Educational Progress of Looked After Children in England: A Study using Group Trajectory Analysis

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Abbreviations:
BIC	Bayesian Information Criterion
GCSE	General Certificate of Secondary Education
GTA	Group Trajectory Analysis
KS1	Key Stage 1 (school years 1-2)
KS2	Key Stage 2 (school years 3-6)
KS3	Key Stage 3 (school years 7-9)
KS4	Key Stage 4 (school years 10-11)
LAC	Looked After Children
OR	Odds Ratio
SENs	Special Educational Needs

Table of Contents Summary
An investigation using group trajectory analysis of care environment and other factors affecting the educational progress of Looked After Children in England.

What's Known on This Subject
Research shows that looked after children tend to have lower educational attainment than other children; this can largely be attributed to their high levels of need. There is evidence that being looked after reduces children's level of educational disadvantage.

What This Study Adds
Applying group trajectory analysis to the educational progress of looked after children facilitates the identification of factors associated with low and high achievement educational paths, including factors

associated with a late decline or a late improvement in children's educational progress.

Contributors' Statements:

Alastair Sutcliffe proposed the research project, obtained the data, and contributed to the formulation of the hypotheses and the drafting of the paper.

Julian Gardiner analysed the data and contributed to the drafting of the paper.

Edward Melhuish contributed to the formulation of the hypotheses, proposed the method of analysis, and contributed to the drafting of the paper.

All authors approved the final draft of the paper.

Abstract

Background
'Looked after' children (LAC) in local authority care are among the most disadvantaged in the country and measures of their wellbeing, including educational outcomes, are poorer than other children's.

Methods
The study sample consisted of all children in England born in academic years 1993/4–1997/8 who were in local authority care at any point during the years 2005/6–2012/13 and for whom results of national tests in literacy and numeracy were available at ages 7, 11 and 16 (N=47,500). Children's educational progress was analysed using group trajectory analysis.

Results
Modelling identified five trajectory groups: Low Achievement, Late Improvement, Late Decline, Predominant and High Achievement. Being looked after earlier was associated with a higher probability of following a High Achievement trajectory and a lower probability of following a Late Decline trajectory. For children first looked after between ages 7 and 16, having a longer total time looked after by age 16 was associated with a higher probability of following a High Achievement trajectory. For children with poor outcomes at ages 7 and 11, being looked after by age 16 was associated with an increased chance of educational improvement by age 16.

Conclusion
This study provides evidence that early entry into care can benefit children by reducing the risk of poor educational outcomes. It also establishes group trajectory analysis as an effective method for analysing the educational progress of LAC, with the particular strength that it allows factors associated with a late decline or improvement in educational progress to be identified.

Introduction

'Looked after' children (LAC) are children for whom the state is responsible as a proxy parent. Whilst the majority of LAC are fostered, some are placed in residential care, adopted or supported to live independently, depending on age and children's level of need. They are some of the most vulnerable and disadvantaged children, and their health outcomes are poor worldwide.[1–5] Educational outcomes are inexorably linked to health outcomes, and tend to be poorer for LAC than for other children.[6–8] However, it has been argued that the educational disadvantage of LAC can mostly be attributed to the difficulties that led to these children being looked after rather than to the effects of government care.[7] Indeed, being looked after may protect children from some of the educational disadvantage that they would otherwise experience.[6,9]

LAC strategy in England is determined by 300 local authorities that compulsorily report annual data to the government.[10–12] In this national study of children who were in the care of the state at any point during the years 2005/6–2012/13 their educational achievement in literacy and numeracy was compared with that of all children in England. Their educational progress was investigated using group trajectory analysis (GTA), a versatile method for identifying groups of individuals showing similar paths for an outcome over time. Originally developed for use in criminology,[13] GTA is now used in many other fields[14] including studying educational progress.[15]

GTA was applied to the educational progress of LAC in literacy and numeracy from age seven years (Key Stage 1, KS1) to age 16 years (Key Stage 4, KS4), when pupils take GCSE exams.

Without prior assumptions the method identifies the trajectory groups that emerge from the data; the demographic and care-related factors associated with membership of each trajectory group are then determined.

Methods

In order to analyse educational progress, we considered the level that children achieved in literacy and numeracy in the tests taken at the end of KS1, Key Stage 2 (KS2), and KS4.[17] Key Stage 3 (KS3) tests were dropped in 2010 and were omitted from the analysis. The data were derived from local authority returns on LAC for the years 2005/6–2012/13. The total number of children in local authority care at any point during these years was 171,097. Educational results were extracted from the National Pupil Database and linked to the annual care returns using children's Unique Pupil Number.[16] Given the years of data collection, only children born in 1991/2–1997/8 could have results for KS1, KS2 and KS4 tests (N = 80,476); 61,405 did so (76.3%). There was a step-change in the rate of entry for LAC for the GCSE exams taken at the end of KS4 between those born in 1991/2–1992/3 and those born in 1993/4–1997/8. We analysed the latter group (N=47,543). Unaccompanied asylum seekers were excluded from the sample (N=43). The final sample consisted of 47,500 children.

Literacy was identified as Reading Level at KS1, English Level at KS2, and English GCSE result at KS4. Numeracy was identified as Maths Level at KS1/KS2 and Maths GCSE result at KS4. To place children's KS4 English and Maths GCSE results on a commensurate scale to the KS1/KS2 test results, approximate equivalences were used: "GCSE passed at grade A* to C" =

level 8, "GCSE passed at grade D to G" = level 5, "GCSE entered but failed" = level 2 and "Not entered for GCSE" = level zero.[18]

Results were obtained for literacy, numeracy and overall educational attainment, defined as the mean of the levels achieved in literacy and numeracy. Since the results were similar for all three outcomes, we report results for overall educational attainment only.

The following covariates were included in the analysis: child's sex, ethnic group, first language, age in school year, academic year of birth, Special Educational Needs (SENs), category of need, placement type (foster care, adoption, independent living, residential), whether the child had had more than one placement type by the end of KS4 and whether the child had spent one or more than one period in care by the end of KS4.

When children are placed in local authority care they are recorded as having one of eight categories of need. A small proportion of children (5.7%) had more than one category of need recorded during their time being looked after; in these cases the earliest recorded category of need was used. The category of need Low Income (N = 135) was merged with Family in Acute Stress. The child's placement type was the last placement recorded before the end of KS4. Placement type "Independent Living" includes placements with the child's own parents or guardian, placement in independent accommodation (including staying with friends or in "bed and breakfast" accommodation), and residential employment. The placement type "Other" (N=278) was merged with "Independent Living".

The total number of looked after periods and the total time looked after were calculated from the annual returns. A period in care may consist of one or more than one placement; the number of individual placements was not recorded in the annual return. The age and educational stage that a child was first looked after were found by subtracting the length of the first recorded period in care from the date of the corresponding record. Only periods in care that extended into the "reporting years" 2005/6–2012/13 were recorded in the data.

Results for LAC at KS1, KS2, and GCSE were compared with those for all children in England.[19–21] Educational progress was analysed using the GTA method developed by Nagin[13] as implemented in the STATA 'traj' plugin.[22] In the GTA modelling procedure the trajectory groups are derived from the outcome variable data. The covariates associated with membership of the trajectory groups are then found through multivariate logistic regression analysis. In the first model (Model 1), the principal covariate of interest was the educational stage when children were first looked after: pre-school, or during educational Key Stages 1, 2, 3 or 4. Children who were first looked after later than the end of Key Stage 4 were used as a reference group.

Model selection was carried out by maximizing the Bayesian Information Criterion (BIC):[13,23]
1. The number of trajectory groups was increased from two until the BIC was maximized, 2. All trajectories were initially assumed to be quadratic, we tested whether modelling each group trajectory as linear improved the BIC, 3. Finally the potential covariates were added successively and retained if adding the covariate increased the BIC.

In Model 2, a refinement of the first model, children first looked after at each educational stage were divided into three groups using tertiles of the total length of time they had spent in care by the end of Key Stage 4.

Results

Demographic and care history variables are summarized in Table 1. There was no missing covariate data.

The educational outcomes of the LAC sample were substantially poorer than those of the general population at each Key Stage; see Tables 2–3.

GTA identified five trajectory groups; 1.Low Achievement (15.9%), 2. Late Improvement (7.0%), 3. Late Decline (20.5%), 4. Predominant (43.3%), and 5. High Achievement (13.3%); see Figure 1. All the trajectories were found to be quadratic, except the Low Achievement group, which was linear. A breakdown of children by educational stage first looked after and trajectory group membership is given in Table 4. The results of Model 1 are given in Table 5. A breakdown of children by educational stage first looked after and tertiles of total time looked after by the end of KS4 is given in Table 6. The results of Model 2 are given in Table 7.

All the potential model covariates were included in the models except child's first language. Model coefficients give the probability of trajectory group membership as odds ratios relative to a reference group. The Predominant group is used as the reference group for the Low Achievement, High Achievement and Late Decline groups. The Late Improvement group follow

a similar trajectory to the Low Achievement group during KS1 and KS2, then show a dramatic improvement in results by KS4 when GCSEs are taken. The question of interest here is, 'What factors are related to whether or not children with poor achievement at KS1 and KS2 improve by the end of KS4?" In order to answer this question, the Low Achievement group was used as the reference group for the Late Improvement group.

Model 1: Educational stage first looked after

See Table 5 and Figure 2. The probability of belonging to the High Achievement group was similar for children first looked after between pre-school and the end of KS2, then declined for children first looked after during KS3 and KS4. Children first looked after at any educational stage up to the end of KS4 were more likely to follow a High Achievement trajectory than children first looked after later than the end of KS4.

The probability of a late decline trajectory followed a complementary pattern, i.e. it was similar for children first looked after between pre-school and the end of KS2, then rose for children first looked after during KS3 and KS4. Children first looked after at any stage up to the end of KS4 were less likely to follow a late decline trajectory than children first looked after later than the end of KS4.

The probability of a Late Improvement trajectory for children who had had a poor educational start was higher for all children first looked after during Key Stages 1–4 than for children first looked after later than the end of KS4.

The probability of following a Low Achievement trajectory was lower for all children first looked after before the end of KS4 than for children first looked after later than the end of KS4. Children first looked after during KS1 had the lowest risk of following this trajectory.

Model 2: Total time in care

See Table 7 and Figure 3. For children first looked after during Key Stages 2–4, those in the highest tertile of time looked after by the end of KS4 were significantly more likely to follow a High Achievement trajectory than those in the lowest tertile. That is, a longer time in care was significantly associated with having the most positive outcome.

For children first looked after during KS3 a longer time in care was significantly associated with a lower probability of following a Late Decline educational trajectory.

The length of time in care by the end of KS4 did not significantly affect the probability of a Late Improvement within each educational stage first looked after.

For children first looked after during KS2 a longer time in care by the end of KS4 was significantly associated with a lower probability of following a Low Achievement trajectory. For children first looked after during KS3 this pattern was reversed, with children with a longer time in care being more likely to follow a Low Achievement trajectory.

Discussion

This study has significant strengths: 1. the large sample size, 2. the application of trajectory analysis to the educational progress of LAC, which we believe to be unprecedented, and 3. the high quality of the local authority data returns, meaning that no children had to be removed from the sample due to missing covariate data.

Some limitations should also be noted. Firstly, the sample includes only those children born in academic years 1993/4–1997/8 who were looked after at some point during the years 2005/6–2012/13. There will be a significant number of LAC who were born in these academic years whose care history did not extend into the years 2005/6–2012/13, with the result that they do not appear in the sample. Many of these children who left local authority care permanently at a fairly early age will have gone on to have good educational outcomes. The absence of these children from the sample means this study may underestimate the beneficial effects on children's educational progress of being looked after at an early stage.

Secondly, periods in care were recorded only if they extended into the years 2005/6–2012/13. Thus some children in the sample may have had earlier periods of being looked after that are not recorded in the data. Thus some children recorded as being first looked after at a given educational stage may have been first in care somewhat earlier and also had a greater total time looked after than the data indicate. This measurement error is likely to weaken the observed effects on trajectory group membership of educational stage first looked after and total time of being looked after.

Of the children who could have had data available from the KS1, KS2 and KS4 tests, 76.3% did so. Providing the probability that a child's educational data was available was determined by the observed model covariates, this data is missing at random and does not lead to biased results. We suggest that the wide range of demographic, need and care related variables included in the models mean that it is likely that the assumption that the data is missing at random is met.

The final limitation to be noted is that correlation cannot be assumed to imply causation. Indeed, in a study of LAC and their educational progress this point needs special emphasis since the problems that cause children to be taken into local authority care, the care environment itself, and educational progress have a complex relationship of mutual influence on each other over time.

Bearing these caveats in mind, it is notable that being looked after at an earlier stage was associated with a higher probability of following a High Achievement trajectory and a lower probability of following a Late Decline trajectory. For children first looked after during Key Stages 2–4, having had a longer time looked after by the end of KS4 was also associated with a higher probability of following a High Achievement trajectory. Similarly, for children first looked after during KS3, having had a longer time looked after by the end of KS4 was associated with a lower probability of following a Late Decline trajectory. The general picture is of better outcomes for those who were looked after earlier and had spent longer in care. However, those children first looked during KS3 who had spent the longest time in care by the end of KS4 had a higher probability of belonging to the Low Achievement group. This may be a consequence of the higher level of need of these children relative to those who had spent a shorter time being

looked after rather than an indication that time in care contributed to low educational achievement.

Children who were first looked after later than the end of KS4 were used as a reference group for children first looked after at earlier stages. In many cases, these children took their GCSEs shortly before being deemed to require local authority care; their relatively poor performance may be at least partly attributed to the high levels of need many of them were experiencing during these exams. This factor means that the conclusion that being looked after increases the probability of a late educational improvement must be tentative. However, it should be noted that the associations found between being first looked after at an earlier educational stage and a greater probability of following a High Achievement path / a lower probability of following a Late Decline trajectory do not depend on the choice of this particular reference group and may be regarded as fairly robust, these conclusions following from comparing groups of children all of whom were first looked after before the end of KS4.

The potential of GTA to identify factors associated with a late decline or improvement in educational achievement is of particular interest. The probability of belonging to the Late Decline group is lower the earlier children were first looked after, and for those first looked after during KS3 it was lower for those who had spent longer being looked after by the end of KS4. Those born in the first half of the academic year were more likely to belong to this group, which leads to the speculation that some children in this group may be those who were easily ahead at primary school but become bored and fell behind. Other risk factors for a Late Decline include being a boy, having had more than one period in care by the end of KS4, having the SEN

Behavioural, Emotional & Social Difficulties, the category of need when first looked after being Socially Unacceptable Behaviour, and the child's placement being Independent Living or Residential rather than Fostering.

There is some evidence that for children with poor educational results up to age 11 being looked after is associated with a higher probability of following a Late Improvement trajectory, although, as noted previously, this conclusion is tentative. The probability of a Late Improvement was higher for girls, and higher for those with Specific learning difficulties or Behavioural, emotional and social difficulties than for other children. Those who had more than one period in care by the end of KS4 were less likely to follow a Late Improvement trajectory, as were those whose placement type was Independent Living or Residential rather than Fostering.

Conclusion

In accord with earlier research, this study provides evidence that being looked after at an early stage and for a longer time is generally beneficial to children's educational progress, a finding that may inform future public policy in this area. We argue that GTA is a flexible and effective tool for analysing the educational progress of LAC. GTA is particular effective in identifying factors associated with temporal changes such as a late decline or late improvement in children's educational achievement. More detailed exploration of the reasons for the temporal changes will require further study, possibly using qualitative methods focussed on individuals identified by trajectory analysis. Research has shown that the factors affecting the educational progress of LAC are internationally comparable.[7] We therefore believe that our conclusions are relevant beyond the UK.

Acknowledgements

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Captions for Figures

Figure 1: The five group trajectories derived from the model of looked after children's educational progress through Key Stages 1, 2 and 4. The percentages of children in each trajectory group are shown below. Group 1 (blue) Low Achievement; Group 2 (red) Late Improvement; Group 3 (green) Late Decline; Group 4 (yellow) Predominant; Group 5 (grey) High Achievement.

Figure 2: Summary of the results of Model 1, showing the effect of the stage when children were first looked after on the probability of belonging to each trajectory group. Results are shown as odds ratio of membership of each trajectory group relative to a reference group: the reference group is the Predominant group (Group 4), except for the results for the Late Improvement group where the reference group is the Low Achievement group (Group 1). Point estimates of the odds ratios are shown with 95% confidence intervals indicated by a vertical line. Stages first in care are abbreviated PS = pre-school, KS1 = Key Stage 1, KS2 = Key Stage 2, KS3 = Key Stage 3, KS4 = Key Stage 4. The dotted horizontal line indicates the effect for children not taken into care until after Key Stage 4 with which the other exposure levels are compared. Models control for all other covariates.

Figure 3: Summary of the results of Model 2, showing the effect of the stage when children were first looked after and the total length of time looked after by the end of Key Stage 4 on the probability of belonging to each trajectory group. Results are shown as odds ratio of membership of each trajectory group relative to a reference group: the reference group is the Predominant group (Group 4), except for the results for the Late Improvement group where the reference group is the Low Achievement group (Group 1). Point estimates of the odds ratios are shown with 95% confidence intervals indicated by a vertical line. Stages first in care are abbreviated PS = pre-school, KS1 = Key Stage 1, KS2 = Key Stage 2, KS3 = Key Stage 3, KS4 = Key Stage 4. Highest tertile of time looked after by end of KS4 = ○, middle tertile of time looked after by end of KS4 = △, lowest tertile of time looked after by end of KS4 = □. The dotted horizontal line indicates the effect for children not taken into care until after Key Stage 4 with which the other exposure levels are compared. Models control for all other covariates.

Tables

Table 1: Breakdown of the sample of looked after children by demographic factors, Special Educational Needs, category of need and care history.

Variable		N	%
Child's sex	Male	24626	51.8
	Female	22874	48.2
Child's ethnic group	White	39310	82.8
	Black	2667	5.6
	Asian	1731	3.6
	Mixed / Other	3792	8.0
Child's first language	English	45173	95.1
	Not English	2327	4.9
Child's month of birth (= age in school year)	Jun / Jul / Aug	12179	25.6
	Mar / Apr / May	11749	24.7
	Dec / Jan / Feb	11776	24.8
	Sep / Oct / Nov	11796	24.8
Child's academic year of birth	1993/4	8559	18.0
	1994/5	9727	20.5
	1995/6	10100	21.3
	1996/7	9724	20.5
	1997/8	9390	19.8
Child's Special Educational Needs	Autistic Spectrum Disorder	2544	5.4
	Behavioural, emotional and social difficulties	16411	34.5
	Moderate learning difficulty	8726	18.4
	Other SEN	2931	6.2
	Physical disability	1248	2.6
	Profound and multiple learning difficulties	1149	2.4
	Speech, language and communication needs	2373	5.0
	Severe learning difficulties	3549	7.5
	Specific learning difficulties	2549	5.4
	Sensory impairment	780	1.6

Table 1 continued: Breakdown of the sample of looked after children by demographic factors, Special Educational Needs, category of need and care history.

Variable		N	%
Child's category of need	Abuse or neglect	21599	45.5
	Child disability	5457	11.5
	Parental illness or disability	1823	3.8
	Family in acute stress	6323	13.3
	Family dysfunction	8315	17.5
	Socially unacceptable behaviour	2581	5.4
	Absent parenting	1402	3.0
Placement type up to the end of KS4	Fostering	26164	55.1
	Adoption	528	1.1
	Independent living / other	3992	8.4
	Residential	12612	26.6
	Not looked after by end of KS4	4204	8.9
Number of types of placement to the end of KS4	One	31152	65.6
	More than one	12144	25.6
	Not looked after by end of KS4	4204	8.9
Number of periods looked after up to the end of KS4	One	38156	80.3
	More than one	5140	10.8
	Not looked after by end of KS4	4204	8.9
Educational stage first looked after	First looked after pre-school	3211	6.8
	First looked after during KS1	4926	10.4
	First looked after during KS2	10596	22.3
	First looked after during KS3	12520	26.4
	First looked after during KS4	12043	25.4
	Not looked after by end of KS4	4204	8.9

Table 2: Children's achievement in literacy and numeracy at Key Stages 1, 2 and 4. Figures for all children in England in 2010 are from the Department of Education.[19,20]

Key Stage	Level attained	LAC Sample				All children in England in 2010	
		Literacy		Numeracy		Literacy	Numeracy
		N	%	N	%	%	%
Key Stage 1	Level 0	11002	23.2	7882	16.6	3	2
	Level 1	12250	25.8	10535	22.2	12	9
	Level 2	20307	42.8	25527	53.7	59	68
	Level 3	3937	8.3	3556	7.5	26	20
	Level 4	4	0.0	0	0.0	0	0
Key Stage 2	Level 0	13438	28.3	13212	27.8	7	6
	Level 2	887	1.9	963	2.0	1	1
	Level 3	11213	23.6	13158	27.7	13	14
	Level 4	18132	38.2	16193	34.1	47	45
	Level 5	3830	8.1	3974	8.4	33	34
Key Stage 4 = GCSE	Not entered ≈ level 0	17704	37.3	14065	29.6		
	Entered but failed ≈ level 2	1944	4.1	4046	8.5		
	Passed at grade D to G ≈ level 5	18452	38.8	20209	42.5		
	Passed at grade A* to C ≈ level 8	9400	19.8	9180	19.3		

Table 3: Children's achievement at English and maths GCSE (Key Stage 4). Figures for all children in England in 2010 are from the Department of Education.[21]

GCSE English and Maths results	LAC Sample		All children in England in 2010
	N	**%**	**%**
Not entered for both exams	18393	38.7	8.9
Entered for both exams, but did not pass both with grade A* to C	22742	47.9	37.3
Passed both exams at grade A* to C	6365	13.4	53.8

Table 4: Percentages of children in each trajectory group broken down by educational stage first looked after.

Educational stage first looked after	N	Group 1: Low achievement	Group 2: Late improvement	Group 3: Late decline	Group 4: Predominant	Group 5: High achievement
First looked after pre-school	3211	14.4%	7.4%	11.8%	49.5%	17.0%
First looked after during KS1	4926	17.5%	8.1%	10.6%	46.5%	17.3%
First looked after during KS2	10596	21.9%	8.7%	11.2%	42.1%	16.1%
First looked after during KS3	12520	18.1%	7.1%	23.6%	39.5%	11.6%
First looked after during KS4	12043	10.0%	4.8%	30.2%	44.3%	10.8%
First looked after later than KS4	4204	10.7%	6.7%	25.5%	45.6%	11.5%
All children	47500	15.9%	7.0%	20.5%	43.2%	13.3%

Table 5: Results of model of group trajectory membership; Model 1. Results are shown as odds ratio (OR) of membership of each trajectory group relative to a reference group: the reference group is the Predominant group (Group 4), except for the results for the Late Improvement group where the reference group is the Low Achievement group (Group 1). 95% confidence intervals and accompanying p-values are given. Number of observations in model = 47,500.

Model coefficient		Group 1: Low achievement		Group 2: Late improvement		Group 3: Late decline		Group 5: High achievement	
		OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Educational stage first looked after	After end of KS4 (reference level)	1.00		1.00		1.00		1.00	
	Pre-school	0.33 (0.26,0.41)	<0.001	1.06 (0.80,1.39)	0.700	0.28 (0.24,0.33)	<0.001	2.36 (2.02,2.76)	<0.001
	During KS1	0.25 (0.21,0.31)	<0.001	1.52 (1.18,1.96)	0.001	0.25 (0.22,0.29)	<0.001	2.76 (2.38,3.19)	<0.001
	During KS2	0.32 (0.27,0.38)	<0.001	1.60 (1.28,2.00)	<0.001	0.27 (0.24,0.30)	<0.001	2.66 (2.34,3.03)	<0.001
	During KS3	0.45 (0.38,0.53)	<0.001	1.47 (1.19,1.82)	<0.001	0.53 (0.48,0.59)	<0.001	1.80 (1.58,2.04)	<0.001
	During KS4	0.40 (0.34,0.47)	<0.001	1.34 (1.09,1.66)	0.007	0.71 (0.64,0.78)	<0.001	1.28 (1.13,1.45)	<0.001
More than one period looked after		1.56 (1.36,1.78)	<0.001	0.62 (0.52,0.73)	<0.001	1.84 (1.68,2.01)	<0.001	0.83 (0.73,0.95)	0.005
Sex = female		0.51 (0.47,0.55)	<0.001	1.38 (1.24,1.53)	<0.001	0.69 (0.66,0.73)	<0.001	1.13 (1.07,1.21)	<0.001
Ethnic group	White (reference category)	1.00		1.00		1.00		1.00	
	Black	0.84 (0.70,1.02)	0.076	0.88 (0.69,1.12)	0.292	0.83 (0.74,0.94)	0.003	1.67 (1.49,1.87)	<0.001
	Asian	0.70 (0.54,0.90)	0.005	1.30 (0.96,1.75)	0.093	0.59 (0.50,0.71)	<0.001	2.14 (1.88,2.43)	<0.001
	Mixed / Other	0.71 (0.60,0.84)	<0.001	0.99 (0.80,1.23)	0.931	1.08 (0.99,1.19)	0.093	1.47 (1.33,1.62)	<0.001
Month of birth	Jun / Jul / Aug (reference category)	1.00		1.00		1.00		1.00	
	Mar / Apr / May	0.96 (0.86,1.07)	0.469	0.96 (0.84,1.10)	0.583	1.06 (0.98,1.14)	0.139	1.04 (0.96,1.14)	0.341
	Dec / Jan / Feb	1.01 (0.90,1.13)	0.890	0.81 (0.71,0.93)	0.003	1.20 (1.11,1.29)	<0.001	1.15 (1.06,1.26)	<0.001
	Sep / Oct / Nov	0.88 (0.79,0.99)	0.033	0.89 (0.78,1.03)	0.116	1.27 (1.18,1.37)	<0.001	1.28 (1.17,1.39)	<0.001
Academic year of birth	1993/4 to 1994/5 (reference category)	1.00		1.00		1.00		1.00	
	1995/6	0.70 (0.63,0.78)	<0.001	1.21 (1.06,1.38)	0.004	0.92 (0.86,0.99)	0.022	1.21 (1.11,1.31)	<0.001
	1996/7 to 1997/8	0.64 (0.59,0.71)	<0.001	1.06 (0.95,1.19)	0.284	1.01 (0.95,1.08)	0.717	1.36 (1.27,1.46)	<0.001

Table 5 continued: Results of model of group trajectory membership; Model 1. Results are shown as odds ratio (OR) of membership of each trajectory group relative to a reference group: the reference group is the Predominant group (Group 4), except for the results for the Late Improvement group where the reference group is the Low Achievement group (Group 1). 95% confidence intervals and accompanying p-values are given. Number of observations in model = 47,500.

Model coefficient		Group 1: Low achievement		Group 2: Late improvement		Group 3: Late decline		Group 5: High achievement	
		OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Special Educational Needs	Autistic Spectrum Disorder	3.80 (3.18,4.54)	<0.001	0.51 (0.42,0.63)	<0.001	1.06 (0.86,1.30)	0.604	0.91 (0.71,1.17)	0.456
	Behavioural, emotional and social difficulties	0.96 (0.87,1.05)	0.356	1.28 (1.15,1.43)	<0.001	1.25 (1.17,1.32)	<0.001	0.60 (0.56,0.64)	<0.001
	Moderate learning difficulty	5.23 (4.76,5.75)	<0.001	0.90 (0.81,1.01)	0.066	1.09 (1.01,1.18)	0.033	0.23 (0.20,0.25)	<0.001
	Other SEN	0.62 (0.51,0.75)	<0.001	1.62 (1.30,2.02)	<0.001	0.75 (0.66,0.85)	<0.001	1.00 (0.89,1.11)	0.964
	Physical disability	1.86 (1.46,2.37)	<0.001	1.00 (0.77,1.30)	0.996	0.73 (0.52,1.02)	0.063	0.80 (0.57,1.12)	0.197
	Profound and multiple learning difficulties	109.52 (56.48,212.38)	<0.001	0.05 (0.02,0.10)	<0.001	1.95 (0.73,5.22)	0.181	0.11 (0.00,3.10)	0.193
	Speech, language and communication needs	3.10 (2.67,3.60)	<0.001	0.81 (0.69,0.95)	0.011	0.86 (0.72,1.02)	0.086	0.40 (0.32,0.50)	<0.001
	Severe learning difficulties	94.54 (73.50,121.61)	<0.001	0.11 (0.09,0.13)	<0.001	1.76 (1.20,2.60)	0.004	0.26 (0.13,0.52)	<0.001
	Specific learning difficulties	0.74 (0.61,0.89)	0.002	2.41 (1.96,2.95)	<0.001	0.82 (0.72,0.93)	0.002	0.32 (0.26,0.38)	<0.001
	Sensory impairment	1.80 (1.35,2.41)	<0.001	0.84 (0.60,1.18)	0.311	0.88 (0.64,1.21)	0.442	0.74 (0.52,1.06)	0.099
Category of need	Abuse or Neglect (reference category)	1.00		1.00		1.00		1.00	
	Child Disability	11.36 (9.67,13.35)	<0.001	0.21 (0.17,0.25)	<0.001	1.43 (1.17,1.73)	<0.001	1.31 (1.03,1.66)	0.029
	Parental Illness or Disability	0.72 (0.56,0.92)	0.008	1.07 (0.81,1.43)	0.623	0.89 (0.76,1.04)	0.151	1.44 (1.27,1.63)	<0.001
	Family in Acute Stress	0.87 (0.76,0.99)	0.035	0.97 (0.82,1.15)	0.747	1.14 (1.05,1.23)	0.001	0.88 (0.80,0.97)	0.010
	Family Dysfunction	0.89 (0.79,1.01)	0.066	0.90 (0.77,1.05)	0.194	1.20 (1.11,1.29)	<0.001	0.83 (0.76,0.90)	<0.001
	Socially Unacceptable Behaviour	1.39 (1.16,1.66)	<0.001	0.67 (0.52,0.86)	0.002	1.84 (1.65,2.04)	<0.001	0.55 (0.45,0.66)	<0.001
	Absent Parenting	0.70 (0.53,0.93)	0.014	1.02 (0.71,1.45)	0.925	1.15 (0.99,1.34)	0.060	1.06 (0.90,1.24)	0.495
Placement type	Fostering (reference level)	1.00		1.00		1.00		1.00	
	Adoption	0.72 (0.45,1.16)	0.181	1.10 (0.63,1.94)	0.731	0.70 (0.47,1.04)	0.081	1.28 (1.03,1.59)	0.025
	Independent living	1.27 (1.08,1.50)	0.005	0.71 (0.58,0.87)	<0.001	1.83 (1.66,2.01)	<0.001	0.84 (0.76,0.94)	0.001
	Residential	4.04 (3.65,4.47)	<0.001	0.34 (0.30,0.38)	<0.001	2.98 (2.79,3.18)	<0.001	0.44 (0.39,0.49)	<0.001
More than one type of placement		0.85 (0.77,0.94)	0.001	1.18 (1.04,1.33)	0.009	1.38 (1.30,1.47)	<0.001	0.73 (0.68,0.79)	<0.001

Table 6: Numbers in tertiles of time looked after by the end of Key Stage 4 for children first looked after at each educational stage. Tertile boundaries are given in months. Points on the boundary are included in the higher tertile.

Educational stage first looked after	Number in first tertile	Tertile 1 / Tertile 2 boundary (months)	Number in second tertile	Tertile 2 / Tertile 3 boundary (months)	Number in third tertile	Number in all tertiles
Pre-school	996	156	1103	173	1112	3211
During KS1	1604	119	1591	130	1731	4926
During KS2	3389	75	3446	90	3761	10596
During KS3	4103	34	4238	46	4179	12520
During KS4	3849	8	3243	18	4951	12043
After end of KS4						4204
TOTAL						47500

Table 7: Results of model of group trajectory membership; Model 2. Results are shown as odds ratio (OR) of membership of each trajectory group relative to a reference group: the reference group is the Predominant group (Group 4), except for the results for the Late Improvement group where the reference group is the Low Achievement group (Group 1). The effect of being taken into care at a given educational stage and a given total time in care by the end of Key Stage 4 are compared with children who were first taken into care after the end of Key Stage 4. 95% confidence intervals and accompanying p-values are given. The model controls for the same covariates as Model 1. Number of observations in model = 47,500.

Model coefficient for educational stage first looked after and total time looked after by end of KS4		Group 1: Low achievement		Group 2: Late improvement		Group 3: Late decline		Group 5: High achievement	
		OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
First looked after pre-school	Highest tertile of time looked after	0.31 (0.23,0.42)	<0.001	1.04 (0.72,1.51)	0.818	0.26 (0.21,0.33)	<0.001	2.11 (1.70,2.62)	<0.001
	Middle tertile of time looked after	0.36 (0.27,0.49)	<0.001	0.93 (0.64,1.35)	0.713	0.30 (0.24,0.37)	<0.001	2.53 (2.05,3.13)	<0.001
	Lowest tertile of time looked after	0.29 (0.21,0.40)	<0.001	1.24 (0.84,1.81)	0.275	0.26 (0.20,0.33)	<0.001	2.59 (2.09,3.22)	<0.001
First looked after during KS1	Highest tertile of time looked after	0.25 (0.19,0.33)	<0.001	1.55 (1.12,2.14)	0.008	0.25 (0.20,0.30)	<0.001	2.55 (2.12,3.07)	<0.001
	Middle tertile of time looked after	0.22 (0.17,0.29)	<0.001	1.62 (1.15,2.28)	0.006	0.26 (0.21,0.31)	<0.001	3.11 (2.58,3.75)	<0.001
	Lowest tertile of time looked after	0.28 (0.21,0.37)	<0.001	1.41 (1.02,1.96)	0.038	0.24 (0.20,0.30)	<0.001	2.80 (2.32,3.38)	<0.001
First looked after during KS2	Highest tertile of time looked after	0.25 (0.20,0.31)	<0.001	1.71 (1.31,2.23)	<0.001	0.25 (0.21,0.29)	<0.001	2.97 (2.56,3.46)	<0.001
	Middle tertile of time looked after	0.30 (0.24,0.37)	<0.001	1.66 (1.27,2.16)	<0.001	0.27 (0.23,0.32)	<0.001	2.71 (2.32,3.17)	<0.001
	Lowest tertile of time looked after	0.43 (0.35,0.53)	<0.001	1.48 (1.15,1.91)	0.002	0.27 (0.23,0.31)	<0.001	2.39 (2.04,2.79)	<0.001
First looked after during KS3	Highest tertile of time looked after	0.51 (0.42,0.62)	<0.001	1.47 (1.15,1.87)	0.002	0.38 (0.33,0.44)	<0.001	2.10 (1.81,2.45)	<0.001
	Middle tertile of time looked after	0.42 (0.34,0.51)	<0.001	1.57 (1.22,2.01)	<0.001	0.55 (0.49,0.63)	<0.001	1.75 (1.50,2.04)	<0.001
	Lowest tertile of time looked after	0.40 (0.33,0.49)	<0.001	1.35 (1.04,1.75)	0.025	0.64 (0.57,0.73)	<0.001	1.60 (1.37,1.86)	<0.001
First looked after during KS4	Highest tertile of time looked after	0.40 (0.33,0.49)	<0.001	1.22 (0.95,1.58)	0.125	0.73 (0.65,0.82)	<0.001	1.39 (1.20,1.60)	<0.001
	Middle tertile of time looked after	0.38 (0.30,0.47)	<0.001	1.43 (1.08,1.90)	0.012	0.65 (0.57,0.74)	<0.001	1.41 (1.20,1.65)	<0.001
	Lowest tertile of time looked after	0.40 (0.33,0.50)	<0.001	1.44 (1.10,1.88)	0.008	0.71 (0.64,0.80)	<0.001	1.09 (0.93,1.27)	0.275