAMEs

438 (27%). Youths categorised as Welsh and other Whites accounted for 3% and 2% of the total
439 sample, respectively. Table 2 shows the estimated individual and neighbourhood
440 characteristics for each ethnic group. There are clear differences between ethnic groups with
441 respect to several factors that we expect to be associated with mental health, including the
442 proportion of single parent households, parental physical and mental health, parents' highest
443 level of education, and length of residence in the neighbourhood.

444 Variation was also observed in parental behaviour: parents of White British and other
445 White ethnicities, on average, spent more leisure time with their children and ate dinner with
446 their children more frequently. Compared to BAME parents, parents from other ethnic groups
447 were less likely to spank/slap their children but exhibited similar behaviour with respect to
448 shouting, involving their children in rule setting, and cuddling or praising their children.
449 There was also appreciable inter-ethnic variation with respect to neighbourhood
450 characteristics, with clear gradients in various neighbourhood characteristics among the ethnic
451 groups. Compared to BAME youths, White British youths were less likely to reside in areas
452 with high levels of crime or economic and/or environmental deprivation.

453



454

455 *Fig. 1 Proportion of young people aged 10–15 from similar ethnic groups across neighbourhoods (Kernel-Density plot).*
 456 *Source: Understanding Society (2015), Waves 1, 3 and 5, linked with data from the 2011 Census.*

457

458 Figure 1 shows the distribution of the proportion of co-ethnic young people across different
 459 neighbourhoods. It is readily apparent that the proportion of co-ethnic residents is widely
 460 distributed for White British, but not for Welsh and all other ethnic groups. However, the
 461 Welsh sample was too small for these effects to dominate in a pooled model. BAMEs and
 462 other Whites are more likely to reside in diverse neighbourhoods with lower proportions of
 463 own-group members at the neighbourhood-level.

464

465 ***Results for individual/family characteristics***

466 Separate inspection of the coefficients for the covariates in the fixed part of the model
 467 examining the individual and family characteristics associated with young people’s mental
 468 health (Table SA6) revealed that having at least one parent in employment, and living in a
 469 single parent household are all likely to result in poor mental health. In contrast, older parents,
 470 whether having at least one parent born outside of the UK, residing in an area for ten years or
 471 more, having a parent without mental health issues, and having a parent with higher education

472 were associated with better mental health among young people. Interestingly, these analyses
473 revealed no significant differences in mental health by youth age or gender, and there were no
474 significant changes in mental health over time.

475

476 *Results from models examining mental health difficulties for the total sample*

477 Table 3 shows the results obtained for the pooled model which used the complete sample (n =
478 5,513). The negative coefficients for the ethnic minority groups indicate that they have better
479 mental health than White British youths, in keeping with previous findings. The changes in
480 the coefficients of Model 1 reflect the effects of parental/familial characteristics and parental
481 behaviour or neighbourhood characteristics. These changes indicate that, relative to young
482 people identifying themselves as White British, all other ethnic groups report fewer total
483 difficulties (i.e. better mental health). There is, however, some variation by ethnicity. For
484 example, these differences are significant for BAMEs and other Whites, but small and non-
485 significant for young people with a Welsh background.

486 These findings for BAMEs persist across every tested model, with some indication that
487 family characteristics is strongly associated with mental health (Model 2). When the models
488 are adjusted for parental behaviour (Model 3), the relationship between mental health among
489 BAMEs compared to White British youths remains strong. This suggests that parenting
490 behaviour does not explain and, if anything, increases the gap in mental health between
491 BAMEs and White British youths. This is illustrated by the fact that the coefficients of Model
492 3 are greater than those of Model 2 and remained highly significant. For the categories of
493 other Whites and Welsh, there is a negligible decline in mental health, which remained non-
494 significant. However, specific aspects of parental behaviour (Appendix SA6, Model 3) was
495 related to the better mental health of youths from these groups. In particular, the frequency of
496 leisure time spent with other Whites and Welsh predicted better mental health, while worse

497 mental health was found among these groups if their parents reported discussing important
498 matters, shouted, or slapped them.

Table 2 Description of individual-level and MSOA-level variables used in the models to examine the relationship between mental health, ethnicity, parental behaviour and neighbourhood characteristics.

	<i>(White British, n = 4, 918)</i>			<i>(Welsh, n = 224)</i>			<i>(other Whites, n = 174)</i>			<i>(BAMEs, n = 1,986)</i>		
	<i>Mean/ Freq</i>	<i>SD/ Percent</i>	<i>range</i>	<i>Mean/ Freq</i>	<i>SD/ Percent</i>	<i>range</i>	<i>Mean/ Freq</i>	<i>SD/ Percent</i>	<i>range</i>	<i>Mean/ Freq</i>	<i>SD/ Percent</i>	<i>range</i>
Individual level												
Youth a girl	2458	50.0%	0/1	120	53.6%	0/1	81	46.6%	0/1	1003	50.5%	0/1
Youth age	12.53	1.69	10/15	12.83	1.56	10/15	12.57	1.77	10/15	12.55	1.71	10/15
Wave												
1	2227	45.3%	0/1	99	44.2%	0/1	71	40.8%	0/1	969	48.8%	0/1
3	1460	29.7%	0/1	79	35.3%	0/1	52	29.9%	0/1	547	27.5%	0/1
5	1231	25.0%	0/1	46	20.5%	0/1	51	29.3%	0/1	470	23.7%	0/1
Household income (log)	8.00	0.53	4.93/9.9	7.82	0.52	6.5/9.14	7.93	0.55	6.17/9.66	7.88	0.56	4.97/9.9
At least one parent works	4211	85.6%	0/1	177	79.0%	0/1	140	80.5%	0/1	1478	74.4%	0/1
Single parent	1232	25.1%	0/1	79	35.3%	0/1	60	34.5%	0/1	566	28.5%	0/1
Parent's mental health	48.63	8.87	5.69/69.73	48.58	9.45	8.9/67.36	49.03	9.73	9.03/65.09	48.19	9.83	3.04/70.96
Parent's physical health	52.22	8.28	11.14/70.49	50.82	9.79	14.21/68.18	52.95	7.13	24.01/68.54	49.67	9.16	12.4/68.77
Parent's age	42.65	6.10	25/75	41.74	6.52	27/71	41.95	6.20	27/60	41.99	5.86	21/73
Parent's education												
<i>Degree</i>	1489	30.3%	0/1	58	25.9%	0/1	82	47.1%	0/1	692	34.8%	0/1
<i>Other higher degree</i>	860	17.5%	0/1	41	18.3%	0/1	20	11.5%	0/1	252	12.7%	0/1
<i>A-levels or similar</i>	1037	21.1%	0/1	47	21.0%	0/1	21	12.1%	0/1	352	17.7%	0/1
<i>GCSE or similar</i>	1067	21.7%	0/1	60	26.8%	0/1	15	8.6%	0/1	320	16.1%	0/1
<i>Other qualification</i>	277	5.6%	0/1	6	2.7%	0/1	24	13.8%	0/1	147	7.4%	0/1
<i>No qualification</i>	188	3.8%	0/1	12	5.4%	0/1	12	6.9%	0/1	223	11.2%	0/1
Parent's birthplace												
<i>Both parents UK born</i>	4134	84.1%	0/1	189	84.4%	0/1	49	28.2%	0/1	461	23.2%	0/1
<i>One parent non-UK born</i>	717	14.6%	0/1	33	14.7%	0/1	63	36.2%	0/1	707	35.6%	0/1
<i>Both parents non-UK born</i>	67	1.4%	0/1	2	0.9%	0/1	62	35.6%	0/1	818	41.2%	0/1
Length of residence												
<i>1 year or less</i>	166	3.4%	0/1	8	3.6%	0/1	12	6.9%	0/1	106	5.3%	0/1
<i>2–3 years</i>	371	7.5%	0/1	11	4.9%	0/1	34	19.5%	0/1	173	8.7%	0/1

<i>4–10 years</i>	2101	42.7%	0/1	87	38.8%	0/1	80	46.0%	0/1	904	45.5%	0/1
<i>10 years or longer</i>	2280	46.4%	0/1	118	52.7%	0/1	48	27.6%	0/1	803	40.4%	0/1
Parental behaviour												
<i>Leisure time</i>	3.50	1.18	1/6	3.35	1.31	1/6	3.57	1.28	1/6	3.18	1.25	1/6
<i>Eat dinner</i>	3.38	0.79	1/4	3.20	0.97	1/4	3.43	0.74	1/4	3.50	0.77	1/4
<i>Talk about important matters</i>	3.31	0.77	1/4	3.35	0.78	1/4	3.42	0.74	1/4	3.39	0.77	1/4
<i>Praise</i>	3.76	0.41	1/4	3.71	0.45	2/4	3.68	0.51	1/4	3.69	0.47	1/4
<i>Cuddle</i>	3.71	0.53	1/4	3.60	0.67	1/4	3.78	0.40	2/4	3.67	0.58	1/4
<i>Involve youth in rule setting</i>	2.50	0.86	1/4	2.34	0.94	1/4	2.55	0.89	1/4	2.57	0.93	1/4
<i>Shouting</i>	2.99	0.71	1/4	2.90	0.73	1/4	2.89	0.65	1/4	2.89	0.78	1/4
<i>Spanking or slapping</i>	1.25	0.50	1/4	1.18	0.44	1/3	1.24	0.45	1/3	1.40	0.63	1/4
Neighbourhood level												
<i>Ethnic density</i>	0.87	0.15	0.09/0.99	0.93	0.10	0.24/0.99	0.16	0.28	0/0.97	0.13	0.16	0/0.77
Deprivation												
<i>Q1-least deprived</i>	1135	23.1%	0/1	26	11.6%	0/1	19	10.9%	0/1	98	4.9%	0/1
<i>Q2</i>	1105	22.5%	0/1	70	31.2%	0/1	28	16.1%	0/1	121	6.1%	0/1
<i>Q3</i>	1143	23.2%	0/1	49	21.9%	0/1	36	20.7%	0/1	162	8.2%	0/1
<i>Q4</i>	884	18.0%	0/1	61	27.2%	0/1	36	20.7%	0/1	286	14.4%	0/1
<i>Q5-most deprived</i>	651	13.2%	0/1	18	8.0%	0/1	55	31.6%	0/1	1319	66.4%	0/1
Crime												
<i>Q1-least deprived</i>	1169	23.8%	0/1	52	23.2%	0/1	35	20.1%	0/1	51	2.6%	0/1
<i>Q2</i>	1103	22.4%	0/1	48	21.4%	0/1	32	18.4%	0/1	137	6.9%	0/1
<i>Q3</i>	967	19.7%	0/1	51	22.8%	0/1	27	15.5%	0/1	294	14.8%	0/1
<i>Q4</i>	922	18.7%	0/1	30	13.4%	0/1	36	20.7%	0/1	686	34.5%	0/1
<i>Q5-most deprived</i>	757	15.4%	0/1	43	19.2%	0/1	44	25.3%	0/1	818	41.2%	0/1
Living environment												
<i>Q1-least deprived</i>	1289	26.2%	0/1	37	16.5%	0/1	34	19.5%	0/1	110	5.5%	0/1
<i>Q2</i>	1091	22.2%	0/1	63	28.1%	0/1	23	13.2%	0/1	156	7.9%	0/1
<i>Q3</i>	1024	20.8%	0/1	32	14.3%	0/1	39	22.4%	0/1	252	12.7%	0/1
<i>Q4</i>	913	18.6%	0/1	50	22.3%	0/1	41	23.6%	0/1	509	25.6%	0/1
<i>Q5-most deprived</i>	601	12.2%	0/1	42	18.8%	0/1	37	21.3%	0/1	959	48.3%	0/1

Note: Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh bacculaureate; international bacculaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE/O-level or similar includes CSE; standard/ordinary (o) grade / lower

499

Table 3 Ethnicity related coefficients ^{ab} derived from multilevel linear regression of mental health with respect to ethnicity, individual/family characteristics, parental behaviour and neighbourhood characteristics among young people.

Ethnicity (comparison group: White British)						
	Other Whites	Welsh	BAMEs	Neighbourhood variance	Individual variance	Variance of Time
	<i>Coeff (SE)</i>	<i>Coeff (SE)</i>	<i>Coeff (SE)</i>			
Model 1 (Individual characteristics)	-0.93* (0.44)	-0.53 (0.41)	-1.13*** (0.17)	1.81	3.77	3.73
Model 2 (+ family/parental characteristics)	-0.56 (0.45)	-0.57 (0.41)	-0.75*** (0.21)	1.66	3.65	3.74
Model 3 (+ parental behaviour)	-0.57 (0.45)	-0.56 (0.41)	-0.83*** (0.21)	1.53	3.56	3.77
Model 4 (model 2 + deprivation and ethnic density)	-0.71 (0.55)	-0.61(0.41)	-0.97* (0.40)	1.65	3.65	3.74
Model 5 (model 2+ crime and living environment) ^c	-0.77 (0.55)	-0.54 (0.41)	-1.01* (0.40)	1.66	3.65	3.74

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Models are sequentially adjusted.

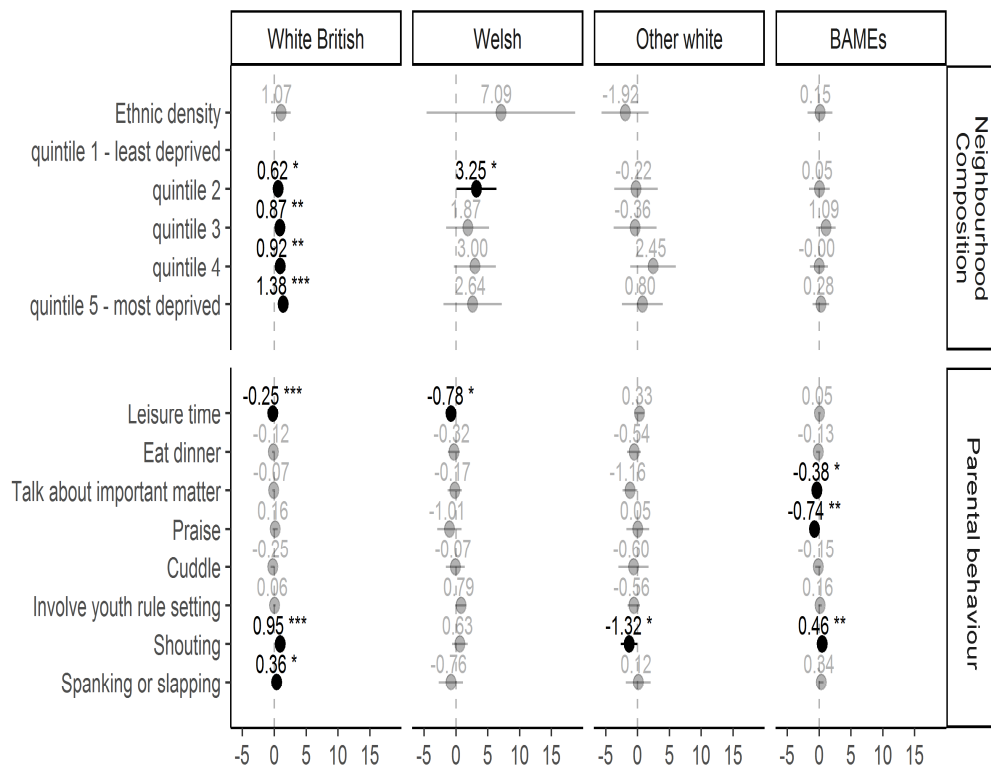
^a Individual/parental characteristics included: sex, age, parents' age, single parent household, parents' highest educational qualification, parents' mental health, parents' physical health, nativity, household income (log), length of neighbourhood residency and waves.

^b For complete set of results, see Appendix SA3.

^c The effect of crime and the living environment alongside ethnic density was assessed in this model without deprivation because of the strong correlation between these variables.

Source: *Understanding Society (2015)*, Waves 1, 3 and 5, linked with MSOA-level data from Census 2011.

500 To further investigate the impact of neighbourhood characteristics and parental
 501 behaviour, separate models examining the mental health of young people from each ethnic
 502 group were analysed. The results, which are shown in Figure 2, indicate a strong and
 503 significant association between deprivation and the mental health of White British youths, and
 504 only weakly significant relationship for Welsh youths. However, deprivation was not related
 505 to the mental health of young people from any other ethnic group.



506
 507 Figure 2. Coefficients from models examining the association between ethnic density, socioeconomic deprivation and
 508 parenting behaviour on the mental health of young people aged 10–15. Models were analysed for each ethnic group
 509 separately. More negative coefficients correspond to lower total difficulties scores (i.e. better mental health). Notes:
 510 * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
 511

512 The effect of parenting varied by ethnicity. The mental health of Welsh and White British
 513 youths increased significantly with the frequency of social interaction with their parents (i.e.
 514 the amount of leisure time spent together). Shouting and spanking appeared to have the most
 515 negative impact on the mental health of White British youths. Although shouting was also
 516 associated with poor mental health for BAMEs, it appeared to be associated with better

517 mental health for other Whites. Discussing important matters with parents and receiving
518 praise were associated with better mental health among BAME young people, whereas the
519 parental behaviour with the most significant impact on mental health among Welsh youths
520 seemed to be leisure time spent with parents.

521 The results presented in Figure 2 show differences between White British youths and
522 those from Welsh and other White backgrounds. The initial pooled models included the
523 assumption that the factors impacting mental health in these groups were identical. However,
524 the results of the separate analyses indicated that young people self-identifying as White
525 British generally fare worse than other Whites and Welsh youths when parental behaviour and
526 socioeconomic deprivation are considered.

527 We also fitted additional interaction models (not shown here) that confirmed the existence
528 of significant inter-ethnic differences in parenting behaviour. However, models fitted to
529 determine whether neighbourhood ethnic density enhanced the effect of certain parental
530 behaviours on young people's mental health were not supported, and neither were models
531 fitted to determine the effect of the level of deprivation. The results for these models are
532 available from the authors upon request.

533

534 ***Results for the other subscales***

535 Differences in the results for each of the four subscales included in the total difficulties score
536 (TDS) are responsible for the observed variation in the mental health of young people (see
537 results given in SA7.1–A7.4). An examination of the subscales indicated that relative to
538 White British youths, all other ethnic groups had lower levels of mean emotional symptoms,
539 hyperactivity-inattention and peer relationship problems. Specifically, BAMEs had lower
540 mean scores on all three subscales described above, Welsh youths on average reported having
541 good peer relationships, and other Whites reported lower mean scores on the hyperactivity-
542 inattention subscale relative to White British youths. There were no detectable differences in

543 the association between conduct problems among White British youths and all other ethnic
544 groups.

545

546 **Discussion**

547 The findings reported here support the results of prior research on inter-ethnic disparities in
548 mental health among young people at the individual and neighbourhood levels. Specifically,
549 earlier studies showed that a relatively small but significant proportion of the variation in
550 mental health as measured by SDQ is associated with socioeconomic deprivation (Harding et
551 al. 2015; Fagg et al. 2006), while other work has found that parenting behaviour might be a
552 contributing factor (Maynard and Harding 2010).

553 The neighbourhood characteristics considered in this work were more weakly related to
554 the mental health of BAMEs than to that of White British youths. In fact, our data provide no
555 indication that these factors strongly influence the mental health of young people from any
556 ethnic group, including those of Welsh and other White ethnicities. These results were
557 somewhat surprising because the descriptive statistics indicate that neighbourhood
558 characteristics vary greatly with ethnicity. The fact that inter-ethnic disparities in mental
559 health were not fully explained by the neighbourhood characteristic included in the models
560 may indicate that the relationship between neighbourhood characteristics and mental health
561 outcomes among young people is based on a complex set of interactions that was captured by
562 the models and the data.

563 Fagg et al. (2006) speculated that the neighbourhoods included in their study might have
564 lacked variation, and that this limited heterogeneity may have contributed to the finding that
565 socioeconomic disadvantages were not related to psychological distress among young people.
566 However, the data used in this work were drawn from a national sample with the necessary
567 heterogeneity in measures of neighbourhood characteristics. Given this fact, how do we
568 explain the observed ethnic differences? We suggest that our results may be due to the age of

569 the participants in our sample. It may be that the influence of friends and parents, together
570 with family circumstances, are more important than neighbourhood characteristics in
571 determining whether young people have mental health difficulties. Earlier studies also
572 suggested that younger people may lack the mobility and social autonomy necessary for the
573 types of interactions with the neighbourhood that might affect mental health (De Clercq et al.
574 2012).

575 Our results also indicate that while deprivation by itself seemingly has little effect on the
576 mental health of young BAMEs, it is an important driver of the effects witnessed for White
577 British youths. For instance, the stratified models in which the mental health of each ethnic
578 group was examined separately indicated that mental health difficulties were more common
579 among White British youths residing in deprived neighbourhoods, and it is these effects that
580 usually increase the gap between the mental health of White British youths and BAMEs. A
581 similar result has been found among adult populations, where the detrimental association
582 between deprivation at the neighbourhood-level and health perceptions was greater in
583 magnitude and stronger for White British people than ethnic minority group members
584 (Bécares, Nazroo, et al. 2012; Jonsson and Demireva 2018).

585 One might also argue, since deprivation is strongly associated with minority
586 neighbourhoods, that White British youths residing in these areas might be affected
587 negatively by being ‘outsiders’, which could lead to discrimination that could, in turn, worsen
588 mental health. Moreover, as minorities in deprived neighbourhoods, White British youths may
589 lack the social support and networks to cope with their life situation, which could adversely
590 affect their mental health. It may be that deprivation does not affect the mental health of
591 young people from minority ethnic groups because they are protected from the adverse effects
592 of residing in a deprived neighbourhood by stronger social support and services tailored to
593 their specific ethnic groups (Bécares, Nazroo, et al. 2012; Bécares, Shaw, et al. 2012).

594 The internal heterogeneity of the BAME group could also possibly explain its non-
595 significant relationship between deprivation and mental health. Combining large ethnic
596 categories into single large groups can be problematic because it may conceal significant
597 differences (Aspinall 1998; Bhopal 1997; Bhopal 2002). Prior studies have reported mental
598 health advantages for Black Africans (Maynard, Harding, and Minnis 2007), Indians (Green
599 et al. 2005; Meltzer et al. 2000), and Bangladeshis (Stansfeld et al. 2004) relative to White
600 British youths, but no such advantage was observed for Black Caribbean youths (Green et al.
601 2005). Unfortunately, in our data set, the sub-samples of the BAME group corresponding to
602 individual BAME ethnicities were too small to permit meaningful analyses of neighbourhood
603 characteristics' effects on specific subgroups, which may have masked some interesting
604 effects. The heterogeneity of the BAME category may also explain the weak association
605 between mental health and residence in ethnically dense neighbourhood environments.

606 The findings of this study also indicate that parental behaviour may have an important
607 influence on the mental health of young people, especially BAMEs, for whom parenting style
608 seemed to produce small but incremental improvements in mental health when the models
609 were adjusted for individual and parental characteristics. Parental behaviour, however, must
610 be balanced between supportive and authoritative styles of parenting. For instance, the
611 frequency of spending leisure time with parents and discussing matters deemed important
612 appear to be associated with better mental health, whereas shouting and spanking predict poor
613 mental health. These findings are supported by previous research suggesting that the parent-
614 child relationship protects young people from the adverse effects of the wider society
615 (Maynard and Harding 2010; Xue et al. 2005) such as deprivation (Fagg et al. 2006). In
616 particular, studies from the US have shown that there may also be a protective component to
617 authoritative parenting behaviours, and the resulting parent-child relationship. Specifically,
618 families living in deprived areas may adopt more authoritative parenting styles that restrict

619 their children's interactions with other residents (Sampson, Morenoff, and Earls 1999;
620 Furstenberg 1999; Lee et al. 2014) and from perceived ills that might negatively impact their
621 well-being.

622 In summary, it appears that while neighbourhood characteristics have some influence on
623 the mental health of young people, our findings generally support previous research indicating
624 that most of the variability in young persons' mental health is due to individual-level
625 variation. There was also some indication that parental behaviour accounted for some of the
626 variation in mental health among young people. The question of why minority group
627 members are more resilient to deprivation than majority group members remains unanswered,
628 and further studies are required to explain this differences.

629

630 *Strengths and limitations*

631 Some limitations of the data used in this work, and of neighbourhood studies in general,
632 should be borne in mind when interpreting the results of this study. One limitation is that the
633 neighbourhoods boundaries considered in this work were defined using administrative
634 measures that may not fully reflect the experiences of young people living in their area of
635 residence. On the other hand, neighbourhood boundaries were defined on the basis of Middle
636 Super Output Areas (MSOAs); as stated above, an MSOA is an aggregated census measure
637 containing 3,000 households with an average population size of 7,500. Given the small
638 geographic area captured by this measure, this level of aggregation might reasonably be
639 expected to correlate quite closely with conversational definitions of neighbourhoods.

640 In addition, studies seeking to disentangle area-level variance have an acknowledged
641 weakness stemming from the difficulty of separating compositional and contextual effects.
642 We sought to overcome this by employing multilevel models that can simultaneously model
643 variance at the individual and neighbourhood-levels, which should increase the precision of
644 the estimates (Lupton 2003; Van Ham et al. 2012; Pickett and Pearl 2001).

645 Another limitation of the data analysis in this work relates to the listwise deletion of some
646 study participants. An acknowledged effect of this is data loss, which may have some
647 implications for the statistical power of any given analysis. A related issue is that listwise
648 deletion may lead to bias because increases in the mean squared error term may be similar to
649 that expected from omitted variables (King et al. 2002). For instance, young people who do
650 not respond to questions regarding their ethnicity are likely to be from minority backgrounds.
651 Similarly, non-response to questions regarding parents' mental and physical health may be
652 more likely if those parents are unwell, biasing the data towards a healthier sample. The
653 alternative to listwise deletion is multiple imputation. However, this method also requires
654 researchers to make the ignorability assumption (Allison 2002). A question that remains
655 unresolved in the literature is how imputation affects the quality and reliability of results
656 when the conditions/assumptions under which it is carried out do not hold (Allison 2002;
657 Mittag 2013).

658

659 **Conclusions and study implications**

660 This study has provided compelling evidence of a pressing need for additional work to
661 explain the variation in mental health among young people by ethnicity. Such studies are
662 necessary because of the disturbingly high prevalence of young people who suffer from
663 mental health difficulties and the fact that childhood/adolescence is the stage where most
664 mental disorders (which are often first detected later in life) have their origins. Greater
665 knowledge of these issues would contribute to both policy-making and academia. Moreover, a
666 better understanding of the complex mechanisms that contribute to inter-ethnic disparities in
667 mental health could lead to significant improvements in the delivery of more targeted and
668 effective interventions for detecting and treating mental ill-health. Future studies may also
669 improve our understanding of the differential trajectories of mental health among ethnic

670 minority groups, and thereby facilitate earlier diagnosis and treatment of individuals who are
671 later diagnosed with more severe mental disorders.

672

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