Non-parental care in childhood and health up to 30 years later: ONS Longitudinal Study 1971-2011.

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ABSTRACT

Background Children who spend time in non-parental care report worse health later in life on average, but less is known about differences by type of care. We examined whether self-rated health of adults who had been in non-parental care up to 30 years later varied by type of care.

Methods We used longitudinal data from the Office for National Statistics Longitudinal Study (LS). Participants were aged<18 and never-married at baseline of each census year from 1971-2001. Separately for each follow-up period (10, 20 and 30 years later), multi-level logistic regression was used to compare self-rated health outcomes by different care types.

Results For combined census years, sample sizes were 157,896 dependent children with 10 years of follow-up, 166,844 with 20 years of follow-up and 173,801 with 30 years of follow-up. For all follow-up cohorts, LS members who had been in care in childhood, had higher odds of rating their health as 'not good' vs 'good'; with the highest odds for residential care. For example, 10-year follow-up odds ratios were 3.5 (95% confidence interval: 2.2, 5.6) for residential care, 2.1 (1.7, 2.5) for relative households and 2.6 (2.1, 3.3) for non-relative households, compared to parental households after adjustment for childhood demographics. Associations were weakest for 10-year, and strongest for 20-year, follow-up. Additional adjustment for childhood social circumstances reduced, but did not eliminate, associations.

Conclusion Decades after children and young people are placed in care, they are still more likely to report worse health than children who grew up in a parental household.

Key words: Child, Foster; longitudinal; health; follow-up studies; censuses

INTRODUCTION

In March 2017, approximately 62 children per 10,000 and 95 children per 10,000 were looked-after by local authorities in England[1] and Wales.[2] This represents a lower rate than the 1970's,[3] but the absolute numbers of children in non-parental care has been steadily increasing for the past decade. Suggested reasons for these phenomena include fewer children entering care but those that do tending to stay longer,[4] and changes to admission criteria favouring home care over residential care except in more severe or complex cases.[5]

Based on evidence predominantly from the UK, but also from the US, Australia and Sweden, it is known that people who have spent part of their childhood in out-of-home care report significantly more adverse outcomes later in life, including worse health,[6-13] than children from the general population. This includes mental [6-13] and physical health,[3,9,14-15] but also increased mortality.[3] Evidence shows correlations between care type and later health might differ depending on the type: Mental health is consistently worse for children in non-parental care compared to general population children,[16-19] but a recent meta-analysis found children in residential care had worse psychosocial outcomes than children living in non-residential care.[20] Possible explanations include residential care putting children, particularly young children, at risk of attachment disorder and developmental delays.[21] A few studies have shown that children in residential care have more mental health problems than those placed with non-relatives, while those in relative households have fewer problems still.[22] Various theories explaining these findings, include minimisation of trauma through residing with kin,[16] more regular contact with a parent[18] and selection into care type by health-related factors.[20]

Research investigating later life health differentials by care type are limited. We are only aware of one study, using the 1970 British Cohort Study, which investigated health outcomes

at the age of 30 years.[13] They showed that residential care childhood was related to higher rates of depression and lower life satisfaction, than foster care (relative and non-relative combined); even after adjustment for pre-care family background. A few other studies have shown that middle-aged adults who had spent time in non-parental care had worse mental health[8-9,15] self-rated health[9] and mortality[3] than children who had not been in non-parental care, but in these studies care status was collected retrospectively and not split by care type.

We improve on these studies by using the prospectively collected nationally-representative Office for National Statistics Longitudinal Study (ONS LS) to examine whether children in various types of care settings (residential care, relative household, unrelated household or parental household) differed in their self-rated health 10, 20 and 30 years later; and whether these differences could be explained by the demographic and socioeconomic backgrounds of the children.

METHODS

Data and sample

The ONS LS is a 1% representative sample of the population of England and Wales, drawn initially from respondents to the 1971 census postal questionnaire who had been born on one of four birthdays.[23] New members are added to the LS if either newly born or immigrants and have the same birthdays. Additional 1% samples have also been drawn from the 1981, 1991, 2001 and 2011 censuses, as well as each sample being followed up. In order to only include dependent children who we could identify as being in non-parental care, the sample for this analysis includes individuals <18 years; of single marital status; not living alone or independently with friends, a partner and/or child; and who were not a temporary visitor in

the household/residential setting on the census date. If the LS member met these study criteria for two consecutive censuses, data from both censuses were included in the analysis. Baseline was considered the first census the sample member responded, separately for each follow-up period.

Measures

Outcomes

Our outcome was self-rated health (SRH), an indicator of physical and mental health problems,[24] self-reported at both the 2001 and 2011 censuses. For the 2001 census, respondents were asked 'over the last 12 months would you say, your health has on the whole been: good, fairly good or not good?' For the 2011 census, the SRH question changed to 'How is your health in general' and expanded to five options: very good, good, fair, bad and very bad. For consistency across time, we collapsed categories for both time periods into 'good' or 'not good' categories by the ONS method:[25] 2001 'good' and 'fairly good' = 'good' vs. 'not good'; 2011 'very good' and 'good' = 'good'; 'fair' 'bad' and 'very bad' = 'not good'.

Care type

For each census from 1971 to 2001, household grid and residential type data were used to classify dependent children as: (1) living with a parent, (2) living with a relative > 18, (3) living with an unrelated family, or (4) living in residential care (children's home or place of detention) on the census day. Those living in other communal establishments (e.g. hotel, hostel, hospital) at the census were excluded from the sample.

Covariates

Baseline childhood demographic (age, gender, cohort, country of birth) and social circumstances (head of household (HoH) marital status, HoH employment status, HoH education, HoH social class and number of children in household) were investigated as potential confounders. These covariates were collected each census year, albeit asked in slightly different ways in some censuses (see Supplementary table S1) and collapsed into the following categories. Cohort (1971 – 2001) refers to the first census for which the LS member had a record in childhood. Country of birth was collapsed into born outside the UK or not. HoH marital status was collapsed into 3 categories: single, legally married or divorced/widowed (1971-1991 censuses tell separated respondents to choose married or re-married categories). HoH employment status was collapsed into 3 categories: Employed, unemployed or other. HoH education was collapsed into achievement of post-18 qualifications or not. HoH social class was based on the NS-SEC classes:[26] (1) Higher managerial, administrative and professional, (2) Lower managerial, administrative and professional, (3) Intermediate, (4) Small employers and own account workers, (5) Lower supervisory and technical, (6) Semi-routine, (7) Routine and (8) Never worked and long-term unemployed. The number of children in the household was based on the number of dependent children usually resident in the household.

Analytical Plan

For each follow-up period separately (10, 20 and 30 years), childhood demographic, childhood social circumstances and health outcomes were compared across baseline care status categories (parental household, relative household, non-relative household and residential care) using Analysis of Variance (ANOVA) for continuous variables and the chi-square statistic for categorical variables.

Given that census non-response is known to vary by socio-demographic variables (i.e. not missing completely at random),[27] and the rich availability of data from other census years on each person, including auxiliary variables, we used multiple imputation to account for missing covariate data. Fourteen datasets were obtained through the chained multiple imputation program in STATA 14. For adults who were in residential care at baseline, HoH social background variables were imputed from other data including their own childhood characteristics from subsequent censuses. More detail is available in the Supplementary materials. A complete case analysis (Supplementary table S2) was largely consistent with the imputed results with the exception that poor health 30-years later for LS members in residential care appeared downwardly biased in the complete case model.

For the main analysis, data were fitted as random intercepts mixed effects models of repeated measurements nested within individuals. Separately by follow-up period, we fitted the following mixed effects logistic regression models: (i) unadjusted, (ii) adjusted for childhood demographic factors, individually and in combination (age, sex, country of birth and cohort), (iii) adjusted for childhood social circumstances, individually and in combination (HoH marital status, HoH employment status, HoH education, HoH occupational class and number of children in household) and (iv) a final model with all covariates. To check whether relationships between care type and health varied by cohort, a type by cohort interaction term was added to the three final models.

RESULTS

A total of 157,896, 166,844 and 173,801 dependent children had follow-up health data at 10, 20 and 30-year follow-up (see Supplementary figure S1 and table S3). Some children had

baseline and follow-up data between two census intervals (40,100; 31,982 and 43,014), resulting in total observations of 197,996, 198,826 and 216,815 respectively. Table 1 shows the imputed characteristics of the sample by care type, separately by follow-up period. Children in residential care were on average older and more likely to be male than children in other care categories. Almost all children in parental households and in residential care had been born in the UK, while the percentages were slightly lower for non-relative and relative households. At every census, parental households, followed by non-relative and then relative households, had the highest proportion of HoH's that were married, employed, had 18+ qualifications and worked in managerial or professional occupations. Over time, fewer HoH's were married and more had 18+ qualifications and worked in managerial or professional occupations.

For all follow-up periods, there was no indication that associations between care type and health varied by cohort year, so associations are presented with cohorts combined. Table 2 shows the odds of not good versus good SRH for adults who had been in various care types 10 years earlier (at least one data collection at the1991 or 2001 censuses), compared to having resided in a parental home at baseline. In unadjusted analysis, children who had been living in any type of care setting had worse SRH 10 years later than children who had been living with their parent(s). However, odds of reporting not good SRH varied by care type, with an odds ratio of 1.7 (95% confidence interval: 1.4, 2.0) if they had lived with a relative, 3.4 (2.7, 4.2) if they had lived with a non-relative and 5.8 (3.7, 9.2) if they had lived in residential care. Adjustment for childhood demographic and social circumstances reduced but did not eliminate associations [relative 1.6 (1.3 to 2.0); non-relative 2.2 (1.8 to 2.8); residential care 3.0 (1.9 to 4.8)]. Age at baseline, cohort (1991 or 2001), HoH employment status and HoH social class altered associations the most of all of the potential confounders.

Adjustment for gender, country of birth and number of children in the household hardly affected strengths of associations.

For the 20-year follow-up (Table 3), the overall care type and health patterns were similar, but fully adjusted odds ratios were stronger than for the 10-year follow-up sample. For example, the odds ratio of reporting not good SRH for residential care compared to parental care was 4.1 (2.9 to 5.9) at 20-year follow-up and 3.0 (1.9, 4.8) at 10-year follow-up. The effects of adjustments were broadly similar, except that adjustment for cohort (1991 compared with 1981) increased odds ratios of residential care groups reporting not good SRH 20-years later.

For the 30-year follow-up (Table 4), patterns were again similar to prior follow-up periods, with magnitudes of the fully-adjusted odds ratios between those for the 10-year and 20-year follow-ups [relative households 1.3 (1.1 to 1.6), non-relative households 2.0 (1.6 to 2.5) and residential care 3.9 (2.8 to 5.4), compared to parental households]. Effects of adjustments were also similar, with adjustment for cohort (care status in 1981 vs 1971) increasing odds ratios for children who had been in relative or non-relative households. Adjustment for HoH marital status also increased odds ratios for children who had been in relative households, unlike the shorter follow-ups.

Sensitivity analyses indicated that residential care was associated with poorer health years later than care in a non-parental household (Supplementary table S4), even for the 10-year follow-up with smaller numbers in residential care. Changing the reference group to only those living with a HoH in a disadvantaged social class did not alter the findings (Supplementary table S5).

DISCUSSION

In this large, nationally representative study of dependent children resident in England and Wales, across four census periods, relationships between out-of-home care and SRH varied by care type. After adjustment for childhood demographic and social circumstances, adults who had lived in residential care settings in childhood had 3.0-4.1 times higher odds of reporting not good health than adults who had lived in parental homes. The odds of not good health at all three follow-up periods were much lower for children residing in a relative's household, at 1.3-2.0 times.

Our general finding that health outcomes vary by care type is consistent with previous literature. For LS children who might have been <18 at 10-year follow-up, results mirror previous studies showing children in residential care have more health problems than children with other care arrangements.[16,20,28-29] Particularly for young children, it is hypothesised that residential care puts them at risk of attachment disorder and developmental delays.[21] This theory is borne out by our results, and others, that children who resided with relatives had better SRH than those living with non-relatives. However, these health differences by care type, at least for mental health, do not appear to be inevitable, with a recent meta-analysis showing that adverse psychosocial outcomes for children in residential care could be eliminated if evidence-based treatment was conducted during their stay.[20]

For LS children who could have been 18+ years at the 10-year follow-up and who were 18+ years at the 20-year follow-up, our results are in line with other studies that have shown that young people transitioning out of care have not overcome their 'bad start', but on average have worse health than their non-care peers.[13-14] We also show that even with greater attrition for the longer follow-up, non-parental care differences at 20-year follow-up appeared larger than at 10-year follow-up. This could be due to changes in placement practices over

time,[28, 30-31] but could also reflect existing health differences between care types being magnified by differential transitions into adulthood.[12-13] A few studies have shown that social support and educational achievement, factors related to better health after transition out of care, can vary by care type;[10,12] suggesting some avenues for reducing health inequalities for children in non-parental care.

For the first time, our results show health differences by care type after 30-years follow-up. For young children in our sample, our results are similar to a study using the 1970 British Cohort Study that found higher rates of depression at age 30 in children who had been placed in residential versus foster care.[13] We improved on this study by showing that living with a non-relative, compared to a relative, was associated with higher reporting of not good health 30 years later. A few other studies have shown that middle-aged adults who had spent time in non-parental care had worse mental health,[8-9,15] self-rated health[9] and mortality[3] than children who had not been in care, but these analyses were not split by care type.

Our results concur with two other studies that have shown that health differences by care type were not entirely explained by adjustment for childhood background factors.[13,16] In our study, data on social background were limited to information collected on the day of the census (See Supplementary table S1). In a sensitivity analysis on LS members where we knew their long-term illness (LTI) status, LTI prevalence was much higher for residential compared to other households (23.9% vs 3.5%). However, after controlling for LTI, odds of not good SRH were still higher for LS members who had resided in any care type including residential care than in a parental household (data not shown).

Research from the US where, like the UK, informal relative care is common, suggests that there are few differences between formal and informal relative families with the children having similar needs for health and social services.[32] There is a culture of informal relative

care in Poland and Southern Europe, while in Sweden, Belgium and Germany, amongst others, relative care is expanding.[33] If relative care is to become a more integral part of child welfare services across Europe, we would agree with recommendations by others that policies need to encompass all relatives and the children in their care, including those with informal arrangements.[34-35] For children where placements with non-relatives are unavoidable, further work could determine what interventions can be applied to mitigate their elevated risk of poor health in adulthood. Moreover, for all care leavers we suggest that the recommendation that care leavers programmes should facilitate easy access to diagnosis and treatment is extended to far beyond the transition-to-adulthood phase.[36-37]

Our study has implications for countries outside the UK too. While England has been at the vanguard of the movement away from residential to non-residential care, a decline in residential care is the general policy across Europe, albeit at varying rates of change.[5,38] Our findings of better long-term health after non-residential care provides evidence of potential economic as well as health benefits in support of these changes.

A major disadvantage of using the ONS LS dataset is a lack of data on reason(s) for non-parental care and family characteristics prior to care, which are likely to correlate highly with self-rated health. For example, residential care tends towards older children with behavioural issues,[39-40] and higher rates of depression.[41-42] Contradictorily, living in a relative household is more likely for poorer families,[43] with a poorer carer;[44-45] a strong determinant of health.[46] Therefore, associations between care type and self-rated health could be explained by differential selection into care type.

Another disadvantage of using census data is that they are only available every 10 years. Consequently, we were not able to identify the exact timings of when children were in care. Moreover, we are unable to identify children with and without local authority care orders. As

far as we are aware, there is no reason why misclassification would occur more for relative than for unrelated care groups. Our relative care group comprises children with care orders and those with informal kinship arrangements. Others have found few differences in the social circumstances or the health and wellbeing of children in these two situations.[32,35] Reverse causality may be an issue for the 10-year follow-up results, as younger children could still be in non-parental care at follow-up due to their poor health, but no such issue exists for the 20- and 30-year results as they were ineligible to be in care. However, confounding by indication could still occur if health issues preceded entering care, especially for the residential care group as we could not control for health in childhood. As in any longitudinal study, sample attrition occurred. There were indications in our data that loss to follow-up was greater in the non-parental care groups, particularly for residential care, suggesting that differential associations of health status by care type may be larger than estimated. Finally, as in any study using routine self-reported data, we cannot rule out the possibility of measurement error.

The main strength of this paper was the repeated prospective collection of care type, health and covariates across four decades. Coupled with the data being nationally-representative, this allowed us to investigate whether children who had resided in non-parental care had differential self-reported health up to 30 years later; impossible using a dataset with a smaller sample or shorter follow-up. Using longitudinally linked census data reduced loss to follow-up, and multiple imputation of missing covariate data improved the precision of, and reduced potential confounding in, our results.

In conclusion, even after accounting for childhood demographic and social circumstances, care type is associated with health status decades later. The European Convention on Human Rights 1998 and UK's Children Act 1989 underpin the legal framework that when non-

parental care is required, priority be given to non-residential care, especially the child's extended relatives and friends.[47-48] Our findings resonate with this policy.

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This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

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Key Points:

- It is well known that children and young people who have spent part of their childhood in out-of-home care report significantly worse health than children from the general population, with evidence that this can vary by placement type.
- This study shows associations between care status in childhood and health persist up to 30-years after adults have been in care.
- In particular, associations were highest for adults who had been placed in residential care, followed by a non-relative's then relative's household.

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Missing references 41-48 are listed online in the Supplementary material

Table 1 Sample characteristics by placement type, separately by follow-up cohort: ONS Longitudinal Study.

	10-year follow-up				20-year follow-up				30-year follow-up			
	Parent (n=195,650)	Relative (n=1,390)	Non-Rel (n=792)	ResCare (n=164)	Parent (n=196,280)	Relative (n=1,202)	Non-Rel (n=1,048)	ResCare (n=296)	Parent (n=214,133)	Relative (n=1,347)	Non-Rel (n=908)	ResCare (n=427)
Not good self-rated health, %	9.4	14.0	21.7	29.3	15.3	28.1	29.4	36.8	20.2	26.4	32.2	42.4
Childhood demographics												
Mean age (SD)	8.3 (0.01)	10.2 (0.1)	10.8 (0.2)	12.9 (0.3)	8.7 (0.01)	10.6 (0.2)	11.2 (0.2)	12.5 (0.2)	8.7 (0.01)	11.1 (0.1)	10.9 (0.2)	11.4 (0.2)
Male, %	50.2	48.6	45.2	57.4	48.8	46.5	46.4	56.0	48.8	50.2	43.5	54.4
Cohort												
1971, %	-	-	-	-	24.1	36.1	27.5	39.5	73.8	68.5	71.5	87.8
1981, %	18.6	11.3	32.6	53.7	46.9	47.5	50.3	48.7	26.2	31.6	28.5	12.2
1991, %	51.8	48.5	49.6	40.9	29.0	16.4	22.2	11.8	-	-	-	-
2001, %	29.6	40.2	17.8	5.5	-	-	-	-	-	-	-	-
Born UK, %	97.4	92.9	93.3	95.7	94.7	88.0	91.5	96.0	94.8	83.8	91.0	95.8
Childhood social background												
Marital status HH, %												

Single,	14.6	23.4	30.4	20.3	7.9	20.1	25.6	14.6	50.2	39.0	47.0	58.5
Married,	77.9	52.8	58.0	67.7	86.3	54.5	62.8	74.9	45.2	41.5	41.7	35.2
Divorced/widowed,	7.5	23.8	11.6	11.9	5.8	25.3	11.5	10.5	4.6	19.5	11.3	6.3
Employment Status HH, %												
Employed	70.0	48.4	56.4	56.2	71.5	55.2	62.9	68.2	88.4	70.4	76.5	84.3
Unemployed	3.5	5.6	6.7	7.3	5.6	8.1	10.5	6.2	5.7	8.0	10.2	3.9
Other	26.5	45.9	36.9	36.5	22.9	36.7	26.7	25.6	5.9	21.6	13.3	11.8
No 18+ Qualification, %	76.3	82.4	82.8	83.7	86.6	94.8	90.6	87.9	85.0	93.3	88.9	84.2
NS-SEC HH, %												
Managerial/ Professional	28.9	18.3	20.7	20.9	24.7	16.8	20.3	20.8	27.0	17.8	21.5	24.9
Intermediate/ technical	32.3	28.4	29.9	26.8	32.2	26.6	28.8	30.6	33.0	27.8	29.8	32.2
Routine	38.8	53.3	49.4	52.4	43.0	56.6	50.9	48.6	40.0	54.4	48.7	42.9
Mean children HH (SD)	2.1 (0.002)	1.8 (0.03)	2.0 (0.05)	2.1 (0.1)	2.2 (0.002)	2.1 (0.04)	2.1 (0.05)	2.2 (0.08)	2.3 (0.002)	1.8 (0.04)	1.7 (0.05)	2.4 (0.08)

Note: N refers to the number of observations, not individuals (10-year follow-up = 197,996; 20-year = 198,826 and 30-year = 216,815). All p-values for difference across care group <0.001.

Table 2 Odds of not good self-rated health 10-years later by care status at baseline, ONS Longitudinal Study - baseline 1991 and 2001 censuses (n=157,896, observations=197,996).

	Care status at baseline			
	Parental household	Relative household	Non-relative household	Residential care
Unadjusted	-	1.7 (1.4 to 2.0)	3.4 (2.7 to 4.2)	5.8 (3.7 to 9.2)
+ Age at baseline	-	1.4 (1.2 to 1.7)	2.7 (2.2 to 3.3)	3.9 (2.5 to 6.0)
+ Sex	-	1.7 (1.4 to 2.0)	3.3 (2.7 to 4.2)	6.0 (3.8 to 9.5)
+ Cohort	-	2.1 (1.7 to 2.5)	2.7 (2.2 to 3.4)	3.4 (2.2 to 5.5)
+Country of birth	-	1.7 (1.4 to 2.0)	3.4 (2.7 to 4.2)	5.8 (3.7 to 9.2)
+ All childhood demographics	-	2.1 (1.7 to 2.5)	2.6 (2.1 to 3.3)	3.5 (2.2 to 5.6)
+ Head marital status	-	1.6 (1.3 to 1.9)	3.2 (2.5 to 4.0)	5.7 (3.6 to 9.0)
+ Head employment status	-	1.5 (1.2 to 1.8)	3.1 (2.6 to 4.1)	5.4 (3.4 to 8.5)
+ Head educational achievement	-	1.6 (1.3 to 2.0)	3.3 (2.6 to 4.1)	5.6 (3.5 to 8.9)
+ Head social class	-	1.5 (1.3 to 1.8)	3.2 (2.5 to 4.0)	5.3 (3.4 to 8.4)
+ Number kids in HH	-	1.7 (1.4 to 2.0)	3.4 (2.7 to 4.2)	5.8 (3.7 to 9.2)
+ All social circumstances	-	1.4 (1.1 to 1.7)	3.0 (2.4 to 3.7)	5.1 (3.2 to 8.0)
Fully adjusted	-	**1.6 (1.3 to 2.0)**	**2.2 (1.8 to 2.8)**	**3.0 (1.9 to 4.8)**

Table 3 Odds of not good self-rated health 20-years later by care status at baseline, ONS Longitudinal Study - baseline 1981 and 1991 censuses (n=166,844, observations=198,826)

	Care status at baseline			
	Parental household	Relative household	Non-relative household	Residential care
Unadjusted	-	2.7 (2.3 to 3.3)	2.8 (2.3 to 3.4)	4.5 (3.2 to 6.2)
+ Age at baseline	-	2.4 (2.1 to 2.9)	2.5 (2.1 to 2.9)	3.6 (2.7 to 5.0)
+ Sex	-	2.7 (2.3 to 3.2)	2.8 (2.3 to 3.4)	4.5 (3.3 to 6.4)
+ Cohort	-	2.3 (1.9 to 2.8)	2.7 (2.2 to 3.3)	3.6 (2.6 to 5.1)
+ Country of birth	-	2.6 (2.2 to 3.1)	2.8 (2.3 to 3.4)	4.5 (3.2 to 6.3)
+ All childhood demographics	-	2.4 (2.0 to 2.9)	3.1 (2.5 to 3.8)	4.5 (3.1 to 6.4)
+ Head marital status	-	2.5 (2.1 to 3.0)	2.9 (2.4 to 3.5)	4.5 (3.2 to 6.2)
+ Head employment status	-	2.8 (2.4 to 3.4)	2.8 (2.3 to 3.4)	4.6 (3.3 to 6.4)
+ Head educational achievement	-	2.6 (2.2 to 3.1)	2.8 (2.3 to 3.3)	4.4 (3.1 to 6.1)
+ Head social class	-	2.6 (2.2 to 3.1)	2.8 (2.3 to 3.3)	4.3 (3.1 to 6.1)
+ Number kids in HH	-	2.7 (2.3 to 3.3)	2.8 (2.4 to 3.4)	4.5 (3.2 to 6.2)
+ All social circumstances	-	2.5 (2.1 to 3.0)	2.8 (2.3 to 3.4)	4.5 (3.2 to 6.4)
Fully adjusted	-	**2.0 (1.7 to 2.4)**	**2.8 (2.3 to 3.4)**	**4.1 (2.9 to 5.9)**

Table 4 Odds of not good self-rated health 30-years later by care status at baseline, ONS Longitudinal Study - baseline 1971 and 1981 censuses (n=173,801, observations=216,815)

	Care status at baseline			
	Parental household	Relative household	Non-relative household	Residential care
Unadjusted	-	1.5 (1.2 to 1.7)	2.2 (1.7 to 2.7)	4.6 (3.4 to 6.2)
+ Age at baseline	-	1.3 (1.1 to 1.6)	2.0 (1.6 to 2.4)	4.1 (3.0 to 5.4)
+ Sex	-	1.5 (1.2 to 1.7)	2.1 (1.7 to 2.6)	4.6 (3.4 to 6.3)
+ Cohort	-	1.6 (1.3 to 1.9)	2.3 (1.8 to 2.8)	4.1 (3.0 to 5.6)
+ Country of birth	-	1.5 (1.2 to 1.8)	2.2 (1.8 to 2.7)	4.6 (3.4 to 6.2)
+ All childhood demographics	-	1.6 (1.3 to 2.0)	2.4 (1.9 to 2.9)	4.3 (3.2 to 5.9)
+ Head marital status	-	1.6 (1.3 to 2.0)	2.3 (1.9 to 2.9)	4.6 (3.4 to 6.3)
+ Head employment status	-	1.4 (1.1 to 1.6)	2.1 (1.7 to 2.5)	4.5 (3.3 to 6.1)
+ Head educational achievement	-	1.4 (1.2 to 1.7)	2.1 (1.7 to 2.6)	4.6 (3.4 to 6.2)
+ Head social class	-	1.3 (1.1 to 1.6)	2.1 (1.7 to 2.6)	4.5 (3.3 to 6.1)
+ Number kids in HH	-	1.5 (1.3 to 1.9)	2.4 (1.9 to 2.9)	4.6 (3.4 to 6.2)
+ All social circumstances	-	1.4 (1.2 to 1.7)	2.2 (1.8 to 2.7)	4.5 (3.3 to 6.1)
Fully adjusted	-	**1.3 (1.1 to 1.6)**	**2.0 (1.6 to 2.5)**	**3.9 (2.8 to 5.4)**

SUPPLEMENTARY MATERIALS

MULTIPLE IMPUTATION

As well as the measures in the analysis models (placement type at baseline, SRH at 10, 20 and 30 years follow-up, baseline age, cohort, born in UK, sex, HoH marital status, HoH employment status, HoH educational achievement, HoH social class and number of dependent children in the household), the imputation model also contained auxiliary variables predictive of missingness (measurement number and long-term illness in 1991, 2001 and 2011). Complete data was available for baseline age, cohort or born in UK, so no imputation was required for these variables. As some LS members met the inclusion criteria at 2 censuses, the imputation model was initially run in a wide format (i.e. 1 data row per person), with each LS member potentially having each time-varying variable once or twice for all analysis variables. Children who were in residential care at baseline did not have any data on HoH socioeconomic characteristics. These data were imputed from other data including that from their own HoH characteristics in a subsequent census if they had two observations in childhood. Just over half of the children in residential care had only one observation. Therefore, for these children, imputation of HoH socioeconomic characteristics relied on their similarity to other children with similar values on other variables. A small number (≈200) were observed in care twice, although not necessarily in residential care. Fourteen imputed datasets were obtained via chained equations using 10 cycles per dataset, as this was the percentage of LS members with complete data on care status and self-rated health in 2001 or 2011 who were missing at least one covariate.

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Figure S1. Structure of the data sample: ONS Longitudinal Study, 1971-2001.

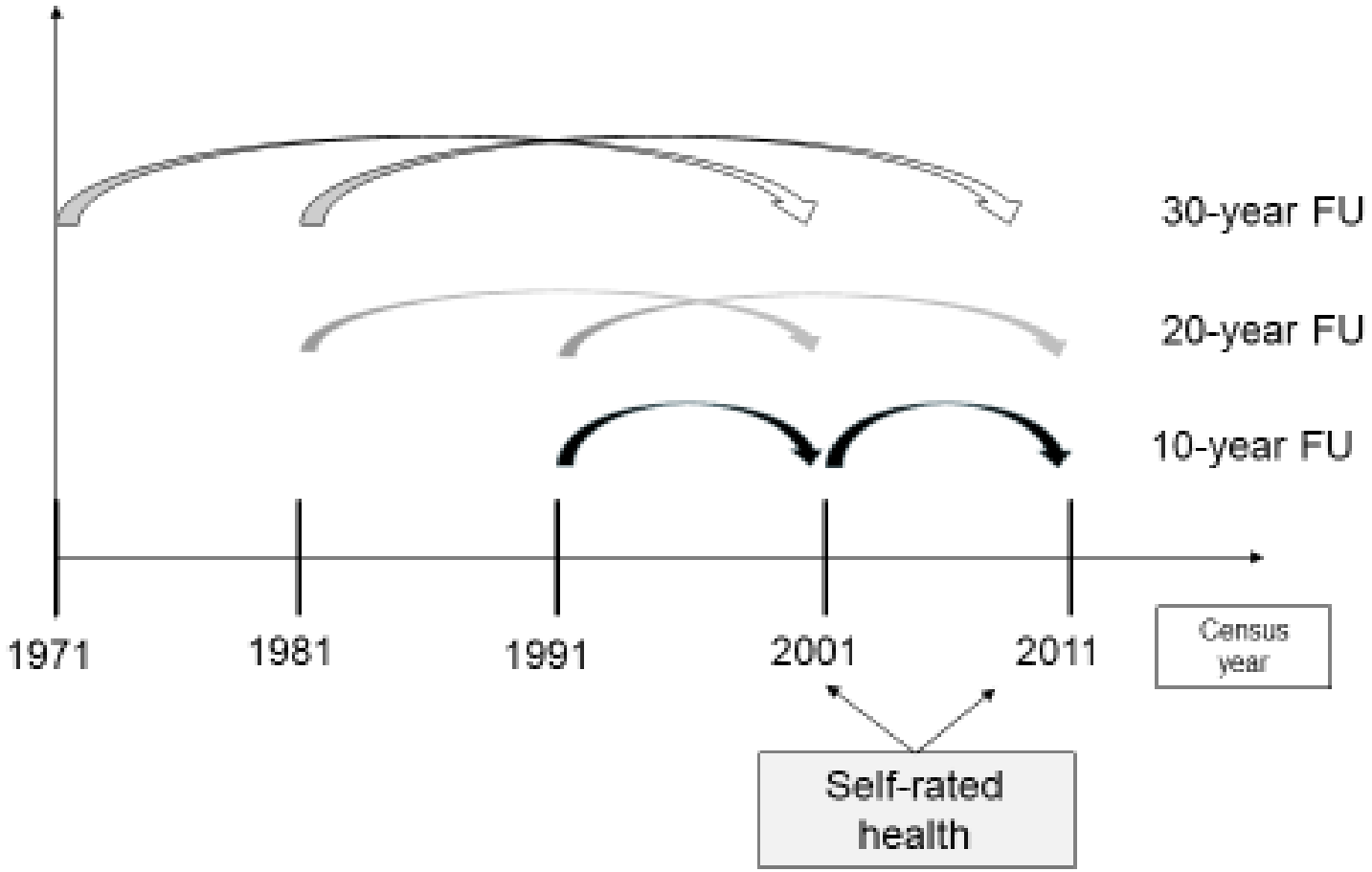

Table S1: Determination of covariate value, from census questionnaires 1971-2001.

Covariate	1971	1981	1991	2001
Age	Derived from census response data - date of birth [age7].	Derived from April 6, 1981 - date of birth [age8].	Derived from April 21, 1991 - date of birth [age9].	Derived from census response data - date of birth [age0].
Gender	Sex as quoted at initial entry point into the LS sample [SEX], replaced by Sex in 2011 [SEX11] if discrepant.			
Country of birth	Country of birth [POB7] 0 = Scotland, Northern Ireland, UK (place not stated); England and Wales. • 1 = all other categories.	Country of birth [COB8] 0 = Scotland, Northern Ireland, England, United Kingdom part not stated and Wales. 1 = all other categories.	Country of birth [COB9] 0 = England, Scotland, Wales, Northern Ireland and United Kingdom (part not stated). 1 = all other categories.	Country of birth [COBP0] 0 = England, Great Britain, Scotland, Wales and Northern Ireland. 1 = all other categories.
Head of household (HoH)	Only include record of non-LS member where NHRC7B7=1 (Relationship to Head of Household 1971).	Only include record of non-LS member where NHOHIND8=1 (Head of household Indicator 1981).	Only include record of non-LS member where NRELAT9=0 (Relationship to Head of household 1991).	Only include record of non-LS member where NHRELAT0 =0 (Relationship to household reference person 2001).
HoH marital status	Marital condition 1971 [NMARCON7]: Write 'SINGLE', 'MARRIED' or 'DIVORCED' as appropriate. If separated and not divorced write 'MARRIED'. 0=married, 1=widowed or divorced, 2=single.	Marital status 1981 [NMARST8]: Please tick the box showing the present marital status. If separated but not divorced please tick 'Married (1st marriage)' or 'Re-married' as appropriate. 0=married or remarried, 1=widowed or divorced, 2=single.	Marital status 1991 [NMRSTAT9]: On the 21st of April what is your marital status? If separated but not divorced, please tick 'Married (first marriage)' or 'Re-married' as appropriate. 0=married or remarried, 1=widowed or divorced, 2=single (never married).	Marital status 2001 [NMSTP0]: what is your marital status (on the 29 April 2001)? 0=married (first marriage), remarried or separated (but still legally married), 1=widowed or divorced, 2=single (never married).

HoH employment status	Economic position 1971 [NECONP7]: Did you have a job last week (the week ended 24th April 1971)? 0=In employment, 1=out of employment, sick or other, 2=retired, permanently sick, student, other inactive.	Economic activity last week 1981 [NECONAC8]: Whether working, retired, housewife etc last week. Please tick all boxes appropriate to your activity last week. 0=In full-time job at any time last week, In part-time job at any time last week or waiting to take up a job already accepted, 1=Seeking work, 2=permanently sick or disabled, housewife, wholly retired from employment, student, other.	Economic status 1991 [NECONP89]: Which of these were you doing last week? Please read carefully through the list and tick all the descriptions that apply. 0=Was working for an employer full time (more than 30 hours per week), was working for employer part time (one hour or more per week), was self-employed employing other people, was self employed not employing other people, was on a government employment or training scheme or was waiting to start a job he/she had already accepted 1=was unemployed and looking for a job, 2=was at school or in other full time education, was unable to work because of long term sickness or disability, was retired from paid work, was looking after the home or family or other (please specify).	Economic position (coded for compatibility with 1981 & 1991) 2001 [NECOP80]: LS derived variable coding full time students as students irrespective of other economic activity. 0=employed part time, employed full time, all self employed categories or waiting to start job, 1=seeking work and ready to start in 2 weeks, 2=retired, student, looking after home, permanently sick or other.

HoH Education	Academic level, 1971 [NEDUC7]: Derived from 'Have you obtained any qualifications after reaching the age of 18 such as: give details. 0=A level or equivalent, other qual higher than A level, other degrees and equivalent or higher university degree; 1=none.	Level of highest qualification at 1981 census [NQMLVHQ8]: Derived from 'Have you obtained any qualifications after reaching the age of 18 such as: give details. 0=Level C (sub degree), Level B (degree level) or Level A (higher degree); 1= No 18+ qualifications.	Level of highest qualification at 1991 census [NQMLVHQ9]: Derived from 'Have you obtained any qualifications after reaching the age of 18 such as: give details. 0=Level C (sub degree), Level B (degree level) or Level A (higher degree); 1= No 18+ qualifications.	Level of highest qualification at 2001 census [NHLQP0]: Derived from census questions on qualifications and professional qualifications. 0= Level 3: 2 A level/HSC/NVQ3 or degree level and above; 1=No qualifications, Level 1 GCSE/O level, Level 2: 5 O level/GCSE.
HoH Social class	'The derivation of 1971 and 1981 NSSEC & Goldthorpe classes is provided in Bukodi and Neuburger (2009) "Data Note. Job and occupational histories for the NSHD 1946 Birth Cohort". The code was kindly provided by Erzsebet Bukodi and adapted for use in the LS by Buscha and Sturgis as part of the ESRC grant 'Inter-cohort Trends in Intergenerational Mobility in England and Wales: income, status, and class (InTIME).'[NNSSEC7 and NNSSEC8]		National Statistics Socio-economic Classification (NSSeC) 1991 [NNSSEC9]. People aged 16 and over who had worked in the last 10 years.	National Statistics Socio-economic Classification (NSSeC) 2001. Calculated from SOC900 [NNSSEC0].
Number of children in household	Number of dependent children usually resident in the household 1971 [HHDCH7]. Coded as 00 – 99. Dependent children are children in families who are either: (a) under 15 years of age, or (b) under 25 years of age and classified as a student.	Number of dependent children in household 1981 [DEPCHNB8]. 0 – 20 = number of dependent children aged <19. A dependent child is a person usually resident in a private household who is either: a) under 16 years of age, or b) aged 16 - 18 with activity last week 'student' and marital condition `single'.	Number of usually resident dependent children aged 0-18 in household, 1991 [DPNCHND9]. 0 – 19 = number of children. 20 = 20 or more children.	Number of dependent children in household 2001 [DPCH0]. Aged 0-18 years. Categories collapsed into 0, 1, 2 or 3 (three or more).

Table S2. Odds of not good self-rated health 10-, 20- and 30-years later by care status at baseline from fully adjusted models[1] of complete case data[2], ONS Longitudinal Study

	10-year follow-up	**20-year follow-up**	**30-year follow-up**
Parental household	Reference	Reference	Reference
Relative household	1.49 (1.20 to 1.84)	2.04 (1.69 to 2.46)	1.26 (1.03 to 1.53)
Non-relative household	2.34 (1.84 to 2.97)	2.73 (2.24 to 3.34)	1.92 (1.52 to 2.41)
Residential care	3.16 (1.97 to 5.06)	5.01 (3.45 to 7.28)	1.56 (1.09 to 2.25)
N	152,320	166,249	171,347
Observations	189,227	198,231	213,169

[1] Adjusted for age at baseline, cohort, sex, country of birth, head of household (HoH) marital status, HoH employment status, HoH educational achievement, HoH social class, number of children in household.

[2] Missing data for HoH marital status, HoH employment status, HoH educational achievement, HoH social class were encoded as an additional category of the relevant variable. Missing values for number of children in household were replaced by the mean.

Table S3: Number (%) of each census dependent child cohort with health data at follow-up 10, 20 and 30 years later, ONS Longitudinal Study

		10 years	20 years	30 years
Care status, 1971				
Parental household	139,012	-	-	111,104 (79.9)
Relative household	665	-	-	484 (72.8)
Non-relative household	564	-	-	370 (65.6)
Residential care	426	-	-	261 (61.3)
Care status, 1981				
Parental household	130,322	-	102,376 (78.6)	103,136 (79.1)
Relative household	1,234	-	830 (67.3)	866 (70.2)
Non-relative household	824	-	547 (66.4)	538 (65.3)
Residential care	289	-	174 (60.2)	167 (57.8)
Care status, 1991				
Parental household	118,937	98,307 (82.7)	94,131 (79.1)	-
Relative household	557	357 (64.1)	557 (67.1)	-
Non-relative household	822	514 (62.5)	822 (61.3)	-
Residential care	215	124 (57.7)	215 (56.7)	-
Care status, 2001				
Parental household	116,611	97,534 (83.6)	-	-
Relative household	1470	1035 (70.4)	-	-
Non-relative household	510	284 (55.7)	-	-
Residential care	83	40 (48.2)	-	-

Table S4. Odds of not good self-rated health 10-, 20- and 30-years later by care status (non-parental care in related and unrelated households combined) at baseline from fully adjusted models[1], ONS Longitudinal Study

	10-year follow-up	**20-year follow-up**	**30-year follow-up**
Parental household	Reference	Reference	Reference
Non-parental household	1.85 (1.60 to 2.15)	2.33 (2.03 to 2.67)	1.56 (1.35 to 1.80)
Residential care	3.04 (1.91 to 4.82)	4.13 (2.90 to 5.90)	3.89 (2.83 to 5.35)
N	157,896	166,844	173,801
Observations	197,996	198,826	216,815

[1] Adjusted for age at baseline, cohort, sex, country of birth, head of household (HoH) marital status, HoH employment status, HoH educational achievement, HoH social class, number of children in household.

Table S5. Odds of not good self-rated health 10-, 20- and 30-years later by care status at baseline from fully adjusted models[1] using a socially disadvantaged reference group[2], ONS Longitudinal Study

	10-year follow-up	**20-year follow-up**	**30-year follow-up**
Parental household	Reference	Reference	Reference
Relative household	1.69 (1.33 to 2.14)	2.19 (1.74 to 2.77)	1.37 (1.09 to 1.72)
Non-relative household	2.40 (1.82 to 3.16)	3.03 (2.36 to 3.90)	2.07 (1.59 to 2.70)
Residential care	3.11 (1.92 to 5.04)	4.63 (3.12 to 6.86)	3.99 (2.79 to 5.70)
N	54,117	61,338	68,730
Observations	58,984	65,746	79,356

[1] Adjusted for age at baseline, cohort, sex, country of birth, head of household (HoH) marital status, HoH employment status, HoH educational achievement, HoH social class, number of children in household.

[2] NS-SEC Routine occupations