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The association between social housing type and children's developmental outcomes

Bilal Nasim[1]

Abstract

This paper is the first to investigate the association between social housing type and children's developmental outcomes. I compare the non-cognitive, cognitive and health outcomes of children in council-rented self-contained flats with children in council-rented semi-detached houses and explore the role of housing and neighbourhood quality in explaining differences in outcomes across the two types of social housing. I find that children in flats exhibit statistically significantly worse non-cognitive outcomes than children in houses and this deficit is not attributable to the child's socioeconomic, parental, family or own characteristics. Over half of this deficit is explained by the poorer housing quality of flats compared with houses. No differential, however, is found in the cognitive outcomes of children in council-rented flats and children in council-rented houses. The evidence on child health outcomes is mixed. No deficit is found in the general health of children in flats, although they are found to exhibit greater coughing and sleeping difficulties. Just under half of the greater sleeping difficulties of children in flats is again accounted for by the poorer housing quality of flats.

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1 Introduction

1.1 Background

The stock of Social Housing in England is significant. It provides homes at below market rents for approximately four million households, representing almost one in five. Owned by either local authorities or other registered social landlords such as housing associations[1], social housing is let at low rents, on average equal to approximately 50% of the local private market rent, on a secure basis to those whom are considered most in need, according to the social landlord's application scheme. There is a growing literature on comparisons between the life outcomes of social renters and renters/owners within the private housing market[2], however, there are very few studies which investigate the extent to which there is variation in the outcomes of individuals *within* the social renting group[3].

Social renters are often perceived to be a homogenous group of similarly disadvantaged individuals. The extent to which this true is an empirical question which I contribute to in this paper. However, what is true is that the *provision* of social housing is certainly not homogenous, varying along a number of dimensions, including the social landlord, region/locality, and the type and character of dwelling. Hitherto there has been limited evidence on the impact on social renters of variation in the provision of social housing along these dimensions. This paper at-tempts to contribute to this literature by considering the role of different types of social housing dwelling in determining the outcomes of social renters, where types of dwelling include houses, bungalows, flats, maisonettes and bedsits. I ask two questions; (i) Are there differences between the outcomes of social renters in different types of dwelling? (ii) If so, what are the mechanisms mediating the differences?

These questions are relevant for policy. Much of the debate hitherto surrounding social housing has tended to be with regards to the lack of construction and supply of new stock. Social housing accounted for 32% of housing stock at the beginning of the 1980's before significant evolution in housing policy, including the introduction of the Right to Buy, induced a large transfer of homes out of local authority or housing association ownership, with around 1.8 million homes sold to private landlords in the following two decades[4]. Waiting lists for social housing continue to grow, currently at just under 2 million households, increasing by over 80% since 1997[5].

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[1]Housing Associations are companies or trustees that are non-profit-making such that any trading surplus is used to maintain existing homes or to finance new ones.
[2]Nasim [26], Lupton et al. [25]
[3]For clarity, by outcomes I do not mean the background characteristics of social renters, but rather what social renters do, and what they achieve, whilst residing in social rented housing.
[4]Jones and Murie [22]
[5]Housing Strategy Statistical Appendix, Department for Communities and Local Government.

To address these concerns, the Affordable Housing Programme, 2011-15, has been introduced and aims to increase the supply of affordable homes in England[6]. However, the overall effectiveness of building and providing more social housing will be partly dependent on the answers to the two questions posed above. Any differences in the outcomes of residents across social housing types, and the mechanisms found to be mediating these differences, should ideally be accounted for when deciding on the provision strategy of these new affordable homes. Not doing so runs the risk of not obtaining the maximum social return from the investment in new affordable housing.

Due to data limitations and ease of interpretability that I discuss in detail, I restrict the analysis in this paper to the comparison of two social housing types, flats and houses, which constitute approximately 80% of all social renting households in the sample. I also focus on the early-stage outcomes of children in families in social housing, rather than adults. The returns over the life-cycle to early childhood skills has been widely established. Cognitive and non-cognitive skills in childhood have been shown to have important effects both on schooling attainment and decisions, and later labour market outcomes[7] and there is also strong evidence for the existence of complementarities between cognitive skills and non-cognitive traits[8]. Similarly, childhood health has been shown to be strongly associated with a wide range of adult outcomes, including educational attainment, income and labour market outcomes, health and socio-economic status[9]. Thus differentials in child non-cognitive, cognitive and health outcomes across social housing types may have long-lasting impacts on development and outcomes into adulthood, and are thus of particular importance.

I do not attempt to solve the problem of causality or identify effects of the two types of social housing, but aim to investigate whether there are differentials in the three child outcomes between children in self-contained council-rented flats and children in semi-detached council-rented houses, and exploit the rich data available to demonstrate that these differentials are poorly explained by the observable socio-economic, parental, family and child characteristics of the two sets of households. In demonstrating the latter, I am aided by the priority-based application process for social housing which helps to ensure that the two groups of social renters, those in flats and those in houses, are similar along a number of dimensions of determinants of child outcomes, despite differing in the average size of their respective households. I discuss this further in Sections 1.2 and 1.3 of this Introduction.

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[6]Affordable housing consists of social rented, affordable rented and intermediate housing, provided to eligible households whose needs are not met by the market. Affordable rented and intermediate housing tends to provide rents at below market prices but generally well above the rents for social rented housing.
[7]Heckman et al. [19], Carneiro et al. [8], Borghans et al. [6].
[8]Cunha et al. [11], Brunello and Schlotter [7], Carneiro et al. [8].
[9]Case et al. [10], Case and Paxson [9], Currie [12], Smith [31].

I then explore two possible mechanisms via which social housing type and child outcomes are associated, housing quality and neighborhood quality, based on previous evidence on the importance of these two factors in determining child development, detailed in Section 1.4 of this Introduction. The paper is then organised as follows: Section 2 presents the methodology and Section 3 summarises the data. The results are presented in Section 4, and are discussed in Section 5. I provide concluding remarks in Section 6.

1.2   Social Housing Application and the Allocation of Housing Type

The analysis is conducted on a sample of families based in the former region of Avon, south-west England, which consisted of the non-metropolitan districts Northavon, Bristol, Kingswood, Woodspring, Wansdyke and Bath. The details of the social housing application and allocation procedure are taken from Bristol City Council[10] Records from 1990[11]. In the late 80s and early 90s anyone on the Housing Register could apply for social housing, and the Housing Register was open to anyone living or working in the district. The application process was as follows:

1. Completion of an application form with the details required to calculate a points score;

2. An Allocation Officer would visit to discuss the completed application form and calculate a points score;

3. The applicant would then receive information about their application:
   (a) Details of the points he/she had been awarded;
   (b) The size of the property he/she would be considered for.

To be eligible for social housing accommodation the applicant would be of the highest priority, based on the points score, who needed the type and size of property available at the time. To establish the level of priority of an applicant, points were awarded based on the characteristics of the applicants' present home and general circumstances. Worse characteristics were assigned higher scores, and thus relatively high scores represented relatively high priority. Priority was assessed using the following characteristics:

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[10]There may have been some differences across these council districts with respect to their individual social housing allocation procedures. However Bristol was by far the most populous district in Avon and application procedures generally were very similar across districts, and so I am comfortable in using the Bristol records as representative for the area as a whole.
[11]The children in the sample used in the analysis for this paper were born in 1990 or 1991

- The level of disrepair of the current home;
- Whether current home had a shortage of bedrooms given the size of the household; Whether current home was too large;
- Whether current home lacked or shared rooms and/or facilities; Whether current accommodation was not self contained;
- Whether current home suffered from environmental factors (e.g. traffic or industrial nuisance);
- Whether household experienced insecurity of tenure;
- Whether person(s) in household were experiencing ill health; The number of elderly persons in household;
- Whether the household was a single-parent families;
- Whether the applicant had experienced a family separation; Whether the applicant was homeless;
- Whether the household included children living in flats;
- Whether the household experienced other social needs (difficult/distressful factors not covered in the rest of the points scheme).

Those of highest priority based on the above questions, unsurprisingly, tended to exhibit rel-ative disadvantage in more standard socio-economic dimensions such as income, education and employment, though these were not directly assessed. A threshold was established to define the level of points score, below which, applicants would be refused eligibility for social housing.

Point 3b of the Application Process above states that the council district decided the size, and the subsequent type, of property the applicant would be considered for. The size of the property an applicant would be considered for was determined solely by the size of the applicants' family, i.e. partner plus children. A young couple with no children for example would not be considered for a semi-detached home with three bedrooms, and likewise a mother and father of three would not be considered eligible for a self-contained flat with one bedroom. This created a 'banding' of applicants along the lines of their eligibility for sizes, and thus types, of property based on the size of their family. The banding of applicants has two implications with respect to the analysis in this paper, which restricts the sample to two housing types only. Firstly, there are effectively two distinct groups of applicants, the self-contained flat applicants and the semi-detached house applicants, and these two groups differ systematically, and by construction, on the size of the family. Secondly, each of the two social housing type groups contains households that are not eligible for the alternative type of housing due to the size of their families. The highest priority applicants are thus established *within* the group of households eligible for one of the two housing types, and are thus not directly 'competing' with each other across housing types. This allows for the possibility that the two groups systematically differ with respect to their point scores, and thus their level of disadvantage.

Due to the non-random allocation of social housing type as a result of family size and the possibility of non-constant point scores/levels of disadvantage across the two social housing types, the estimate of the association between social housing type and child outcomes cannot be considered causal. However, although the point scores are not available in the data, by conditioning on a rich set of socio-economic, parental, family and child characteristics I can explore the extent to which the two groups differ in observable levels of disadvantage and the manner in which the differences in family size impact on estimates of the association between social housing type and child outcomes.

1.3   Family Size and Child Outcomes

As a result of the social housing type allocation process outlined above, the families in flats and houses, while being similar along a number of socio-economic, parental and child dimensions, are likely to differ systematically with respect to the number of persons in the household. Although I address this heterogeneity in the analysis, the observed differences in family size across housing type may be associated with unobserved heterogeneity which is non-trivial in determining child outcomes and explaining housing type differentials in the child outcomes.

There is a great deal of evidence showing associations between family size and a wide range of child and adult outcomes. In her 1989 book "Family Size and Achievement"[12], Judith Blake concludes, contrary to the widely accepted view of the time, that children with two or more siblings were *less* well educated and went on to be less successful than single children or children from two-child families. She argues that this was primarily a result of parents in larger homes having less time and money to invest per child. More recently family size has been found to be negatively correlated with children's educational outcomes[13] and it has been demonstrated that a great deal of the negative association between family size and child outcomes is driven by birth order effects, i.e. children in larger families do worse mostly due to impacts on the marginal children through the effect of being born later than their siblings[14].

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[12] Blake [5].
[13] Black et al. [3].
[14] Black et al. [3], Iacovou [20], Blake [5].

This effect is most visible in the Black et al, 2005 study, where upon introducing birth order indicators, the negative effect of family size is reduced to almost zero. The authors argue that this evidence weakens the case for an independent and causal impact of family size on child outcomes above birth order considerations. In the analysis in this paper, for completeness I condition separately on both the total number of persons in the home and the number of older siblings.

For the analysis in this paper, variation in family size and number of siblings represents a significant concern if, unaccounted for, it induces upward bias in the absolute value of the estimated association between social housing type and the child outcomes of interest. In this scenario, at least part of the association between social housing type and child outcomes is being mediated by differences in the size of the family and the number of siblings. However the literature on the relationship between family size and number of siblings, and child outcomes, outlined above, suggests that larger families and more siblings are *negatively* associated with developmental out-comes. This firstly implies that unaccounted for variation in family size and number of siblings would induce upward bias in the estimated association between housing type and child outcomes only if children in flats are found to exhibit better outcomes than children in houses. If children in houses are found to exhibit better outcomes than those in flats, omitting family size and number of siblings variation would induce *downward* bias in the estimate of the association, as children would be found to be doing better in houses *despite* the fact that they tended to belong to larger families and had more siblings. Secondly, in this latter scenario, where children in houses are found to exhibit better outcomes than those in flats, having accounted for family size and number of siblings, any further unobserved heterogeneity associated with these family characteristics would have to bias the estimated association in the opposite direction to that induced when not accounting for family size and number of siblings, to be a major concern for the analysis in this paper. Although this is possible, it is much less of a worry than if family size and number of siblings, and child outcomes, were found to be positively associated. I examine these issues explicitly in the analysis.

1.4   Housing Type and Child Outcomes

The second research question posed in Section 1.1, namely, "What are the mechanisms mediating the differences in child outcomes across social housing type?", stems from the idea that there is nothing intrinsic about a particular dwelling type which would affect, or be associated with, the outcomes of the residents, and thus any differences in outcomes must result from differences in the characteristics of social housing types. There are two dimensions in which the social housing types investigated in this paper, self-contained flats and semi-detached houses, may differ; housing quality and neighbourhood quality. These two dimensions of characteristics are broad and in the analysis I include a varied set of measures and indicators pertaining to each of them.

The literature suggests that both housing and neighbourhood quality may represent possible mechanisms mediating any differences in child outcomes between the two social housing types. The child outcomes considered in this paper are the non-cognitive, cognitive and health development of children between the ages of 42 and 60 months.

Housing quality could affect the outcomes of children in the residence directly, and/or indirectly via affecting parents or siblings in ways which are significant in determining child development. Research conducted by Gifford and Lacombe [17], on the direct impact of housing quality on child/young person outcomes suggests poor housing quality is associated with worse child socio-emotional outcomes conditional on household income, parental education and mental health, and child's gender. The bulk of the Epidemiological literature on housing quality and the outcomes of residents focusses on health. Robust associations are shown between housing quality and a variety of child health outcomes including respiratory health and asthma[15]. Further, there is a vast literature on the effect of housing quality on adult health outcomes. Epidemiological research has found significant associations between indicators of housing quality[16] and asthma and chest problems[17], long-standing illness and disability[18], blood pressure[19] and self-reported health[20]. None of the studies mentioned identify causal associations. To the extent that these associations are causal, however, poor housing quality may directly impact on child health outcomes. Very little research, other than the Gifford and Lacombe paper aforementioned, has been conducted on the association between housing quality and child non-cognitive or cognitive outcomes. These child outcomes may be associated with housing quality directly. They could also be indirectly affected via the impact of housing quality on child health to the extent that child health deter-mines child non-cognitive and cognitive outcomes. Finally, child non-cognitive (mental health) and cognitive outcomes may also be affected by housing quality via the impact on the health of parents, and subsequently, their ability and capacity to parent.

Differences across the two social housing types in their respective neighbourhoods may also mediate differences in child outcomes. Sociological and Epidemiological theory suggest four broad channels through which a pupil's neighbourhood can impact on child non-cognitive, cognitive and health development[21];

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[15] Andriessen et al. [1]; Strachan and Carey [32].

[16] These include indicators for damp and mould, living and bedroom temperatures, overcrowding, pest problems, water leaks and mothers' satisfaction with home.

[17] Barton et al. [2], Jacobs et al. [21].

[18] Blackburn et al. [4].

[19] Jacobs et al. [21].

[20] Kahlmeier et al. [23]

[21] Galster [15], Ellen and Turner [14].

- Social interactive.
  - Socialisation by adults: The influence of role models as reference points for behaviour, the strength of local social norms and the extent of a collective presence and community within the neighbourhood.
  - Peer influences: The existence of positive/negative peer pressure, the importance of relative position and relative status, reference points for behaviour amongst peers and the availability of extra-curricular activities and engagement.
  - Social networks: The interpersonal communication of information and resources of various kinds transmitted through neighbours.

- Environmental.
  - Exposure to crime and violence.
  - Physical surroundings: Neighbourhoods may exhibit deteriorated structures and public neighbourhood infrastructure as well as exposure to toxic air, soil and/or water.

- Geographical.
  - Physical distance and isolation: The proximity to and accessibility of economic opportunities in addition to transport and mobility infrastructures more broadly.

- Institutional.
  - Local institutional resources: The availability and quality of schools, nurseries and medical centers.
  - Local market actors: The prevalence of certain private market actors such as off li-censes, fast food restaurants and betting stores in addition to the existence and scale of local illegal drug markets.

However the evidence on the effect of neigbourhoods on child outcomes is mixed. The Moving To Opportunity programme in the United States involved families living in public housing being randomly assigned housing vouchers, providing them with the option of moving to neighbourhoods with lower levels of deprivation. Sanbonmatsu et al. [30] find little to suggest that moving to a better neighbourhood improved the cognitive outcomes of children, while Katz et al. [24] find significant associations between the improvement in neighbourhood quality and long-term improvements in well-being, health and adolescent behaviour. Oreopoulos [27] examines the effect of a poor quality neighbourhood on the long-run labour market outcomes of adults who were assigned when young to substantially different public housing projects. The results suggest that living in contrasting housing projects cannot explain the large variances in labour market outcomes.

In contrast, however, Garner and Raudenbush [16] find a significant negative association between neighbourhood deprivation and educational attainment. For the analysis in this paper I present a comprehensive comparison of the housing and neighbourhood quality across the two social housing types, and explore the role of each of these dimensions in explaining associations between social housing type and child outcomes.

2 Methodology

My aim is to quantify the association between the type of social housing and child outcomes. I estimate a reduced-form equation using OLS where I measure the unconditional association between a binary housing-type variable measured at period t and child outcomes measured in period $t + 1$. The housing-type indicator, HT, is equal to '1' if the household is in a council-rented semi-detached house, and '0' if the household is in a council-rented self-contained flat. This raw association captures the overall relationship between social housing type, as defined, and the child outcome of interest.

$$y_{it+1} = \beta_0 + \beta_1 HT_{it} + u_{it};$$ (1)

β_1 is not identified and can not be considered a causal impact of housing type on the outcome of interest, as one can not rule out the violation of $E[HT_{it}; u_{it}] = 0$. There are a number of possible sources of endogeneity. Firstly, the two groups of social renters, those in flats and those in houses, may differ along dimensions which may be related to child outcomes independent of the type of social housing resided in, such as household and socio-economic characteristics. These differences will have been mitigated to a great extent by the points-based social housing eligibility process described in Section 1.2, but nevertheless observed conditional heterogeneity may remain, which, if not accounted for, would bias upward the estimate of β_1, with β_1 subsuming the effects of any heterogeneity in households and socio-economic characteristics. Another source of endogeneity derives from differences in family structure. The families in self-contained flats will, by construction, be smaller than those in semi-detached houses due to the housing type allocation process. Any independent association between the size of the family and/or conditional on the size of the family, the number of siblings, and the child outcome of interest, will induce an inconsistent estimate of β_1. To explore these sources of heterogeneity I present a comparison of household characteristics of the two housing-type groups, comprising of parental, socio-economic, and child information and both the size of the family and the number of older siblings[22], to establish the extent to which the two groups differ along observable dimensions, performing t-tests on the equality of the group means of each of the measures. To account for possible selection into each of the two groups along these observable dimensions I estimate a more robust

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[22]Older siblings are conditioned on based on the family size and sibling literature detailed in Section 1.3.

association between social housing type and child outcomes by conditioning on the full set of socio-economic, parental, family and child characteristics, measured in period $t + 1$.

$$y_{it+1} = \beta_0 + \beta_1 HT_{it} + \beta_2 X_{it+1} + u_{it}; \qquad (2)$$

X_{it+1} is the vector of household characteristics and includes the mothers' education level and mental health status, family income and an indicator for lone parenthood. To account for family size, X_{it+1} includes the number of individuals in the household and whether the child has any older siblings[23]. X_{it+1} also includes the child's month of birth. Including these control variables allows a comparison of the outcomes of children between households that are observably similar but differ in the type of social housing they reside in. Given that I cannot account for unobserved sources of selection bias in the model, a statistically significant estimate of β_1 in equation (2) is considered purely as a robust association and interpreted as an association between social housing type and the child outcome of interest which cannot be accounted for by the rich set of socio-economic, parental, family and child characteristics described above.

The analysis is then extended to investigate possible mechanisms mediating any robust associations found between social housing type and child outcomes, exploring the roles of housing and neighbourhood quality. I first present a comparison of the housing and neighbourhood quality between the two social housing type groups. Drawing on the epidemiological literature referenced in Section 1.4 I create a set of indicators for both housing quality and neighbourhood quality and perform t-tests on the equality of the housing type group means of each of these indicators, to examine the extent to which housing and neighbourhood quality, as defined, vary across the two groups. Using equation (2) as the baseline model, I then estimate three further specifications. The first and second introduce the set of housing and neighbourhood quality indicators, respectively, to the baseline model, and the third specification introduces both sets of indicators together to the baseline model, as described in equation (3);

$$y_{it+1} = \beta_0 + \beta_1 HT_{it} + \beta_2 X_{it+1} + \beta_3 HQ_{it+1} + \beta_3 NQ_{it+1} + u_{it}; \qquad (3)$$

where HQ_{it+1} and NQ_{it+1} are the vectors of indicators for housing quality and neighbourhood quality, respectively. If housing and/or neighbourhood quality mediates any estimated robust association between social housing type and child outcomes, then the inclusion of the quality indicators should diminish this association implying a lower β_1 in equation (3) than that found in equation (2).

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[23]The analysis is also conducted using the number of older siblings and the total number of siblings, instead of the binary indicator of having any older siblings. The results are substantively identical in all specifications and so I only report the results using the binary indicator for older siblings.

3   Data

The analysis is conducted using the Avon Longitudinal Study of Parents and Children (ALSPAC). This is a rich, nationally representative data set for a cohort of children born in the former region of Avon in the UK[24]. Over 14,000 pregnant women residing in the region were invited to participate if their estimated date of delivery was between the 1st of April 1991 and the 31st December 1992. Approximately 85% of eligible mothers enrolled resulting in a cohort of approximately 12,000 live births and respondents were interviewed at least annually[25]. Information was collected on a vast range of socio-economic and environmental characteristics on the child and both parents which were used for the control set in the analyses.

3.1   Outcome Measures

There are three sets of outcome measures used in the analysis, capturing the non-cognitive, cognitive and health development of children. For the non-cognitive dimension I utilise The Revised Rutter Parent Scale for Preschool Children[26]. This is a psychometric behavioural scale providing a measure of the child's emotional and behavioural difficulties. The mother is asked to rate how a series of brief descriptions of behaviour and mental state relate to their own child, responding with one of "Does not apply", "Applies somewhat" or "Certainly applies". These descriptions are categorised into one of five dimensions of the Rutter scale; emotional difficulties, conduct difficulties, hyperactivity, anti-sociality and behavioural difficulties. The variation in the score for each dimension ranging between 0 to 8 for hyperactivity, and 0 to 52 for behavioural difficulties, with a higher score representing greater difficulties in development along that dimension. The scores are with respect to the child at age 42 months, and represent a comprehensive and well-established metric by which to gauge the social and non-cognitive development of preschool children. Key Stage 1 scores in Reading and Maths are used as the measures of cognitive development. These are tests derived from the National Curriculum in maintained schools in England and Wales and are taken between the ages of 60 and 84 months. The child attains one of five levels, the higher levels indicating higher cognitive performance.

To capture the health development of the child at age 42 months I utilise three measures. The first is a measure of the general health of the child over the past year, with mother-reported responses being one of four available options ranging from "never well", the lowest score, to "very healthy", the highest score. Thus the higher the score, the healthier the child.

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[24] The County of Avon was abolished in 1996 and the area split between four new Unitary Authorities.

[25] The ALSPAC team conducted additional clinics for a sub-sample of children which are not used for the analysis in this paper.

[26] Elander and Rutter [13]

The second is a variable describing the number of occasions in the past year that the child has had a cough, with five options available ranging from none (zero occasions) to ten or more occasions. Lastly, I use a measure of sleeping quality, which is a mother-reported score ranging from 0 to 7 with higher scores representing greater difficulties.

For ease of interpretation, all of the non-cognitive, cognitive and health measures are recoded for the analysis, such that a higher score represents better performance with respect to that measure, and standardised to mean zero and a standard deviation of one.

3.2 Social Housing Type

The social housing indicators used for the analysis are derived from two questions the participants were required to answer early in their pregnancy (at approximately 15 weeks gestation). The mothers were first asked what the tenure type of their residence was. The options pro-vided were "being bought/mortgaged", "owned with no mortgage to pay", "rented from the council", "rented from a private landlord" and "rented from a housing association". In addition the mothers were asked what the housing type of their residence was, with the options being "a whole detached house (or bungalow)", "a semi-detached house (or bungalow)", "a whole terraced house" or "a flat/maisonnette (self-contained)". I construct the key social housing type indicator variable such that it is restricted to those mothers who answered "rented from the council" in response to the question regarding tenure type, and equal to '1' if the mother answered "a semi-detached house (or bungalow)", or '0' if the mother answered "a flat/maisonnette (self-contained)", to the housing type question.

Some mothers responded to the tenure type question with "rented from a housing association". Housing associations are non-governmental bodies, governed by a group of trustees comprising representatives of the funders, local authority and tenants. Between 1988 and 2008, the vast majority of social-rented housing has been steadily transferred, via the Large Scale Voluntary Transfer scheme, from local authority ownership to housing association ownership, and the ALSPAC mothers renting from a housing association would have been subject to this transfer. However, I do not include these respondents in the estimation sample due to the timing of the ALSPAC data, namely the fact that the study children were born in 1990 and 1991, and for whom outcomes are measured between 1995 and 1997. Between 1992 and 1997 75% of all English transfers of housing stock to housing association ownership were in "rural prosperous" local authorities[27]. Transfers during this period took place mostly in smaller, shire (rural) counties, often in Conservative control, with higher stock values and lower debt.

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[27]Pawson et al. [28].

These early transfers were highly selective and involved a non-representative sample of social housing tenants at the time, and thus the inclusion of mothers and households in housing rented from a housing association runs the risk of adding selection bias to the estimation sample. It is also worth noting that the analysis for all three child outcomes is repeated, though not reported, with the housing association mothers included in the estimation sample, with the results for all three outcomes substantively identical.

I also exclude mothers who responded with "a whole detached house (or bungalow)" from the indicator variable as this group represent only 2% of the mothers renting from the council, and as such are uncommon and observably dissimilar to both the semi-detached house and self-contained flat groups with respect to family income and mothers' education. I also exclude the "a whole terraced house" mothers, making up approximately 15% of the council-renters due to the variation in the type and size of terraced social housing found contained flats but also many larger residences similar in scale to semi-detached houses. It is thus not obvious whether terraced houses should be combined with the semi-detached houses or the self-contained flats in the indicator variable. Of those renting from the council, just under 80% either resided in a semi-detached house or a self-contained flat, the two housing types included in the indicator variables used for the analysis, within which semi-detached houses accounted for 37% and self-contained flats accounted for 63%.

It is worth noting that the social housing type indicator is taken at 15 weeks gestation, while the child outcome measures are taken at 42 months at the earliest. At 42 months there is no information on the housing tenure and type and so the family may feasibly have changed residence tenure and/or type. This presents a problem to the extent that the proportion of mothers (families) in each group who moved residence may not be constant across social housing type. Housing tenure and type information is also available when the child is 8 months. I thus create a modified version of the indicator variable which further restricts the variable on whether the family are observed in the same residence when the child is 8 months old. However, although this refines the indicator, it also introduces potential selection bias, in that those families observed in the same residence at both time points have made an implicit or explicit housing decision which in turn is potentially endogenous, and the determinants for which may be non-constant across social housing type. For example, one can imagine parents in a semi-detached house choosing to remain because of a desire to remain, compared with a parents in self-contained flats choosing to remain because no other feasible choices are available. I conduct the analysis separately using both versions of the social housing type indicator, and the results are substantively unaffected. For this reason I only report results using the first indicator, based only on the social housing type information taken at 15 weeks gestation.

3.3   Parent, Child and Family

The characteristics of the parents, children and families are all taken directly from ALSPAC. These include the mothers' education level, family income, a lone parenthood indicator, a mea-sure of the mothers' mental health, the child's month of birth, the number of residents in the home and the number of older siblings. All variables are taken at 42 months, with the exception of the lone parenthood indicator which is taken at birth and mothers' mental health which is taken at 18 weeks gestation.

The mothers' education level variable is derived from a question with the response options of no qualifications, O-level (including CSE and vocational), A-level and Degree. Family income is banded, providing five responses ranging from below £100 per week to above £400 per week, and is normalised by the number of residents in the home to account for larger families having greater incomes derived from benefits and to capture per-child income. The lone parenthood indicator is binary and equals '1' if the mother does not have a current partner, or if the mother has a partner who does not live in the home. Mothers' mental health is captured by the total score of the Crown-Crisp Experiential Index (Crown & Crisp, 1979) which is an inventory comprising of 48 items representing six sub-scales of mental health. All variables are standardised to mean zero and a standard deviation of one with the exception of the older siblings and lone parenthood measures which are binary.

3.4   Housing and Neighbourhood Quality

The ALSPAC data also provide a set of measures for the housing and neighbourhood characteristics. There are a rich set of variables pertaining to the housing conditions experienced by the child. Based on the housing quality literature detailed in Section 1.4, I include indicators for damp and mould, living and bedroom temperature, overcrowding, pest problems and water leaks, as well as a catch-all measure indicating the mothers' satisfaction with her home. I use a variety of measures for neighbourhood quality. ALSPAC provides a direct question for respondents on the quality of the neighbourhood in the form of an index ranging from 0 to 12. This general index, however, may not capture variance in all pertinent aspects of a neighbourhood, and so based on the sociological literature on neighbourhood quality again described in Section 1.4, I exploit ALSPAC information on the social networks experienced by the mothers and the extent to which crime affects their lives. Social network indicators come in the form of variables describing the mothers' interaction with neighbours and vice-versa. The mother is asked whether she visits her neighbours and/or looks after her neighbours' children, and is also asked whether her neighbours visit her and/or look after her own children. Crime is proxied using variables describing the extent to which the mother is worried by the possibility of being burgled, mugged, sexually assaulted or having her home vandalised.

The housing quality indicators are available at both 8 and 42 months, which are used to create a 'permanent' measure of each of the housing quality indicators, by taking the average of the two observations for each indicator. Neighbourhood quality indicators are only available at 8 months. As with the child outcomes measures, the housing and neighbourhood quality variables are recoded such that a higher score represents a better condition or state with respect to that quality measure, and standardised to mean zero and a standard deviation of one.

3.5 Sample

Of the 13,719 pregnant mothers who responded to the initial Home Ownership Status question, 1,939 stated that they were currently residing in Council Rented accommodation. Of this group, 523 stated that they lived in a semi-detached house while 956 stated they resided in a self-contained flat combining for the maximum sample of 1,479.

Of the 1,479 sample, 774 have non-missing Rutter information and this represents the estimation sample for non-cognitive outcomes of which 313 (40%) mothers stated that they resided in semi-detached housing while 461 (60%) stated they were living in a self-contained flat. 1,280 have non-missing Key Stage 1 information representing the cognitive estimation sample, of which 465 (36%) were in semi-detached housing while 815 (64%) were in self-contained flats. Finally, 772 have non-missing general health information representing the health estimation sample, of which 311 (44%) were in semi-detached housing and 461 (56%) were in self-contained flats. The attrition for the non-cognitive and health outcomes is due to the outcomes being observed at 42 months while the housing indicator is determined using information taken during pregnancy. There are relatively more non-missing observations for the cognitive outcomes due to the fact that the cognitive outcomes are Key Stage 1 scores matched in to ALSPAC from administrative education data. Differences in the children, households, and housing and neighbourhood quality between the two social housing types are discussed in the next section.

4   Results

4.1   Houses vs Flats

Table 1 presents comparative statistics between the two social housing type groups for the child outcomes, household and family characteristics and the sets of indicators for both housing quality and neighbourhood quality. All of the variables in Table 1 have been standardised and their values interpreted as standard deviations from the mean with the exception of the Older Sib-lings and Lone Parenthood variables which are binary. For ease of interpretation, the outcomes (non-cognitive, cognitive and health measures) have been

coded such that higher values represent greater development or fewer difficulties in that particular dimension. Similarly, the housing and neighborhood quality measures are coded such that a higher value represents a better or more desirable condition with respect to that quality indicator. For each standardised measure in the left column I present the mean for each social housing type group and the corresponding difference between the two groups, defined as the mean for flats less the mean for houses, in the final column, with the significance level providing the result of the t-test on the equality of means.

Focussing initially on the Outcomes panel, the final column of Table 1 suggests that the children residing in self-contained flats exhibit worse non-cognitive outcomes than those in semi-detached houses, across all dimensions of the Rutter Scale apart from anti-sociality, with statistically significant differences ranging between 0.15 and 0.32 standard deviations (s.d) for hyperactivity and behavioural difficulties, respectively. Similarly, children in flats also exhibit poorer health outcomes with differences ranging between 0.15 s.d for both general health and sleeping quality and 0.27 s.d for coughing. Interestingly, no statistically significant differentials are observed for the cognitive measures of reading and maths.

It can be seen from the Selection Controls panel that, as expected, the households in semi-detached houses have statistically significantly greater numbers of people and older siblings in the residence. However, the two groups are similar with respect to the mothers' education level and mental health, family income, lone parenthood, and the child's month of birth, with no significant differences observed in any of these variables. This is supportive of the idea put forward in Section 1.2, that the social housing type allocation process, by construction, leads to differences in the average size of the households of the two groups, but the application process and eligibility requirements for social housing significantly mitigate differences in other observable household and family characteristics between the two groups.

The final two panels of Table 1 present the comparison of the housing and neighbourhood quality measures between the two groups. Self-contained flats exhibit statistically significantly lower housing quality. Mothers in flats report lower bedroom and living room temperatures (approximately 0.28 s.d), greater levels of damp and mould (0.32 s.d) and greater levels of overall dissatisfaction about the home (0.56 s.d). Self-contained flats tend to be less crowded than semi-detached houses, suggesting that although the flats are smaller, this is more than matched by the greater number of individuals in houses. However, the difference is relatively small, under 0.1 s.d, and significant only at the 10% level. The neighbourhoods of households in self-contained flats are also reported to be of lower quality with respect to both the general neighbourhood quality index (0.55 s.d) and crime (0.38 s.d), though no significant differences are found in social networks. Taken together, there appear to significant differences in both housing and neighbourhood quality between the two groups.

4.2 Housing Type and Child Outcomes

Tables 2, 3 and 4 present the OLS regression results described by equations (1) through (3) in Section 2 for non-cognitive, cognitive and health outcomes, respectively. All five specifications shown condition on the number of years since the family last moved, taken at 8 months, to control for any length of stay heterogeneity across groups. Focussing first on non-cognitive out-comes in Table 2, the Raw specification suggests that children in council-rented semi-detached houses perform approximately 0.2 s.d higher on the Rutter scale than those in council-rented self-contained flats, conditioning only on the length of stay in the current residence. Based on the results of the balancing tests presented in Table 1, I next add the household characteristics which do not differ across groups. These are the mothers education level and mental health, family income, lone parenthood and the child's month of birth and are marked as Parental Controls at the bottom of the table. This specification, labeled Parent, has a small impact on the House Type coefficient, reducing it by approximately 20% to 0.16 s.d, though it is worth noting that the coefficient from each of the Raw and Baseline specifications falls within the 95% confidence interval of the other. The size of the reduction in the coefficient, although not trivial, supports the notion that households in the two groups are broadly similar with respect their characteristics and how these impact on non-cognitive child outcomes.

The next specification, Baseline, further adds the family structure variables, the family size and the number of older siblings, which differ significantly between then two groups as shown in Table 1. This has the impact of marginally *increasing* the differential, suggesting that children in semi-detached houses exhibit greater non-cognitive development despite tending to be part of larger families with more siblings, and providing tentative evidence in support for the research outlined in Section 1.3 finding a negative association between child development and the size of the family and number of older siblings. This represents the baseline specification and suggests that children in flats perform approximately 0.17 s.d worse than children in houses, and that this differential is robust to, and thus cannot be accounted for, a broad range of socio-economic, parental, family and child characteristics[28].

The final three columns of Table 2 explore the possible mediating mechanisms for the Baseline specification differential, by adding to the Baseline specification first the set of housing quality indicators (Housing specification), then the neighbourhood quality indicators (Neighbourhood specification) and finally both sets of indicators together (Both specification).

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[28]The robustness of this result is further supported by Propensity Score Matching (PSM) analysis. The propensity score is created using the full set of socio-economic, parental and child characteristics, in addition to the number of siblings. I employ Kernel based PSM with 99% common support, 6 blocks and with the balancing property satisfied. The results suggest the differential between children in flats and houses is higher than that estimated using OLS, at approximately 0.2 s.d, when the children and families are matched in this way.

The introduction of the housing quality indicators causes the House Type coefficient to become insignificant, reducing it by over 50% compared with the Baseline specification. This suggests that the relatively poorer housing quality of council-rented self-contained flats, as demonstrated in Table 1, has an important role in explaining the poorer non-cognitive outcomes of children in these flats compared with children in council-rented semi-detached houses. The coefficient is robust, however, to the introduction of the neighbourhood quality indicators, reducing by less than 10%, suggesting that neighbourhood quality, proxied by the indicators used in this analysis, does not substantially mediate the association between social housing type and non-cognitive outcomes shown in the Baseline specification. This inference is further supported when both sets of quality indicators are included in the final specification, in which the House Type coefficient is virtually identical to the Housing specification.

In line with the evidence from Table 1, Table 3 demonstrates that there is no differential in cognitive outcomes across social housing type. The coefficient on House Type, in contrast to that observed for non-cognitive outcomes, is small and very poorly determined in the Raw specification, and remains insignificant across all specifications. Though not shown here, the results remain the same if the sample is restricted to the same estimation sample as that which is used for the non-cognitive outcomes. This implies that the same children in flats exhibiting lower non-cognitive outcomes do not also exhibit lower cognitive outcomes, relative to children in houses. Similarly, the results are substantively the same when estimating the model for the KS1 Reading and Maths outcomes separately.

Table 4 presents the results for the three health outcomes, and thus provides three columns, one for each health outcome, for each specification. Focussing first on general health in the General column, the Raw specification suggests that children in semi-detached houses exhibit approximately 0.12 s.d better health than children in flats, although it is worth noting that this estimate is only just significant at the 10% level. Conditioning on parent and child characteristics in the Parent specification causes the coefficient to reduce slightly, approximately 13%, and become insignificant, and remains just insignificant when including the family size variables in the Baseline specification, implying there are no statistically significant differences in the general health of children in houses and flats having accounted for parent, child and family characteristics. This remains the case when conditioning on the housing and neighbourhood quality indicators in the final three specifications.

The Raw specification in Table 4 suggests almost a 0.27 s.d difference in the Coughing outcome for children between houses and flats, with this difference being highly statistically significant. In contrast to the General outcome, this differential is robust to the Parent specification, reducing by just under 12% but remaining highly significant.

The Baseline specification reduces the coefficient by a further 12%, but remains highly significant at just over 0.2 s.d, implying that there is a robust association between the frequency of coughing episodes in the previous year and living in flats compared with houses. Interestingly, housing and neighbourhood quality indicators fail to explain any of this differential across social housing types, with the coefficient remaining at or just above 0.2 s.d. It is worth noting that for both the General and Coughing health outcomes, the introduction of the family size variables in the Baseline specification do not increase the differential as is observed for non-cognitive outcomes in Table 2. The differential remains unchanged between the Parent and Baseline specifications for the General outcome, and decreases for the Coughing outcome.

The sleeping quality outcome in the Sleeping column also exhibits a significant coefficient on House Type in the Raw specification but the coefficient becomes insignificant and reduces by a third with the introduction of parent and child characteristics in the Parent specification. How-ever, the coefficient increases to approximately 0.23 s.d and becomes significant in the Baseline specification, suggesting, perhaps intuitively, that residing in a home with larger families and more older siblings is negatively associated with sleep quality. Thus children in houses experience better sleep despite generally residing in houses with larger families and more older siblings, and having accounted for this, the differential increases. In contrast to the General and Coughing health outcomes however, both housing quality and, to a lesser extent, neighbourhood quality indicators appear to mediate the differential in the Sleeping outcome. The Housing specification for the Sleeping outcome shows that the coefficient has reduced by almost 50% and becomes insignificant. Including both housing and neighbourhood quality indicators in the final specification for the Sleeping outcome shows a reduction of the coefficient above 60% compared with the Baseline.

5   Discussion

5.1   Key Findings: Social Housing Type and Child Outcomes

There are three key and novel findings from the analysis conducted in this paper. Firstly, children in social housing exhibit different non-cognitive outcomes depending on whether they reside in a house (semi-detached) or flat (self-contained). Children in flats perform 0.17 s.d worse than children in houses, and this difference cannot be accounted for by a wide range of socio-economic, parental, family and child characteristics. The estimate is statistically robust to the inclusion of socio-economic and family characteristics and the effect size is only slightly smaller with the inclusion of these characteristics, suggesting that this robust association is plausibly not driven by unobserved heterogeneity between the two groups of social renters. This inference is further supported by Propensity Score Matching analysis,

detailed in footnote 28, implying that the differential remains statistically significant, and is in fact slightly larger, when directly comparing families that are similar in all of the socio-economic, parental, family and child characteristics, including the size of the family and the number of older siblings. Children in flats also exhibit greater coughing episodes and sleeping difficulties than children in houses which again cannot be accounted for by the socio-economic, parental, family and child characteristics.

The second key finding of the paper is that, for non-cognitive outcomes in particular, the poorer outcomes for children in flats is largely explained, over 50%, by the quality of the flats compared with the quality of the houses. This implies that there may be positive returns to improving the quality of council-rented accommodation, in particular, self-contained flats, on the non-cognitive outcomes of pre-school children living in those residences. A few things are worth noting, how-ever. The housing quality variables are correlated with one another and thus, in this paper, little substantive can be said with respect to which of the housing quality indicators, if any, are the most important mediators. Similarly, little can be said about the mechanisms via which housing quality impacts on non-cognitive outcomes. Further research is required to address these issues, the understanding of which would be important to establishing effective ways of eliminating the social housing type inequalities in non-cognitive child outcomes. Neighbourhood quality is found to not explain any of the differences observed in any of the child outcomes.

The third key finding is that no differential between children in council-rented flats and those in houses is found in cognitive outcomes and this is true even when the sample of observations is restricted to be identical to the sample exhibiting non-cognitive differentials in outcomes. I.e. Housing type, while being strongly and robustly associated with non-cognitive development, is unrelated to cognitive development. The implication of this result is that the set of factors determining children's cognitive outcomes is not the same as that which determines children's non-cognitive outcomes. In addition to housing type, the role of housing quality in determining cognitive and non-cognitive outcomes differs. To show this I perform a joint F-test on the housing quality indicators in a regression which also includes socio-economic, parental, family and child characteristics, but excludes the binary House Type indicator. The housing quality indicators are jointly significant at the 10% level for non-cognitive outcomes, but insignificant for cognitive outcomes[29]. Further, an extension of the analysis could incorporate identifying information of the nursery/pre-school and school which the child attended to explore whether pre-schooling and schooling impacts differently on non-cognitive and cognitive outcomes. It is plausible that pre-school and early schooling helps to mitigate variation in early cognitive development, whilst not having much impact on non-cognitive and behavioural outcomes. Indeed, while pre-school has been found to be positively and robustly associated with early cognitive outcomes[30],

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[29]Full results not presented here but are available upon request.
[30]Goodman and Sianesi [18], Sammons* et al. [29]

Goodman and Sianesi, 2005 find mixed effects of pre-school on socialisation and adverse effects on behaviour at age 7.

It is also worth noting that the results of the analysis in this paper broadly support the evidence on the effect of family size and number of older siblings on child development outlined in section 1.3. By comparing the Parent and Baseline specifications in Tables 2 and 3, respectively, the social housing type differential in non-cognitive and cognitive outcomes *increases* with the introduction of the two family variables describing the size and the number of older siblings. This increase is slight for non-cognitive outcomes and with respect to a statistically insignificant differential for cognitive outcomes. Nevertheless, this provides tentative evidence that, ceteris paribus, children of higher birth order in larger families exhibit poorer developmental outcomes, such that conditioning on these family characteristics *increases* the positive association between social housing type and those outcomes.

Finally, the research in this paper highlights the variation in the determinants of child health across health outcomes. The results for the General and Coughing health outcomes differ from those for the Sleeping outcome in two substantive ways; the impact of family size and the number of older siblings, and the role of housing and neighbourhood quality as mediators. In contrast to both the General and Coughing outcomes, accounting for family size and the number of sib-lings *increases* the housing type differential in sleeping quality. Similarly, in contrast to General and Coughing outcomes, accounting for housing quality significantly reduces the housing type differential in sleeping quality. Thus despite being considered a health outcome, sleeping quality more closely resembles the non-cognitive (behavioural) outcomes with respect to its relationship with family size and sibling number, and housing quality.

6   Conclusion

This paper shows that children in different types of social housing do not exhibit the same level of development in their early years, with children growing up in self-contained flats showing poorer development than children in semi-detached houses. A significant part of the reason for this is because children living in self-contained flats experience poorer quality housing. Children living in self-contained flats also reside in poorer quality neighbourhoods, but this does very little to explain the worse developmental outcomes experienced by those children.

However, this is not true for all child outcomes. Cognitive outcomes are very similar for children in flats and houses, while the poorer quality housing and neighbourhood experienced by children in flats does not account for the worse general health and more frequent coughing episodes experienced by those children. This is of great importance from a research perspective.

It highlights the nebulous nature of the concept of child development and demonstrates the need for researchers to be very specific and clear in both defining the dimensions of child development in which they are interested, and the degree to which they extrapolate to considerations for broader and/or alternative measures of child development.

7 Tables

Table 1: Comparison of child-outcomes, family and housing characteristics between the children belonging to families in semi-detached houses and self-contained flats.

	House Type				
	Semi-detached Houses, N=523		Self-contained Flats, N=956		Difference
	Mean	Obs	Mean	Obs	
Outcomes (Child-age)					
Non-cognitive (42 months)					
Emotional Difficulties	0.161	313	-0.109	461	-0.271***
Conduct Difficulties	0.152	313	-0.103	461	-0.255***
Hyperactivity	0.087	313	-0.059	461	-0.145**
Antisociality	0.022	313	-0.015	461	-0.038
Behavioural Difficulties	0.187	313	-0.127	461	-0.315***
Rutter	0.121	313	-0.083	461	-0.205***
Cognitive (60 months)					
KS1 Reading	0.011	466	-0.006	814	-0.017
KS1 Maths	0.024	464	-0.014	812	-0.038
KS1 Combined	0.023	465	-0.013	815	-0.036
Health (42 months)					
General Health in Past Year	0.088	311	-0.059	461	-0.147**
Coughing in Past Year	0.163	305	-0.109	455	-0.272***
Sleeping Quality	0.093	313	-0.063	463	-0.156**
Selection Controls (42 months)					
Number In Residence	0.346	285	-0.221	446	-0.566***
Older Siblings [0,1]	0.83	385	0.73	605	-0.11***
Mothers Education Level	-0.049	442	0.029	750	0.078
Family Income	-0.049	263	0.031	427	0.079
Lone Parent At Birth [0,1]	0.143	523	0.123	956	-0.019
Childs Month Of Birth	0.022	432	-0.013	730	-0.035
Mothers Mental Health	-0.054	423	0.032	708	0.087
Housing Quality (8 and 42 months)					
Bedroom Temp	0.181	519	-0.098	946	-0.279***
Living Room Temp	0.187	520	-0.102	946	-0.289***
Damp	0.207	521	-0.113	952	-0.319***
Mould	0.206	520	-0.114	948	-0.321***
Crowding	-0.058	520	0.032	935	0.091*
Mothers Fellings About Home	0.364	522	-0.199	953	-0.564***
Neighbourhood Quality (8 months)					
Neighbourhood Quality	0.356	523	-0.194	956	-0.551***
Crime	0.244	502	-0.133	926	-0.377***
Positive Social Network	0.048	523	-0.026	956	-0.074

[1] All variables shown in Table 1 have been standardised within full sample (1479), unless otherwise specified. Thus the values represent standard deviations from the sample mean.
[2] The Older Siblings and Lone Parent variables are both binary.
[3] The Difference column provides the mean difference between the two groups (Flats - Houses) with the significance level corre-sponding to the result of a t-test on the equality of means.
[4] * significant at 10%, ** significant at 5% and *** significant at 1%.

Table 2: OLS regression of the binary housing type variable on Non-cognitive outcomes.

Rutter					Baseline	
Spec	Raw	Parent	Baseline	Housing	Neighbourhood	Both
House Type	0.197***	0.158***	0.168***	0.083	0.153**	0.087
	0.053	0.055	0.056	0.061	0.059	0.063
R-squared	0.024	0.058	0.061	0.067	0.058	0.058
Obs	774	774	774	774	774	774
Controls						
Parental		x	x	x	x	x
Family			x	x	x	x
House Qual				x		x
Neigh Qual					x	x

[1] House Type represents a binary variable equal to '1' if the child resides in a council-rented semi-detached house, and '0' if the child resides in a council-rented self-contained flat
[2] The Rutter outcome variable is an un-weighted average of the five non-cognitive dimensions of the Rutter Scale; emotional difficulties, conduct difficulties, hyperactivity, anti-sociality and beahvioural difficulties. A higher score represents better non-cognitive functioning.
[3] The final three columns augment the Baseline specification with housing characteristics, neighbourhood characteristics and both housing and neighbourhood characteristics combined, respectively.
[4] * significant at 10%, ** significant at 5% and *** significant at 1%.

Table 3: OLS regression of the binary housing type variable on Cognitive outcomes.

KS1 Read & Maths					Baseline	
Spec	Raw	Parent	Baseline	Housing	Neighbourhood	Both
Treated	0.099	-0.029	0.076	0.079	0.051	0.071
	0.222	0.218	0.221	0.238	0.233	0.247
R-squared	0.004	0.116	0.123	0.116	0.118	0.109
Obs	1280	1280	774	1280	1280	1280
Controls						
Parent		x	x	x	x	x
Family			x	x	x	x
House Qual				x		x
Neigh Qual					x	x

[1] House Type represents a binary variable equal to '1' if the child resides in a council-rented semi-detached house, and '0' if the child resides in a council-rented self-contained flat.
[2] The KS1 Read and Maths variable is the sum of the child's KS1 scores in Reading and Maths. A higher score represents better cognitive functioning.
[3] The final three columns augment the Baseline specification with housing characteristics, neighbourhood characteristics and both housing and neighbourhood characteristics combined, respectively.
[4] * significant at 10%, ** significant at 5% and *** significant at 1%.

Table 4: OLS regression of the binary housing type variable on Cognitive outcomes.

Health										Baseline								
Spec	Raw			Parent			Baseline			Housing			Neighbourhood			Both		
Outcome	General	Coughing	Sleeping	General	Coughing	Sleeping	General	Coughing	Sleeping	General	Coughing	Sleeping	General	Coughing	Sleeping	General	Coughing	Sleeping
House Type	0.125*	0.268***	0.293**	0.108	0.237***	0.199	0.108	0.208***	0.229*	0.104	0.196**	0.117	0.112	0.215**	0.205	0.102	0.223***	0.084
	0..075	0..075	0.142	0.077	0.077	0.148	0.079	0.078	0.148	0.085	0.081	0.159	0.083	0.083	0.159	0.088	0.088	0.167
R-squared	0.006	0.014	0.007	0.024	0.057	0.057	0.031	0.057	0.057	0.047	0.055	0.073	0.038	0.059	0.042	0.048	0.061	0.057
Obs	772	760	776	772	760	776	772	760	776	772	760	776	772	760	776	772	760	776
Controls																		
Parent				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Family							x	x	x	x	x	x	x	x	x	x	x	x
House Qual										x	x	x				x	x	x
Neigh Qual													x	x	x	x	x	x

1 House Type represents a binary variable equal to '1' if the child resides in a council-rented semi-detached house, and '0' if the child resides in a council-rented self-contained flat.
2 The three Health outcome variables relate to general health over the previous year, frequency of coughing episodes over the previous year and current sleeping quality. A higher score represents better health.
3 The final three columns augment the Baseline specification with housing characteristics, neighbourhood characteristics and both housing and neighbourhood characteristics combined, respectively.
4 * significant at 10%, ** significant at 5% and *** significant at 1%.

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