TEENAGE HOUSING TENURE AND NEIGHBOURHOODS AND THE LINKS WITH ADULT OUTCOMES: EVIDENCE FROM THE 1970 COHORT STUDY

CASEreport 64

January 2011

Rebecca Tunstall, Ruth Lupton, Dylan Kneale and Andrew Jenkins

Acknowledgements

This work was funded by the Homes and Communities Agency and the Tenant Services Authority. It is one of a pair produced at the same time. The other report, which uses the Millennium Cohort Study, can be found at http://sticerd.lse.ac.uk/case.

As members of the project steering group, Kurshida Mirza (HCA), Jim Bennett (HCA), and Phil Miles (TSA) gave valuable feedback on results and early drafts. Stephen Muers (HCA) also provided helpful guidance and ideas, and Abigail McKnight (LSE) provided guidance on methods and presentation.

We would also like to thank colleagues at the Centre for Longitudinal Studies at the Institute of Education, including Jon Johnson and Peter Shepherd, who assisted in linking cohort data to neighbourhoods, and Anna Tamas of CASE, who prepared the text.

Note

The views expressed in this report are those of the authors and do not necessarily represent those of the Homes and Communities Agency and the Tenant Services Authority.

Contents

Summary

Introduction

This study is one of a pair funded by the Homes and Communities Agency and the Tenant Services Authority. The other report can be found at http://sticerd.lse.ac.uk/case/. This pair of studies develops the findings of two previous reports on the relationship between housing and life chances (Feinstein *et al*, 2008, Lupton *et al*, 2009). These previous reports examined housing circumstances in childhood for those born in 1946, 1958, 1970 and 2000, and the relationship between childhood housing and adult outcomes across a range of measures for those born in 1946, 1958 and 1970. They found as yet unexplained connections between being 'ever' in social housing in childhood and worse adult outcomes on an overall measure of deprivation and a range of individual measures for those born in 1958 and in 1970 (but not for those born in 1946) (Feinstein *et al*, 2008, Lupton *et al*, 2009). Statistically significant associations remained after using a very large set of more than 50 controls for family and individual characteristics, for many outcomes and many ages, although the size of all of the associations was substantially reduced.

The current study uses the British Cohort Study, whose members were born in 1970 and who were aged 40 in 2010. It examines housing and neighbourhood circumstances of this generation at age 16 in 1986, and their outcomes at age 34 in 2004. It aims to explore:

- if there are any differences in adult outcomes between those in social renting and private renting, between private renting and home ownership, and within home ownership as teenagers; and
- the characteristics of the neighbourhoods experienced by those in different tenures as teenagers, and whether features of social housing neighbourhoods might either constitute all or part of what appeared to be a 'tenure effect'.

The homes and neighbourhoods of people born in 1970 when they were 16 year old teenagers in 1986

- At the age of 16, 18% of those born in England in 1970 were living in social housing, 79% were in home ownership and 2% were in private renting. The vast majority living with their parents rather than in their own households as independent adults.
- Compared to teenagers in owner occupied homes, teenagers in social housing had had, on average, a number of disadvantages at birth and in early childhood that were related to family circumstances and could not in any way have been 'caused' by their housing or neighbourhood at age 16. For example, on average they had parents with lower qualifications and lower occupational class, they were more likely to in be a lone parent family at birth and at 16, they had mothers who had their first children younger, they had lower birth weights, they were more likely to have experienced family dissolution during childhood, and to have more siblings. This suggests that in the 1970s and 1980s social housing was successfully targeting more disadvantaged families.
- The kinds of neighbourhoods teenagers lived in varied sharply by tenure. At both small neighbourhood scale (about 100-150 households) and larger neighbourhood scale (about 2,200 households), teenagers in social housing were highly concentrated in the most deprived neighbourhoods and those dominated by social housing. 62% of teenagers in social housing were in the three most deprived deciles (tenths) of small neighbourhoods, compared to 18% of those in home ownership, and teenagers in social housing were largely excluded from less deprived neighbourhoods. 33% of teenagers in social housing

were in social housing dominated small neighbourhoods, compared to just 4% of those in owner occupation.

Outcomes in adulthood

- Those in both rented tenures at age 16 in 1986 were more likely to have less desirable outcomes at age 34 in 2004 than those in home ownership at 16, in terms of all the eleven measures we examined: paid employment, means tested benefits claiming, highest qualifications, literacy and numeracy, depression, malaise, self-efficacy, life satisfaction, regular exercise, cigarette smoking and self-rated health. This complements the results found for this cohort in Feinstein *et al* (2008) and Lupton *et al* (2009).
- The present analysis allows us to compare social renting and private renting. Those in social renting at 16 had worse raw outcomes in terms of chances of claiming means tested benefits, having literacy and numeracy problems, smoking, qualifications, self-rated health, and self efficacy than those in private renting at 16.
- However, those in social renting at 16 actually had slightly better raw outcomes in terms of chances of depression, malaise and life satisfaction at 34 than those in private renting.

The role of teenage housing tenure in explaining adult outcomes

- We controlled for individual and family advantage, with both a small and large set of controls. The small set of controls included eight measures: index of Family Advantage, mothers' age at the birth of her first child, whether mother had moved away from her home region by the birth of her first child, cohort member's weight at birth, whether the cohort member was born into a lone parent family; whether they were in a lone parent family at 16; number of siblings resident in the household at 16; and region lived in at 16. The larger set of controls included 56 variables, as used in Feinstein *et al* (2008) and Lupton *et al* (2009).
- With the small set of controls, differences in outcomes between those in social renting and in home ownership at 16 for regular exercise at 34 were no longer statistically significant. With the large set of controls, differences in outcomes between those in social renting and in home ownership at 16 were no longer statistically significant for six of the eleven variables at 34, while statistically significant links remained for smoking, depression, qualifications, paid employment and self-rated health. Both sets of controls reduced the size of the association between teenage tenure and adult outcomes considerably. These results complement the results found for this cohort in Feinstein *et al* (2008) and Lupton *et al* (2009).
- However, again results vary between the main rented tenures, but private renting at 16 does not appear to have offered any clear advantage over social renting at 16 in terms of young adult outcomes. After the small set of controls, those in social renting at 16 had higher odds ratios of being in employment, a positive outcome, and lower odds of some negative outcomes (claiming benefits, depression, malaise and low life satisfaction) compared to those in home ownership than those in private renting as teenagers. On the other hand, those in social housing as teenagers did worse than those in private renting in terms of the remaining half of the outcomes.
- This study has found some as yet unexplained connections between childhood tenure and adult outcomes, as in previous studies, but the critical tenure difference appears not to be between social renting and other tenures, but between both rented tenures and home ownership.

The role of teenage neighbourhoods in explaining adult outcomes

- Regression tests showed some evidence for the existence of a longitudinal relationship between teenage neighbourhood deprivation and tenure mix and adult outcomes, after controlling for family and individual circumstances.
- After applying controls for family and individual circumstances with both the small and large set of controls, taking neighbourhood characteristics into account modified somewhat the relationship seen between teenage tenure and adult outcomes.
- Thus, the associations between tenure and outcomes we have found can be described as partly due to neighbourhood characteristics in terms of deprivation and tenure mix at small neighbourhood scale (about 100-150 households) and larger neighbourhood scale (about 2,200 households).
- However, the associations between tenure and outcomes we have found cannot be described as entirely or mainly due to 'neighbourhood effects'.
- Again, this evidence of associations between teenage tenure and adult outcomes that remain after controls for family and individual advantage and neighbourhood characteristics does not amount to evidence that these differences were caused by housing tenure.
- The relationship between housing tenure and outcomes is certainly not straightforward. It may be that research using other descriptions of neighbourhoods, such as employment rates, or other scales such as local authority scale, might show area effects making a greater contribution. In addition, it may be that there are other 'hidden' variables, such as particular family and individual characteristics that might explain the relationships found.
-

Implications for today's children and their housing and neighbourhoods

- Over the past 40 years, as British Cohort Study members have grown up, the UK housing system has changed considerably and UK neighbourhoods have also changed.
- However, rented homes and their neighbourhoods are still important for today's children and families. The companion study to the present one, based on the Millennium Cohort Study shows that in 2006, 18% of children aged 5 lived in social rented homes and 9% lived in privately rented homes (the study is found at http://sticerd.lse.ac.uk/case).
- We have found evidence that characteristics of those born in 1970, which are either known at birth or at age 16, are associated in some way with differences in later outcomes at age 34, and could be used to predict later disadvantage.
- Whether the associations we have found are large or small or a concern for policy is a matter for judgment.

Introduction

Aims and approach

This research builds on past work using the British cohort studies to investigate childhood housing conditions and their relations to adult outcomes (Feinstein *et al*, 2008 and Lupton *et al*, 2009), and on other work in the field.

The report is one of a pair produced at the same time, each building on our previous work in different ways. The other report, which uses the Millennium Cohort Study of those born in 2000, investigates housing conditions, tenure and neighbourhood conditions for those born in 2000 at age 5 in 2006, taking advantage of the extensive information provided in the study. It also looks at associations between housing tenure and early developmental outcomes, and the role that neighbourhood characteristics may play in this. It can be found at http://sticerd.lse.ac.uk/case.

The earlier studies found as yet unexplained connections between being 'ever' in social housing in childhood and worse adult outcomes on a range of measures for those born in 1958 and in 1970 (Lupton *et al*, 2009). Statistically significant associations remained after using a very large set of more than 50 controls for family and individual characteristics, for many outcomes and many ages, although the size of the associations was substantially reduced. For example, about half of the gap between the 'ever' resident in social housing as a child and the 'never' group on self-rated health, cigarettes smoked and not being in paid employment remained after a large set of childhood controls (Lupton *et al*, 2009).

On the face of it, these results suggested that there might be some 'tenure effect' on life chances, albeit not for all outcomes and in many cases an effect of relatively small size. We suggest that:

- Previous studies compared social housing to all other tenures. This might have obscured differences between social renting and private renting, between private renting and home ownership, and within home ownership.
- The characteristics of the neighbourhoods housing is located in might be important, and features of social housing neighbourhoods, such as deprivation or single tenure estates, might either constitute all or part of what appeared to be a 'tenure effect'.
- Other special characteristics not included even in the very large set of controls, perhaps more directly linked to access to social housing, such as mental or physical health problems, redundancy or relationship breakdown, might explain all or part of the association seen (Lupton *et al*, 2009).
- The connection between childhood housing tenure and adult outcomes, while might be less important than the connection between other major social variables and adult outcomes.

The aim of this paper is to explore the first two of these ideas in more detail.

Data and methods

This paper uses the British Cohort Study, whose members were born in 1970 and were aged 40 in 2010, to explore these ideas. This was one of the three cohort studies used in Feinstein *et al* (2008) and the four used in Lupton *et al* (2009) (the other three tracked people born in 1946, 1958 and 2000). It is the most recent cohort study whose members have reached

adulthood. It was the one for which the most numerous connections were found between childhood tenure and adult outcomes in Feinstein *et al* (2008) and Lupton *et al* (2009).

The British Cohort Study follows a sample of people born in Great Britain in 1970 as they have grown up. Data were collected at birth, at age 5, and 10, 16, 26, 30, and 34 (and most recently at age 38 years, this latest sweep being unavailable for analysis at the time of the research). Childhood waves of data collection involved interviews with parents. Children were also tested academically and as they entered adolescence they were interviewed. (For more information on the British Cohort Study and its data, see Lupton *et al*, 2009). Because of the interest of the sponsoring organisations in England, we report data for cohort members born in England, rather than Great Britain (in contrast to Feinstein *et al*, 2008 and Lupton *et al*, 2009). We report figures for cohort members who were included in data collection at three points, in 1970, 1986 and 2004, who were living in England at age 16, and for whom full data was collected on the main variables we will use (Figure 1). This produces a sample of 4,434 people in all (while a total of around 9,000 were either born into the 1970 study or joined in childhood as migrants who were tracked for at least some variables all the way through to 2004, across the whole of Great Britain). All cohort study analysis faces the issue of sample attrition and the possibility that it is non-random (Plewis et al. 2004). (For more detail on the sample of cohort members and missing data, please see Appendix 1).

The British Cohort Study provides a wealth of data on cohort members. Figure 1 shows the data used in this report.

Figure 1: British Cohort Study data used in this project

1970 - cohort members at birth

- Mothers' age at birth of first child (which may have been before cohort member's birth in 1970)*
- Whether mother had moved away from her home region by the birth of her first child (which may have been before cohort member's birth in 1970)*
- Index of Family Advantage (made up of parents' highest qualifications and occupational classes at cohort member's birth; divided into five groups or 'quintiles')*
- Cohort member's weight at birth (standardised)*
- Whether there were one or two parents resident in the household*

1986 - cohort members aged 16

- Housing tenure (divided into three categories: i) home ownership, ii) social renting (council or housing association), iii) private renting and 'other')
- Characteristics of the neighbourhood in which cohort member was living (in terms of deprivation and tenure mix at small and large neighbourhood scale; defined later)*
- Region lived in*
- Whether there were one or two parents resident in the household*
- Number of siblings resident in the household*

2004 – cohort members aged 34 (outcome measures)

Whether in paid employment (binary)
Whether claimed means tested benefits (binary)
Highest qualification achieved (ordinal)
Whether had literacy or numeracy problems (binary)
Score for self efficacy (ordinal)
Whether depressed (binary)
Whether had 'malaise' (less severe form of depression) (binary)
Whether had low life satisfaction (binary)
Whether took regular exercise (binary)
Self-rated health (ordinal)
Whether smoked one or more cigarettes a day (binary)

Note: *=characteristics to be used as control variables in the small set of controls

Unlike in previous studies, we examined childhood housing tenure in terms of a fixed point, at the end of childhood at age 16 in 1986. We examined tenure in terms of each of the main tenure groups, to enable comparison between private renting and social renting, and between home ownership and private renting.

We describe the relationship between teenage housing and outcomes in adulthood, at age 34 in 2004. The outcome measures used are the same as those used in Lupton *et al* (2009). Then we test to see if statistically significant associations remained between teenage tenure and adult outcomes after controlling for family and individual factors known at birth or at age 16. We use two sets of controls, a 'small set' including the eight variables asterisked in Figure 1 above, and a 'large set' of 56 variables which were used in Feinstein et al. 2008 and Lupton et al. 2009. (For more detail on the control variables and strategy, please see Appendix 2).

We also describe the relationship between teenage housing tenure at age 16 and the characteristics of neighbourhoods teenagers were living in. Neighbourhood characteristics data are drawn from the 1991 census, so describe neighbourhoods as they were some years after the point teenagers were observed at (the alternative, 1981, was equidistant from 1986). We have to assume the characteristics of neighbourhoods changed only modestly 1986-1991

(and that, for example, most highly deprived neighbourhoods in 1986 were also highly deprived in 1991. Other evidence suggests that this is highly likely, for example Tunstall with Fenton 2009).

We initially present differences based on housing tenure and neighbourhood descriptively based on bivariate analyses. Later, we also use regression modelling to control for a number of factors simultaneously. For binary dichotomous outcomes we use binary logistic regression and ordinal regression for ordinal variables (see Box 1). Given that we are examining neighbourhood factors, it may be expected that we would need to employ a hierarchical structure to our models to account for the fact that individuals from the same neighbourhood may be more similar to one another than individuals from different neighbourhoods. However, there were very few numbers of cohort members who lived in the same neighbourhood as another cohort member (less than 50% when using our larger definition of neighbourhood, ward), and very few who lived in neighbourhoods where there were more than two cohort members were resident at age 16. Therefore, imposing a hierarchical structure to our analyses was unnecessary**.**

Teenage housing and neighbourhoods in 1986 and adult outcomes in 2004

Teenager's housing tenure

Lupton *et al* (2009) showed that across Great Britain, 38% of all people born in 1970 spent at least some time in social housing in childhood, aged 5-16. However, the numbers and proportions in social housing were falling as the children grew up (Lupton *et al*, 2009).

Table 1 shows the tenure mix by the time cohort members in England were sixteen. Almost all were in their household of origin and had not set up home on their own. 81% were in owner occupied homes, 17% in social rented homes and 2% in private rented homes or other tenures (such as living rent free). The proportion in home ownership may seem high compared to the overall household tenure mix at the time (the Survey of English Housing showed that 61% of all households were home owners in 1981 and 66% were in 1988, see DCLG 2010). However, family households – and particularly those with older children – were the household type most likely to be in home ownership.

The low numbers and proportions in private renting mean that not all later analysis can be carried out on results for this group.

The group in social housing at 16 are a sub-set of the group who were 'ever' in social housing at one of the observations at age 5, 10 and 16 (in Lupton *et al*, 2009). Not all of those in social renting at 16 will have been in social housing earlier in childhood.

Table 1: Tenure of cohort members at age 16 in 1986

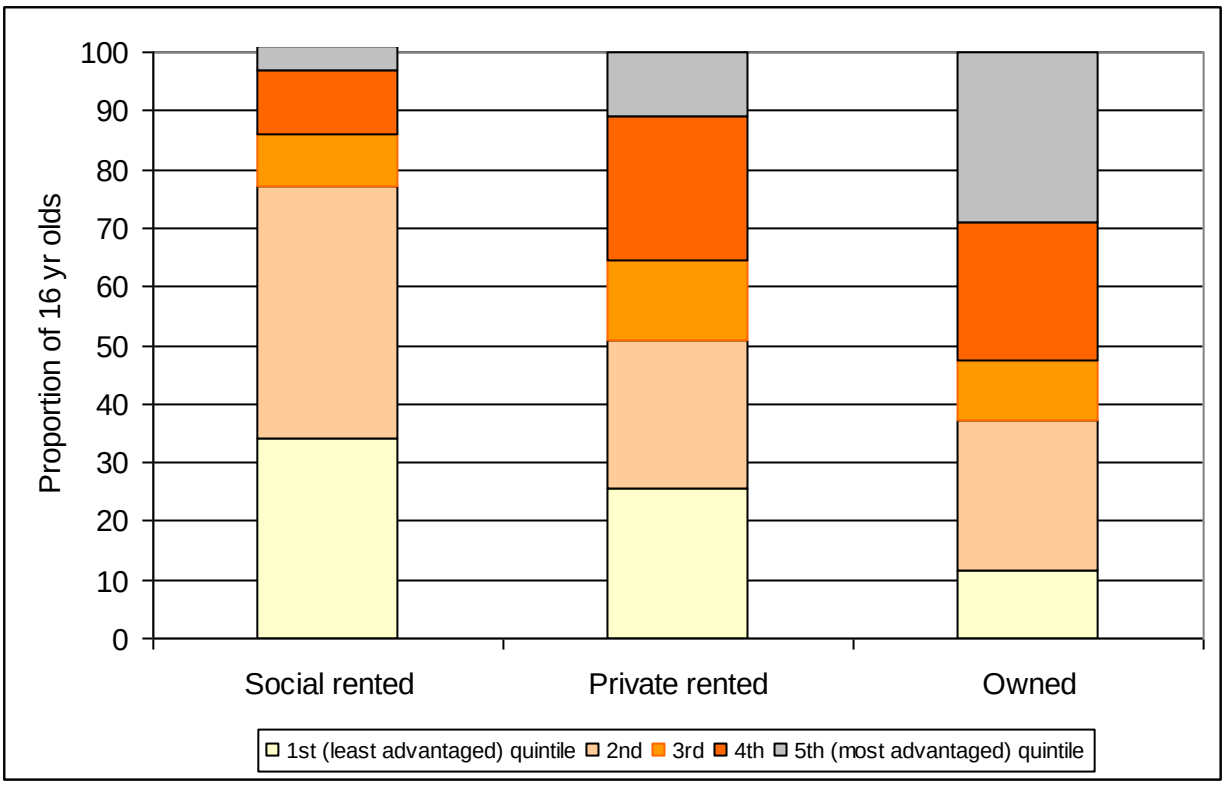
Owner occupied	Social rented	Private rented and 'other'	Total
80.8%	17.1%	2.1%	100%
3,583	753	94	4,434

Note: 'Other' tenures include circumstances such as living with cohort member's grandparents and living rent-free

This report does not go into detail on housing conditions, but we know that by the time people born in 1970 were 16, the vast majority in all tenures were living in homes with hot water and bathrooms, and in houses rather than flats. Social housing and private renting offered similar conditions, while teenagers in home ownership were the most likely to be in houses rather than flats (for more detail on housing conditions, see Lupton *et al*, 2009).

Teenagers in different tenures had different family and individual characteristics. We created an 'Index of Family Advantage', dividing cohort members up into five quintiles according to the highest qualifications and occupational class of their parents when the children were born. For lone parent households, we assumed average employment status and educational qualification for the absent partner (which may slightly overestimate the advantage of lone parent households. Alternatives would be to simply have used the lone parent's characteristics, or to have estimated the likely characteristics of the average partner of people with the characteristics lone parents had. The effect of overestimating the advantage of lone parents would be to very slightly overestimate the advantage of families in social housing, because this tenure has more lone parent headed households than the others, see table 2 below). Figure 2 shows the results.

Figure 2: Proportion of teenagers in each tenure from families in different quintiles on the Index of Family Advantage at child's birth



Note: Valid (non-missing) proportions of index of family advantage only (n=4332)

The family characteristics of teenagers in social renting stand out. In 1986, only 4% had parents in the top quintile on the Index of Family Advantage, and only 15% had parents in the top two quintiles combined. 76% of teenagers in social renting had parents whose education and jobs put them in the bottom two quintiles.

In contrast, substantial proportions of teenagers in both private renting and home ownership came from every quintile of Family Advantage, although in general private renting families were somewhat disadvantaged and home owner families were more advantaged. Half of all children in private renting had parents whose education and jobs put them in the bottom two fifths, while over half of all children in owner occupation had parents whose education and jobs put them in the top two quintiles.

A wide range of other measures of child and family advantage, some of which may be linked to later life outcomes, varied substantially by tenure (Table 2).

Table 2: Other characteristics of cohort members and their families at birth and at age 16, later used in small set of control variables, by tenure at age 16

	All tenures	Owner occupied	Social rented	Private rented and other
Mother's mean age at first birth (which may not have been cohort member's birth)	22.8 years	23.2 years	21.0 years	22.1 years
Family structure when cohort member was born				
Lone parent	4%	2%	10%	8%
Two parent	96%	98%	90%	92%
Mother first became mother outside her own region of birth	28%	29%	23%	25%
Index of Family Advantage at teenager's birth				
Least advantaged quintile	16%	12%	35%	23%
2nd	28%	25%	41%	25%
3rd	10%	10%	9%	14%
4th	21%	23%	11%	25%
Most advantaged quintile	25%	30%	4%	10%
Cohort member's standardised birth weight (mean)	0.1	0.1	-0.1	0.0
Family structure when cohort member aged 16				
Lone parent	7%	5%	17%	17%
Two natural parents	86%	88%	71%	76%
Reconstituted family/other	8%	7%	12%	8%
Number of siblings when cohort member 16 (mean)	1.4	1.3	1.4	1.1
Region living in at age 16				
East	14%	14%	12%	14%
East Midlands	10%	10%	9%	9%
London	7%	7%	8%	6%
North East	8%	6%	14%	3%
North West	16%	16%	15%	18%
South East	14%	15%	11%	17%
South West	12%	12%	9%	10%
West Midlands	10%	10%	13%	6%
Yorkshire and Humber	10%	10%	9%	17%
Sample size	4,434	3,511	757	94

Note: This analysis is based on a subsample of cohort members who were born in England and for whom we had data on tenure at 16, and all the variables in this table (see Appendix 1).

Those in both rented tenures tended to be more disadvantaged that those in home ownership. However, those in private renting were in an intermediate position between the two other tenures. For some variables those in private renting as teenagers showed a similar pattern to those in social housing as teenagers (for example, the chances of having been born into a lone parent family or being in one at 16). In some cases those in private renting showed

patterns more similar to those in home ownership (number of siblings, region), and in others in between (Index of Family Advantage, child birth weight, mother's age at first birth).

These results reflect the likelihood of outcomes across the different tenure groups, and do not mean that all in social housing as teenagers had less individual or family advantage than all those in home ownership or that all in home ownership avoided problems. Most of these factors predated age 16 and of course were not caused by tenure at 16. Instead, it is more likely that disadvantage at birth, for example through young motherhood or parental relationship breakdown – lead to access to social housing and private renting.

These factors may also have an impact on adult outcomes in their own right. Later in the analysis, they will be used as control variables.

The relationship between teenage housing tenure and outcomes at age 34

This study uses the same variables to measure adult outcomes as used in Feinstein et al. 2008 and Lupton et al. 2009:

- in paid employment/not;
- claiming means tested benefits/not;
- literacy or numeracy problems/none;
- depressed/not;
- suffering malaise/not;
- taking regular exercise/not;
- low life satisfaction/not;
- smoking/not;
- highest qualifications;
- self-rated health; and
- self-efficacy.

These variables were selected for past studies because they were available in a consistent manner for the 1946, 1958 and 1970 cohorts and for members of these cohorts at various ages. Most of these variables are binary (either/or measures), but the last three are ordinal (with a number of categories). Most of these outcome measures can be accepted as unambiguously either desirable or undesirable in terms of personal life and social policy. However, those who were not in paid employment in 2004 may have been in a variety of more and less desirable and advantaging situations, including study, caring and disability, as well as being unemployed, while the hours and income of those in employment could have varied considerably. In several cases, we have treated the variables in a slightly different way to analysis in earlier studies, and the sample is a little different as we are looking at England only and those with age 16 and 34 data only. This means that the particular detailed results, such as exact percentages with different outcomes, are not directly comparable between this and earlier studies. However, overall results, such as whether different tenure groups had more or less positive outcomes, can be compared across the studies.

Lupton *et al* (2009) found that of those born in 1970, those 'ever' in social housing in childhood (aged 5-16) had worse outcomes for all variables at all ages 26, 30 and 34 than those 'never' in social housing in childhood, a category which combined those who were in home ownership, private renting and other tenures. Here we found a complementary pattern of results. Unlike in Lupton et al. 2009, we can also compare outcomes for the two rented tenures. For every variable, based on bivariate analysis, those in both rented tenures at age 16 were more likely to have worse age 34 outcomes than those in home ownership as teenagers. For example, only 5% of those in home ownership at 16 had no qualifications by

the age of 34, while 10% of those in private renting did and 18% of those who were in social renting did (Table 3).

For most variables, those in private renting at age 16 were more likely to have the less desirable outcomes than those in home ownership by the age of 34, but less likely to do so than those in social renting. Those in social renting as teenagers were more like to have less desirable outcomes in adulthood than those in private renting at 16 in terms of:

- claiming means tested benefits;
- literacy and numeracy problems;
- smoking;
- highest qualifications;
- self-rated health; and
- self-efficacy.

However, those who were in social renting and private renting as teenagers were similarly likely to not take regular exercise and to be employed.

Those in social renting as teenagers actually had slightly higher chances of better outcomes in adulthood than those in private renting in terms of:

- malaise;
- depression; and
- life satisfaction (Table 3).

Table 3: Outcomes at age 34 in 2004 by teenage housing tenure (%)

	All tenures	**Owner occupied**	**Social rented**	**Private rented and other**
In paid employment	84%	85%	76%	76%
On means tested benefits	7%	5%	15%	13%
Literacy or numeracy problems	15%	13%	23%	14%
Depressed	13%	13%	21%	23%
Malaise	25%	23%	31%	36%
Taking regular exercise	79%	80%	75%	76%
Low life satisfaction	22%	20%	28%	29%
Smoked at least one cigarette per day	24%	20%	41%	32%
Highest qualification				
No qualifications or below O'Levels	23%	19%	43%	32%
O' Levels and A' Levels	42%	41%	44%	50%
Degree+	35%	40%	13%	18%
Self-rated health				
'Poor' or 'Fair'	21%	19%	30%	21%
'Very good'	45%	45%	46%	49%
'Excellent'	34%	36%	25%	30%
Self-efficacy				
High	81%	83%	72%	78%
Next highest	12%	12%	17%	12%
Lowest categories	7%	5%	13%	10%
Sample size	4,434	3,511	757	94

Note: Categories for self-rated health, self-efficacy and highest qualification were collapsed in order to satisfy assumptions for modelling.

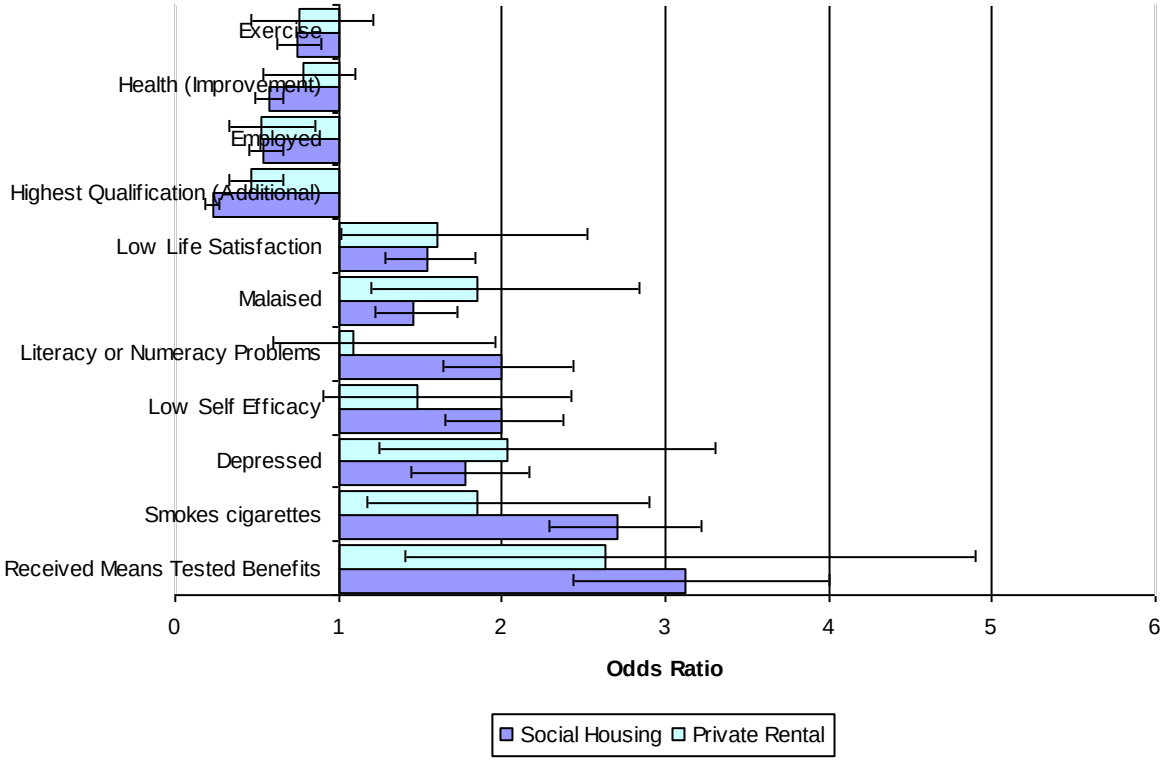
Most of the less advantageous outcomes in Table 3 affect minorities of the overall population. For example, only 7% were claiming means tested benefits at age 34, and while 15% of those in social housing as teenagers were claiming means tested benefits at age 34, 85% were not doing so. These results reflect the likelihood of outcomes across the different tenure groups, and do not mean that all in social housing as teenagers had less good outcomes than all in home ownership or that all in home ownership avoided later problems. In addition, these raw results do not in themselves point to any 'tenure effect', since the difference could be accounted for by other characteristics of the individuals in different tenures, not the tenure itself. However, we know that teenagers in home ownership were more advantaged on a broad range of measures (Table 2). This issue will be explored in more detail below.

The next figure demonstrates an alternative way of viewing the results in Table 3, via the 'odds' of the outcomes at age 34. Figure 3 shows the 'odds ratios' of the outcomes for those in both rented tenures as teenagers compared to those in home ownership as teenagers. An 'odds ratio' of less than one means that the outcome was less likely for those in social housing as teenagers compared to those in home ownership. An odds ratio of more than one means that the outcome was more likely for those in social housing compared to those in home ownership. In the case of ordinal variables, the odds refer to the odds of experiencing a higher level versus a lower level (of self-rated health, for example) for one group versus another (such as those resident in social versus owner occupied housing). More positive outcomes (like exercise and health) appear first in the chart, followed by more negative outcomes (like low life satisfaction and malaise)..

'Odds' and 'odds ratios' are technical terms and do not mean exactly the same as 'risk', 'chances' and 'probability'. Risks, chances and probabilities all refer to the likelihood of a given person having a given outcome. For example, 20.2% of cohort members in owner occupied homes at age 16 were smoking at least one cigarette a day at 34, compared to 40.3% of those in social housing as teenagers (Table 3). Relative risks, chances and probabilities are the risks for one group compared with the risks for another group. The relative risk of those in social housing at 16 smoking at 34 compared to those in owner occupation as teenagers was 40.3/20.2 or 2.00 (two times the relative risk).

In every case, in terms of raw results, the odds ratio was higher than one for more negative outcomes and lower than one for positive outcomes. Thus in every case, in terms of unadjusted (raw) results, renters had higher odds of more negative outcomes and lower odds of more positive outcomes.

Figure 3: Odds ratios for various raw outcomes at age 34 for those in both rented tenures as teenagers, compared to those in home ownership as teenagers



Note: Baseline category is owner occupied tenure. 'Error bars' (horizontal lines) represent the 95% confidence interval for odds ratio estimates from models. Confidence intervals that pass through one indicate no significant differences between the rented tenure and owner occupation (at the 5% level – and so not at the 2% or 1% level either). Longer error bars indicate greater potential variance around the central estimate. Estimates displayed in this chart are also found in Table A2 in Appendix 3.

However, the 'odds' of something occurring is the probability of having the condition (such as smoking at least one cigarette a day) divided by the probability of not having the condition (not smoking at least one cigarette a day). For those in owner occupation as teenagers, the odds of smoking at 34 were 20.2%/79.8% (see Table 3), or 0.253. For those in social renting as teenagers the odds were 40.3%/59.7% (see Table 3) or 0.675. The 'odds ratio' is the odds for one group compared with the odds for another. So here, the odds ratio of smoking at 34 for those in social housing as teenagers compared to those in home ownership as teenagers is 0.675/0.253 or 2.66. An odds ratio for two groups of about 2.66 does not directly translate to meaning that the outcome was '2.66 times as likely' for one group as the other. As noted, those in social housing at 16 were two times as likely to be smoking at 34 compared to those in owner occupation.

As we have seen, those in different tenures had different individual and family characteristics which might be linked independently to adult outcomes (Figure 1, Table 2) and could affect the relationships observed in Figure 3.

Next we carried out regression analysis, to explore the relationship between teenage tenure and adult outcomes after controlling for family and individual circumstances. (See Appendix 2 for more details on control variables and strategy). Firstly, we used a small set of eight control variables, variables which featured in Tables 2 and 3 above:

- index of Family Advantage (made up of parent's highest educational level and parents' occupational class at cohort member's birth; divided into five groups or 'quintiles');
- mothers' age at the birth of her first child;

- whether mother had moved away from her home region by the birth of her first child;
- cohort member's weight at birth;
- whether there were one or two parents resident in the household at birth;
- whether there were one or two parents resident in the household at 16;
- number of siblings resident in the household at 16; and
- region lived in at 16.

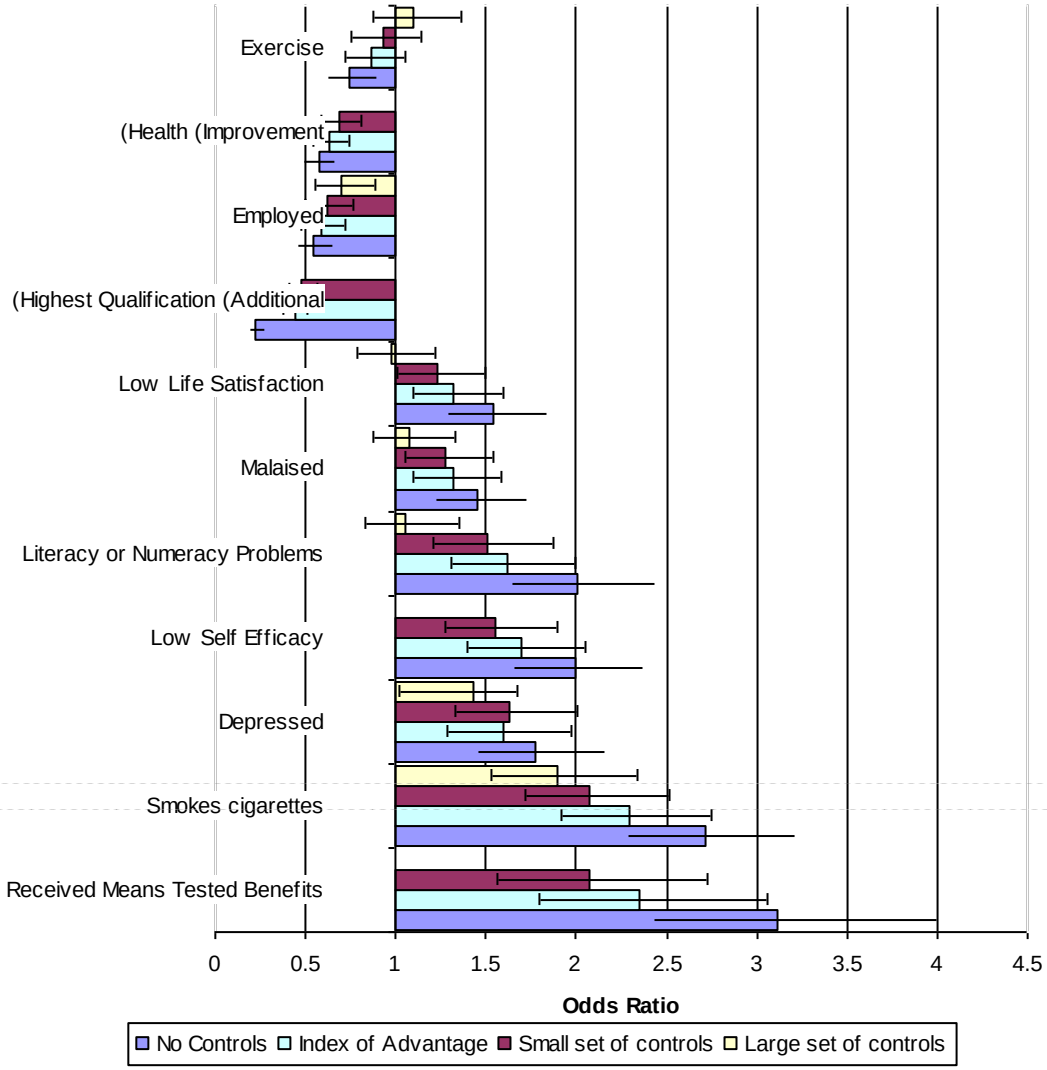
As in previous studies, we did not choose control variables to fully account for all the distinctive individual and family characteristics of those in different tenures or for the actors which are associated with different families getting into different tenures. These might include, for example, parental mental or physical health problems, redundancy or relationship breakdown prior to arrival in social housing, which were not included even in the very large set of controls used in previous research, and might explain all or part of the relationship seen between childhood tenure and adult outcomes (Lupton *et al*, 2009). This would involve intricate work, examining family events that took places between survey sweeps, for example between birth and age 5, 5 and 10 and 10 and 16, ensuring these events took place before arrival in social housing and were associated with social housing tenancy.

In addition to the controls described above, we used a much larger set of 56 control variables, reflecting childhood school environment, height and weight, behaviour, cognition, socioeconomic factors and demographic factors, which were used in Feinstein *et al* (2008) and Lupton *et al* (2009) (see these reports for more details).

In addition, Feinstein et al. 2008 and Lupton et al. 2009 used linear regression models to examine the effect of tenure on each outcome while simultaneously controlling for 56 other factors. Here we used a different model specification for each outcome variable, dependent on the distribution and nature of the outcome. (See Appendix 2 for more details).

Results of regression on the odds ratios for adult outcomes are shown in Figures 4 and 5.

Figure 4: Odds ratios for various outcomes at age 34 for those in social renting as teenagers compared to those in home ownership as teenagers (raw outcomes and various controls)



Note: Baseline category: owner occupied housing. Confidence intervals (shown as error bars) that pass through one indicate no significant differences between social renting and owner occupation. Longer error bars indicate greater potential variance around the central estimate. Estimates displayed in this chart are also found in Appendix 3.

Figure 4 shows that using just one control variable, the Index of Family Advantage, reduced all the odds ratios by a considerable amount. For example, after taking account of family advantage, the likelihood that those in social housing as teenagers received means tested benefits age 34 reduced from over three times the odds (3.2) that those in ownership did to just over two times (2,3, Figure 4). There were marked attenuation in the impact of living in social housing for most outcomes after the inclusion of family advantage, with the exception of paid employment and self-rated health, where the social housing effect remained of the same magnitude. Nevertheless, unexplained and statistically significant associations between teenage tenure and adult outcomes remained for most outcomes, with the exception of participation in regular exercise. Unadjusted differences in this outcome by tenure (see in Table 3) thus appear to likely be due to differences in these individual and family circumstances of teenagers in different tenures, rather than due to any 'tenure effect'.

For the other ten outcome measures we looked at, using the small set of eight controls for individual and family characteristics reduced odds ratios further, particularly for malaise and

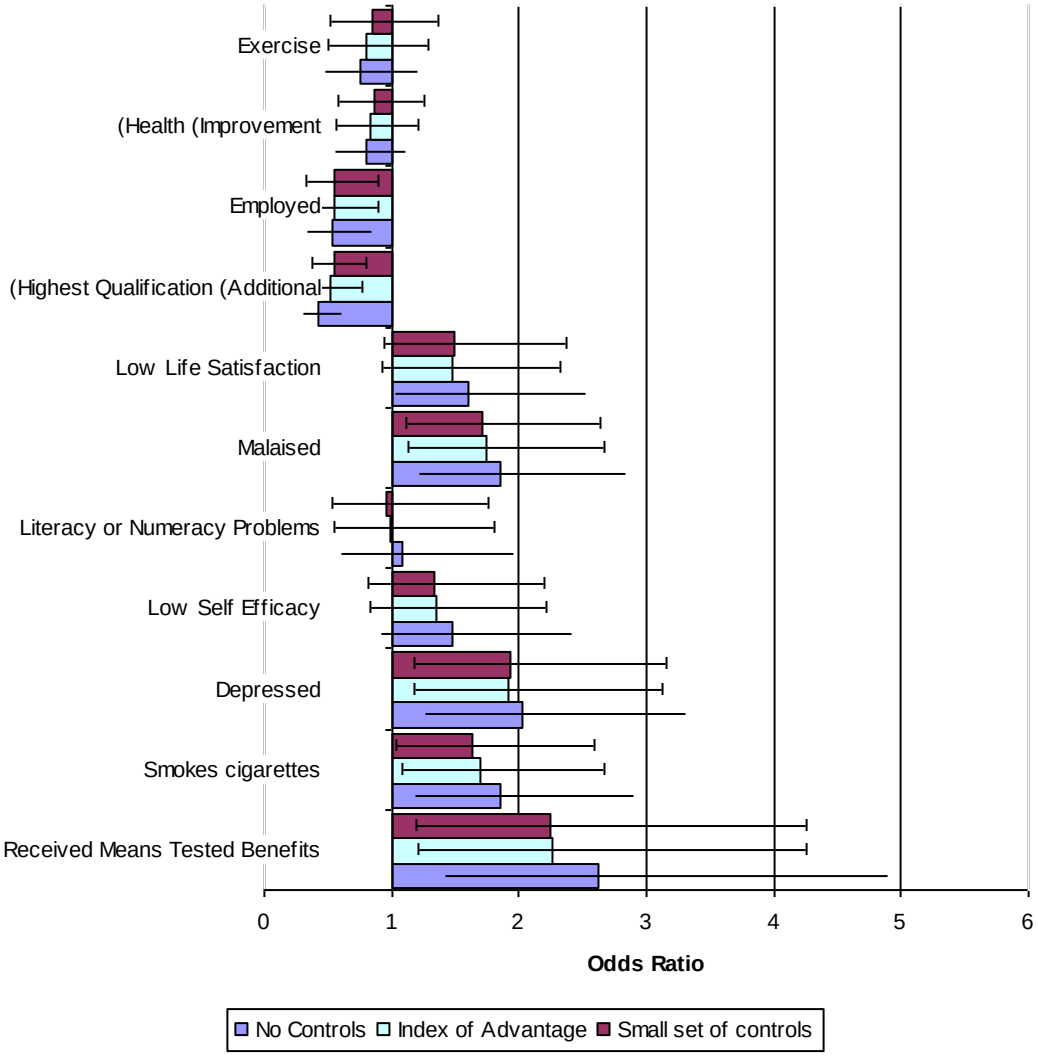
life satisfaction. This could suggest that much of the raw differences in outcomes at 34 for those in social renting and these in home ownership at 16 for these measures were likely be due to differences in these individual and family circumstances of teenagers in different tenures, rather than due to any 'tenure effect'. However, unexplained and statistically significant associations between teenage tenure and adult outcomes remained after the small set of controls.

Finally, we also applied the large set of 56 control variables employed in Feinstein *et al* (2008) and Lupton *et al* (2009) (see these sources for a complete list). Using the large set of controls produced statistically significant results for two variables – employment, depression and cigarette smoking. Because of concerns in overfitting the data due to a small number of events for some outcome variables, and because of problems in converging the models, we were unable to fit a model with the large set of controls to all outcomes. However, the additional controls moved the odds ratio closer to one in all three cases.

In summary, these results complement those in Lupton *et al* (2009). Controlling for individual and family advantage substantially reduced the association seen between teenage housing tenure and adult outcomes for those born in 1970. This approach shows graphically how important the connections are between individual and family circumstances and adult outcomes. Nevertheless, statistically significant associations remained between teenager housing tenure and some outcomes at age 34, after both the small and large set of controls.

What counts as a 'large' remaining odds ratio, or one which is important for social policy, is partly a matter of judgment. It will be affected by how prevalent and how problematic the condition is, and by what factors social policy can be expected to influence (and may be better assessed through predicted probabilities). As an example, the odds of claiming means tested benefits at age 34 was 2.07compared to those in home ownership, after the small set of controls. However, we must also remember that a majority in both tenures were not claiming benefits and, given the larger size of the tenure, those who were in home ownership as teenagers accounted for the majority of all those claiming benefits at 34 in absolute terms.

Figure 5: Odds ratios for various outcomes at age 34 for those in private renting as teenagers compared to those in home ownership as teenagers (raw outcomes and various controls)

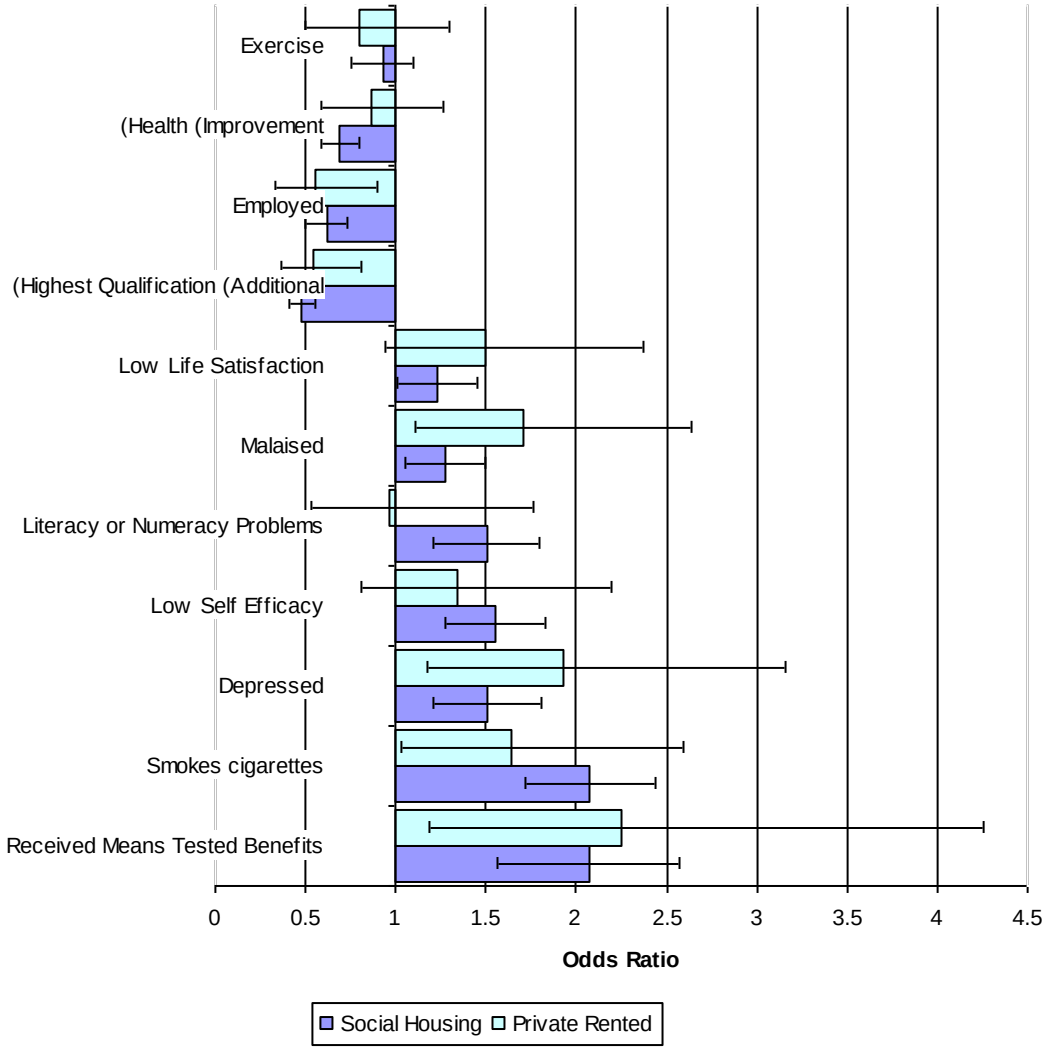


Note: Baseline category: owner occupied housing. We do not show the coefficients for the models with the large set of controls for private renting because of concerns about overfitting in the model. Confidence intervals (shown as error bars) that pass through one indicate no significant differences between private renting and owner occupation. Longer error bars indicate greater potential variance around the central estimate Estimates displayed in this chart are also found in Appendix 3.

Many results for the small number in private renting at 16 did not achieve statistical significance (Figure 5). However, in general, we see the same pattern as for social renters. The controls for family and individual advantage reduced the odds ratio of negative outcomes in adulthood between those in private renting as teenagers and those in home ownership as teenagers markedly, but did not remove them entirely. We do not show the results using a large set of controls because of the small size of the sample living in privately rented accommodation at age 16. The next chart compares the odds ratios for those in social housing and those in private renting as teenagers using the small set of controls (Figure 6).

The next chart compares the odds ratios for those in social housing and those in private renting as teenagers, after the small set of controls (Figure 6). We can make a direct comparison for seven of the eleven outcomes, where there are statistically significant results.

Figure 6: Odds ratios for various outcomes at age 34 for those in both social housing and private renting as teenagers compared to those in home ownership as teenagers, (small set of controls)



Note: Baseline category: owner occupied housing. We do not show the coefficients for the models with the large set of controls for private renting because of concerns about overfitting in the model. Confidence intervals (shown as error bars) that pass through one indicate no significant differences between private or social renting and owner occupation. Because the group in private renting as teenagers was small, fewer outcomes achieve statistical significance. Longer error bars indicate greater potential variance around the central estimate. Estimates displayed in this chart are also found in Appendix 3.

These results develop and provide more nuance than the results found for this cohort in Feinstein *et al* (2008) and Lupton *et al* (2009) which examined the adult outcomes of those 'ever' in social housing in childhood compared to those ‘never’ in social housing in childhood (being in all other tenures combined).

These results develop and provide more nuance than the results found for this cohort in Feinstein *et al* (2008) and Lupton *et al* (2009) which examined the adult outcomes of those 'ever' in social housing in childhood compared to those ‘never’ in social housing in childhood (being in all other tenures combined).

For those in social renting and those in private renting as teenagers, as seen above in Figure 4 and 5, all of the differences in adult outcomes in the unadjusted models were attenuated somewhat with the inclusion of controlling factors in models. This suggests that a substantial portion of the differences in outcomes by teenage tenure in unadjusted models was due to

background family socioeconomic and demographic characteristics. However, a significant tenure effect remained. The *relative* position of the two rented tenures has not ostensibly changed a great deal on the relative position seen in unadjusted results (Figure 3). For some variables, private renting appeared to offer advantages over social housing. For other variables it does not, and the size of the odds ratios varied. However, while those in private rented appeared to be at greater risk of depression, malaise, low life satisfaction, and being in receipt of means tested benefits than those who grew up in social housing, these differences were not significant when we formally tested for differences in the parameters in models using our small set of controls.

After the small set of controls, the odds ratios for those in both rented tenures as teenagers suggested more negative adult outcomes than those in owner occupation for the following:

- full-time employment;
- depression;
- cigarette smoking;
- malaise;
- qualifications; and
- means tested benefits at age 34.

Those in social renting alone experienced a greater risk of negative adult outcomes than those in owner occupied housing for the following:

- self-rated health;
- self-efficacy;
- life satisfaction.

In summary, we have found some as yet unexplained associations between teenage tenure and adult outcomes, as in previous studies (Feinstein *et al*, 2008, Lupton *et al*, 2009), but these are the associations of private rented tenure as well as social rented tenure. This suggests an adaptation to the findings of Lupton *et al* (2009) showing that the critical tenure difference appears not to be between social renting and other or 'private' tenures, but between rented tenures and home ownership. Private renting at 16, based on our small sample, does not appear to have offered any clear advantage over social renting at 16 in terms of young adult outcomes.

Again, this evidence of associations between housing tenure at 16 and outcomes at 34 that remain after a small set of controls is not the same as evidence that these differences were caused by housing tenure. Many other potential controls could be applied, which might account for part or all of the apparent relationship. Although the large set of controls we used is very large, it is not targeted at special characteristics of social housing or those in it. These results are also subject to the caveats that we discussed earlier, notably the small size of the sample in privately rented tenure.

We suggested that particular family and individual characteristics, such as parental mental or physical health problems, redundancy or relationship breakdown prior to arrival in social housing, were not included even in the very large set of controls used in previous research, and might explain all or part of the relationship seen between childhood tenure and adult outcomes (Lupton *et al*, 2009).

However, the next issue we are going to explore is the characteristics of the neighbourhoods housing is located in and teenagers were living in. This might be important, and features of social housing neighbourhoods might constitute all or part of what appeared to be a 'tenure effect'.

Teenage neighbourhoods and the relationship with adult outcomes

We considered the type of neighbourhoods cohort members were living in at the age of 16 in 1986 in terms of two characteristics:

- multiple deprivation; and
- whether they were areas dominated by social housing.

We considered two scales of neighbourhood:

- small neighbourhoods: These were based on Census enumeration districts (EDs). EDs were small areas typically containing of 100-150 households, used to gather and report census data for censuses up until 1991. (They have since been replaced by Output Areas).
- Large neighbourhoods: These were based on electoral wards. Wards contain on average around 2,200 households.

Neighbourhood deprivation

To describe the deprivation of the neighbourhoods teenagers were living in 1986, we used the Carstairs measure of deprivation (Carstairs and Morris, 1991). This is an index of multiple deprivation, originally developed to understand geographical disparities in health, and was the only such index available until central government developed the Index of Local Deprivation in the 1990s. It is still widely used. As in the more recent Index of Multiple Deprivation, the 'Carstairs' index is primarily comprised of data on the characteristics of neighbourhood populations, rather than for example physical or economic characteristics of the neighbourhood itself.

'Carstairs' scores based on 1991 census data are available for large neighbourhoods, according to 1991 ward boundaries (wards). We also constructed a set of new 'Carstairs' scores for the small neighbourhoods, based on variables used in the Carstairs index, and on 1991 census data for enumeration districts. No index or other neighbourhood data was available for 1986 exactly. It would have been possible to use 1981 census data as an alternative. We divided all large and small neighbourhoods in England into ten deciles (tenths) according to the Carstairs score. Overall, teenagers were fairly evenly spread between neighbourhoods with different levels of deprivation.

Neighbourhood tenure mix

We defined tenure mix in terms of 'social housing dominated areas', and did so at two scales. Despite policy interest in tenure mix, few studies to date have assessed neighbourhood tenure mix nationwide. In 1997, a Department of the Environment report sought to identify 'deprived council estates' by examining small neighbourhoods (enumeration districts) which had both high proportions of council housing and high levels of deprivation (DoE, 1997).

In our study, firstly, 'social housing dominated small neighbourhoods' were defined as:

- Census enumeration districts (EDs) in which 75% or more of homes was social rented in 1991; and
- any EDs adjacent to these, where 50% or more of homes were social rented in 1991, based on census data.

A neighbourhood that fitted this definition would have 75-125 social rented homes, which could be in the form of a handful of small blocks, one long street or a handful of *cul de sacs*. Enumeration district boundaries often do not fit neatly around housing estate boundaries. However, these 'social housing dominated' small neighbourhoods could include all or parts of

a small estate, and could make up parts of a larger estate. By 1991, the Right to Buy had been operating for eleven years, removing social rented homes from neighbourhoods, so this definition will not capture all those areas which were 'social housing dominated' at the peak of council housing in 1981. On the other hand, this definition captures some areas that later on lost social rented homes and fell below the threshold.

Secondly, 'social housing dominated larger neighbourhoods' were defined as:

- wards in which 50% or more of homes were socially rented; and
- any wards adjacent to those above, where 30% or more homes were socially rented.

We used a lower cut-off for the larger neighbourhoods because it is inherently harder for a minority tenure like social housing to dominate a larger area. In 1991, very few larger neighbourhoods had 75% or more households in social housing. Again, ward boundaries do not align neatly with estate boundaries, but a social housing dominated larger neighbourhood might include 1,000 social rented homes, which could be in the form of part of or all of a small or larger estate. Some but not all social housing dominated small neighbourhoods were inside social housing dominated larger neighbourhoods.

Table 4 shows that only a small minority of all in our sample aged 16 in 1986 lived in 'social housing dominated areas' by either definition.

Table 4: Cohort members living in a 'social housing dominated' neighbourhood at age 16 in 1986

	Small neighbourhood	Large neighbourhood
Percentage of all cohort members	9%	15%
Number	377	651

What kind of places were social housing dominated neighbourhoods found in? Teenagers in social housing dominated neighbourhoods were concentrated in certain parts of England. Teenagers in social housing dominated areas were much more likely to be in the North East, and somewhat more likely to be in the North West, West Midlands and Yorkshire and Humber than other teenagers. Sixty-eight per cent of all teenagers in small social housing dominated neighbourhoods and 69% in larger social housing dominated neighbourhoods came from these four regions; this compared to 53% who were actually resident in social housing themselves from these four regions.

There is also a substantial overlap between our two measures of neighbourhood type. Not surprisingly, those in social housing dominated areas and were more likely to be in more deprived areas, and are almost entirely excluded from the less deprived half of all neighbourhoods. 52% of those in social housing dominated small neighbourhoods were in the most deprived decile of small neighbourhoods, 81% were in the most deprived two deciles, and only 2% were in the least deprived half of neighbourhoods.

Were teenagers in different tenures also in different types of neighbourhood?: Neighbourhood deprivation

At both small and larger neighbourhood scale, teenagers in social housing were concentrated in the most deprived neighbourhoods. 21% of teenagers in social housing were in the most deprived decile of small neighbourhoods, and 29% were in the most deprived decile of larger neighbourhoods. 62% of teenagers in social housing were in the three most deprived deciles of small neighbourhoods. 66% were in the three most deprived deciles of larger

neighbourhoods. Teenagers in social housing were largely excluded from less deprived neighbourhoods. Only 9% of were in the least deprived three deciles of small neighbourhoods, and only 7% were in the least deprived three deciles of larger neighbourhoods (Figures 7 and 8).

Figure 7: Proportion of teenagers in each tenure found in small neighbourhoods in different deciles of our deprivation index 1991, at age 16 in 1986

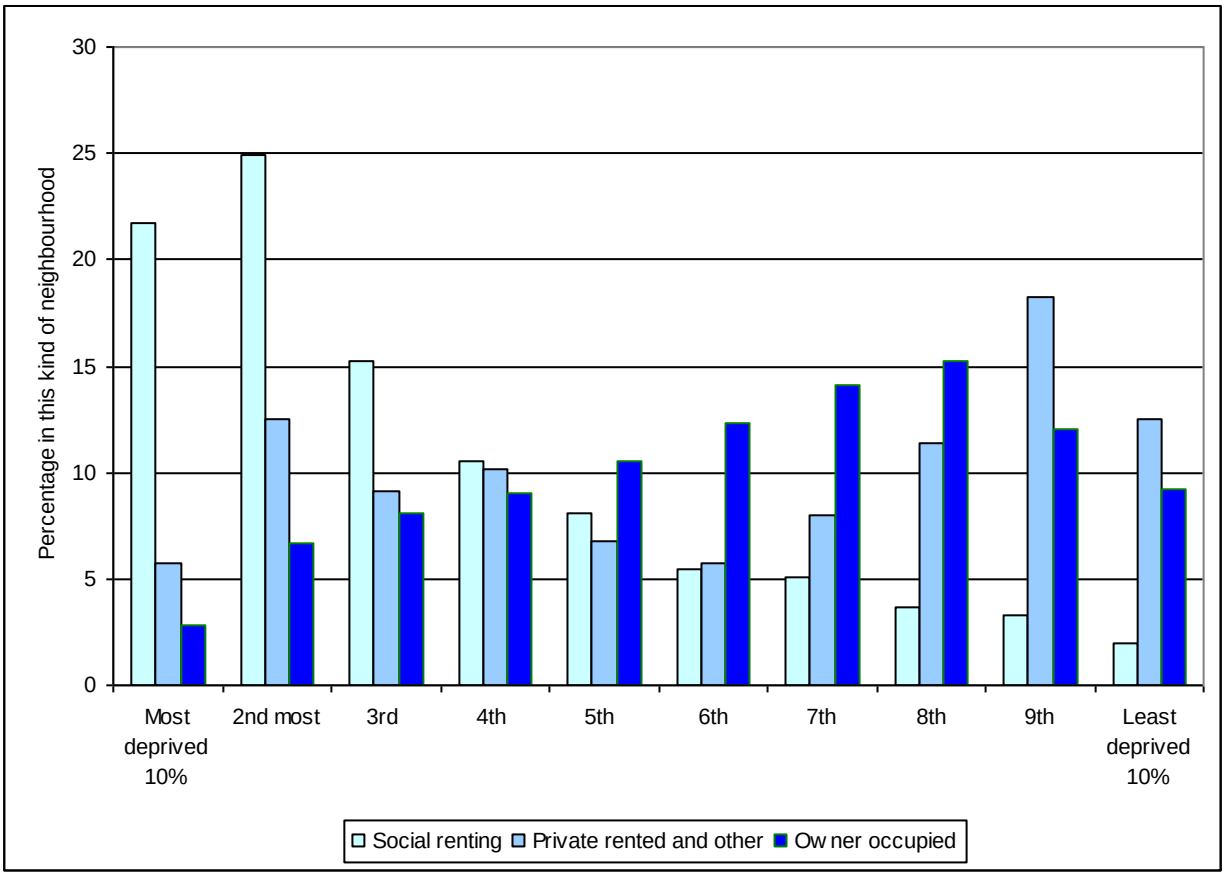
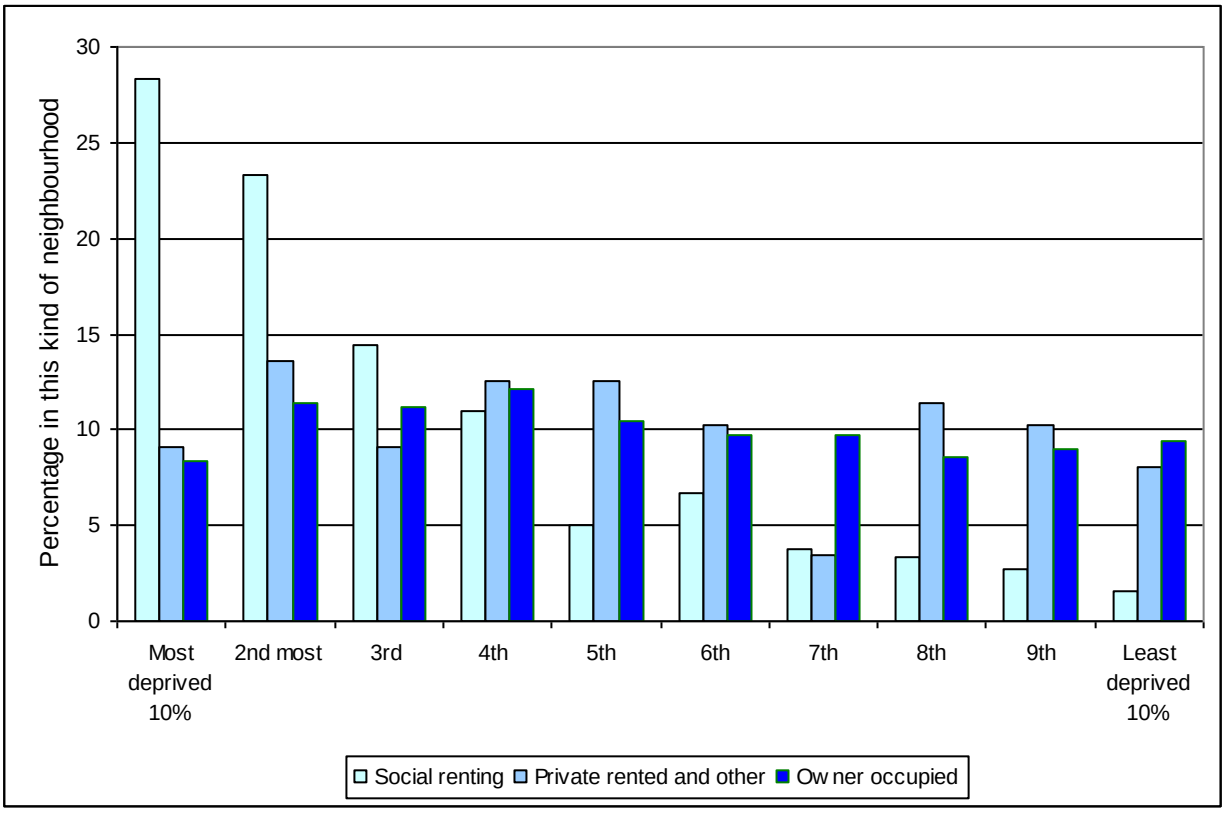


Figure 8: Proportion of teenagers in each tenure found in large neighbourhoods in different deciles according to the Carstairs index 1991, 16 year olds in 1986



Figures 7 and 8 demonstrate how geographical scale is important when investigating population mix and segregation. Looking at small neighbourhoods, teenagers in owner occupied homes were somewhat concentrated in less deprived areas (Figure 7). Looking at larger neighbourhoods, they were fairly evenly spread amongst more and less deprived areas (Figure 8). Only 17% were in the most deprived three deciles of small neighbourhoods, but 31% were in the most deprived three deciles of larger neighbourhoods. 36% were in the last deprived three deciles of small neighbourhoods and just 27% were in the least deprived three deciles of larger neighbourhoods. Looking at smaller neighbourhoods, the small number of teenagers in private renting were concentrated both in most deprived and less deprived neighbourhoods. Looking at larger neighbourhoods, they were fairly evenly distributed across neighbourhoods with different levels of deprivation.

Our sample and the cohort as a whole were slightly underrepresented in the most and least deprived small neighbourhoods, although both the sample and cohort were overrepresented in the 50% most deprived large neighbourhoods. Given that these deciles were based on the deprivation in Britain as a whole, this may reflect a tendency for families with dependent children in the 1980s to be resident in more deprived areas.

Were teenagers in different tenures also in different types of neighbourhood?

Neighbourhood tenure mix

Using both the small and larger neighbourhood definitions, around a third of those living in social housing, were living in a 'social housing dominated' neighbourhood. Again, demonstrating the importance of scale, among those living in owner occupied housing, only 3.5% were classed as living in a social housing dominated small neighbourhoods and 10% were living in a social housing dominated larger neighbourhoods.

Table 5: Cohort members living in social housing dominated neighbourhoods at age 16, by tenure at age 16

	All tenures	Owner occupied	Social rented	Private rented and other
Proportion in this tenure in social housing dominated small neighbourhoods	8.5%	3.5%	32%	7.5%
N	(377)	(125)	(245)	(7)
Proportion in this tenure in other small neighbourhoods	91.5%	96.5%	68%	92.5%
N	(4,057)	(3,458)	(512)	(87)
Proportion in this tenure in social housing dominated large neighbourhoods	15%	10%	38%	10%
N	(651)	(358)	(284)	(9)
Proportion in this tenure in other large neighbourhoods	85%	90%	62%	90%
N	(3,783)	(3,225)	(473)	(85)

Looking just at small neighbourhoods, in the overall sample, 78% of all teenagers lived in owner occupied homes outside social housing dominated areas and three per cent lived in owned occupied homes inside social housing dominated areas. This small group may include teenagers whose parents had exercised the Right to Buy by the mid 1980s. However, many in this group may be the children of home owners unconnected with the Right to Buy but who lived on the fringes of small estates or in areas of mixed tenure (see Figure 1). Almost six per cent of the sample lived in social housing in social housing dominated area and almost 12% lived in social rented homes outside social housing dominated areas.

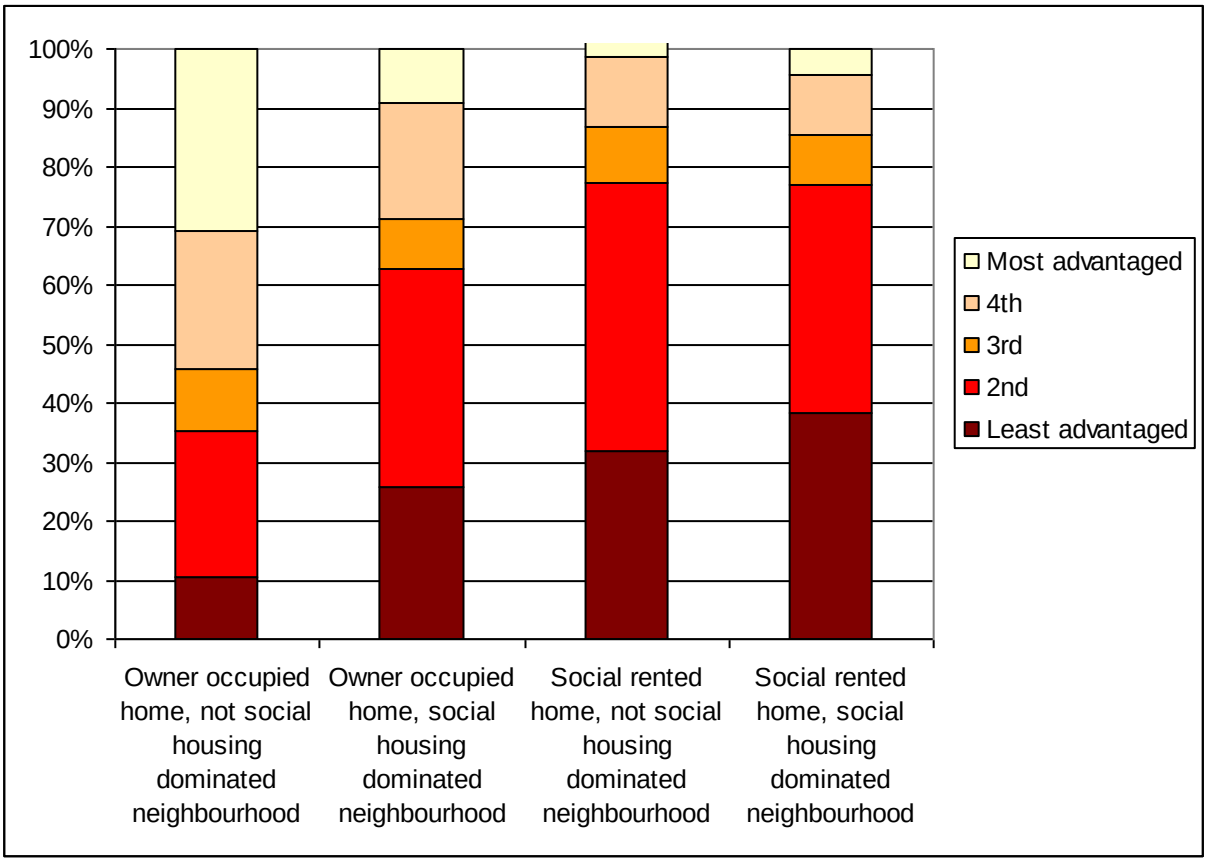
Looking at larger neighbourhoods, overall, 73% of all teenagers lived in owner occupied homes outside social housing dominated areas. Amongst teenagers living in large neighbourhoods dominated by social housing, more than half were the children of homeowners. Eight per cent of the total sample lived in owned occupied homes inside social housing dominated areas, while 6% lived in social housing in social housing dominated areas. 11% lived in social rented homes outside social housing dominated areas.

There is substantial overlap between the areas which were more deprived and the areas dominated by social housing. Again, while there are close relationships between tenure and neighbourhood characteristics, different sub-groups of owners and different social renters may experience very different neighbourhood contexts.

In summary, half of teenagers in social renting were living in the most deprived quintile in the country, whether considering small or larger neighbourhoods; less than a tenth of teenagers in owner occupied housing were doing so (using larger neighbourhoods). Neither group were living in social housing dominated neighbourhoods.

Cohort members in owner occupied homes made up a third of all cohort members in social housing dominated small neighbourhoods and more than half in social housing dominated larger neighbourhoods. Owner occupiers in an area dominated by social housing are likely to be in a lower value neighbourhood and lower value home than many other owners. On the other hand, social renters in an area not dominated by social housing are likely to be in a higher value neighbourhood and in more desirable social housing.

Figure 9: Index of Family Advantage quintiles for parents of teenagers in different tenures and different types of small neighbourhoods, age 16 in 1986



Note: Valid (non-missing) proportions of index of family advantage only (n=4332)

Within each tenure, teenagers with parents with lower educational qualifications and lower occupational class (those with lower Index of Family Advantage scores) were more likely to live in social housing dominated areas (Figure 3). It appears that a process of sorting has resulted in more advantaged families getting into homes in more desirable areas in both the major tenures, although the differences within social housing were limited. In addition, within each tenure group there were other differences. Among owner occupiers, teenagers with other disadvantages, for example: those with larger families at 16 and born to younger mothers, were more likely to live in social housing dominated areas. Among social renters, although the proportion in a family with two biological parents was around the same, those in social housing dominated areas were much more likely to be part of a lone parent family and less likely to be part of a reconstituted family.

The relationship between teenage neighbourhood and adult outcomes

As we have seen, those in different tenures as teenagers had different neighbourhood circumstances, characteristics which might be linked independently to adult outcomes. In particular, those in social housing as teenagers were much more likely to be in deprived neighbourhoods and neighbourhoods dominated by social housing than those in other tenures, but those in private renting were also somewhat disadvantaged. Could the characteristics of the neighbourhoods in which housing was located and teenagers were living in constitute all or part of the remaining association between teenage tenure and adult outcomes seen after controls (Figures 5 and 6)?

Most definitions of 'neighbourhood effects' say that a neighbourhood effect is not simply an association between the characteristics of a place people live in and their outcomes. It is an

association that persists after taking into account at least some of the resident's individual characteristics (or the characteristics of neighbourhood residents as a group) which are thought to be associated with outcomes (eg Galster, 2001; Galster *et al*, 2007).

We carried out regression analysis, again using linear regression models to explore the relationship between teenage tenure, teenage neighbourhood and outcomes at age 34. The aim was to see if neighbourhood characteristics were amongst the variables which could have played a role in the association found above between teenage housing tenure and adult outcomes. We focussed on using the small rather than the very large set of controls. As our purpose is to understand the role of neighbourhood factors, relative to the individual and family factors, so a small, transparent set of individual and family controls is preferable to the large set of controls.

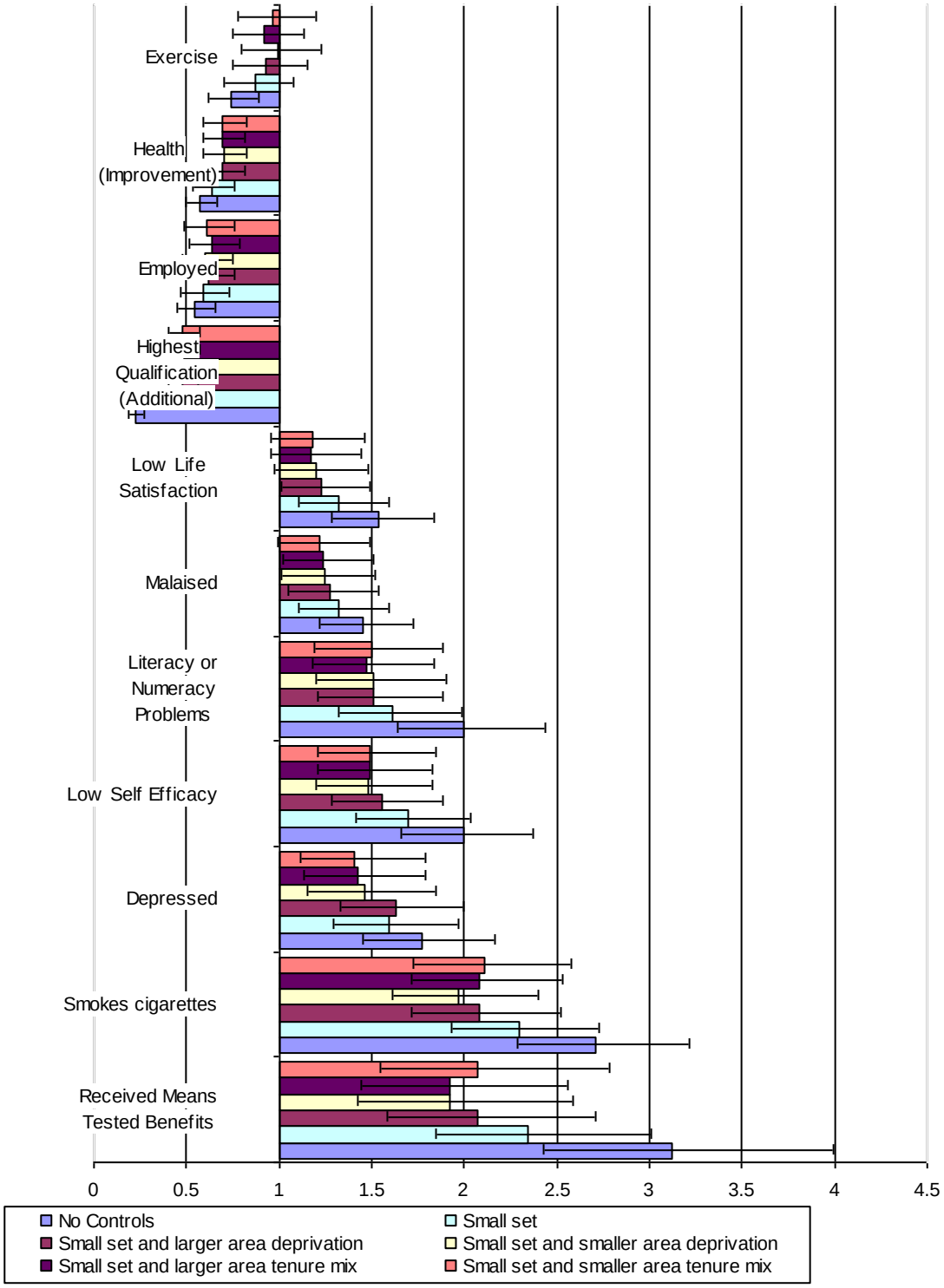
We carried out regression analysis, using the same specifications as outlined earlier, to explore the relationship between teenage tenure, teenage neighbourhood, and outcomes at age 34. The aim was to see if neighbourhood characteristics were amongst the variables which could have played a role in the association found above between teenage housing tenure and adult outcomes. Here, we focused on using the small rather than the very large set of controls as our purpose is to understand the role of neighbourhood factors, relative to the individual and family factors. We examined all the several characteristics of teenagers' neighbourhoods described above: deprivation at smaller and large neighbourhood scale; and whether the neighbourhood was social housing dominated, again at smaller and larger neighbourhood scale.

Our neighbourhood deprivation measure shows the effect of moving an additional decile away from the most deprived decile of neighbourhoods, according to the Carstairs index (large neighbourhoods) and our own index (based on the Carstairs index, small neighbourhoods). The tenure mix variable shows the effect of moving from a social housing dominated area to another area. It does not distinguish between different kinds of non-social housing dominated areas, which may be very varied. Some theories about neighbourhood tenure effects suggest that they may be non-linear, and that moving from the most social housing dominated neighbourhoods may have the biggest effects. Here our measure gives us a direct look at any non-linear effects of moving out of the most social housing dominated neighbourhoods.

Figure 10 shows the association between tenure and our adult outcomes as odds ratios, and demonstrates the change on applying small set of controls to models (as in Figures 5 and 6) and then the additional effect of applying each of the neighbourhood measures separately (Figure 10). We show the results for social housing alone (which do not change if we remove those in private renting from the model).

For most variables, controlling for the characteristics of the neighbourhood in which the teenager lived (in addition to the small set of controls) had a moderate additional effect on the size of the association between tenure and outcomes. The additional effect was much smaller than the effect of the Index of Family Advantage alone or the small set of controls for individual and family characteristics. If we had used the larger set of controls for individual and family advantages (as used for Figure 7), and neighbourhood characteristics, it is likely that the neighbourhood variables would have had even smaller additional effect. We found no instance where the characteristics of the neighbourhood offset or explained away the association between teenage tenure and adult outcomes.

Figure 10: Odds ratios for various outcomes at age 34 for those living in in social housing compared to those in home ownership as teenagers (using the small set of controls, and various measures of teenage neighbourhood characteristics)



Note: Baseline category: owner occupied housing. Confidence intervals (shown as error bars) that pass through one indicate no significant differences between social renting and owner occupation. Longer error bars indicate greater potential variance around the central estimate. Estimates displayed in this chart, together with the parameters for neighbourhood variables are also found in Appendix 3.

The various neighbourhood controls appear to have a significant effect on adult outcomes after the controls for individual and family advantage and tenure for the following outcomes:

- self-efficacy;
- means tested benefits;

- low life satisfaction;

- paid employment; and
- qualifications.

Most of these relationships were between large neighbourhood deprivation and adult outcomes. However, tenure mix also had a moderate association with the following variables:

- depression (large and small neighbourhood);
- life satisfaction (large neighbourhood).

(See table in Appendix for parameter estimates)

We found a slightly larger number of statistically significant associations when characterising neighbourhoods by degree of deprivation than by whether they were dominated by social housing (18 associations rather than 14). We found a slightly larger number of statistically significant associations for large neighbourhoods (with an average 2,300 households) rather than small neighbourhoods (with an average 100-150 households) (18 associations rather than 16). The deprivation measures appeared to have a very slightly greater effect on the size of odds ratios than the tenure mix measures. There was very little difference in impact between the large neighbourhood and small neighbourhood measures. In general, though, there was little to choose between the four neighbourhood measures.

We experimented with alternative ways of testing neighbourhood deprivation, for example, comparing the effect of being in a small or larger neighbourhood in the most deprived decile compared to all the rest, in the most deprived compared to the second most deprived decile, in the most deprived compared to neighbourhoods outside the two most deprived deciles. Results are not reported here in detail. Each of these measures had a slightly different effect on odds ratios, but again none stood out and none greatly increased the impact on odds ratios seen in Figure 10.

We also wanted to see if these tenure and neighbourhood 'effects' interacted with each other. These tests did not produce any statistically significant results. This suggests that neighbourhood characteristics and individual housing tenure may have largely separate associations, although in practice these variables are highly correlated with each other. Thus if a cohort member lived in social housing which was also a deprived or a social housing dominated neighbourhood (as many did), the two factors would have an additive effect but very little of a multiplicative one.

In summary, these results suggest we have found independent 'neighbourhood effects' of teenage neighbourhood on adult outcomes.. As noted above, whether the size of the impact on odds ratios counts as small or large is a matter of judgment. The associations found above between teenage tenure and adult outcomes for those born in 1970 were partly but not entirely or mainly the result of tenure being a proxy for neighbourhood deprivation. Thus these results extend and provide more nuance than those found in Feinstein *et al* (2008) and Lupton *et al* (2009).

Discussion and conclusions

This report has developed and provided more nuance to the work of two recent reports on the relationship between housing and life chances (Feinstein *et al*, 2008 and Lupton *et al*, 2009).

Comparing tenures

In the introduction, we suggested that previous studies might have obscured differences between rented tenures and within home ownership.

The current study has shown that this is true. In terms of raw results, those in social renting and private renting at age 16 have similar outcomes at age 34 in terms of a number of variables: paid employment status, being on means tested benefits, taking regular exercise, and low life satisfaction. Those in social renting at 16 actually had slightly better outcomes at 34 than those in private renting in terms of depression, malaise and low life satisfaction, despite the fact that teenagers in private renting had similar housing conditions (Lupton *et al*, 2009) and slightly less family and individual disadvantage.

When using various controls for family and individual advantage, those in private renting as well as those in social renting as teenagers also had less favourable outcomes at age 34 than those in home ownership as teenagers for all variables. Thus we have found some as yet unexplained association between teenager tenure and adult outcomes, as in previous studies, but the critical tenure difference appears not to be between social renting and other tenures, but between rented tenures and home ownership. Private renting at 16 does not appear to have offered any clear advantage over social renting at 16 in terms of adult outcomes.

We have also found additional evidence of the diversity within home ownership, which might be a fruitful area for further research. Those in home ownership as teenagers had lower rates of family and individual disadvantage than those in rented housing, but they did not escape disadvantage entirely, and for some measures they constituted the majority (in numbers) of all those with family and childhood disadvantage and less desirable adult outcomes.

Neighbourhoods and neighbourhood effects

We also suggested that the characteristics of the neighbourhoods housing is located in might be important, and features of social housing neighbourhoods might either constitute all or part of the associations between tenure and outcomes.

Those who lived in social housing as teenagers lived in distinctive neighbourhoods compared to those in other tenures. They were much more likely than owner occupiers and more likely than private renters to live in deprived neighbourhoods. They were also much more likely to live in neighbourhoods dominated by social housing (although only a minority did so).

Despite the stark differences in the characteristics of neighbourhoods experienced by teenagers in different tenures, and the evidence for some neighbourhood effects outcomes, the associations between tenure and outcomes we have found cannot be explained as entirely or mainly due to the deprivation or tenure mix of their areas. After controlling for family and individual advantage, taking neighbourhood characteristics into account modifies the relationship seen between tenure and outcomes, but only by a small amount.

It may be that research using other descriptions of neighbourhoods, such as employment rates, or other scales, might show more effects. Particular family and individual characteristics, such as parental mental or physical health problems, redundancy or relationship breakdown prior to arrival in social housing were not included even in the very large set of controls used in previous research, and might explain all or part of the relationship seen between childhood tenure and adult outcomes.

Implications for today's children and their housing and neighbourhoods

Over the past 40 years, as British Cohort Study members have grown up, the UK housing system has changed considerably and UK neighbourhoods have also changed. However, rented homes and their neighbourhoods are still important for today's children and families. The companion study to the present one, based on the Millennium Cohort Study shows that in 2006, 18% of children aged 5 lived in social rented homes and 9% lived in privately rented homes (the study is found at http://sticerd.lse.ac.uk/case).

We have found evidence that characteristics of those born in 1970, which are either known at birth or at age 16, are associated in some way with differences in later outcomes at age 34, and could be used to predict later disadvantage. Whether the associations we have found are large or small or a concern for policy is a matter for judgment. We cannot say that we have found conclusive evidence of either tenure effects or neighbourhood effects.

References

Carstairs, V. and Morris, R. (1991) *Deprivation and health in Scotland,* Aberdeen: Aberdeen University Press.

DCLG (2010) Survey of English Housing livetables; Table S01 Trends in tenure (http://www.communities.gov.uk/housing/xls/139262.xls) Viewed 27th August.

Department of Environment [DoE] (1997) *Mapping local authority estates using the Index of Local Conditions*, London: HMSO.

Feinstein, l., Lupton, R., Hammond, C., Mujtaba, T. and Sorhaindo, A. with Tunstall, R., Richards, M., Kuh, D. and Jonson, J. (2008) *The public value of social housing: A longitudinal analysis of the relationship of housing and life chances*, London: Centre for Research on the Wider Benefits of Learning, Institute of Education, University of London.

Galster, G. (2001) 'On the nature of neighbourhood', *Urban Studies,* 38, pp 2111-24.

Galster, G., Marcotte, D. E., Mandell, M., Wolman, H. and Augustine, N. (2007) 'The influence of neighbourhood poverty during childhood on fertility, education and earnings outcomes', *Housing Studies,* 22, pp 723-51

Lupton, R.; Tunstall, R.; Sigle-Rushton, W.; Obolenskaya, P.; Sabates, R.; Meschi, E.; Kneale, D. and Salter, M. (2009) *Growing up in social housing in Great Britain: The experience of four generations*, London: Homes and Communities Agency.

Mensah, F. K., and Hobcraft, J. (2008) Childhood deprivation, health and development: associations with adult health in the 1958 and 1970 birth cohort studies, *Journal of Epidemiology and Community Health,* 62, 599-606.

Plewis, I; Calderwood, L; Hawkes, D and Gad, N (2004) *National Child Development Study and 1970 British Cohort Study Technical Report: Changes in the NCDS and BCS70 Populations and Samples over Time 1st Edition October 2004* London: CLS, Institute of Education

Tunstall, R with Fenton, A (2009) *Communities in recession: The impact on deprived neighbourhoods* York: JRF (www.jrf.org.uk/sites/files/jrf/communities-recession-impact-neighbourhoods.pdf)

Appendix 1: Methods: Sample of cohort members and missing data

All cohort study analysis faces the issue of sample attrition (where people cannot be traced for later sweeps of the survey) and variable non-response (where they do not answer particular questions) and the possibility that it is non-random (Plewis et al. 2004). If left unchecked, missing data can lead to substantial bias in the parameter estimates (results figures); smaller samples also lead to greater uncertainty in our estimates (and increased likelihood that results will not be statistically significant and may be due to chance).

We address non-response in this report through creating a dummy category for 'missingness' for the control variables responsible for the vast majority of missingness in our data, a common strategy for dealing with missing data in the literature (for example Mensah and Hobcraft 2008).

As with the previous Lupton et al (2009) and Feinstein et al (2008) reports, we do not correct for missingness among our variables of interest (tenure at age 16 and neighbourhood variables at age 16) or our outcomes at age 34.

All information presented in the remainder of this report, unless stated, represents information for those born in England with valid information for:

- Tenure (age 16);
- Neighbourhood (age 16);
- Controlling factors (birth and age 16); and
- With full information for all outcome variables, with the exception of cigarette smoking (the question had high non-response rates).

This gives a working sample of 4,434. For cigarette smoking, we alter the sample to give a working sample of 4,179. Our efforts to preserve the sample size appear to have maintained its overall representativeness between our working and full cohort samples. However, as we do not explicitly correct for attrition bias or impute missing values for variables of interest or outcome variables, some differences may still exist.

Because the data suggest that sample attrition affects disadvantaged people more, any results suggesting that individuals who lived in social housing or more deprived neighbourhoods during childhood fare worse are likely to be a conservative estimate of the true differences between groups.

The Table below is a variant of Table 2 and demonstrates the differences between characteristics of cohort members and their families between samples before and after those with missing variables are removed from the sample.

Table A1: Characteristics of cohort members and their families at birth and at age 16, by tenure at age 16: Results after those with missing variables are shown in brackets.

	All tenures	Owner occupied	Social rented	Private rented and other
Mother's mean age at first birth (which may not have been cohort member's birth)	22.8 years	23.2 years	21.0 years	22.1 years
Family structure when cohort member was born				
Lone parent	4%	3%	10%	6%
Two parent	96%	97%	90%	94%
Mother first became mother outside her own region of birth				
No	71% (72%)	70% (71%)	75% (77%)	73% (75%)
Yes	28% (28%)	29% (29%)	22% (23%)	25% (25%)
Missing	2%	1%	3%	2%
Index of Family Advantage at teenager's birth				
Least advantaged quintile	16% (16%)	11% (12%)	34% (35%)	23% (23%)
2nd	27% (28%)	24% (25%)	40% (41%)	25% (25%)
3rd	10% (10%)	10% (10%)	9% (9%)	15% (15%)
4th	21% (21%)	23% (23%)	11% (11%)	28% (28%)
Most advantaged quintile	24% (25%)	29% (30%)	4% (4%)	10% (10%)
Missing	2%	2%	3%	0%
Cohort member's standardised birth weight	0.1	0.1	-0.1	0.0

Note: This analysis is based on a subsample of cohort members who were born in England and for whom we had data on tenure at 16, and all the variables in this table (see Box 1). Figures in brackets represent valid (non-missing) proportions.

Appendix 2: Methods: Control variables and strategy

The variables asterisked in Figure 1 and featured in Tables 2 and 3 above represent the 'small set of controls', the controlling factors used in the bulk of the analysis. They are:

- index of Family Advantage (made up of parent's highest educational level and parents' occupational class at cohort member's birth; divided into five groups or 'quintiles');
- mothers' age at the birth of her first child;
- whether mother had moved away from her home region by the birth of her first child;
- cohort member's weight at birth;
- whether there were one or two parents resident in the household at birth;
- whether there were one or two parents resident in the household at 16;
- number of siblings resident in the household at 16; and
- region lived in at 16.

As in previous studies, we did not choose control variables to fully account for all the distinctive individual and family characteristics of those in different tenures or for the actors which are associated with different families getting into different tenures. These might include, for example, parental mental or physical health problems, redundancy or relationship breakdown prior to arrival in social housing, which were not included even in the very large set of controls used in previous research, and might explain all or part of the relationship seen between childhood tenure and adult outcomes (Lupton *et al*, 2009). This would involve intricate work, examining family events that took places between survey sweeps, for example between birth and age 5, 5 and 10 and 10 and 16, ensuring these events took place before arrival in social housing and were associated with social housing tenancy.

In addition to the controls described above, we used a much larger set of 56 control variables, the 'alga set of controls'. These reflect childhood school environment, height and weight, behaviour, cognition, socioeconomic factors and demographic factors, which were used in Feinstein *et al* (2008) and Lupton *et al* (2009) (see these reports for more details). This 'large set' of controls was used in the previous study as an extreme strategy, to investigate how far it was possible to reduce in size and statistical significance the association seen between housing tenure in childhood and adult outcomes. Using such a large group of controls has some disadvantages. For example, it is less easy to understand the controls or to see patterns at work. There may be a great deal of correlation between the control variables. Some of the variables used related to factors in childhood and could conceivably have been caused by housing experiences in childhood themselves, rather than visa versa. Finally, such a large set of controls may cause problems in 'overfitting' the model, where relationships between predictors and outcomes become distorted as the model we are trying to estimate becomes too complex for the number of cohort members (and, technically, the number of predictors exceeds the degrees of freedom). Using the liberal rule of thumb of one predictor variable per ten 'cases' suggests that using the large set of controls maybe unsuitable for modelling receipt of means tested benefits[2], particularly given that our control variables (including tenure) have small categories in some cases. Using the 'small set' of controls generally avoids this problem, although it means that the detailed results are not directly comparable to those in Feinstein et al. 2008 and Lupton et al. 2009, and will tend to over-estimate rather than underestimate associations, and increase the risk of omitted variable bias. These concerns represent caveats to the results we present in this report, although are not unique to our study alone.

[2] This is also a concern with depression and literacy and numeracy problems in particular, although we continue to explore these outcomes.

We include and concentrate on a smaller set of controls than previous studies because:

i) We want to avoid the potential for 'overfitting' our models (having a large number of controls in proportion to the actual number of cohort members in the sample), particularly where we are looking for within tenure differences;
ii) we want to avoid the potential for underestimating the effect of tenure and/or neighbourhood. Some of the larger set of variables, particularly those recorded later in life, while likely to be highly predictive of many of our outcomes, may also be in part, a function of previous tenure and/or neighbourhood exposures;
iii) in this report, we are particularly interested in variations in, and comparisons with, the associations with social housing, for example by neighbourhood; the priority in this report is not see if associations with social housing can be entirely removed through use of controls.

Nevertheless, we use the large set of controls at some points in the interests of comparability with previous reports and robustness.

In addition, Feinstein et al. 2008 and Lupton et al. 2009 used linear regression models to examine the effect of tenure on each outcome while simultaneously controlling for 56 other factors. Here we used a different model specification for each outcome variable, dependent on the distribution and nature of the outcome. (In the case of highest qualification, self-rated health and self-efficacy we use ordinal logistic regression models. In the case of outcomes measured dichotomously including employment status, receipt of benefits, literacy or numeracy problems, depression, obesity and exercise, we use binary logistic regression models. Life-satisfaction and malaise were heavily skewed, as most people were satisfied and malaise-free, and were transformed into dichotomous variables and modelled in binary logistic models. Finally in the case of cigarette smoking, where the outcome itself was heavily skewed as most people overall don't smoke, we used negative binomial regression models). Again, this means that results are not directly comparable to those in Feinstein et al. 2008 and Lupton et al. 2009.

Appendix 3: Regression results in detail

Table A2: Coefficients from models used in Figure 3

	Received Means Tested Benefits	Smokes cigarettes	Depressed	Self Efficacy (Decreasing)	Literacy or Numeracy Problems	Malaised	Low Life Satisfaction	Highest Qualification (Additional)	Employed	Health (Healthier Category)	Exercise
Social Housing	3.118**	2.712**	1.770**	1.996**	2.001**	1.452**	1.537**	0.286**	0.544**	0.575**	0.744**
	[2.432,3.998]	[2.287,3.217]	[1.449,2.162]	[1.668,2.388]	[1.645,2.434]	[1.222,1.726]	[1.285,1.837]	[0.246,0.332]	[0.449,0.658]	[0.496,0.667]	[0.619,0.895]
Private Renting	2.628**	1.851**	2.034**	1.483	1.084	1.850**	1.602*	0.424**	0.528**	0.798	0.754
	[1.409,4.901]	[1.181,2.904]	[1.249,3.311]	[0.907,2.425]	[0.599,1.963]	[1.206,2.838]	[1.017,2.524]	[0.292,0.617]	[0.327,0.852]	[0.546,1.166]	[0.467,1.215]
N	4434	4149	4434	4434	4434	4434	4434	4434	4434	4434	4434
pseudo R^2	0.034	0.028	0.009	0.010	0.012	0.005	0.005	0.030	0.010	0.006	0.002
ll	-1093.2	-2234.8	-1828.9	-2659.5	-1821.9	-2480.1	-2302.0	-4602.7	-1958.0	-4631.7	-2249.4

Exponentiated coefficients; 95% confidence intervals in brackets; these are represented in Figure 3 as 'error bars'

+ p<.10, * p<.05, ** p<.01

Table A3 part 1: Selected coefficients from models used in Figures 4, 5 and 6 (full output available on request from dylankneale@ilcuk.org.uk).

No Other Controls

	Received Means Tested Benefits	**Smokes cigarettes**	**Depressed**	**Self Efficacy (Decreasing)**	**Literacy or Numeracy Problems**	**Malaised**
Social Housing	3.118**	2.712**	1.770**	1.996**	2.001**	1.452**
	[2.432,3.998]	[2.287,3.217]	[1.449,2.162]	[1.668,2.388]	[1.645,2.434]	[1.222,1.726]
Private Renting	2.628**	1.851**	2.034**	1.483	1.084	1.850**
	[1.409,4.901]	[1.181,2.904]	[1.249,3.311]	[0.907,2.425]	[0.599,1.963]	[1.206,2.838]
N	4434	4149	4434	4434	4434	4434
pseudo R^2	0.034	0.028	0.009	0.010	0.012	0.005
Index of Advantage as a control						
Social Housing	2.346**	2.293**	1.597**	1.697**	1.617**	1.324**
	[1.798,3.060]	[1.912,2.750]	[1.290,1.977]	[1.402,2.055]	[1.312,1.991]	[1.102,1.590]
Private Renting	2.268*	1.696*	1.913**	1.354	0.994	1.739*
	[1.208,4.258]	[1.078,2.668]	[1.172,3.123]	[0.826,2.220]	[0.547,1.808]	[1.131,2.673]
N	4434	4149	4434	4434	4434	4434
pseudo R2	0.048	0.035	0.013	0.015	0.021	0.008
Small set of controls						
Social Housing	2.068**	2.078**	1.510**	1.552**	1.506**	1.271*
	[1.566,2.731]	[1.718,2.513]	[1.209,1.886]	[1.272,1.894]	[1.211,1.872]	[1.051,1.538]
Private Renting	2.251*	1.635*	1.928**	1.337	0.963	1.711*
	[1.189,4.261]	[1.032,2.590]	[1.176,3.159]	[0.814,2.195]	[0.527,1.759]	[1.110,2.639]
N	4434	4149	4434	4434	4434	4434
pseudo R2	0.064	0.051	0.020	0.020	0.030	0.014
Large set of controls						
Social Housing		1.894**	1.430**		1.058	1.076
		[1.531,2.342]	[1.022-1.671]		[0.827-1.354]	[0.872,1.328]
Private Renting		1.508+	1.628+		0.811	1.544+
		[0.928,2.451]	[0.973-2.724]		[0.430-1.532]	[0.986,2.420]
N		4137	4423		4434	4434
pseudo R2		0.097	0.051		0.117	0.045

Exponentiated coefficients; 95% confidence intervals in brackets; these are represented in Figures 4. 5 and 6 as 'error bars'

+ p<.10, * p<.05, ** p<.01 Blank cells indicate models that were either not fitted because of concerns about overfitting or did not converge. Some cases were dropped on converging the model with the larger number of controls due to some covariates predicting the outcome perfectly.

Table A3 part 2: Remaining coefficients from models used in Figures 4, 5 and 6 (full output available on request from dylankneale@ilcuk.org.uk).

No Other Controls	**Low Life Satisfaction**	**Highest Qualification (Additional)**	**Employed**	**Health (Healthier Category)**	**Exercise**
Social Housing	1.537**	0.286**	0.544**	0.575**	0.744**
	[1.285,1.837]	[0.246,0.332]	[0.449,0.658]	[0.496,0.667]	[0.619,0.895]
Private Renting	1.602*	0.424**	0.528**	0.798	0.754
	[1.017,2.524]	[0.292,0.617]	[0.327,0.852]	[0.546,1.166]	[0.467,1.215]
N	4434	4434	4434	4434	4434
pseudo R^2	0.005	0.030	0.010	0.006	0.002
Index of Advantage as a control					
Social Housing	1.323**	0.438**	0.586**	0.635**	0.870
	[1.094,1.599]	[0.374,0.513]	[0.478,0.719]	[0.544,0.742]	[0.715,1.058]
Private Renting	1.475+	0.526**	0.557*	0.828	0.800
	[0.934,2.330]	[0.359,0.772]	[0.344,0.902]	[0.566,1.212]	[0.495,1.294]
N	4434	4434	4434	4434	4434
pseudo R2	0.011	0.080	0.012	0.008	0.009
Small set of controls					
Social Housing	1.231*	0.477**	0.617**		
	[1.010,1.499]	[0.405,0.562]	[0.498,0.763]		
Private Renting	1.499+	0.546**	0.549*		
	[0.946,2.376]	[0.371,0.804]	[0.337,0.893]		
N	4434	4434	4434		
pseudo R2	0.017	0.093	0.021		
Large set of controls					
Social Housing	0.979		0.696**		
	[0.787,1.217]		[0.549,0.882]		
Private Renting	1.252		0.619+		
	[0.771,2.034]		[0.371,1.031]		
N	4434		4424		
pseudo R2	0.056		0.064		

Exponentiated coefficients; 95% confidence intervals in brackets; these are represented in Figures 4, 5 and 6 as 'error bars'

+ p<.10, * p<.05, ** p<.01 Blank cells indicate models that were either not fitted because of concerns about overfitting or did not converge. Some cases were dropped on converging the model with the larger number of controls due to some covariates predicting the outcome perfectly.

Table A4 part 1: Selected coefficients from models used in Figure 10 (full output available on request from dylankneale@ilcuk.org.uk).

No Other Controls	**Received Means Tested Benefits**	**Smokes cigarettes**	**Depressed**	**Self Efficacy (Decreasing)**	**Literacy or Numeracy Problems**	**Malaised**	**Health (Healthier Category)**	**Exercise**
Social Housing	3.118**	2.712**	1.770**	1.996**	2.001**	1.452**	0.575**	0.744**
	[2.432,3.998]	[2.287,3.217]	[1.449,2.162]	[1.668,2.388]	[1.645,2.434]	[1.222,1.726]	[0.496,0.667]	[0.619,0.895]
Private Renting	2.628**	1.851**	2.034**	1.483	1.084	1.850**	0.798	0.754
	[1.409,4.901]	[1.181,2.904]	[1.249,3.311]	[0.907,2.425]	[0.599,1.963]	[1.206,2.838]	[0.546,1.166]	[0.467,1.215]
N	4434	4149	4434	4434	4434	4434	4434	4434
pseudo R^2	0.034	0.028	0.009	0.010	0.012	0.005	0.006	0.002
Small set of controls								
Social Housing	2.068**	2.078**	1.510**	1.552**	1.506**	1.271*	0.690**	0.928
	[1.566,2.731]	[1.718,2.513]	[1.209,1.886]	[1.272,1.894]	[1.211,1.872]	[1.051,1.538]	[0.587,0.810]	[0.757,1.138]
Private Renting	2.251*	1.635*	1.928**	1.337	0.963	1.711*	0.861	0.843
	[1.189,4.261]	[1.032,2.590]	[1.176,3.159]	[0.814,2.195]	[0.527,1.759]	[1.110,2.639]	[0.588,1.262]	[0.519,1.369]
N	4434	4149	4434	4434	4434	4434	4434	4434
pseudo R2	0.064	0.051	0.020	0.020	0.030	0.014	0.012	0.018
Small set of controls and large area deprivation								
Social Housing	1.957**	2.078**	1.467**	1.468**	1.513**	1.243*	0.700**	0.969
	[1.476,2.596]	[1.713,2.520]	[1.171,1.839]	[1.200,1.797]	[1.213,1.888]	[1.025,1.508]	[0.594,0.824]	[0.788,1.190]
Private Renting	2.282*	1.635*	1.940**	1.352	0.962	1.719*	0.859	0.836
	[1.204,4.323]	[1.032,2.590]	[1.183,3.180]	[0.823,2.222]	[0.526,1.757]	[1.115,2.652]	[0.586,1.259]	[0.515,1.359]
Deprivation Decile (Ward)	0.949*	1.000	0.975	0.952**	1.005	0.981	1.012	1.039*
	[0.903,0.998]	[0.970,1.030]	[0.942,1.009]	[0.922,0.982]	[0.970,1.040]	[0.954,1.008]	[0.990,1.035]	[1.008,1.071]
N	4434	4149	4434	4434	4434	4434	4434	4434
Pseudo R2	0.066	0.051	0.020	0.022	0.030	0.014	0.012	0.019
Small set of controls and small area deprivation								
Social Housing	1.922**	1.967**	1.462**	1.482**	1.508**	1.243*	0.699**	0.992
	[1.428,2.587]	[1.609,2.404]	[1.155,1.849]	[1.201,1.829]	[1.197,1.900]	[1.017,1.519]	[0.590,0.827]	[0.800,1.229]
Private Renting	2.235*	1.625*	1.922**	1.330	0.963	1.707*	0.863	0.851
	[1.180,4.233]	[1.026,2.575]	[1.172,3.150]	[0.810,2.185]	[0.527,1.759]	[1.107,2.633]	[0.589,1.264]	[0.524,1.382]
Deprivation Decile (ED)	0.967	0.974+	0.985	0.979	1.001	0.990	1.006	1.031+
	[0.920,1.016]	[0.945,1.005]	[0.951,1.020]	[0.948,1.010]	[0.966,1.037]	[0.962,1.019]	[0.983,1.030]	[1.000,1.063]
N	4434	4149	4434	4434	4434	4434	4434	4434
pseudo R2	0.065	0.052	0.020	0.020	0.030	0.014	0.012	0.019
Small set of controls and large neighbourhood tenure mix								
Social Housing	1.925**	2.082**	1.421**	1.489**	1.474**	1.238*		
	[1.446,2.562]	[1.713,2.530]	[1.131,1.786]	[1.213,1.826]	[1.179,1.842]	[1.019,1.505]		
Private Renting	2.290*	1.635*	1.938**	1.338	0.967	1.714*		
	[1.210,4.333]	[1.032,2.590]	[1.182,3.178]	[0.815,2.198]	[0.529,1.766]	[1.112,2.644]		
High Social Housing (Ward)	1.414*	0.990	1.335*	1.222+	1.116	1.134		
	[1.037,1.928]	[0.796,1.232]	[1.052,1.694]	[0.983,1.519]	[0.872,1.428]	[0.923,1.393]		
N	4434	4149	4434	4434	4434	4434		
Pseudo R2	0.066	0.051	0.021	0.021	0.030	0.014		
Small set of controls and small neighbourhood tenure mix								
Social Housing	2.074**	2.105**	1.409**	1.493**	1.497**	1.217+		
	[1.545,2.783]	[1.721,2.574]	[1.112,1.786]	[1.207,1.846]	[1.189,1.885]	[0.994,1.489]		
Private Renting	2.251*	1.637*	1.915**	1.330	0.963	1.703*		
	[1.189,4.261]	[1.033,2.593]	[1.169,3.140]	[0.810,2.185]	[0.527,1.759]	[1.104,2.627]		
High Social Housing (ED)	0.989	0.950	1.296+	1.156	1.024	1.182		
	[0.677,1.443]	[0.730,1.237]	[0.968,1.736]	[0.885,1.509]	[0.757,1.386]	[0.915,1.527]		
N	4434	4149	4434	4434	4434	4434		
pseudo R2	0.064	0.051	0.021	0.020	0.030	0.014		

Exponentiated coefficients; 95% confidence intervals in brackets; these are represented in Figures 10 as ‘error bars’
+ p<.10, * p<.05, ** p<.01

Table A4 part 2: Remaining coefficients from models used in Figure 10 (full output available on request from dylankneale@ilcuk.org.uk).

No Other Controls	**Low Life Satisfaction**	**Highest Qualification (Additional)**	**Employed**	**Health (Healthier Category)**	**Exercise**
Social Housing	1.537**	0.286**	0.544**	0.575**	0.744**
	[1.285,1.837]	[0.246,0.332]	[0.449,0.658]	[0.496,0.667]	[0.619,0.895]
Private Renting	1.602*	0.424**	0.528**	0.798	0.754
	[1.017,2.524]	[0.292,0.617]	[0.327,0.852]	[0.546,1.166]	[0.467,1.215]
N	4434	4434	4434	4434	4434
pseudo R^2	0.005	0.030	0.010	0.006	0.002
Small set of controls					
Social Housing	1.231*	0.477**	0.617**	0.690**	0.928
	[1.010,1.499]	[0.405,0.562]	[0.498,0.763]	[0.587,0.810]	[0.757,1.138]
Private Renting	1.499+	0.546**	0.549*	0.861	0.843
	[0.946,2.376]	[0.371,0.804]	[0.337,0.893]	[0.588,1.262]	[0.519,1.369]
N	4434	4434	4434	4434	4434
pseudo R2	0.017	0.093	0.021	0.012	0.018
Small set of controls and large area deprivation					
Social Housing	1.189+	0.501**	0.607**	0.700**	0.969
	[0.973,1.453]	[0.424,0.591]	[0.489,0.753]	[0.594,0.824]	[0.788,1.190]
Private Renting	1.510+	0.540**	0.551*	0.859	0.836
	[0.952,2.393]	[0.367,0.794]	[0.338,0.896]	[0.586,1.259]	[0.515,1.359]
Deprivation Decile (Ward)	0.970*	1.042**	0.986	1.012	1.039*
	[0.942,0.999]	[1.019,1.066]	[0.954,1.019]	[0.990,1.035]	[1.008,1.071]
N	4434	4434	4434	4434	4434
Pseudo R2	0.018	0.095	0.022	0.012	0.019
Small set of controls and small area deprivation					
Social Housing	1.199+	0.519**	0.600**	0.699**	0.992
	[0.973,1.477]	[0.437,0.617]	[0.479,0.752]	[0.590,0.827]	[0.800,1.229]
Private Renting	1.494+	0.551**	0.548*	0.863	0.851
	[0.943,2.369]	[0.375,0.811]	[0.337,0.892]	[0.589,1.264]	[0.524,1.382]
Deprivation Decile (ED)	0.988	1.039**	0.988	1.006	1.031+
	[0.959,1.019]	[1.014,1.064]	[0.955,1.022]	[0.983,1.030]	[1.000,1.063]
N	4434	4434	4434	4434	4434
pseudo R2	0.018	0.094	0.022	0.012	0.019
Small set of controls and large neighbourhood tenure mix					
Social Housing	1.176	0.484**	0.635**		
	[0.960,1.440]	[0.409,0.572]	[0.511,0.790]		
Private Renting	1.506+	0.545**	0.547*		
	[0.950,2.386]	[0.371,0.803]	[0.336,0.890]		
High Social Housing (Ward)	1.245*	0.930	0.860		
	[1.008,1.537]	[0.781,1.109]	[0.679,1.089]		
N	4434	4434	4434		
Pseudo R2	0.018	0.093	0.022		
Small set of controls and small neighbourhood tenure mix					
Social Housing	1.184	0.478**	0.605**		
	[0.960,1.461]	[0.402,0.569]	[0.483,0.758]		
Private Renting	1.494+	0.546**	0.548*		
	[0.943,2.368]	[0.371,0.804]	[0.337,0.892]		
High Social Housing (ED)	1.158	0.987	1.080		
	[0.890,1.508]	[0.792,1.231]	[0.802,1.455]		
N	4434	4434	4434		
pseudo R2	0.018	0.093	0.021		

Exponentiated coefficients; 95% confidence intervals in brackets; these are represented in Figure 10 as 'error bars'

+ p<.10, * p<.05, ** p<.01