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Neighbourhood and own social housing and early problem behaviour trajectories
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Abstract:	Purpose: To explore the roles of proportion of social rented housing in the neighbourhood ('neighbourhood social housing'), own housing being socially rented, and their interaction in early trajectories of emotional, conduct and hyperactivity symptoms. We tested three pathways of effects: family stress and maternal psychological distress, low quality parenting practices, and peer problems. Methods: We used data from 9,850 Millennium Cohort Study (MCS) families who lived in England when the cohort children were aged 3. Children's emotional, conduct and hyperactivity problems were measured at ages 3, 5 and 7. Results: Even after accounting for own social housing, neighbourhood social housing was related to all problems and their trajectories. Its association with conduct problems and hyperactivity was explained by selection. Selection also explained the interaction between neighbourhood and own social housing on hyperactivity, but not why children of social renter families living in neighbourhoods with lower concentrations of social housing followed a rising trajectory of emotional problems. The effects of own social housing, neighbourhood social housing and their interaction on emotional problems were robust. Peer problems explained the association of own social housing with hyperactivity. Conclusions: Neither selection nor the pathways we tested explained the association of own social housing with conduct problems, the association of neighbourhood social housing with their growth, or the association of neighbourhood social housing, own social housing and their interaction with emotional problems. Children of social renter families in neighbourhoods with a low concentration of social renters are a particularly vulnerable group for emotional problems.

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Neighbourhood and own social housing and early problem behaviour trajectories

Abstract

Purpose: To explore the roles of proportion of social rented housing in the neighbourhood ('neighbourhood social housing'), own housing being socially rented, and their interaction in early trajectories of emotional, conduct and hyperactivity symptoms. We tested three pathways of effects: family stress and maternal psychological distress, low quality parenting practices, and peer problems. **Methods**: We used data from 9,850 Millennium Cohort Study (MCS) families who lived in England when the cohort children were aged 3. Children's emotional, conduct and hyperactivity problems were measured at ages 3, 5 and 7. **Results**: Even after accounting for own social housing, neighbourhood social housing was related to all problems and their trajectories. Its association with conduct problems and hyperactivity was explained by selection. Selection also explained the interaction between neighbourhood and own social housing on hyperactivity, but not why children of social renter families living in neighbourhoods with lower concentrations of social housing followed a rising trajectory of emotional problems. The effects of own social housing, neighbourhood social housing and their interaction on emotional problems were robust. Peer problems explained the association of own social housing with hyperactivity. **Conclusions**: Neither selection nor the pathways we tested explained the association of own social housing with conduct problems, the association of neighbourhood social housing with their growth, or the association of neighbourhood social housing, own social housing and their interaction with emotional problems. Children of social renter families in neighbourhoods with a low concentration of social renters are a particularly vulnerable group for emotional problems.

Keywords: emotional and behavioural problems; housing tenure; neighbourhood social housing; social housing

There is much evidence to suggest that, even after accounting for individual families' selective sorting into neighbourhoods on their own socio-economic characteristics, some neighbourhood characteristics, such as the socio-economic deprivation of the local population, are related to children's outcomes [1]. Social Disorganisation Theory [2] links neighbourhood structures with children's outcomes by levels of collective resources (e.g., parks, schools, libraries or community centres), collective efficacy [3] (community cohesion and trust), relative deprivation (the feeling of dissatisfaction from the comparison to one's neighbours) and social contagion. The social contagion hypothesis has received much attention, especially in the developmental psychology literature [4]. Studies generally find that neighbourhood influences, especially on externalising problems (such as antisocial behaviour and hyperactivity) among older children, are transmitted through peers [5]. Children growing up in disadvantaged neighbourhoods are more likely to be both rejected by peers and exposed to antisocial or delinquent peers [6]. According to the confluence model, rejection by peers influences peer networks by means of high-risk youth aggregating into gangs, which influences the development of antisocial behaviour, especially in adolescence [7]. The role of family processes in 'transmitting' neighbourhood influences to children has also received much attention. For example, certain neighbourhood contexts make parents more exposed to stressful events, which in turn may adversely their and their children's mental health [8]. Recent studies have begun to pay attention to parenting as a mediator of neighbourhood influences, with promising results. For example, a recent study in England found that maternal warmth and parental monitoring completely mediated the effect of neighbourhood socio-economic deprivation on primary school children's antisocial behaviour [9].

One neighbourhood characteristic whose role in children's behaviour problems has received little attention in British studies is social housing. In Britain, social housing has

hitherto been let at low rents on a secure basis to those who are most in need or struggling

with their housing costs. Social housing is normally provided by local authorities ('councils')

and not-for-profit organisations (such as housing associations). In 2009, 18 per cent of homes

in Great Britain were rented from the social sector, compared to 37 per cent of households

that were buying their homes with a mortgage, 32 per cent of homes that were owned

outright, and 13 per cent of homes that were rented privately [10]. There is some recent

evidence that, even after accounting for selection, adults (especially women) who lived in

social housing in childhood are at risk for a range of poor outcomes [11]. Although this does

not prove that social housing tenancy is causing the negative outcomes, it does, however,

suggest that social housing does not halt or reverse disadvantage. One possible reason may be

that social housing is concentrated in the most deprived areas. Neighbourhoods with a high

concentration of social housing (which likely include places referred to as 'estates') have

high levels of crime, unemployment, antisocial behaviour and stigma, and low levels of adult

educational attainment and mental health [12], all of which have been associated with

problem behaviour, even among young children [9]. However, no study, to our knowledge,

has yet explored longitudinally the association between neighbourhood social housing and

child problem behaviour in contemporary Britain. Following at ages 5 and 7 years a large

cohort of 3-years olds in England, we carried out this study to fill this gap. We expected that

children in neighbourhoods with high levels of social rented housing ('neighbourhood social

housing') would have elevated levels of problem behaviour, even after accounting for

whether they also themselves lived in social rented housing ('own social housing'). We also

expected that the apparent adverse effect of own social housing on behaviour would be

stronger for children living in neighbourhoods with low levels of social housing. Those

children's families would be more isolated, and the children themselves more likely to be

socially rejected [13], and, as such, more vulnerable to emotional and behavioural problems.

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We also anticipated, however, that the apparent effect of neighbourhood social housing would be explained by selection into neighbourhoods. Selection bias occurs when the mechanism sorting families into neighbourhoods is not independent from the outcome studied [26]. For example, families with lower education may be more likely to both have children with more emotional and behavioural problems and move into areas with a higher concentration of social housing. Failure to account for such selection can lead to overstating or understating the influence of neighbourhoods. We therefore adjusted for selection into neighbourhoods with family's own social housing, maternal education, ethnicity and maternal age at first birth. We expected the apparent penalty of own social housing, which indexes a concentration of disadvantages, on problem behaviour to be more robust. Even after accounting for selection and for family stress and maternal psychological distress as its possible pathway [14], the association of own social housing with problem behaviour would be significant, and explained by quality of parenting practices (henceforth 'parenting') and peer relationship problems, such as rejection. We anticipated that peer problems would have a larger effect than parenting on mediating the association between own social housing and children's externalising difficulties.

Method

Sample

Our data came from the Millennium Cohort Study (MCS; www.cls.ioe.ac.uk/mcs), a longitudinal survey of 19,244 families drawing its sample from all births in the UK over a year, from 1 September 2000. MCS was designed to over-represent areas with high proportions of ethnic minorities in England, areas of high child poverty, and the three smaller UK countries. The MCS sample is disproportionately stratified, firstly by country, and then type of electoral ward within which all the year's births were eligible. Electoral

wards/divisions are the key building block of UK electoral geography. The average

population is around 5,000, though counts can vary substantially. The MCS sample was

drawn on the basis of ward boundaries that existed before the 2001 Census.

Ethical approval for the MCS was gained from NHS Multi-Centre Ethics Committees,

and parents gave informed consent before interviews took place. Sweep 1 took place when

the children were around 9 months. Sweeps 2, 3, and 4 (Times 1, 2, and 3, respectively),

when emotional (internalising) and behavioural (externalising) problems were measured, took

place around ages 3, 5, and 7. We analysed data from Times 1-3. We used records for only

one child per family (the first-born where there were twins or triplets). Our analytic sample

comprised children living in England at age 3 (n = 10,086) and with a score for emotional or

behavioural problems in at least one of Times 1-3 (n = 9,850). Complete data on emotional

and behavioural problems were not necessary as growth curve modelling, that we adopted, is

able to handle unbalanced data [15].

Measures

It is difficult to establish causal associations between neighbourhood social housing,

own social housing and early problem behaviour because many factors might jointly

determine housing tenure, neighbourhood selection, and child behaviour. For example, more

educated parents are more likely to have well-adjusted children, and less likely to be living in

social housing or in disadvantaged neighbourhoods (such as those with a higher concentration

of social housing). To avoid attributing to social housing that which is due to correlated

determinants of both social housing and child outcomes, our models adjusted for maternal

education, ethnicity and maternal age at first birth. Maternal education also stands in for a

host of other indicators of socio-economic disadvantage. For example, 80% of the mothers

with no qualifications at the age 7 MCS survey were in the bottom 40% of equivalised net

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family income, in contrast to 9% with the highest (postgraduate qualification) [16]. Maternal

age at first birth [17-18] and ethnicity [20] were also potential confounders. Maternal

psychological distress and family stress, parenting, and peer problems were the three

pathways of the effect of own social housing we tested. Our child-level covariates were sex

and statement of special educational needs. Girls, in general, are at lower risk of emotional

and behavioural problems than boys [19]. Aside from behavioural difficulties, children with

special educational needs have more emotional problems [21]. An assessment of special

educational needs is carried out by the Local Education Authority. Children with the most

serious difficulties, including behavioural, have a statement of special educational needs. A

statement describes the child's needs and how they should be met, including what school they

should go to.

The following describes how the key study variables were measured. All variables,

unless otherwise specified, were measured at each time-point, i.e., ages 3, 5, and 7.

Internalising (emotional) and externalising (hyperactivity and conduct) problems

were measured with the parent-reported Strengths and Difficulties Questionnaire (SDQ) [22]

subscales of emotional symptoms, hyperactivity/inattention and conduct problems. Each

SDQ item is a statement about a particular behaviour, scored 0 if the response is 'not true', 1

for 'somewhat true', and 2 for 'certainly true'. Each SDQ subscale has 5 items. In our sample,

internal consistency was at acceptable levels, and in line with other SDQ research [23].

Across the three sweeps, Cronbach's alpha ranged from .50 to .65 for emotional, .55 to. 68

for conduct, and. 71 to .78 for hyperactivity problems.

Neighbourhood social housing was measured with the percentage (from the 2001 UK

Census) of adult residents living in social housing in the neighbourhood (i.e., lower super

output area; LSOA), banded into quintiles. LSOAs typically include about 600 homes and

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1,500 residents. Neighbourhood social housing was fixed for a given locality over the time observed, but could vary between surveys if the family moved.

Own social housing was a binary dummy of whether the child's family lived in social housing or not.

Adverse life events (ALE) were measured as the number (out of eleven) of potentially stressful life events experienced between two consecutive sweeps. The events, derived from available MCS data and based on Tiet et al.'s [24] Adverse Life Events Scale, are: family member died, negative change in financial situation, new stepparent, sibling left home, child got seriously sick or injured, divorce or separation, family moved, parent lost job, new natural sibling, new stepsibling, and maternal depression (currently being treated for depression or having been diagnosed with depression). At each sweep, the number of events occurring since the previous sweep was summed to form a total ALE score.

Maternal psychological distress was measured with the 6-item Kessler scale [25], which assesses the experience of recent non-specific psychological distress (α = .81-.84 across sweeps).

Parenting was parent-reported and measured by three items indexing the quality of parenting practices. These items, all scored on Likert scales, measured the frequency of reading activities between parent and child, level of home organisation, and regularity of bedtimes. Higher scores in these variables indicate less frequent reading, a more organised home, and more regular bedtimes.

Peer relationship problems were measured with the parent-reported SDQ subscale of peer problems. The five items of the subscale are: 'rather solitary, tends to play alone', 'has at least one good friend', 'generally liked by other children', 'picked on or bullied by other children', and 'gets on better with adults than with other children'. Cronbach's alpha ranged from .47 to .58 across the three sweeps.

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Key covariates were the child-level variables of sex, ethnicity, and statement of special educational needs at age 7, when this information was first collected in MCS. The family-level covariates were maternal age at first birth and maternal education. Maternal education was measured with the mother's highest academic qualification by the age 7 MCS survey, coded into 'higher degree', 'first degree', 'A level or Higher Education Diploma', 'General Certificate of Secondary Education (GCSE) a-c', 'GCSE d-g', 'other qualification (including overseas)', and 'no qualification'.

Analytic strategy

First, we investigated whether those families in our analytic sample (n = 9,850) were different (at p < .05) from those families not in the analytic sample (n = 236) on our study variables. Next, we explored the shape of the children's average trajectories of externalising and internalising problems, which, as will be discussed below, was curvilinear. Following this, we inspected the correlations between our main variables. Finally, we fitted three-level growth curve models which enabled us to avoid the underestimation of standard errors due to the hierarchical nature of our data [27] by having repeated measures (at ages 3, 5 and 7) of externalising and internalising problems (Level 1) nested in children (Level 2) nested in areas (Level 3). We accounted for area clustering at the level of pre-2001 electoral ward on which the MCS survey design was built. We allowed the children's average problems to vary by area of residence at the origin of the study to reflect the disproportionate chances of selection in the sample design. Therefore, we used a different geographical unit for area clustering and % of social renters in the neighbourhood. In all our conditional models (i.e., Models 2-7) we also adjusted for sampling strata (a Level 3 variable, as explained in 'Sample') to reflect the stratified sample design of MCS. These models allowed us to estimate the average level of problems at a particular time-point and the average growth rate in problems over time. By

specifying a random slope on the age of the child to allow for changes in problems across time to vary between children, we could also model individual trajectories of problems from age 3 to age 7. We fitted both fixed and random linear slopes, and we included a fixed quadratic term for age to account for the curved shape of children's average trajectories.

The full sequence of models estimated is as follows. Model 1 (the unconditional model) investigated the average levels and growth of externalising and internalising problems by regressing them on age in years (grand mean centred at age 5.13 years) and its square. Grand mean centring age at the 'midpoint' minimises the correlation between age and age-squared thus stabilising the estimation [28]. Model 2 added own and neighbourhood social housing, both specified to be related to the intercepts and slopes (linear and quadratic) of externalising and internalising problems. This enabled us to examine whether levels of problems at around age 5 and rate of change in problems over age shifted with neighbourhood and own social housing. Model 3 included the interaction between neighbourhood and own social housing, also specified to be related to the intercepts and slopes of externalising and internalising problems. Model 4 added the selection factors and the child characteristics. Models 5-7 tested the proposed pathways. Model 5 added family stress and maternal psychological distress, Model 6 parenting, and Model 7 peer problems. We allowed all variables introduced in models 5-7 to predict the intercepts and slopes of externalising and internalising problems. All models were estimated in MLwiN 2.28.

Results

Descriptives

There were moderate differences in the study variables between the analytic and the non-analytic samples (Tables 1-2). In the analytic sample, there was an under-representation of mothers with lower qualifications, and ethnic minority and social renter families. By

contrast, the non-analytic sample over-represented early motherhood and maternal depression, lower quality parenting practices, and neighbourhoods with a higher density of social housing. The unconditional model (Model 1; not presented) showed that emotional, hyperactivity and conduct problems decreased on average from age 3 to 5, and then increased slightly from age 5 to 7. The within-child, between-child and between-ward variance was larger in hyperactivity than in conduct and emotional problems, suggesting that hyperactivity varied more over time, and differed more both between families and between areas. The between-ward variance was larger in conduct than emotional problems. The converse was true for the between-child and the within-child variance. Correlations between the main study variables were low to moderate.

(Tables 1-2)

Conditional models

Results for Models 2-3 and 5-6 are not shown. In general, when no adjustment for covariates was made (Model 2), both neighbourhood and own social housing had significant effects on problems at the average age and, for some outcomes, on the development of problems over time. However, the effect of own social housing was larger than that of neighbourhood social housing on all outcomes at the average age (conduct: $b = .409$, se $= .043$ (own social housing) vs. $b = .045$, se $= .013$ (neighbourhood social housing); emotional symptoms: $b = .255$, se $= .043$ (own social housing) vs. $b = .044$, se $= .014$ (neighbourhood social housing); hyperactivity: $b = .558$, se $= .059$ (own social housing) vs. $b = .054$, se $= .019$ (neighbourhood social housing)). Neighbourhood social housing was related to both linear and non-linear change in conduct problems. Own social housing was related to linear change in conduct problems, and only to quadratic change in hyperactivity. Model 3 showed that the interaction between neighbourhood and own social housing was significant

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on age 5 emotional (b = -.103, se = .040) and hyperactivity (b = -.127, se = .054) problems.

The negative sign of both coefficients suggests that the effect of own social housing on these problems was stronger in neighbourhoods with lower concentrations of social housing. Model 4 (Table 3), which added the child factors and the selection factors, revealed that selection explained most of the neighbourhood social housing effects. Adjusting for maternal education and maternal age at first birth fully attenuated the effect of neighbourhood social housing on both types of externalising problems. In addition, this adjustment explained the interaction between neighbourhood and own social housing on hyperactivity. In this model the interaction between neighbourhood and own social housing became significant on the change in emotional symptoms over time (b = -.034, se = .015). The introduction of family stress and maternal psychological distress in Model 5 fully explained the between-ward random variation in emotional symptoms but it did not change the pattern of the fixed effects of neighbourhood or own social housing for any of the three outcomes. Model 6 introduced the three parenting variables. Home organisation, frequency of parent-child reading and regularity of bedtimes were inversely related to children's problems, particularly conduct, but did not change the pattern of neighbourhood or own social housing effects for any problem type. Model 7 (Table 4) showed that peer relationship problems fully explained the between-ward variation in conduct problems, and the effect of own social housing on hyperactivity. However, like the other pathways tested, peer problems could not explain the effect of neighbourhood social housing on the development of conduct problems over time or the effect of own social housing on conduct problems. Peer problems were, similarly, unable to explain the effects of neighbourhood social housing, own social housing, and their interaction on emotional symptoms and their trajectory.

(Tables 3-4)

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Figures 1-2 plot the significant effects of neighbourhood social housing on trajectories

of children's problem behaviour. As can be seen in Figure 1, a child living in a

neighbourhood with a high concentration of social housing starts out with more conduct

problems at age 3 than a child living in a neighbourhood with a low concentration of social

housing, although the two trajectories eventually meet. Figure 2 shows that a child in social

housing living in a neighbourhood with a lower concentration of social housing follows a

rising trajectory of emotional problems. This child is at higher risk for emotional problems

than his counterparts, including the child in social housing living in a neighbourhood with a

higher concentration of social housing.

(Figures 1-2)

Discussion

Following a large cohort of 3-years olds in England at ages 5 and 7 years, we carried

out this study to investigate the role of neighbourhood social housing in children's

trajectories of emotional, hyperactivity and conduct problems. In line with previous findings

about the role of the neighbourhood home-ownership rate in positive social outcomes in

adults [29], neighbourhood social housing was related to problems and their trajectories in

children, even after accounting for own social housing. The effect of neighbourhood social

housing on children's conduct problems and hyperactivity was explained by selection.

Selection also explained the interaction between neighbourhood and own social housing on

hyperactivity, but not why children in social housing in neighbourhoods with lower

concentrations of social housing were at higher risk for emotional problems, or why they

followed a rising trajectory of emotional problems. In general, the effects of own social

housing, neighbourhood social housing and their interaction on emotional problems were

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robust. Peer problems explained the association between living in social housing and hyperactivity.

Our findings suggest that families' selective sorting into neighbourhoods explained the association of neighbourhood social housing and children's conduct and hyperactivity problems at the start of primary school, and peer problems explained the positive association between own social housing and hyperactivity. Neither selection nor the pathways we tested could explain the association of own social housing and conduct problems, the association of neighbourhood social housing and the development of conduct problems over time, or the effects of neighbourhood social housing, own social housing, and their interaction on emotional problems.

One of the unexpected findings of this study was that our measures of the quality of parenting practices did not explain why children who lived in social housing had more emotional and behavioural problems. Rather than concluding that parenting did not mediate this association, we think that this null finding may be due to our measure of parenting. In this study, we indexed parenting by parents' level of provision of structure, routines and activities rather than parents' discipline style and emotional tone of their interactions with their children, which are more strongly related to children's emotional and conduct problems [30]. Measures such as amount of time spent playing with the child, frequency of using praise and reward, and discipline style may have been useful measures in this regard. Unfortunately, we were limited by the type of parenting variables measured longitudinally in our dataset. Future studies should investigate whether less coercive parenting patterns and a more positive parent-child relationship may mediate the effect of own social housing and its interaction with neighbourhood social housing on early emotional and behavioural problems.

Our study is not without limitations. First, other unmeasured individual and family characteristics may be associated with a family's choice of (or assignment to) neighbourhood,

thus accounting for associations between neighbourhood social housing and children's conduct and emotional problems. For example, paternal antisocial behaviour could explain both families' selective sorting into neighbourhoods and the effect of own social housing on conduct and emotional problems. Because the Millennium Cohort Study did not follow non-resident fathers, however, the inclusion of such information would have excluded single-mother families, thus limiting the usefulness of our findings. In Great Britain, almost two-thirds of lone parents with dependent children rent their home, mostly from the social sector [10]. Second, with only three time-points of data on emotional and behavioural problems currently available for MCS, we were limited in our ability to model the functional form of children's individual trajectories. Third, the reliance on parental reports to assess children's problems and parenting means that correlations between these measures are likely inflated by the idiosyncrasies of the informant. However, eliciting reports from other informants such as teachers and the children themselves for the early years would not have been possible. Fourth, our parenting variables were one-item proxies, and the peer problems scale showed low reliability, particularly at age 3.

Despite these limitations, our study showed that children of social renter families may be a particularly vulnerable group for emotional and behavioural difficulties even at a young age, and explained why. Some of these vulnerabilities were due to peer rejection. Even after taking peer problems into account, however, these children were at risk of conduct problems and were a particularly high-risk group for emotional problems if they lived in neighbourhoods with a low concentration of social renter families. Given the poor outcomes of children following rising trajectories of problems in early childhood, our findings suggest that this may be a group of children that could be given priority in future prevention or intervention research.

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Table 1

Descriptives of the Continuous Study Variables in the Analytic and Non-analytic Samples

Variable	Analytic sample (n=9,850)		Non-analytic sample (n=236)	
	M (SE)	95% CI	M (SE)	95% CI
Neighbourhood social housing				
Age 3	3.17 (0.05)	[3.06, 3.23]	3.85 (0.14)	[3.57, 4.14]
Age 5	3.10 (0.05)	[3.00, 3.20]	3.68 (0.25)	[3.19, 4.18]
Age 7*	3.18 (0.02)	[3.14, 3.21]	3.74 (0.15)	[3.44, 4.04]
Maternal psychological distress				
Age 3	3.28 (0.05)	[3.18, 3.38]	5.52 (0.89)	[3.76, 7.27]
Age 5	3.10 (0.05)	[3.00, 3.20]	7.11 (2.41)	[2.36, 11.86]
Age 7*	3.20 (0.05)	[3.11, 3.29]	6.33 (0.33)	[5.68, 6.99]
Adverse life events				
Age 3	1.61 (0.02)	[1.57, 1.64]	1.26 (0.09)	[1.08, 1.44]
Age 5	1.40 (0.02)	[1.37, 1.43]	1.28 (0.15)	[1.00, 1.57]
Age 7*	1.14 (0.01)	[1.12, 1.16]	0.45 (0.05)	[0.34, 0.55]
Regular bedtimes				
Age 3	3.14 (0.01)	[3.11, 3.17]	2.90 (0.09)	[2.73, 3.08]
Age 5	3.50 (0.01)	[3.48, 3.53]	2.92 (0.14)	[2.65, 3.19]
Age 7*	3.45 (0.01)	[3.45, 3.49]	3.03 (0.13)	[2.78, 3.27]
(Low) parental involvement				
Age 3	1.76 (0.02)	[1.72, 1.80]	3.24 (0.18)	[2.89, 3.59]
Age 5	1.78 (0.02)	[1.75, 1.82]	3.13 (0.19)	[2.76, 3.50]
Age 7*	2.08 (0.01)	[2.05, 2.11]	3.35 (0.23)	[2.91, 3.80]
Home organisation				
Age 3	3.78 (0.02)	[3.74, 3.81]	3.64 (0.08)	[3.48, 3.79]
Age 5	3.63 (0.01)	[3.61, 3.66]	3.55 (0.15)	[3.26, 3.84]
Age 7*	3.71 (0.01)	[3.68, 3.73]	3.79 (0.11)	[3.58, 3.99]
Peer problems				
Age 3	1.55 (0.02)	[1.50, 1.60]	2.21 (0.76)	[0.72, 3.69]
Age 5	1.13 (0.02)	[1.08, 1.17]	1.80 (0.36)	[1.09, 2.51]
Age 7*	1.29 (0.02)	[1.26, 1.33]	3.30 (0.54)	[2.24, 4.34]
Mother's age at first birth	25.88 (0.16)	[25.57, 26.19]	22.42 (0.36)	[21.70, 23.13]

Note. Means and proportions are weighted. CI = Confident Intervals. For weighted values, Pearson chi-square is converted to a design-based F statistic to account for the MCS sampling design. Standard errors and CIs are adjusted for clustered sampling except in cases marked * based on a sample represented by a single primary sampling unit (i.e., ward) for a given sampling stratum. These discrepancies arise occasionally because of migration out of the original strata.

Table 2

Descriptives of the Categorical Study Variables in the Analytic and Non-analytic Samples

Variable	%			
	Analytic sample (n=9,850)	**Non-analytic sample (n=236)**	**χ^2**	**df**
Girl	49.39	45.11	1.02	[1, 252]
Child's ethnicity			**74.66**	[4.32, 1087.86]
White	86.70	44.90		
Mixed	3.42	2.92		
Indian	2.11	5.01		
Pakistani/Bangladeshi	4.12	35.23		
Black/black British	2.58	7.33		
Other	1.06	4.61		
Statement of SEN*	2.70	2.70	0.00	1
Maternal education*			**301.62**	6
Higher degree	4.54	0.00		
First degree	13.23	3.57		
A level or (HE) Diploma	17.87	4.59		
GCSE a-c	32.91	13.78		
GCSE d-g	11.46	7.65		
Other qualification	3.34	9.18		
No qualification	16.65	61.22		
In social housing				
Age 3	24.76	38.69	**9.58**	[1, 252]
Age 5	22.62	34.18	3.57	[1, 244]
Age 7*	22.33	36.11	**7.79**	1

Note. Bolded values are significant at $p < .05$ level. Proportions are weighted. For weighted values, Pearson chi-square is converted to a design-based F statistic to account for the MCS sampling design. Unweighted variables were marked * based on a sample represented by a single primary sampling unit (i.e., ward) for a given sampling stratum. These discrepancies arise occasionally because of migration out of the original strata. SEN= special educational needs; HE = Higher Education; GCSE = General Certificate of Secondary Education.

Table 3

Fixed Effects Estimates and Variance Covariance Estimates of Problem Trajectories (Model 4)

	Conduct problems		Hyperactivity		Emotional symptoms	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
	Fixed effects					
Constant	**2.593**	**0.104**	**5.209**	**0.160**	**1.728**	**0.102**
Age	**-0.309**	**0.015**	**-0.146**	**0.019**	0.022	0.014
Age^2	**0.092**	**0.009**	**0.066**	**0.012**	0.019	0.010
Stratum (Ref: England-advantaged)						
England-disadvantaged	**0.150**	**0.037**	0.109	0.056	0.065	0.035
England-ethnic	0.070	0.062	0.098	0.055	0.097	0.059
NSH	0.018	0.015	0.017	0.020	**0.045**	**0.015**
NSH x age	**-0.022**	**0.005**	-0.007	0.006	0.002	0.005
NSH x age^2	**0.014**	**0.003**	0.007	0.004	-0.002	0.003
In social housing	0.353	0.206	**0.681**	**0.261**	**0.576**	**0.196**
In social housing x age	-0.066	0.062	0.060	0.085	**0.179**	**0.065**
In social housing x age^2	0.063	0.049	-0.030	0.058	-0.009	0.046
NSH x in social housing	-0.032	0.047	-0.094	0.059	**-0.105**	**0.044**
NSH x in social housing x age	0.005	0.014	-0.011	0.019	**-0.034**	**0.015**
NSH x in social housing x age^2	-0.012	0.011	0.000	0.013	0.005	0.011
Maternal education (Ref: No qualification)						
Higher degree	**-0.645**	**0.081**	**-1.011**	**0.121**	**-0.502**	**0.079**
First Degree	**-0.723**	**0.063**	**-1.182**	**0.091**	**-0.550**	**0.059**
A level or HE Diploma	**-0.558**	**0.055**	**-0.675**	**0.082**	**-0.491**	**0.054**
GCSE a-c	**-0.492**	**0.048**	**-0.438**	**0.072**	**-0.428**	**0.047**
GCSE d-g	**-0.206**	**0.059**	-0.135	0.088	**-0.178**	**0.058**
Other qualification	-0.152	0.093	-0.275	0.141	**-0.251**	**0.093**
Mother's age at first birth	**-0.025**	**0.003**	**-0.023**	**0.005**	**-0.010**	**0.003**
Girl	**-0.264**	**0.029**	**- 0.616**	**0.043**	0.041	0.028
Child's ethnicity (Ref: White)						
Mixed	-0.021	0.079	0.014	0.117	0.032	0.076
Indian	-0.058	0.088	0.206	0.133	**0.199**	**0.086**
Pakistani/Bangladeshi	-0.131	0.070	**0.347**	**0.106**	**0.634**	**0.068**
Black/black British	**-0.339**	**0.082**	**-0.357**	**0.123**	-0.068	0.080
Other	**-0.271**	**0.122**	0.119	0.183	**0.344**	**0.120**
Statement of SEN	**1.012**	**0.091**	**1.957**	**0.136**	**0.516**	**0.089**
	Random effects					
Between-ward intercept variance	0.005	0.004	0.013	0.010	0.003	0.004
Between-child intercept variance	**1.350**	**0.029**	**2.809**	**0.059**	**1.048**	**0.026**
Between-child slope variance	**-0.177**	**0.008**	**0.081**	**0.013**	**0.101**	**0.007**
Between-child intercept-slope covariance	**0.092**	**0.004**	**0.123**	**0.007**	**0.052**	**0.004**
Between-occasion intercept variance	**1.100**	**0.019**	**1.919**	**0.033**	**1.299**	**0.022**

Note: Effects in boldface are significant at p < .05. NSH = neighbourhood social housing; HE = Higher Education; GCSE = General Certificate of Secondary Education; SEN= special educational needs

Table 4

Fixed Effects Estimates and Variance Covariance Estimates of Problem Trajectories (Model 7)

	Conduct problems		Hyperactivity		Emotional symptoms	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
			Fixed effects			
Constant	**2.525**	**0.136**	**4.298**	**0.199**	**1.317**	**0.135**
Age	**-0.425**	**0.039**	**-0.153**	**0.051**	0.037	0.038
Age^2	**0.107**	**0.026**	**0.103**	**0.036**	0.002	0.027
Stratum (Ref: England-advantaged)						
England-disadvantaged	**0.094**	**0.032**	0.044	0.052	-0.001	0.030
England-ethnic	0.040	0.055	0.004	0.091	0.017	0.053
NSH	0.001	0.014	-0.001	0.020	**0.028**	**0.014**
NSH x age	**-0.014**	**0.005**	-0.002	0.006	0.002	0.005
NSH x age^2	**0.010**	**0.003**	**0.008**	**0.004**	-0.003	0.003
In social housing	**0.390**	**0.186**	0.457	0.263	**0.511**	**0.188**
In social housing x age	-0.057	0.068	-0.009	0.089	**0.155**	**0.065**
In social housing x age^2	0.042	0.044	-0.016	0.059	-0.070	0.046
NSH x in social housing	-0.054	0.042	-0.059	0.060	**-0.119**	**0.043**
NSH x in social housing x age	0.009	0.015	0.005	0.020	**-0.035**	**0.015**
NSH x in social housing x age^2	-0.008	0.010	-0.002	0.013	0.019	0.010
Maternal education (Ref: No qualification)						
Higher degree	**-0.467**	**0.076**	**-0.749**	**0.120**	**-0.243**	**0.072**
First Degree	**-0.531**	**0.058**	**-0.922**	**0.092**	**-0.271**	**0.055**
A level or HE Diploma	**-0.391**	**0.053**	**-0.446**	**0.084**	**-0.236**	**0.050**
GCSE a-c	**-0.348**	**0.047**	**-0.244**	**0.074**	**-0.212**	**0.044**
GCSE d-g	**-0.137**	**0.056**	-0.011	0.088	-0.039	0.053
Other qualification	-0.152	0.093	**-0.304**	**0.148**	-0.086	0.090
Mother's age at first birth	**-0.018**	**0.003**	**-0.016**	**0.005**	-0.005	0.003
Girl	**-0.213**	**0.027**	**-0.573**	**0.043**	**0.095**	**0.026**
Child's ethnicity (Ref: White)						

|						
Mixed	-0.039	0.073	-0.020	0.116	-0.022	0.069
Indian	-0.128	0.083	0.084	0.133	0.006	0.081
Pakistani/Bangladeshi	**-0.278**	**0.068**	0.102	0.110	**0.362**	**0.066**
Black/black British	**-0.368**	**0.078**	**-0.519**	**0.125**	-0.134	0.075
Other	**-0.299**	**0.122**	**-**0.002	0.194	0.070	0.119
Statement of SEN	**0.637**	**0.087**	**1.596**	**0.136**	0.074	0.082
Adverse life events	**0.050**	**0.014**	**0.051**	**0.019**	**0.033**	**0.014**
Adverse life events x age	-0.007	0.006	-0.007	0.007	**0.021**	**0.005**
Adverse life events x age^2	0.006	0.004	-0.003	0.005	0.006	0.004
Maternal psychological distress	**0.361**	**0.029**	**0.501**	**0.041**	**0.491**	**0.030**
Maternal psychological distress x age	**-0.073**	**0.012**	-0.003	0.016	**0.022**	**0.011**
Maternal psychological distress x age^2	**0.042**	**0.008**	-0.016	0.011	0.001	0.008
Home organisation	**-0.089**	**0.014**	**-0.109**	**0.020**	**-0.049**	**0.015**
Home organisation x age	**0.027**	**0.006**	0.002	0.008	**-0.016**	**0.006**
Home organisation x age^2	**-0.012**	**0.004**	**-0.012**	**0.005**	-0.003	0.004
(Low) parental involvement	**0.047**	**0.015**	**0.078**	**0.021**	-0.021	0.016
(Low) parental involvement x age	-0.005	0.006	-0.010	0.007	**-0.011**	**0.005**
(Low) parental involvement x age^2	0.001	0.004	-0.004	0.005	0.002	0.004
Regular bedtimes	**-0.101**	**0.019**	**-0.094**	**0.026**	**-0.062**	**0.020**
Regular bedtimes x age	**0.021**	**0.007**	0.003	0.010	0.009	0.007
Regular bedtimes x age^2	-0.003	0.005	0.003	0.007	0.003	0.005
Peer problems	**0.163**	**0.011**	**0.200**	**0.015**	**0.291**	**0.011**
Peer problems x age	0.003	0.004	**0.032**	**0.005**	**0.032**	**0.004**
Peer problems x age^2	0.004	0.003	-0.000	0.004	-0.004	0.003
			Random effects			
Between-ward intercept variance	0.000	0.000	0.007	0.009	0.000	0.000
Between-child intercept variance	**1.082**	**0.025**	**2.573**	**0.056**	**0.740**	**0.021**
Between-child slope variance	**-0.153**	**0.007**	**0.062**	**0.013**	**0.071**	**0.006**
Between-child intercept-slope covariance	**0.084**	**0.004**	**0.105**	**0.007**	**0.042**	**0.004**
Between-occasion intercept variance	**1.005**	**0.018**	**1.839**	**0.032**	**1.180**	**0.021**

Note: Effects in boldface are significant at p < .05. NSH = neighbourhood social housing; HE = Higher Education; GCSE = General Certificate of Secondary Education; SEN= special educational needs

Figure 1. Predicted Trajectories of Conduct Problems by Neighbourhood Social Housing (NSH)
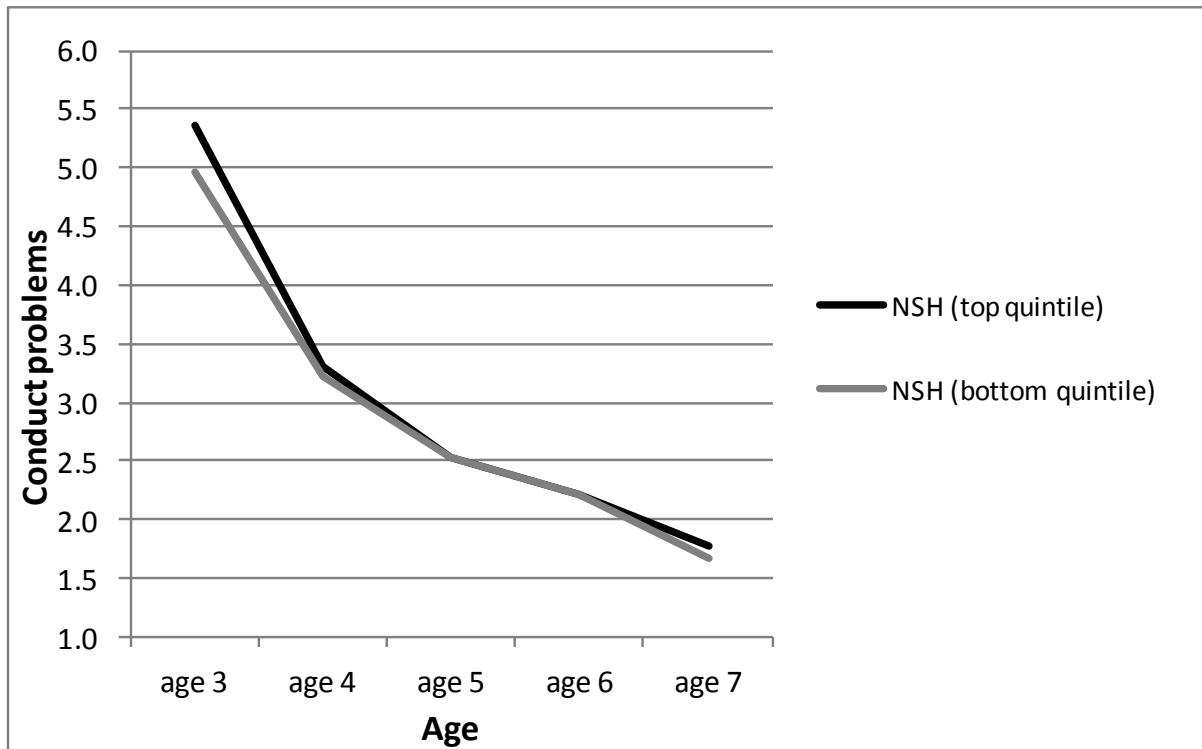
Note: 'NSH (top quintile)' is the top quintile of neighbourhoods based on the proportion of adult residents in social housing. 'NSH (bottom quintile)' is the bottom quintile of neighbourhoods based on the proportion of adult residents in social housing. Predictions are plotted for children whose mothers' highest academic qualification is 'GCSE a-c' (the mode of maternal education) and otherwise the reference group for each categorical variable, and at the mean of each continuous variable.

Figure 2. Predicted Trajectories of Emotional Symptoms by Neighbourhood Social Housing (NSH) for Families in Social Housing
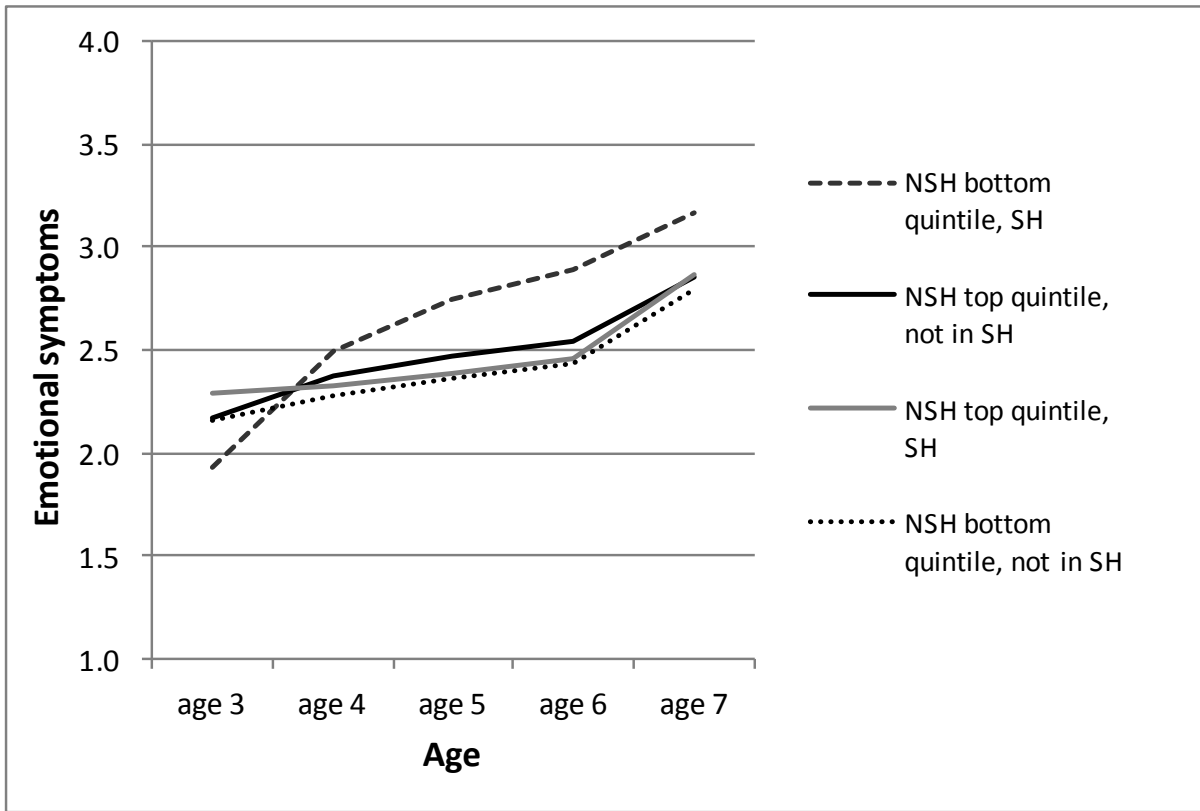
Note: See note to Figure 1. 'SH' is living in social housing.