Abstract

This study examined English school poverty effects on trajectories of child behaviour across ages 3, 5, 7 and 11, and the moderating roles of ethnicity and gender. School poverty predicted internalising and externalising problems concurrently, and internalising problems longitudinally. In poor schools, girls had a steeper incline in internalising problems, but made greater reductions in externalising problems. Ethnic differences were also found in the association between school poverty and child adjustment. Gender and ethnic background may influence how a child responds emotionally and behaviourally to the composition of peers at school.

Keywords: child behavior, ethnicity, gender, Millennium Cohort Study, school composition

School poverty effects on trajectories of child behaviour: Do they depend on gender and ethnicity?

Much research has explored the role of school socio-economic composition on educational achievement (Hutchison, 2003; Konstantopoulous & Borman, 2011; Sammons, West, & Hind, 1997; Schagen & Schagen, 2005; van Ewijk & Sleegers, 2010). However, its influence on child emotional (internalising) and behavioural (externalising) problems has received less attention, despite evidence that mental health problems in childhood and adolescence may compromise academic functioning (Bub, McCartney, & Willett, 2007; Needham, Crosnoe, & Muller, 2004). Like academic outcomes, child behaviour outcomes are antecedents to mental health problems in adulthood (Hofstra, van der Ende, & Verhulst, 2002) along with a host of other adult outcomes including lack of education (Colman et al., 2009), unemployment (Knapp, King, Healey, & Thomas, 2011) and relationship problems (Colman et al., 2009).

School-composition effects capture the collective influence of pupil peer groups at school. Composition refers to the aggregation (at the school-level) of pupils' characteristics, including demographic, socio-economic or academic/intellectual (Coleman et al., 1966; Jencks & Mayer, 1990; Konstantopoulos & Borman, 2011; Rumberger, 2011; Rumberger & Palardy, 2005). One of the main theories linking school composition effects to individual child outcomes is 'contagion theory' (Jencks & Mayer, 1990). According to contagion theory, the socio-economic composition of a school determines what kind of behavioural norms are transmitted through peer influence. This contagion of behaviours and attitudes from peers within the school may impact the behaviours of individual children (Dishion & Tipsord, 2011; Gaviria & Raphael, 2001). A second theory says that schools with disadvantaged socio-economic intakes have certain institutional characteristics that may relate unfavourably to child behaviour. For example, schools with lower social class

compositions have been shown to have higher teacher turnover (Dolton & Newson, 2003; Smithers & Robinson, 2004). Other characteristics of disadvantaged schools may include lower parental involvement in schooling, less effective management processes within schools and a less rigorous curriculum (Thrupp, Lauder, & Robinson, 2002).

There is some evidence that disadvantaged socio-economic intakes predict negatively pupil emotional and behavioural adjustment in primary school (Flouri & Midouhas, 2016; George & Thomas, 2000; Humphrey & Wigelsworth, 2012; Humphrey, Lendrum, & Wigelsworth, 2010) and in secondary school (Coley, Sims, Dearing, & Spielvogel, 2017). In England, using multilevel regression models accounting for clustering of children within schools and amount of time in school, Flouri and Midouhas (2016) found a small but robust effect of state school socio-economic composition at ages 5 and 7 on pupils' internalising and externalising problems at age 7, using data from the UK's Millennium Cohort Study. The intraclass correlations (ICCs), a measure of how much variation at the individual level is attributable to differences at the cluster (in this case, school) level, ranged from .02 to .06 depending on the problem type. Indeed, most studies have found small school effects on child behaviour and well-being outcomes. Sellstrom and Bremberg's (2006) review identified six school effect studies with a focus on 'problem behaviour/well-being'. They found that ICCs ranged from .01 to .25. Existing research has not, however, explored whether school socio-economic composition is associated with change in internalising and externalising problems *over time*. Understanding the longitudinal impact on internalising and externalising problems across the primary school period would allow us to get closer to understanding whether this is a causal relationship.

Furthermore, little is known about whether the relationship between school socio-economic composition effects and internalising and externalising problems depends on

individual pupil characteristics such as gender and ethnicity. Children with particular characteristics attending schools with lower socio-economic compositions may have better than expected emotional and behavioural adjustment. Girls, in general, are at lower risk of behavioural problems and higher risk of internalising problems than boys (Egger & Angold, 2006; Gutman, Joshi, Parsonage, & Schoon, 2015). A fair amount of research finds that boys (relative to girls) are more vulnerable to environmental risk factors including family poverty and stress in early life (Werner & Smith, 2001; Hetherington & Elmore, 2003), though these differences appear to lessen with age.

Ethnicity is another characteristic that may be associated with differential effects of school socio-economic composition (Coley et al., 2017). Firstly, there are ethnic differences in emotional and behavioural problems in the UK. In general, research shows that the main ethnic minority groups in the UK have similar or lower rates of emotional, behavioural and hyperactivity problems than White British children (Goodman, Patel, & Leon, 2008), despite experiencing more poverty (Platt, 2007). In the literature using data from the aforementioned MCS, the data analysed in the present study, some minority ethnic groups have been found to have greater internalising and externalising problems than White children but others demonstrate fewer problems, partly dependent on age. At age 3, using the MCS data, Platt (2012) found that children from Indian and Pakistani or Bangladeshi backgrounds had more, and Black African children had fewer, internalising and externalising problems, when measured with a composite score. Also using the MCS data, Zilanawala, Sacker, Nazroo and Kelly (2015) showed that, among the same children, Pakistani and Black Caribbean children had significantly higher externalising problems scores at age 7, explained by their socio-economic backgrounds, and Black African children had lower scores, than their White peers. The better adjustment of Black African children was unexplained by family socio-economic and parenting factors. Furthermore, internalising problems were higher among Pakistani,

Bangladeshi and Black Caribbean children relative to White children, only partly attenuated by their socio-economic position. Other research by Zilanawala, Sacker and Kelly (2016) has found that Mixed ethnic children have better socio-emotional outcomes than their non-Mixed counterparts and that they followed different growth trajectories.

Ethnic differences in child behaviour may also exist for children depending on the socio-economic composition of peers in their school. Recent reports (Greaves, Macmillan, & Sibieta, 2014) have shown that attainment and progress of pupils in disadvantaged urban areas of the UK is higher than other areas of the country (frequently termed the 'London effect' but it applies to other urban areas as well). Burgess (2014) identified that pupil ethnic background explains some, though not all, of this effect on attainment progress as non-white ethnic minorities tend to be clustered within urban schools. Burgess argued that families and their children from minority ethnic backgrounds may have higher aspirations, a superior work ethic and, especially for those from immigrant backgrounds, place greater hopes in the education system than White British families which translates to greater school engagement. As schools with disadvantaged socio-economic compositions are found within disadvantaged urban areas, we might find that children from minority ethnic backgrounds relative to White children in poor schools also have fewer internalising and externalising problems (not only higher attainment, given their associations, Bub et al., 2007; Needham, Crosnoe, & Muller, 2004). These children may have 'non-cognitive' skills such as self-regulation, work ethic and school engagement driven by their family values and aspirations that help to buffer the effects of a disadvantaged socio-economic composition.

On the other hand, children from ethnic minority backgrounds may do more poorly in schools with higher socio-economic intakes. In such schools where ethnic composition is overwhelmingly White, children with minority ethnic backgrounds may experience feelings

of social inferiority (Crosnoe, 2009), which, in turn, may be associated negatively with mental health. Therefore, attending a more affluent school may have a detrimental, rather than positive, effect for children from minority ethnic backgrounds due to mechanisms of relative deprivation (Jencks & Mayer, 1990).

The present study

This study examined whether the socio-economic composition of schools relates to primary school children's internalising and externalising problems, concurrently and longitudinally. It also tested whether this relationship depends on gender and ethnicity. It modelled the relationship between school socio-economic composition, measured with the percentage of pupils in the school who are eligible for a free school meal (FSM), and children's trajectories of child adjustment problems across four timepoints (age 3, 5, 7 and 11). A number of possible confounders of the relationship between school composition and child behaviour were adjusted for including family socio-economic disadvantage, child eligibility for a FSM, maternal education, maternal psychological distress and child cognitive ability. By doing so, biases related to selection into schools were reduced. Accounting for selection into schools is important in order to ascertain whether school 'effects' are genuine or are due to individual pupil characteristics unaccounted for (Ginther, Haveman, & Wolfe, 2000). In this study, selection occurs if the sorting of pupils into schools is not independent from emotional/behavioural adjustment. For example, child cognitive ability at the beginning of school should be related to both emotional/behavioural adjustment and choice of school.

It was hypothesized that school socio-economic composition would predict internalising and externalising problems such that a greater intake of disadvantaged pupils would relate to more problems concurrently and longitudinally, even after accounting for key child and family background characteristics. However, it was expected that the remaining

effect would be small relative to individual and parent/family characteristics. Furthermore, it was hypothesized that child gender and ethnicity would be associated with differential school composition effects on internalising and externalising problems.

Methods

Participants and Procedure

The Millennium Cohort Study (MCS; www.cls.ioe.ac.uk/mcs) is a longitudinal survey of 19,244 families drawing its sample from all births in the UK over a year, beginning in September 2000. The MCS sample is disproportionately stratified to ensure adequate numbers in the four UK countries and electoral wards with disadvantaged or (in England) ethnic minority populations (Plewis, 2007). Ethical approval for MCS was gained from NHS Multi-Centre Ethics Committees, and parents gave informed consent before interviews took place. Data from Sweeps 2-5 were used, taking place when the children were around 3, 5, 7 and 11 years, respectively, starting in early childhood and moving through the phase of primary school education. Using records for only one child per family (the first-born where there were twins or triplets), the analytic sample (n=7,848) comprised children attending an English state school with data on school-level FSM-eligibility at age 7 (available for English state schools only) and with data on emotional and/or behavioural problems at minimally one of the four waves (age 3, 5, 7 or 11).[1]. Figure 1 demonstrates how the analytic sample was derived.

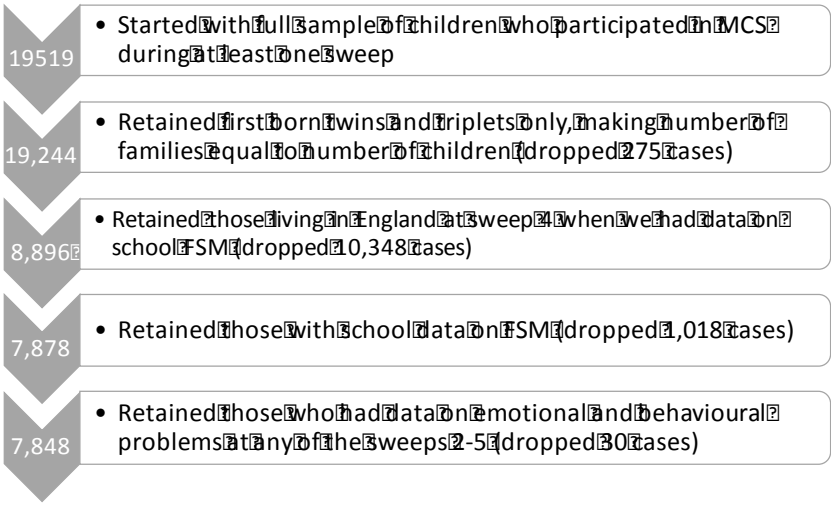

Figure 1. Analytic sample description

Measures

School socio-economic composition ('School FSM') was measured with the percentage of pupils eligible for a free school-meal (FSM) in state-maintained schools in England. Data were collected during the January 2009 (corresponding with Sweep 4) census, obtained from the School Data Unit at the Department for Education. Percentages were banded into deciles based on all primary schools in England. These data were linked with MCS data in a secure environment using the unique reference number of each child's school. Measuring family income using an indicator of FSM eligibility is widespread in educational research in the UK, given its availability in the school census. However, it is an imperfect measure (Hobbs & Vignoles, 2007; 2010).

Internalising and externalising problems were measured at ages 3, 5, 7 and 11 with the main parent-reported Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The SDQ is a 25-item scale measuring four domains of difficulties (hyperactivity, emotional symptoms, conduct problems and peer problems) and prosocial behaviour. Item response options are 0 (*not true*), 1 (*somewhat true*) and 2 (*certainly true*). In line with recommended practice for community samples (Goodman, Lamping, & Ploubidis, 2010), the internalising problems scale comprised the 10 items from the emotional symptoms and peer problems

subscales, and the externalising problems scale was derived from the 10 items from the hyperactivity and conduct problems subscales. Scores for each 10-item scale may range from 0 to 20. A higher score indicates *more* problems. An increase in 1-point on the SDQ scale is associated with going from either a response of 'not true' to 'somewhat true' or a response of 'somewhat true' to 'certainly true'. In the sample, internal consistency was at acceptable levels, and in line with other SDQ research (Stone, Otten, Engels, Vermulst, & Janssens, 2010). Cronbach's alpha values for internalising problems at age 3, 5, 7 and 11 were .61, .66, .71 and .76, respectively. For externalising problems, these figures were .78, .76, .79 and .80.

The two moderating variables were *child's gender* and *ethnicity*. Ethnic categories were White, Mixed, Indian, Pakistani, Bangladeshi, Black Caribbean, Black African and other.

Key covariates were both parent/family-level and child-level. In order to assess the contribution of school-level socio-economic composition above and beyond the child's own socio-economic background and hence reduce selection bias associated with selective sorting of families into schools (and neighbourhoods), three family-level socio-economic indicators were adjusted for:1) whether the child was eligible for a FSM at age 7, 2) family *socio-economic disadvantage* (SED) and 3) *maternal education* (University degree or not by child's age 11). Family SED was measured with a summary of four binary items indexing economic and material deprivation (Malmberg & Flouri, 2011). This score captures poverty and its associated material conditions more broadly than relying on measured income alone, and emphasizes the interrelationships between family-level socio-economic risk factors. The four items were overcrowding (>1.5 people per room excluding bathroom and kitchen), not owning the home, receipt of means-tested income support, and income poverty (below the poverty line). For each wave (at child's ages 3, 5, 7 and 11), a mean across the four items was used. Additionally, *maternal psychological distress* (at child's ages 3, 5, 7 and 11) was

measured with the 6-item Kessler scale (Kessler et al., 1993). Cronbach's alpha was .86, .86, .87 and .89 for ages 3, 5, 7 and 11, respectively.

The child-level variables were *age* in years (at child's ages 3, 5, 7 and 11), *cognitive ability* (at the beginning of primary school at age 5) and whether the child changed school at least once. To measure cognitive ability, regression factor scores were derived from principal components analysis of multiple age-adjusted ability assessment scores. Then the factor score was transformed into a standardized score with a mean of 100 and a standard deviation of 15 (Hanscombe et al., 2012). At age 5, ability was assessed with the BAS Naming Vocabulary, BAS Pattern Construction (measuring spatial problem solving) and BAS Picture Similarities (measuring non-verbal reasoning) scales. Accounting for cognitive ability at one timepoint was considered sufficient given that cognitive ability has been found to be moderately stable across childhood in previous papers using the MCS data (Flouri, Midouhas, & Joshi, 2015).

All models accounted for the stratified sample design of MCS, indicating the areas from which families were sampled in the first sweep (age 9 months). There were nine strata: England-disadvantaged, England-advantaged, English-ethnic, Wales-advantaged, Wales-disadvantaged, Scotland-advantaged, Scotland-disadvantaged, Northern Ireland-advantaged and Northern Ireland-disadvantaged.

Analytic plan

Traditional growth curve regression modelling (Snijders & Bosker, 1999) was used to analyse the data on MCS children and their families. The multilevel structure had repeated measures of internalising and externalising problems (Level 1) nested with the child (Level 2). A third level was tested with school as the unit in an empty model (with no independent variables) but the between-school variation in this model was not statistically significant so this was left this level out of the model. (Over half of the sample did not attend school with another MCS children and therefore clustering was minimal.) To measure growth in these

models, a variable measuring time is required. In this analysis, age in years centred at the grand mean across sweeps (7.74 years) captured time. To capture individual trajectories of problems, these models have a random intercept and slope for age. As the average trajectory of internalising and externalising problems has a linear shape (internalising problems increased and externalising problems decreased steadily across sweeps) only age (and not age-squared) was included in the models.

A series of six regression models were run. Model 1 estimated the main effect of school FSM and the effect of school FSM at the intercept (around age 8) and on the instantaneous rate of linear change in internalising and externalising problems, above and beyond pupil-level FSM eligibility and adjusting for additional child and family/parent characteristics that may confound the relationship. In Models 2 and 3, moderation of the school FSM effects by gender and ethnicity, respectively, was tested. Interaction terms were added to Model 2 examining the interaction of school FSM and each pupil characteristic at the intercept (around 8 years; e.g. 'school FSM x girl') and on the instantaneous linear rate of change in internalising and externalising problems (e.g., 'school FSM x girl x age'). The interaction of school FSM and child characteristics on the instantaneous non-linear rate of change was also tested but there were no significant interaction effects so we left these multiplicative terms out of all models for parsimony.

Results

Sample description and correlations between the main variables

Table 1 contains the sample descriptive statistics for the analytic (n = 7,848) and non-analytic samples (n = 11,396). On average, children attended schools in the fifth decile in terms of school FSM. Their internalising problems increased and their externalising problems decreased, on average, across primary school. The analytic sample had higher school-level proportions of pupils eligible for FSM than those in the rest of the MCS sample. Children in

the analytic sample also had more emotional (at ages 5 and 7) and behavioural (at ages 3, 5 and 7) problems and their mothers reported more psychological distress at the child's age 5 and 7. Children were less likely to change schools in the analytic sample and were younger. However, child gender, ethnicity and cognitive ability, as well as family SED and maternal education did not differ between the two samples (except for family SED being higher at age 7 in the analytic sample).

Table 2 shows the correlations between school FSM and externalising and internalising problems at ages 3, 5, 7 and 11, in the sample (n = 7,848). As expected, School FSM was weakly but significantly associated with both internalising and externalising problems at all four timepoints.

Table 1

Descriptives of Study Variables in the Analytic Sample and the Non-Analytic Sample

Categorical variables	Analytic Sample		Non-Analytic Sample		
	N	%	N	%	[a]F
Girl	3860	49.52	5489	48.61	0.84
Ethnicity					
White	5959	85.61	9785	87.72	1.92
Mixed	305	3.47	289	2.82	
Indian	283	1.82	214	1.94	
Pakistani	533	3.51	421	2.89	
Bangladeshi	225	1.14	171	0.90	
Black Caribbean	133	1.16	126	0.88	
Black African	224	1.66	195	1.49	
Other ethnicity	185	1.62	171	1.35	
Mother is university-educated	1438	15.69	2066	15.29	0.21
Child changed school	1963	33.09	1197	65.40	134.39***
Child eligible for FSM	1107	17.70	66	12.97	[b]7.34**
Continuous variables	N	Mean (SD)	N	Mean (SD)	[c]F
Internalising problems					
Age 3	7895	2.89(2.17)	6683	2.85(2.92)	0.64
Age 5	7172	2.55(2.23)	7510	2.42(2.96)	5.89*
Age 7	7563	2.96(2.57)	5852	2.48(3.35)	60.37***
Age 11	6618	3.42(2.96)	6168	3.29(3.78)	2.69
Externalising problems					

Age 3	6671	6.84(3.37)	7924	6.62(4.37)	8.81**
Age 5	7148	4.87(3.00)	7501	4.70(4.08)	5.18*
Age 7	7556	5.00(3.25)	5857	4.57(4.47)	28.57***
Age 11	6603	4.74(3.32)	6158	4.77(4.39)	0.08
School FSM (age 7) in deciles	7848	5.44(2.83)	30	8.89(1.15)	187.31***
Maternal psychological distress					
Age 3	5670	3.29(3.21)	6787	3.20(4.40)	1.04
Age 5	6657	3.21(3.31)	7122	3.00(4.51)	7.21**
Age 7	6985	3.27(3.49)	5632	3.00(4.83)	8.71**
Age 11	6207	4.28(4.14)	5911	4.24(5.34)	0.12
Socio-economic disadvantage (SED)					
Age 3	7484	0.21(0.25)	11396	0.23(0.34)	3.42
Age 5	7452	0.21(0.25)	7713	0.22(0.34)	2.13
Age 7	7844	0.23(0.26)	6001	0.19(0.34)	23.66***
Age 11	6885	0.21(0.25)	6402	0.23(0.33)	1.28
Child's age					
Age 3	7216	3.12(0.17)	8366	3.16(0.26)	55.14***
Age 5	7480	5.19(0.21)	7765	5.23(0.29)	46.86***
Age 7	7848	7.23(0.22)	6009	7.24(0.30)	6.45*
Age 11	6885	11.15(0.31)	6402	11.19(0.37)	25.22***
Child cognitive ability (age 5)	7338	100.61(12.78)	7525	100.76(17.56)	0.14

Notes: Means and percentages are weighted except for sweep 5 figures as one sampling stratum unit was not represented at this sweep. Ns are unweighted.

[a] F statistic for design-based Pearson chi-square that is converted to F test to account for the MCS sampling design.
[b] Pearson Chi-Square used instead of F given one sampling stratum unit unrepresented.
[c] Adjusted Wald test, *p<.05.

Table 2

Correlations among Main Variables (Child Problems and School FSM) in the Analytic Sample

	Extern Age 3	Extern Age 5	Extern Age 7	Extern Age 11	Intern Age 3	Intern Age 5	Intern Age 7	Intern Age 11	School FSM Age 7
Extern Age 3	1								
Extern Age 5	.60	1							
Extern Age 7	.54	.69	1						
Extern Age 11	.47	.59	.68	1					
Intern Age 3	.37	.27	.24	.21	1				
Intern Age 5	.29	.40	.31	.27	.49	1			
Intern Age 7	.29	.36	.45	.33	.42	.57	1		
Intern Age 11	.26	.32	.36	.50	.32	.43	.53	1	
School FSM Age 7	.19	.18	.16	.16	.21	.21	.19	.12	1

Notes: All coefficients significant at $p < .001$. Age 3, 5, 7 and 11 refer to MCS sweeps 2, 3, 4 and 5respectively. Extern = Externalising; Intern = Internalising; FSM = free school meal (eligible). Those in the analytic sample attended English state schools and had data on school FSM %s and externalising or internalising problems during at least one of the four sweeps.

Describing main variables by gender and ethnicity

Females attended schools with slightly lower proportions of individuals eligible for FSMs (Table 3). Compared to White children, children from other ethnicities attended schools with higher proportions of FSM-eligible pupils. Males had significantly more internalising problems at age 3 but did not differ from females at other ages. Children from non-White ethnicities (except for Mixed) had significantly more internalising problems at age 3. At ages 5 and 7, children from Mixed, Indian, Pakistani, Bangladeshi and other ethnicities had significantly more internalising problems than White children. At age 11, only Pakistani and Bangladeshi children had significantly more internalising problems than White children. Pakistani and Bangladeshi children had the highest scores in internalising across the four sweeps. For externalising problems, males had significantly more problems at all four ages. Pakistani children also had significantly higher scores at all four ages. Black African children had higher scores at age 3, but lower scores at ages 7 and 11 compared to White children. In addition to Black African children, at age 11, Indian and Bangladeshi children also had lower scores than their White counterparts. Black Caribbean children had significantly more problems at age 5 only.

Table 3

Weighted mean differences in school FSM by gender and ethnicity

	Mean (SE)	F[a]
Gender		
Male (Ref. cat.)	5.51(2.82)	
Female	5.37(2.85)	4.04*
Ethnicity		
White (Ref. cat.)	5.06(0.10)	
Mixed	6.24(0.22)	28.50***
Indian	6.08(0.31)	10.21**
Pakistani	7.62(0.37)	47.45***
Bangladeshi	8.72(0.30)	134.10***
Black Caribbean	8.03(0.37)	59.91***
Black African	8.31(0.28)	124.68***
Other	7.26(0.41)	28.10***

Notes: [a]Adjusted Wald test, *p<.05, **p<.01, ***p<.001.

Table 4

Weighted mean differences in internalising problems by gender and ethnicity

	Age 3		Age 5		Age 7		Age 11	
	Mean (SE)	F[a]	Mean (SE)	F[a]	Mean (SE)	F[a]	Mean (SE)	F[a]
Gender								
Male (Ref. cat.)	3.00(2.54)		2.58(0.04)		3.02(0.06)		3.30(0.06)	
Female	2.78(2.40)	14.71***	2.53(0.05)	0.90	2.89(0.06)	3.47	3.37(0.06)	0.75
Ethnicity								
White (Ref. cat.)	2.76(0.04)		2.42(0.04)		2.83(0.05)		3.29(0.05)	
Mixed	3.06(0.18)	2.78	2.89(0.16)	7.75**	3.37(0.21)	6.64*	3.52(0.21)	1.27
Indian	3.70(0.27)	12.11***	3.31(0.22)	16.67***	3.42(0.28)	4.21*	2.94(0.19)	3.19
Pakistani	5.08(0.16)	198.44***	4.24(0.18)	98.78***	4.21(0.14)	89.52***	3.96(0.14)	20.66***
Bangladeshi	4.37(0.35)	20.92***	3.35(0.27)	11.69***	4.30(0.23)	39.23***	3.89(0.19)	9.16**

Black Caribbean	3.27(0.24)	4.17*	3.17(0.44)	2.87	3.11(0.23)	1.40	3.01(0.31)	0.77
Black African	3.30(0.26)	4.08*	3.00(0.32)	3.27	3.00(0.23)	0.53	2.89(0.22)	3.16
Other	3.54(0.28)	7.44**	3.73(0.31)	17.91***	3.75(0.35)	6.54*	3.63(0.26)	1.75

Notes: [a]Adjusted Wald test, *p<.05, **p<.01, ***p<.001. All estimates were weighted except for those at age 11 as at least one stratum had a single sampling unit at this sweep.

Table 5

Weighted mean differences in externalising problems by gender and ethnicity

	Age 3		Age 5		Age 7		Age 11	
	Mean (SE)	F[a]	Mean (SE)	F[a]	Mean (SE)	F[a]	Mean (SE)	F[a]
Gender								
Male (Ref. cat.)	7.24(3.97)		5.30(3.57)		5.57(3.80)		5.12(3.72)	
Female	6.44(3.65)	65.51***	4.42(3.18)	115.47***	4.40(3.42)	170.29***	4.01(3.28)	165.73***
Ethnicity								
White (Ref. cat.)	6.81(3.69)		4.82(3.28)		5.00(3.57)		4.60(3.63)	
Mixed	6.96(3.80)	0.37	5.22(3.61)	3.61	5.14(3.53)	0.35	4.68(3.66)	0.13
Indian	6.83(5.16)	0.00	4.69(4.48)	0.23	4.80(4.74)	0.42	4.13(3.19)	4.38*
Pakistani	8.19(5.47)	45.88***	5.89(4.48)	22.70***	5.63(4.31)	18.48***	5.02(3.18)	6.62*
Bangladeshi	7.31(5.62)	1.84	4.91(5.07)	0.06	5.05(4.57)	0.05	4.05(2.86)	6.20*
Black Caribbean	7.36(4.12)	1.38	5.50(3.50)	4.81*	5.10(3.85)	0.16	4.65(3.64)	0.02
Black African	5.85(3.62)	9.38**	4.41(3.98)	0.79	3.96(3.63)	9.04**	3.51(2.81)	21.52***
Other	6.60(5.02)	0.28	5.22(3.69)	2.23	4.82(3.97)	0.21	4.31(3.10)	1.15

Notes: [a]Adjusted Wald test, *p<.05, **p<.01, ***p<.001. All estimates were weighted except for those at age 11 as at least one stratum had a single sampling unit at this sweep.

Regression modelling

Testing the effect of school FSM on internalising and externalising problems (Model 1)

In Model 1 (Table 6), an increase in one decile across the distribution of schools in terms of FSM composition was statistically significantly associated with an increase in 0.051 (*SE* = 0.013) and 0.060 (*SE* = 0.017) points on the internalising and externalising problems scales, respectively, at the intercept (around age 8), above and beyond pupil-eligibility for FSM status, family socio-economic disadvantage and other key confounders. There was a significant effect of school FSM on the instantaneous rate of linear change in internalising problems around the intercept (β = -0.007, *SE* = 0.002) and on the instantaneous rate of nonlinear change in internalising problems around the intercept (β = -0.002, *SE* = 0.001). School FSM did not predict longitudinal change in externalising problems.

All child and family covariates were significant predictors of internalising and externalising problems, respectively, at the intercept (around age 8), except for gender on internalising problems. Family SED, mother's psychological distress, pupil FSM eligibility and having changed schools were related to having more internalising and externalising problems. Mother's education and child cognitive ability were related to having fewer internalising and externalising difficulties. With regard to the moderators (gender and ethnicity), having an Indian or Pakistani ethnic background (relative to White) was associated with having more internalising problems. However, having a Black African background (relative to White) was linked with fewer internalising problems, on average. Children from Indian, Bangladeshi, Black African and other ethnic backgrounds had significantly fewer externalising problems than White children.

The significant within-child intercept variance (Internalising: β = 3.032, *SE* = 0.044; Externalising: β = 4.149, *SE* = 0.060) and between-child intercept variance (Internalising: β = 3.212, *SE* = 0.082; Externalising: β = 5.853, *SE* = 0.136) was larger in externalising than in

internalising problems, suggesting that, compared to internalising, externalising problems varied more over time, and differed more between children.

Figure 2 shows the predicted trajectories of problems for illustrative cases of children attending schools with high and low percentages of pupils who are eligible for FSM ('high school FSM' and 'low school FSM') throughout based on Model 1. The trajectories of children attending a high FSM school and a low FSM school are roughly parallel for both types of problems. Internalising problems follow a slight U-shaped trajectory whereby children drop slight in their problems around ages 5-7, only to increase a bit in their problems from 8-11. Externalising problems decrease quite a bit from ages 3 to 8, and then plateau until age 10 when they begin to increase slightly. However, the gap in internalising problems for a child attending a school with high FSM and a child attending a school with low FSM is around 0.3 points on the scale. For externalising problems the gap is around 0.5 points.

Testing the interaction of school FSM and child gender (Model 2)

In Model 2 (Table 6), there were statistically significant interactions of school FSM and gender on the rate of change in internalising problems (β = 0.005, *SE* = 0.002) and in externalising problems (β = -0.009, *SE* = 0.002). Figures 3 and 4 show the trajectories of problems estimated for illustrative cases of children attending schools with high and low percentages of pupils who are eligible for FSM ('high school FSM and 'low school FSM) throughout by gender. For internalising problems (Figure 3), the boy and girl from the high and low FSM school increase in their problems over time but the girl in the high FSM school has a rate of change slightly faster than the boy in this school. The boy and the girl in the low FSM school follow nearly the same trajectory.

As for externalising problems, the gap between the girl in the high FSM school and the boy in the high FSM school widens over time with the girl dropping more in her level of

problems over time (Figure 4). The boy and girl in the low FSM school decrease slightly over time following nearly parallel trajectories.

Testing the interaction of school FSM and child ethnicity (Model 3)

Figures 5 and 6 contain the predicted trajectories of problems for illustrative cases of children attending high and low FSM schools respectively, by ethnicity. Starting with internalising problems, having a Mixed (β = -0.127, *SE* = 0.051) ethnic background moderated the effect of school FSM at the intercept (around age 8) on internalising problems. The Mixed ethnic child in the high FSM school has elevated internalising problems (Figure 5) relative to the White child but this gap is not as evident in the low FSM school (Figure 6).

School FSM interacted with Indian (β = -0.030, *SE* = 0.006), Pakistani (β = -0.027, *SE* = 0.004) and Bangladeshi (β = -0.025, *SE* = 0.006) ethnicity to predict the rate of linear change in internalising problems (Model 3, Table 6). In high FSM schools (Figure 5), Indian, Pakistani and Bangladeshi children decrease in their problems from age 3 to 11, relative to the White child who appears to start at a lower level of problems that increases across this period. Therefore, the gap between the White child and the Indian, Pakistani, and Bangladeshi child appears to narrow across time. In low FSM schools (Figure 6), on the other hand, children from all ethnic backgrounds follow a fairly flat U-shaped trajectory in their problems from 3 to 11 years of age.

With regard to externalising problems (Figures 7 and 8), in general, children from each ethnic background are steadily declining in the level of problems across early childhood and primary school. Having a Mixed (β = -0.157, *SE* = 0.172), Bangladeshi (β = -0.412, *SE* = 0.175) and Black African (β = -0.250, *SE* = 0.117) ethnic background moderated the effect of school FSM at the intercept (around age 8). The child with a Bangladeshi ethnic background and a Black African ethnic background show fewer problems at around age 8 than their

White counterparts in the high FSM school (Figure 7). In the low FSM school (Figure 8), however, the Bangladeshi child and the child with a Mixed ethnicity appear to have more problems around age 8 than the White child.

Furthermore, as with internalising problems, having an Indian (β = -0.017, *SE* = 0.006) and Pakistani (β = -0.013, *SE* = 0.004) ethnic background moderated the effect of school FSM on the annual change in problems. The Indian and Pakistani children in a high FSM school decrease more in their externalising problems over time relative to the White child who plateaus at a higher level of problems from age 9 (Figure 7). This is despite the Indian, Pakistani and White children starting out (at age 3) with a relatively similar level of problems. (The Indian child and the Pakistani child follow a similar trajectory to the White child in the low FSM school shown in Figure 8.).

Table 6

Fixed Effects Estimates and Variance Covariance Estimates for Models 1-3 Predicting Internalising and Externalising Problems

	Model 1		Model 2		Model 3	
	Internalising	Externalising	Internalising	Externalising	Internalising	Externalising
			Fixed effects			
School FSM	0.052***(0.013)	0.060**(0.017)	0.086**(0.030)	0.118**(0.041)	0.065***(0.014)	0.082***(0.018)
School FSM x age	-0.007**(0.002)	-0.003(0.002)	-0.009***(0.002)	0.001(0.003)	-0.001(0.002)	0.001(0.001)
School FSM x age^2	-0.002***(0.001)	0.001(0.001)	-0.002**(0.001)	0.000(0.001)	-0.002**(0.001)	0.001(0.001)
Child characteristics						
Child's age	0.104***(0.013)	-0.162***(0.014)	0.104***(0.013)	-0.161***(0.014)	0.089***(0.013)	-0.171***(0.014)
Child's age^2	0.029***(0.004)	0.060***(0.004)	0.029***(0.004)	0.060***(0.004)	0.028***(0.004)	0.059***(0.004)
Child FSM status	0.328***(0.079)	0.551***(0.109)	0.332***(0.079)	0.553***(0.109)	0.330***(0.079)	0.552***(0.109)
Girl	-0.030(0.049)	-0.842***(0.069)	0.149(0.106)	-0.675***(0.151)	-0.030(0.049)	-0.843***(0.069)
Ethnicity (Ref: White)						
Mixed	-0.097(0.138)	-0.101(0.195)	-0.093(0.138)	-0.102(0.195)	0.660(0.336)	0.789(0.477)
Indian	0.470**(0.157)	-0.454*(0.218)	0.463**(0.157)	-0.464*(0.218)	0.075(0.365)	-0.103(0.508)
Pakistani	0.849***(0.143)	-0.336(0.196)	0.854***(0.143)	-0.360(0.196)	1.354**(0.479)	0.494(0.661)
Bangladeshi	0.318(0.230)	-1.316***(0.315)	0.326(0.230)	-1.297***(0.315)	0.449(1.111)	2.102(1.553)
Black Caribbean	-0.029(0.230)	-0.375(0.323)	-0.025(0.230)	-0.372(0.323)	-0.316(0.791)	0.384(1.126)
Black African	-0.656**(0.200)	-2.112***(0.275)	-0.664**(0.199)	-2.119***(0.275)	-0.881(0.713)	-0.195(0.993)
Other	0.139(0.218)	-0.714*(0.299)	0.140(0.217)	-0.708*(0.298)	-0.058(0.579)	0.301(0.804)
Cognitive ability	-0.020***(0.002)	-0.040***(0.003)	-0.020***(0.002)	-0.041***(0.003)	-0.020***(0.002)	-0.040***(0.003)
Family/Maternal characteristics						
Family SED	0.374***(0.095)	0.428***(0.120)	0.374***(0.095)	0.424***(0.119)	0.379***(0.095)	0.441***(0.200)
Mother is university-educated	-0.174**(0.005)	-0.925***(0.092)	-0.174**(0.065)	-0.924***(0.092)	-0.176**(0.065)	-0.925***(0.092)

Maternal psychological distress	0.149***(0.005)	0.148***(0.006)	0.149***(0.005)	0.149***(0.006)	0.149***(0.005)	0.148***(0.006)
Interactions						
School FSM x girl			-0.023(0.018)	-0.038(0.025)		
School FSM x girl x age			0.005**(0.002)	-0.009***(0.002)		
School FSM x Mixed					-0.127*(0.051)	-0.157*(0.072)
School FSM x Mixed x age					-0.001(0.005)	-0.008(0.005)
School FSM x Indian					0.016(0.056)	-0.081(0.077)
School FSM x Indian x age					-0.030***(0.006)	-0.017**(0.006)
School FSM x Pakistani					-0.107(0.060)	-0.129(0.082)
School FSM x Pakistani x age					-0.027***(0.004)	-0.013**(0.004)
School FSM x Bangladeshi					-0.052(0.126)	-0.412*(0.175)
School FSM x Bangladeshi x age					-0.025***(0.006)	-0.014(0.007)
School FSM x Black Caribbean					0.018(0.098)	-0.115(0.138)
School FSM x Black Caribbean x age					-0.007(0.006)	-0.008(0.008)
School FSM x Black African					0.012(0.085)	-0.250*(0.118)
School FSM x Black African x age					-0.007(0.006)	-0.005(0.006)
School FSM x Other					0.016(0.077)	-0.160(0.105)
School FSM x Other x age					-0.005(0.007)	-0.009(0.008)
MCS strata (Ref.=E-advantaged)						
E-disadvantaged	0.188*(0.059)	0.186*(0.084)	0.186**(0.059)	0.185*(0.084)	0.186**(0.059)	0.166*(0.084)
E-ethnic	0.186(0.107)	0.046(0.150)	0.188(0.107)	0.048(0.150)	0.206(0.107)	0.108(0.150)
W-advantaged	-0.188(0.473)	-0.608(0.668)	-0.186(0.473)	-0.609(0.668)	0.182(0.472)	-0.587(0.667)
W-disadvantaged	-0.278(0.360)	-0.130(0.510)	-0.291(0.360)	-0.143(0.510)	-0.285(0.359)	-0.163(0.509)
S-advantaged	0.531(0.559)	0.861(0.800)	0.518(0.559)	0.847(0.800)	0.556(0.560)	-1.399(1.117)
S-disadvantaged	-1.271(0.792)	-1.345(1.118)	-1.284(0.792)	-1.383(1.118)	-1.285(0.791)	0.824(0.802)

NI-advantaged	-2.150(1.810)	-3.629(2.626)	-2.172(1.810)	-3.653(2.626)	-2.149(1.808)	-3.617(2.622)
NI-disadvantaged	-0.331(0.882)	0.835(1.192)	-0.272(1.810)	0.872(1.192)	-0.330(0.881)	0.871(1.191)
Constant	3.690***(0.209)	7.911***(0.293)	3.600***(0.214)	7.828***(0.300)	3.651***(0.210)	7.827***(0.293)
			Random effects			
Child-level intercept	3.212***(0.082)	5.853***(0.136)	3.210***(0.082)	5.847***(0.136)	3.191***(0.081)	5.831***(0.136)
Child-level slope	0.071***(0.004)	0.066***(0.004)	0.071***(0.004)	0.065***(0.004)	0.069***(0.004)	0.065***(0.004)
Child-level intercept-slope covariance	0.250***(0.013)	0.047***(0.017)	0.250***(0.013)	0.045***(0.017)	0.245***(0.012)	0.046***(0.017)
Occasion-level	3.032***(0.044)	4.149***(0.060)	3.031***(0.044)	4.150***(0.060)	3.030***(0.044)	4.148***(0.060)

Note. *$p < .05$, **$p<.01$, ***$p<.001$. FSM = Free School Meal. SED = Socio-Economic Disadvantage. E=England; W=Wales; S=Scotland; NI=Northern Ireland. Northern Ireland-advantaged is missing because there were no children in the analytic sample who were born in a ward from this stratum category. Age is centred at 7.74.

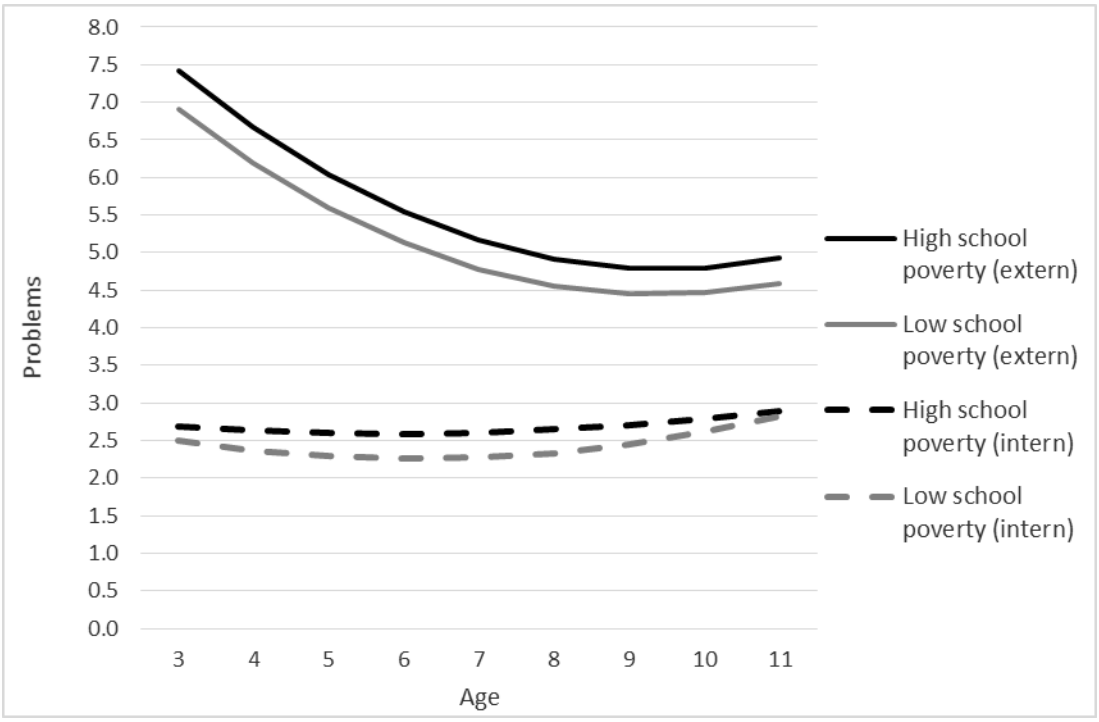

Figure 2. Predicted internalising and externalising problem trajectories for children by school FSM level (Model 1)

Note: The predictions are plotted for the reference group for each categorical variable and at the mean of each continuous variable. High school FSM is defined at the 8th decile and low school FSM is defined at the 2nd decile.

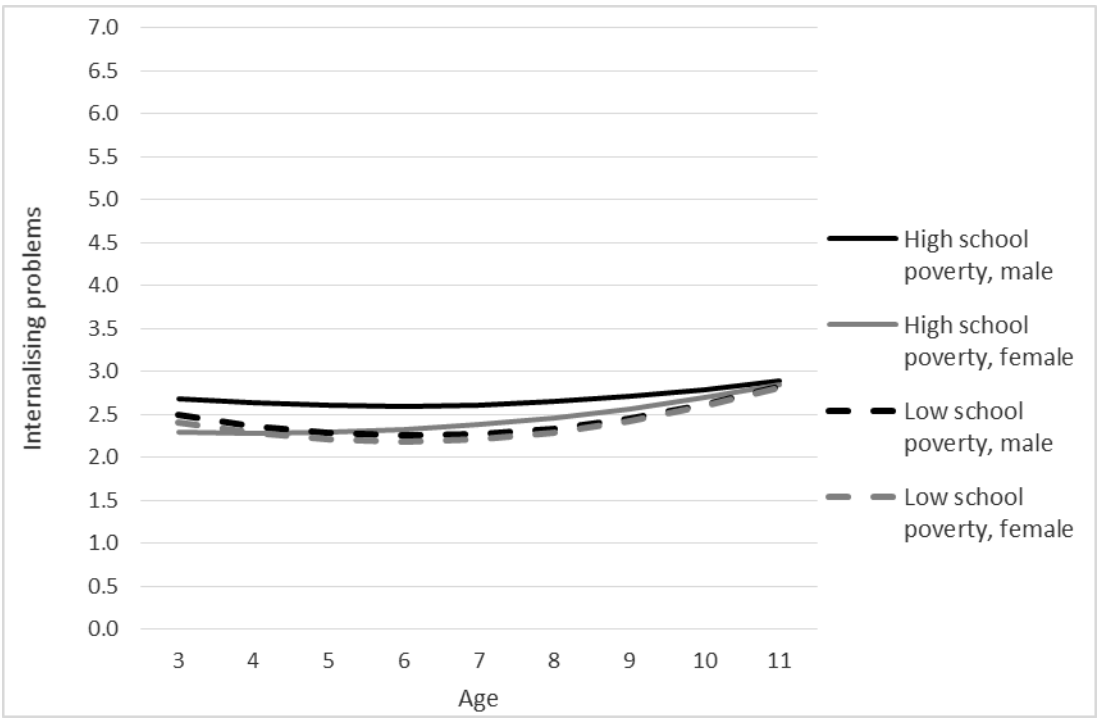

Figure 3. Predicted internalising problem trajectories for children by school FSM level and gender (Model 2)

Note: See Note for Fig. 2.

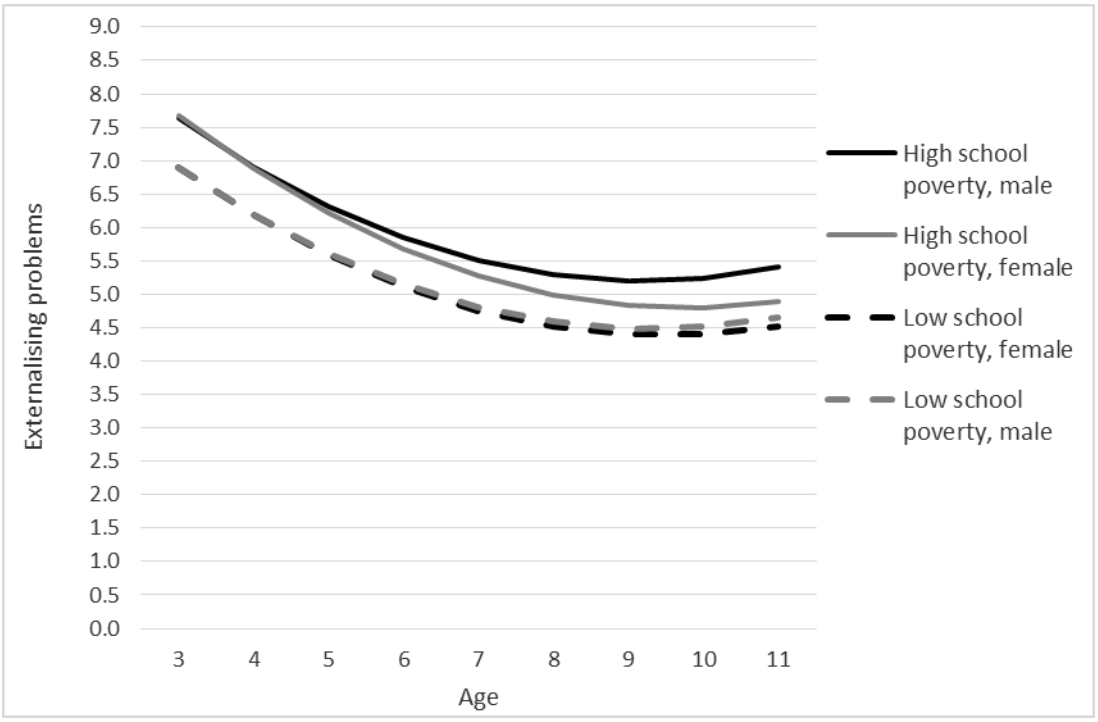

Figure 4. Predicted externalising problem trajectories for children by school FSM level and gender (Model 2)
Note: See Note for Fig. 2.

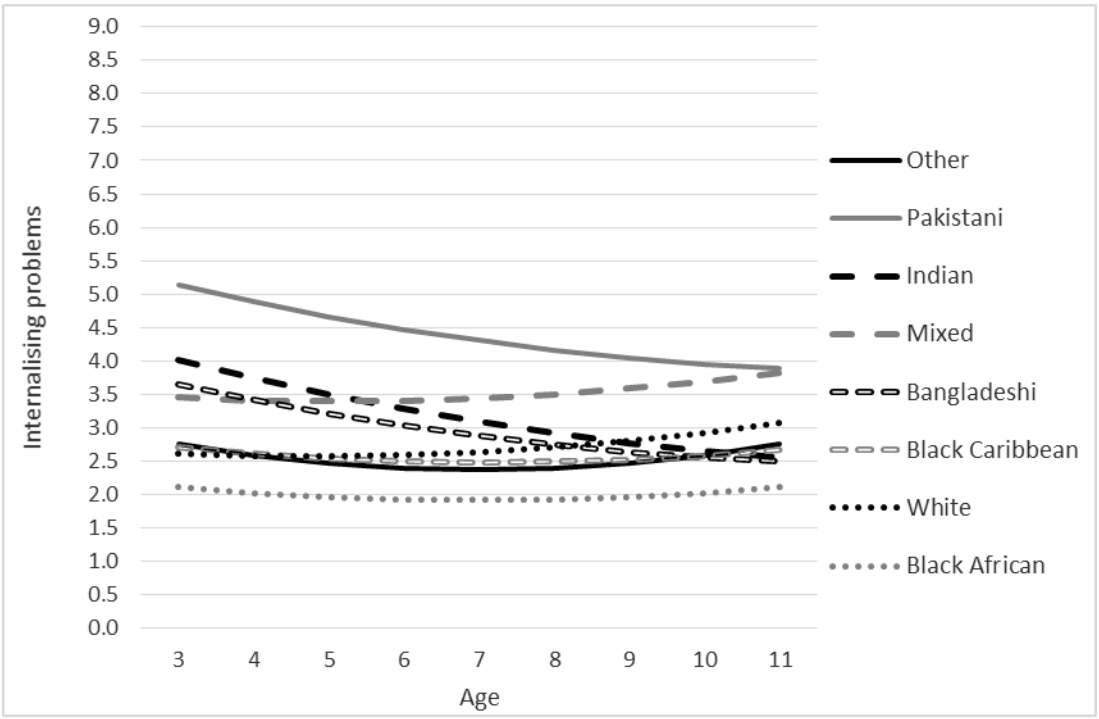

Figure 5. Predicted internalising problem trajectories for children in high FSM schools by ethnicity (Model 3)
Note: See Note for Fig. 2.

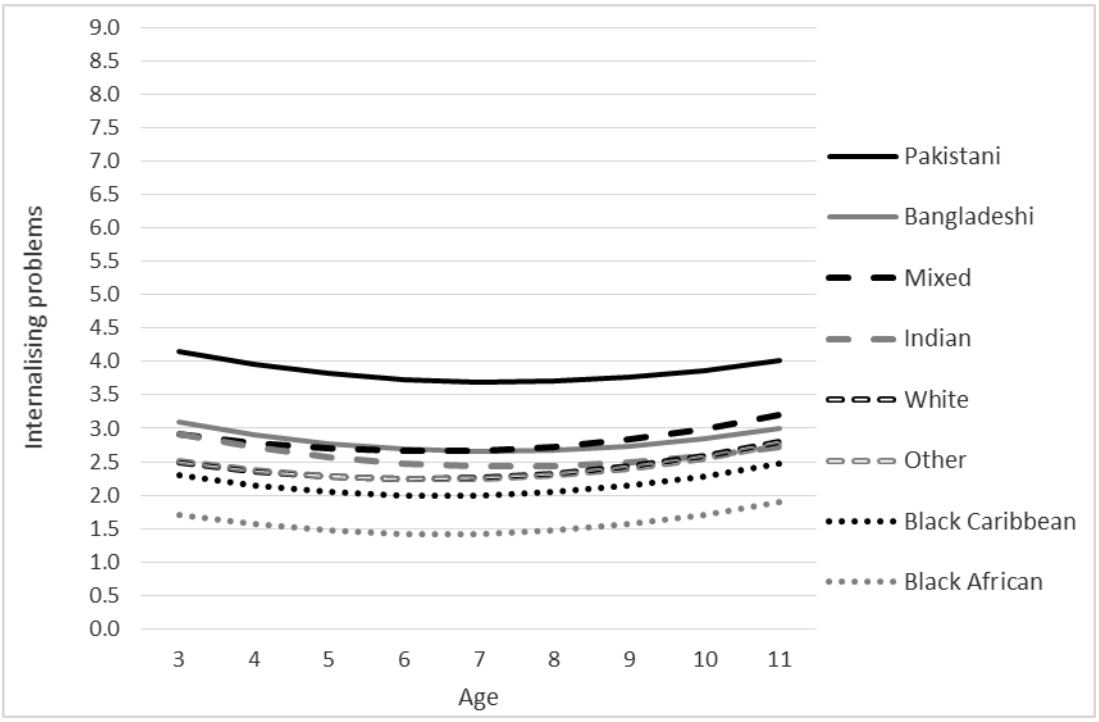

Figure 6. Predicted internalising problem trajectories for children in low FSM schools by ethnicity (Model 3)
Note: See Note for Fig. 2.

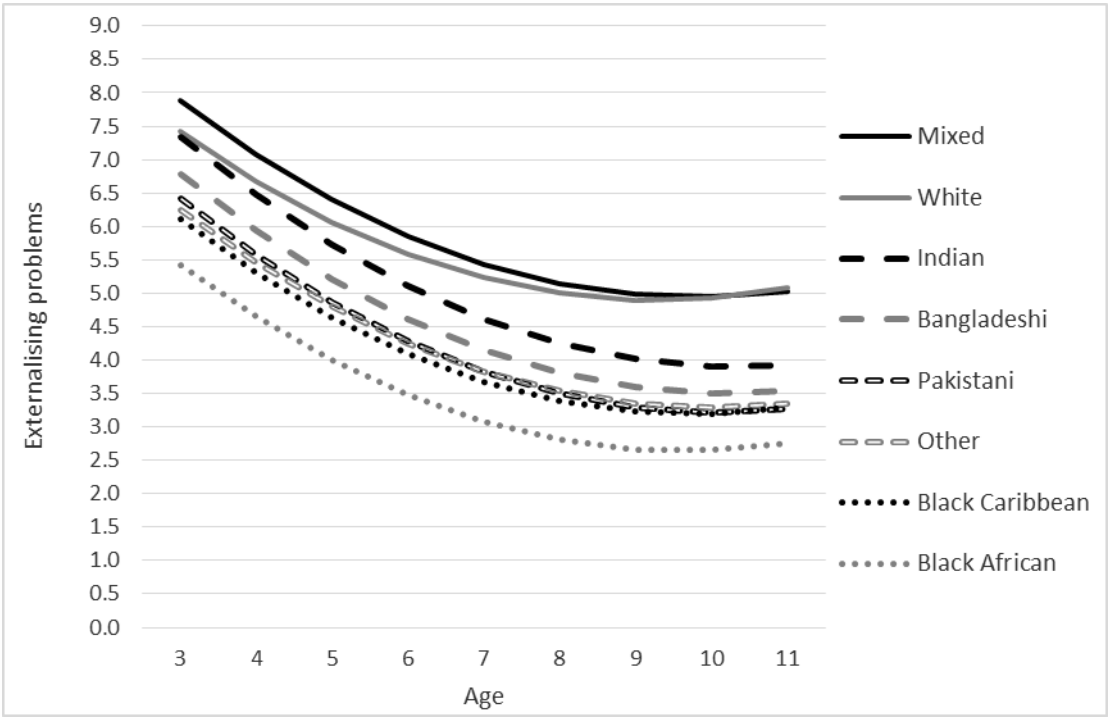

Figure 7. Predicted externalising problem trajectories for children in high FSM schools by ethnicity (Model 3)
Note: See Note for Fig. 2.

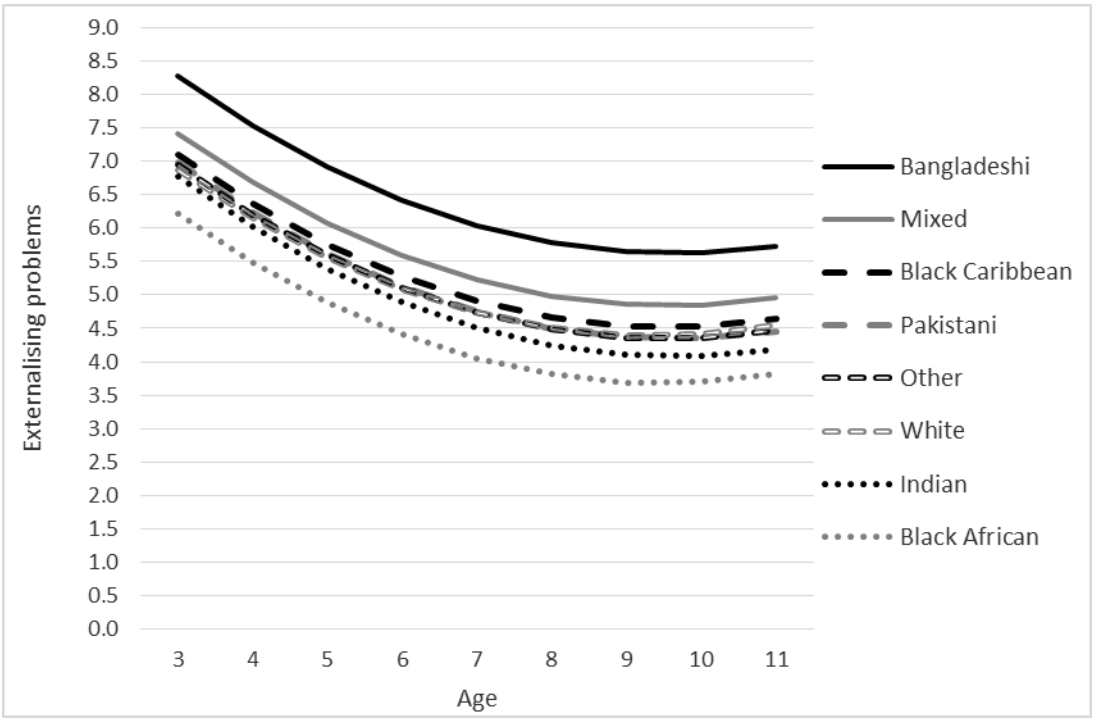

Figure 8. Predicted externalising problem trajectories for children in low FSM schools by ethnicity (Model 3)
Note: See Note for Fig. 2.

Discussion

Using large-scale longitudinal data from the Millennium Cohort Study, this is the first study to examine gender and ethnic differences in the effect of school socio-economic composition on English children's problem trajectories across primary school. Among children who did not change school across this period, the typical child in English state schools had few emotional and behavioural difficulties across childhood. Internalising problems increased and externalising problems decreased over time, on average. As children grow older, they increasingly learn to use self-regulatory strategies to control their behaviour and minimise behavioural outbursts. This appears to be represented in the trajectory of externalising problems. Emotional and peer problems may increase over time as children's peer relations begin to play a significant role in their lives, beyond the superficial friendships of early childhood (Berk, 2014; Weems & Costa, 2005).

School socio-economic composition was associated with children's internalising and externalising problems even in models adjusting for key child and family/parent characteristics, echoing existing literature on English socio-economic school intakes and child mental health (Flouri & Midouhas, 2016). Also in line with this literature, the effects were small relative to parent/family and individual child factors. For example, although these effects are not directly comparable given their measurement units, an increase in one decile across the distribution of schools by percentages of FSM-eligible pupils was related to an increase in only .09 points on the externalising scales, respectively. This is compared to an increase of around 1/2 of a point on the scale for a child being eligible for a FSM and a decrease of almost 1 point for having a mother who is university-educated. School socio-economic composition was also associated with the average child's trajectory of internalising (but not externalising problems) across primary school (the effect was even smaller - .002). On average, children demonstrated slight increases in their internalising problems in high poverty schools that were not evident in low poverty schools. This is a new finding as research has not yet explored longitudinally the link between school composition and child behaviour.

Furthermore, school socio-economic composition predicted change over time for children from particular genders and ethnic backgrounds. In general, in fully adjusted analyses, girls had fewer externalising problems than boys, echoing existing research (Egger & Angold, 2006), but they did not differ in their internalising problems around age 8, contrary to some prior research (Gutman et al., 2015). However, girls in 'poorer' schools had a steeper incline in internalising problems across the primary school period. Moreover, girls in schools with high proportions of FSM-eligible pupils made greater reductions in their externalising problems over time than boys. On the contrary, in schools with low proportions of FSM-eligible children, both girls and boys appeared to follow parallel trajectories of

internalising and externalising problems. Both boys and girls may respond negatively to poor environments but in different ways. Some research shows that girls' processes of adaptation in the face of environmental risk lead to more internalising symptoms including feelings of hopelessness and depression (McGee, Davis, Brisbane, & Collins, 2001). On the other hand, boys in risky environments may develop coping strategies that include increased externalising behaviours such as aggression and violence. This is supported in other research (McGee et al., 2001; Milam et al., 2012). It is notable that gender differences were found in the association of school poverty with *trajectories* of emotional and behavioural problems rather than at a fixed time point. Therefore, for example, boys' behaviour may worsen slightly over time in poor school contexts rather than displaying continual bad behaviour relative to girls.

After adjusting for key child and family background characteristics, Indian and Pakistani children had greater internalising problems but Indian, Bangladeshi and children from other ethnic backgrounds had fewer externalising problems, around age 8. Black African children had fewer internalising and externalising problems, a finding that is common in previous research with children and adolescents (Astell-Burt Maynard, Lenguerrand, & Harding, 2012; Fagg, Curtis, Stansfeld, & Congdon, 2006; Zilanawala et al., 2015). Research shows their advantage may be due to favourable socio-economic characteristics of their mothers which are linked with fewer emotional and behavioural problems (McMunn, Kelly, Cable, & Bartley, 2011).

A number of ethnic differences in the association between school socio-economic composition and child adjustment were found. Some minority ethnic children showed fewer problems than White children in high poverty schools. Bangladeshi and Black African children had fewer behavioural problems in high poverty schools. Children from Indian and Pakistani ethnic groups attending a school with a higher proportion of poor children had a

faster rate of decline in both internalising and externalising problems over time, and Bangladeshi children in high poverty schools reduced more in their externalising problems than White children. Poorer schools are clustered within major urban areas of England. These findings might be reflective of a greater focus on education, school work and therefore school engagement among Indian, Pakistani, Bangladeshi and Black African pupils living in poorer urban neighbourhoods of England (Burgess, 2014; Greaves et al., 2014). Those in poorer urban neighbourhoods may be more likely to be recent immigrants who place more hopes in the education system and therefore have higher expectations for their children to succeed. Good behaviour would be expected as part of this engagement with education and educational institutions.

On the other hand, Mixed and Bangladeshi children maintained a higher level of externalising problems over time than White children in schools with low proportions of FSM-eligible pupils, possibly due to 'relative deprivation' mechanisms. These children may feel out of place and develop feelings of inferiority as a result which could be related to emotional and behavioural problems. In poor schools, children from ethnic minority backgrounds will be surrounded by more children sharing their own ethnic background and therefore may have a greater sense of belongingness.

In this study, Mixed ethnic children were found to be vulnerable to externalising problems in low poverty schools but they were susceptible to internalising problems in high poverty schools. Previous research has found a complex picture of Mixed children's emotional and behavioural development. Some research finds no differences between Mixed and White ethnic children (Platt, 2012). Other research finds an advantage for Mixed ethnic children in the early years but that some mixed ethnic groups increase in their problems as they grow older relative to their non-mixed counterparts (Zilanawala et al., 2016). The present study's findings may be explained by differences in the ethnicities of mixed children

who are more likely to attend poor vs. non-poor schools which may be related to issues around cultural expectations and identity development at these ages (Zilanawala et al., 2016). Future research should attempt to unpack this finding and its mechanisms.

This study has several limitations. First, capturing school socio-economic composition using the percentage of pupils eligible for FSMs is an imperfect indicator of family poverty. Using data from the Family Resources Survey, a nationally representative survey of England, Hobbs and Vignoles (2010) found that although children eligible for FSM were more likely than other children to be in the lowest income households, only one-quarter to one-half of children were in the lowest income households. This was mainly due to the fact that this measure does not capture income benefits received. Children eligible for FSM may be receiving income benefits that push them up the household income distribution. Measuring the socio-economic status of pupils in each school using another measure was not possible, however, given the available school census data. Second, other unmeasured individual and family characteristics may be associated with a family's choice of neighbourhood and thus school, thereby accounting for the association between school socio-economic composition and child internalising and externalising problems. Third, the reliance on parental reports to assess children's problems means that these measures are likely inflated by the idiosyncrasies of the informant. Although there is a teacher report of SDQ scores at age 7, eliciting reports by teachers at age 5 and 11 was not done in MCS. Fourth, I was unable to capture the role of children's pre-school experiences. These may either reduce the effect of school socio-economic composition or may be reflected in their estimates.

Despite these limitations, this study showed that there is a need to consider individual demographic characteristics of pupils when it comes to English primary school composition effects on emotional and behavioural adjustment. Future research should investigate the mechanisms through which school socio-economic composition relates to emotional and

behavioural problems for children depending on their gender and ethnic background. The findings reported here are relevant to school-based programmes and policies that aim to support both mental and behavioural health among primary school children. Initiatives that focus on local patterns of risk among pupil populations would be best informed by this research including those that take a whole school approach to targeting children's social and emotional skills including reducing their emotional and behavioural problems (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011).

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