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Pregnancy associated outcomes in women who spent some of their childhood in care: findings from the UK Millennium Cohort Study

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4 **of their childhood in care: findings from the UK Millennium**
5 **Cohort Study.v**
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ABSTRACT

Objectives

There has been very little description of the health and social outcomes at pregnancy and early motherhood of girls who were previously in care. The objectives of this study were to compare the sociodemographic and health profiles of mothers who had spent time in care as a child to mothers who had not. In particular to examine associations between the mothers spending time in care with the likelihood of smoking during pregnancy, the presence of symptoms of maternal depression and the initiation of breastfeeding.

Design

A retrospective cross sectional study using the baseline questionnaire of the Millennium Cohort Study

Setting

The UK.

Participants

A nationally representative study of 18,492 mothers of babies born in the UK during 2000-2002. These mothers were born between the 1960 and the mid-1990s.

Exposure

A history of being a looked after child.

Primary and secondary outcome measures

1. The likelihood of smoking during pregnancy
2. Symptoms of maternal depression
3. The initiation of breastfeeding

Results

Women who had spent time in care were significantly less likely to be of higher social class, to live in a high-income household or to have achieved a high level of education. They were more likely to have a low birth weight baby and be a single parent. Women who had spent time in care were 3 times more likely to smoke during pregnancy (adj. OR 3.0 95% CI 2.14, 4.3) and were twice as likely to have symptoms of depression (adj. OR 1.98 95% CI 1.4-2.7) compared with women who had not spent time in care.

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Conclusions

Our results suggest that these women carry social disadvantage into motherhood, with the potential of continuing the cycle of deprivation. There is a case for increasing our attention on this group who can be readily accessed by maternity and early years' services.

For peer review only

ARTICLE SUMMARY

This study uses the UK Millennium Cohort study to identify mothers who had spent part of their childhood as a looked after child. We looked at the difference in socio-demographic factors and health outcomes between these women and women who had not been in care during their childhood. We also looked at the likelihood of three health-related maternal outcomes: smoking in pregnancy, maternal depression and the initiation of breast feeding. Mothers who had spent part of their childhood in care had worse health and social outcomes than those who had not.

Strengths and Limitations

- Nationally representative sample
- Potential selection bias against mothers who had spent time in care and whose own children had been taken into care

INTRODUCTION

Children looked after by local authorities are an important group for public health action. In the year ending March 2013, there were approximately 68 110 looked after children in England (57 per 10,000 children) [1 2] and it has been estimated that during their childhood, around 3% of children in England and Wales spend some time in care [3]. These children often come from vulnerable households, and have many risk factors for poor social, educational and health outcomes [4 5]. Many of these health, social, and psychological difficulties are related to the reasons for the child entering the care system. Sixty-two percent of these children entered the care system due to abuse or neglect, and for 3% of looked after children, their own health problems led to them entering care [2]. It is likely that these disadvantages continue into adult life for many of these children[6]. Despite these health and social disadvantages, there is very little evidence on the health status of this group. They are an underrepresented group in research as they are a highly mobile group, with issues of parental consent making enrolment into research studies difficult [7].

Few studies have used nationally representative samples focusing on health outcomes over the life course of looked after children [1 6 8]. Even fewer have investigated outcomes during pregnancy and early motherhood [9]. In particular, whether mothers with a history of time spent in care have adverse maternal and pregnancy outcomes is currently unknown.

Pregnancy and early motherhood is an important point in the life cycle: a time when women have a high level of contact with health and social care services. As a consequence there is potential for interventions to break the cycle of deprivation especially with adults who have previously spent time in care and who may have had a reduction in residential stability leading to disjointed health service access and reduced exposure to health advice and information.

Although previous work has looked at the associations between sexual risk behaviours and a history of time in care, very little evidence is available on the health status and maternal outcomes of these women. Previous research has shown that girls who are looked after by local authorities have worse sexual health outcomes than girls who had never been in care. Girls who have been in care have a greater risk of teenage pregnancy earlier age at first intercourse and an increased number of sexual partners compared to girls who had not spent any time in the care system [10-13].

In a review of maternal predictors for child health status, emotional wellbeing, and educational attainment, Keirnan and Mensah found that mothers who had spent time in care before the age of 17 were more likely to report that their child was in fair or poor health rather than good or excellent health, compared to mothers who had not lived away from home [9]. As far as we are aware, investigation of maternal and pregnancy outcomes whilst accounting for possible confounding factors such as socioeconomic class and maternal education has not previously been published.

The early years have been shown to be crucial for positive child development. We chose to focus on maternal indicators and behaviours that are likely to have an impact on child physical and mental wellbeing: smoking during pregnancy, breastfeeding initiation, symptoms of maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [14]. Maternal

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3 depression is associated with impaired mother-infant attachment, and children of depressed
4 mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater
5 risk of psychopathology in later life [15-17]. Despite breastfeeding having short and long term health
6 benefits for both mother and baby [18], the UK has one of the lowest rates of breastfeeding
7 worldwide, especially in young white women from disadvantaged social groups [19].
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10 We compared the sociodemographic and health profiles of mothers who had spent time in care as a
11 child to mothers who had not. We also looked at the relationship between the mothers spending
12 time in care with the likelihood of the outcomes of smoking during pregnancy, the presence of
13 symptoms of maternal depression and the uptake of breastfeeding.
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16 17 **METHODS**

18 19 **Millennium Cohort Study**

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22 The Millennium Cohort Study is a nationally representative cohort study of 18 818 infants from
23 18,553 families born in the UK [20]. A random two-stage sample of all infants born in the UK
24 between 2000 -2002, and who were alive and resident in the UK at 9 months was drawn from the
25 Department of Social Security Child Benefit Registers. Children born in England and Wales were
26 recruited between September 2000 and August 2001, and Children born in Scotland and Northern
27 Ireland were recruited between November 2000 and January 2002. Child Benefit Registers cover
28 virtually all children, but excludes those whose residence status is uncertain or temporary. Children
29 who had died within the first 9-10 months of life were excluded. These children are estimated to be
30 less than 1% of all births [21]. The study used stratified sampling by electoral ward, with
31 oversampling to ensure adequate representation of families living in poverty and those living in
32 areas with high ethnic minority populations. Parents and guardians were interviewed by trained
33 interviewers to capture socio-demographic and health information when their children were 9
34 months old, with subsequent follow up at 3, 5 and 7 years.
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40 This study was a cross sectional survey using the baseline questionnaire (9 months postnatally) of
41 the Millennium Cohort Study.
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44 **Time spent in care as a child**

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46 Mothers were asked the question "Before the age of 17 did you spend any time living away from
47 both of your parents?" If they answered yes, they were asked to indicate the nature of the time
48 spent away from home and the amount of time they spent in care. Parents who had spent time in a
49 children's home or with foster parents run by either a local authority or a charitable organisation
50 were coded as having spent time in care. We classed mothers who had spent any amount of time in
51 care as the "exposed." group. The comparison ("unexposed") group consisted of all mothers who
52 had answered "no" to the question "Before the age of 17 did you spend any time living away from
53 both of your parents?", or who had only spent time in a boarding school, prison or young offenders
54 institution, or with relatives. Mothers who did not answer the question or who indicated that they
55 were unsure of their answer were excluded.
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Breast feeding

Mothers were asked if they ever tried to breastfeed their cohort baby. If they answered yes, they were asked when they last gave their baby breast milk. Their answer was converted into breastfeeding duration, and then categorised into 'never', 'less than 2 months' 'over 2 and less than 4 months' and 'over 4 months.' The information was also coded into a binary category of 'never' and 'ever breastfed'.

Smoking during pregnancy

Maternal smoking was coded as 'current non-smoker', 'smoked during pregnancy', or 'gave up smoking during pregnancy'. These categories were recoded as a binary outcome of 'smoked during pregnancy' and 'did not smoke during pregnancy'.

Symptoms of depression

Symptoms of depression were measured using 9 questions of the validated Malaise Inventory [22 23].

Ethnicity

Ethnicity was analysed as 'white' or 'non-white'.

Potential confounding factors

Mother's age at the birth of the child, household socioeconomic class, household income and mother's education were considered as potential confounding factors. Household socioeconomic class was measured by taking the occupation of the parent with the highest socioeconomic position according to the four UK National Statistics socioeconomic categories. Household income was calculated from the self-reported data on the questionnaire. Mother's education was determined by their highest attainment of a National Vocational Qualification or equivalent group. These qualifications were grouped as follows: higher (bachelor's degree or equivalent), medium (end of schooling at age 18, A'Level or equivalent), lower (end of compulsory schooling at age 16, GCSE or equivalent, or lower).

Inclusion and exclusion criteria

The Millennium Cohort Study did not recruit families if the child had been taken into care at the time of initial assessment.

For this analysis, mothers were included if they were the birth mother of the Millennium Cohort Study participant. Mothers who did not answer the question of whether they lived away from home were excluded, as were mothers who answered the question as "I don't know".

One study participant who withdrew consent after the study began was excluded.

Duplicate interviews were identified and excluded, removing the additional interviews of women who had more than one child recruited into the study.

Statistical analysis

First, we compared the following characteristics of the “exposed” with “unexposed” groups using the Chi-squared statistic: gestational age (coded in weeks), birth weight (below 2.5Kg or below 2.5 Kg), mode of delivery (normal, instrumental, caesarean section), parity (1, 2, 3 or >3 previous children), and family status (lone parent, cohabiting, or married).

We then used logistic regression to estimate odds ratios for a history of time spent in care and the outcomes of smoking during pregnancy, breastfeeding initiation and symptoms of depression, with adjustment for potential confounding factors. Potential confounders were included if they were significantly associated with the outcome (indicated by Wald, $P < 0.05$) after controlling for other factors in the model. The “unexposed” group were used as the reference for these analyses. Cases with missing data were excluded from regression analyses.

All analyses took into account the clustered stratified study design by using the survey commands in Stata version 13.0 [24]. Reported p values and confidence intervals account for clustering, and estimates of proportions and odd ratios are weighted by sampling weights [25].

RESULTS

There were 18,552 respondents of the baseline interview of the Millennium Cohort Study. Fifty-seven respondents who were not the natural mothers of the cohort baby were excluded, as were 3 interviews that did not have data relating to their time in care history. Therefore our study population included 18,492 natural mothers.

In the study population, there were 291 mothers who reported spending time in care as a child, which was 1.5% of the cohort (95% CI 1.3-1.8). Of the mothers who reported spending time in care, 75% spent a year or more in care (see Table 1).

Table 1 - Distribution of time spent in care by the 291 mothers who reported spending time in care

Time in care	Frequency	Percent
Less than 3 months	38	13
3 months to 1 year	35	12
1-2 years	42	14
2-5 years	90	31
5 -10 years	44	15
> Over 10 years	42	15
Total	291	

These mothers were born in previous decades, with 5% born after 1980, 42% between 1970 and 1980, 50% between 1960 and 1970 and 4% born before 1960. Mothers who had spent time in care were younger, less likely to achieve a high social class, less likely to have a high household income and less likely to have achieved a high level of education, compared with the rest of the cohort (Table 2). They were also more likely to be a single parent, have a larger family and to smoke during their pregnancy (table 3). There was no statistically significant association between ethnic group and reporting spending time in care. These differences were all statistically significant at the 5% level.

Although their babies were more likely to be born by normal vaginal delivery, they were more likely to have a low birth weight, but there were no statistically significant differences in the gestation at delivery when compared to non-exposed women (table 4).

Table 2 - Socio-demographic characteristics of women with and without a history of time spent in care

Characteristic	Time in Care		P value
	Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI]	
Age at delivery			<0.001
<20	11.1 [7.7,15.9]	4.9 [4.4,5.3]	
20-29	59.3 [52.3,65.9]	41.3 [39.6,43.0]	
30-39	28.6 [22.6,35.5]	50.3 [48.5,52.1]	
>40	1.0 [0.3,3.9]	3.6 [3.3,4.0]	
Ethnic group			0.52
White	88.3 [82.3,92.5]	86.8 [84.3,88.9]	
Other ethnic group	11.7 [7.5,17.7]	13.2 [11.1,15.7]	
Social Class			<0.001
Managerial	17.3 [18.8,24.6]	44.9 [42.7,47.1]	
Intermediate occupations	16.0 [11.5,21.8]	19.6 [18.8,20.5]	
Routine and manual	51.3 [44.5,58.0]	30.8 [29.1,32.6]	
Never worked and long term unemployed	15.4 [11.2,20.9]	4.6 [4.0,5.4]	
Household income			<0.001
<£10,400	48.4 [41.3,55.4]	22.1 [20.7,23.6]	
10,400-20,800	35.2 [28.7,42.2]	31.9 [30.3,33.4]	
£20,800 -31,200	9.5 [6.0,14.9]	22.1 [20.9,23.3]	
£31,200-52,000	5.3 [2.5,10.9]	17.0 [15.8,18.3]	
>£52,000	1.7 [0.7,4.2]	7.0 [5.6,8.6]	
Education			< 0.001
Higher	11.7 [7.2,18.5]	32.9 [30.7,35.1]	
Medium	7.5 [4.6,12.1]	14.3 [13.6,15.0]	
Lower	37.4 [31.6,43.6]	38.0 [36.3,39.7]	
Other	4.0 [1.8,8.7]	2.4 [2.1,2.8]	
Lone parent	10.4 [6.8,15.25]	3.5 [3.0,4.1]	<0.001

Table 3 - Pregnancy and maternal characteristics of women with and without a history of time spent in care

Characteristic	Time in Care		P value
	Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	
Parity			<0.001
1	28.7 [22.6,35.6]	41.4 [40.3,42.5]	
2	33.9 [28.2,40.2]	35.8 [34.9,36.7]	
3	17.7 [13.6,22.7]	15.0 [14.3,15.7]	
>3	19.7 [14.6,26.2]	7.9 [7.3,8.5]	
Smoking during pregnancy			<0.001
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	
Gave up	14.9 [10.4,21.1]	13.3 [12.5,14.1]	
Never smoked	27.1 [21.5,33.5]	65.9 [64.6,67.3]	
Symptoms of depression			<0.001
Yes	31.3 [25.4,37.8]	13.4 [12.7,14.1]	

No 68.7 [62.2,74.6] 86.6 [86.0,87.3]

Table 4 - Birth and neonatal outcomes for women with and without a history of time spent in care

Characteristic	Time in Care		P value
	Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	
33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
>37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birthweight			0.009
2.5kg or above	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
Below 2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breast feeding			<0.001
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Table 5 shows the odds ratios for the association between having spent time in care and smoking during pregnancy, breastfeeding and symptoms of postnatal depression. Women who had spent time in care were 3 times more likely to smoke during pregnancy compared with women who had not spent time in care, even after adjusting for possible confounding factors. They were also less likely to initiate breastfeeding compared with women who had not spent time in care, although this effect was smaller and not statistically significant after adjusting for other factors (table 5). Women who had spent time in care were twice as likely to have symptoms of depression, even after controlling for possible confounding factors.

Table 5 - Unadjusted and adjusted odds ratios (95% CI) for smoking during pregnancy, any breastfeeding and symptoms of depression among mothers according to previous time spent in care

	% ^f of participants (n)	Unadjusted (95% CI)	Adjusted (95% CI)
Mother smoked during pregnancy	(18,485)		
No time spent in care	20.8 (4,051)	1	1
Any time spent in care	58.0 (173)	5.3 (3.9-7.1)	3.0 (2.1-4.3)*
Any breastfeeding	(18,488)		
No time spent in care	69.7 (11,988)	1	1
Any time spent in care	53.5 (156)	0.5 (0.4-0.7)	1.1 (0.7-1.4)*

Symptoms of depression	(17,766)		
No time spent in care	13.4 (2,566)	1	1
Any time spent in care	31.3 (87)	2.94 (2.19-3.96)	1.98 (1.4-2.7)*

^fWeighted percentages

*Adjusted for maternal age, income, education and social class

DISCUSSION

Summary of findings

In our study, which represents the mothers of babies born in the UK during 2001-2002, 1.6% of women in this cohort had spent some of their childhood in the care system. The majority of these women had spent a year or more in care. The mothers in our study who had spent some of their childhood in care were disadvantaged in terms of social and economic factors when compared to the mothers who had not spent time in care. They were more likely to smoke during their pregnancy and have symptoms of depression. This likelihood persisted after adjusting for confounding factors. In univariable analysis, they were less likely to breastfeed, but this effect did not persist after adjusting for confounding factors. This suggests that these women carry social disadvantage into adulthood and motherhood, with the potential of continuing the cycle of deprivation.

Comparison with other studies

As far as we are aware, this study is one of the first to look at health status and maternal outcomes of pregnant women who have previously been in care. The links between social disadvantage and being a looked after child, and the links between social disadvantage and poor maternal outcomes are well documented. It is not surprising that the findings of this study show that being a looked after child and is associated with social disadvantage and adverse maternal outcomes. Previous studies have shown that looked after children are more likely to become teenage mothers. Compared to previous estimates of the number of children in England in care at any one time, our estimate is considerably lower. Simkiss et al. [3], suggest that 3% of children in the UK have spent some time in care. Our estimate may be low because we have missed many mothers who have previously been in care, which could be due to them declining to take part, or because their children had been taken into care. If this is the case, then these mothers are likely to be different to those who agreed the recruitment of their children. It is likely that the families who were not recruited into the Millennium Cohort Study were more unstable than those who were, or who had a greater distrust of institutions.

Strengths and limitations

A strength of this study is the use of Millennium Cohort Study data, a nationally representative sample which ensured adequate representation from socially disadvantaged groups and people from ethnically diverse backgrounds. Using this cohort allowed us to capture women who had previously been in care during their adult lives, which can be otherwise difficult to do. A major limitation of this

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3 study is that a large number of women with a history in care may not be included in the MCS, due to
4 not agreeing to take part or being ineligible because their own children had been taken into care.
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7 However, although we can compare our prevalence to estimates of children currently in care, it is
8 not possible to obtain estimates of how many women of child bearing age at the time of our cohort
9 may have been in care during their childhoods without prevalence data of looked after children from
10 the 1960s to the 1990s.
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12 13 **Potential mechanisms and policy implications**

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15 The population of this study are women born between the 1960's and mid-1980s, and their children
16 who are now 13-14 years old. The findings of this study have relevance to these children as they
17 enter adolescence and adulthood, as evidence suggests that activity in the early years can have
18 lasting effects on health and psychosocial functioning [26-28]
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21 From this study it is not possible to determine whether the social disadvantage is a direct
22 antecedent to being in care, or whether being in care led to subsequent social disadvantage. The
23 question remains whether being in care confers a disadvantage in terms of maternal behaviours and
24 outcomes over and above the social and economic disadvantage.
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28 However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of
29 the social care system is to reduce the social disadvantage that the child experienced on entering
30 care, and idealistically improve their life circumstances in order for the child to have a better start in
31 life. Our results show that the UK still has a long way to go in reducing the long term disadvantage
32 experienced by children in care. Of particular concern is the evidence presented here that suggests
33 that this disadvantage persists to child bearing age and is associated with maternal behaviours and
34 outcomes that have the potential to affect the health and wellbeing of their children.
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38 It is known that maternal smoking, depression and breast feeding rates are potentially modifiable
39 behaviours with appropriate screening, education and support from healthcare professionals. Tools
40 exist to screen for and identify perinatal depression, and there are ways that women with
41 depression can be supported and treated [29]. Likewise, smoking in pregnancy and breastfeeding
42 can be asked about and women who would like to change their current behaviours can be supported
43 to change [19 30 31]. Pregnancy and early motherhood is a time when women who are often
44 otherwise healthy have a large amount of contact with health care services. These results suggest
45 that it may be worthwhile to pay particular attention to women who have a history in being in care
46 when they present to health and social care services during pregnancy and early motherhood.
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48 Currently a history of time in care is not part of the routine information collected during prenatal
49 visits. It has been suggested that a wider range of socio-demographic information should be
50 collected in order to create a deeper understanding of the individual mother's needs [9].
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54 The best way to use this information for policy changes is yet to be determined. Interventions aimed
55 at improving the educational and emotional outcomes for looked after children are varied, despite
56 difficulties in producing sustained improvement. Educational and emotional outcomes for looked
57 after children in European countries such as Denmark, Germany and Norway are better than those
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3 in the UK. The use of the social pedagogy approach has been accredited for some of these
4 differences. This approach emphasises emotional warmth and personal development. Information
5 on how the health and emotional wellbeing of looked after children can perpetuate cycles of
6 deprivation may add to this body of research. [32]
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8 9 **Future research**

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11 There has been an increased focus on the outcomes for looked after children, particularly over the
12 past decade[33 34]. Therefore outcomes for looked after children could be very different for women
13 previously in care who are pregnant currently, as compared to those pregnant 10 years ago. It would
14 be useful to look at the current health outcomes of mothers previously in care and their children in
15 order to see if presently there are inequities, and if whether these inequities are reducing.
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19 Information is currently collected by the Department of Education on the educational outcomes of
20 looked after children, and this research has been used to target interventions at increasing their
21 educational attainment [35]. Berridge argues that focusing on these educational targets alone are
22 not enough, and a theory and approach that encompasses a wide view of the challenges faced by
23 looked after children is needed [36]. We argue that the mental and physical health of looked after
24 children during pregnancy is an area that should be added as a piece of this policy puzzle.
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27 28 **Conclusions**

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30 Findings from the Millennium Cohort Study indicate that mothers with a history of spending time in
31 care are disadvantaged socially and economically when compared to other mothers even after they
32 have left care and during their children's infancy. We looked in more detail at smoking during
33 pregnancy, symptoms of depression in early motherhood and whether breast feeding was initiated,
34 and found that mothers who had spent time in care were more likely to smoke during pregnancy
35 and have symptoms of depression. This is consistent with previous research suggesting that social
36 and health disadvantages faced by looked after children persist into adult life.
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Competing interests: None.

Ethical approval: This research involved secondary analysis of the MCS and therefore did not require ethical approval. Ethical approval for the Millennium Cohort Study was granted from the multi-centre research ethics committee.

Data sharing: The datasets are available on the UK Data Archive. Further information about the study and data can be found at www.cls.ioe.ac.uk/.

References

1. Martin A, Ford T, Goodman R, et al. Physical illness in looked-after children: a cross-sectional study. *Archives of disease in childhood* 2013 doi: 10.1136/archdischild-2013-303993[published Online First: Epub Date]].
2. Department of E. Children looked after in England (including adoption and care leavers) year ending 31 March 2013. London: Office of National Statistics, 2013.
3. Simkiss DE, Spencer NJ, Stallard N, et al. Health service use in families where children enter public care: a nested case control study using the General Practice Research Database. *BMC health services research* 2012;**12**:65 doi: 10.1186/1472-6963-12-65[published Online First: Epub Date]].
4. Department of Education. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2012. Statistical First Release. London: Office of National Statistics, 2012.
5. Department of Education. Children looked after in England (including adoption and care leavers) year ending 31 March 2012. Statistical First Release. London: Office of National Statistics, 2012.
6. Viner RM, Taylor B. Adult health and social outcomes of children who have been in public care: population-based study. *Pediatrics* 2005;**115**(4):894-9 doi: 10.1542/peds.2004-1311[published Online First: Epub Date]].
7. Ford T, Vostanis P, Meltzer H, et al. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British journal of psychiatry : the journal of mental science* 2007;**190**:319-25 doi: 10.1192/bjp.bp.106.025023[published Online First: Epub Date]].
8. Department of E. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2013. London: Office of National Statistics, 2013.
9. Keirnan K, Mensah F. Maternal indicators in pregnancy and childhood infancy that signal future outcomes for children's development, behaviour and health: evidence from the Millennium Cohort Study: Department of Social Policy and Social Work, University of York, 2010.
10. Carpenter SC, Clyman RB, Davidson AJ, et al. The association of foster care or kinship care with adolescent sexual behavior and first pregnancy. *Pediatrics* 2001;**108**(3):E46

11. Svoboda DV, Shaw TV, Barth RP, et al. Pregnancy and parenting among youth in foster care: A review. *Children and Youth Services Review* 2012;**34**(5):867-75 doi: 10.1016/j.chilcyouth.2012.01.023[published Online First: Epub Date]].
12. Vinnerljung B, Franzén E, Danielsson M. Teenage parenthood among child welfare clients: A Swedish national cohort study of prevalence and odds. *Journal of Adolescence* 2007;**30**(1):97-116
13. Polit DF, Morton TD, White CM. Sex, Contraception and Pregnancy Among Adolescents in Foster Care. *Family Planning Perspectives* 1989;**21**(5):203-08 doi: 10.2307/2135572[published Online First: Epub Date]].
14. Whitworth M, Dowswell T. Routine pre-pregnancy health promotion for improving pregnancy outcomes. *The Cochrane database of systematic reviews* 2009(4):CD007536 doi: 10.1002/14651858.CD007536.pub2[published Online First: Epub Date]].
15. Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics* 2006;**118**(2):659-68 doi: 10.1542/peds.2005-2948[published Online First: Epub Date]].
16. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal* 2002;**23**(1-2):145-63 doi: 10.1002/imhj.10009[published Online First: Epub Date]].
17. Canadian Paediatric Society. Maternal depression and child development. *Paediatrics & child health* 2004;**9**(8):575-98
18. NICE. Maternal and child nutrition: NICE, 2008.
19. Dyson. Promotion of breast feeding initiation and duration: evidence into practice briefing: NICE, 2006.
20. Centre for Longitudinal Studies. The age 9 months survey of the MCS (2001- 2002. Secondary The age 9 months survey of the MCS (2001- 2002 20. [http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=854&sitesectiontitle=The+age+9-months+survey+of+the+MCS+\(2001-02\)](http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=854&sitesectiontitle=The+age+9-months+survey+of+the+MCS+(2001-02)).
21. Office of National Statistics. Infant and perinatal mortality 2001: health areas, England and Wales. *Health Statistics Quarterly* 2002;**15**
22. Rodgers B, Pickles A, Power C, et al. Validity of the Malaise Inventory in general population samples. *Social psychiatry and psychiatric epidemiology* 1999;**34**(6):333-41
23. McGee R, Williams S, Silva PA. An evaluation of the Malaise Inventory. *Journal of psychosomatic research* 1986;**30**(2):147-52
24. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [program], 2013.
25. Hanson K, ed. *Millennium cohort study, first, second and third surveys: a guide to the datasets*. 3rd ed. London: Centre for Longitudinal Studies, Institute of Education, 2008.
26. Dixon J. Young people leaving care: health, well-being and outcomes. *Child & Family Social Work* 2008;**13**(2):207-17 doi: 10.1111/j.1365-2206.2007.00538.x[published Online First: Epub Date]].
27. Barker DJ. The origins of the developmental origins theory. *Journal of internal medicine* 2007;**261**(5):412-7 doi: 10.1111/j.1365-2796.2007.01809.x[published Online First: Epub Date]].
28. Peruzzi A. From Childhood Deprivation to Adult Social Exclusion: Evidence from the 1970 British Cohort Study. *Soc Indic Res* 2014:1-19 doi: 10.1007/s11205-014-0581-2[published Online First: Epub Date]].
29. Nylen KJ, Moran TE, Franklin CL, et al. Maternal depression: A review of relevant treatment approaches for mothers and infants. *Infant Mental Health Journal* 2006;**27**(4):327-43 doi: 10.1002/imhj.20095[published Online First: Epub Date]].
30. NICE. CG45 Antenatal and postnatal mental health: clinical management and service guidelines, 2010.
31. NICE. PH26 Quitting smoking in pregnancy and following childbirth, 2010.

- 1
2
3 32. Boddy J, Statham J, McQuail S, et al. Workign at the 'edges' of care? European models of support
4 for young people and families: Thomas Coram Research Unit, Institute of Education,
5 University of London, 2009.
6
7 33. Treasury CStt. Every child matters, 2003.
8
9 34. Polnay L, Ward H. Promoting the health of looked after children. Government proposals demand
10 leadership and a culture change. Bmj 2000;**320**(7236):661-2
11
12 35. Unit SE. A better education for children in care: Social Exclusion Unit, 2003.
13
14 36. Berridge D. Theory and explanation in child welfare: education and looked-after children. Child &
15 Family Social Work 2007;**12**(1):1-10 doi: 10.1111/j.1365-2206.2006.00446.x[published
16 Online First: Epub Date] | .
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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of cohort studies

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5,6,7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		(b) For matched studies, give matching criteria and number of exposed and unexposed	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5,6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	7
		(d) If applicable, explain how loss to follow-up was addressed	n/a
		(e) Describe any sensitivity analyses	n/a
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		(c) Consider use of a flow diagram	8
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	10
		(c) Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	Report numbers of outcome events or summary measures over time	n/a
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9
		(b) Report category boundaries when continuous variables were categorized	8,9
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	10
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10/11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Pregnancy associated outcomes in women who spent some of their childhood looked after by local authorities: findings from the UK Millennium Cohort Study

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4 **of their childhood looked after by local authorities: findings**
5 **from the UK Millennium Cohort Study.**
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ABSTRACT

Objectives

There has been very little description of the health and social outcomes at pregnancy and early motherhood of girls who were previously looked after by local authorities. The objectives of this study were to compare the sociodemographic and health profiles of mothers who had spent time in a children's home or with foster parents as a child to mothers who had not. In particular, to examine associations between being looked after and the likelihood of smoking during pregnancy, the presence of symptoms of maternal depression and the initiation of breastfeeding.

Design

A retrospective cross sectional study using the baseline questionnaire of the Millennium Cohort Study.

Setting

The UK.

Participants

A nationally representative study of 18,492 mothers of babies born in the UK during 2000-2002..

Exposure

A history of being a looked after a child.

Primary and secondary outcome measures

1. The likelihood of smoking during pregnancy
2. Symptoms of maternal depression
3. The initiation of breastfeeding

Results

In univariable analyses, women who had been looked after were significantly less likely to be of higher social class, to live in a high-income household or to have achieved a high level of education. They were more likely to have a low birth weight baby and be a single parent. In multivariable analysis, women who had been a looked after child were more likely to smoke during pregnancy (adj. OR 3.0 95% CI 2.14, 4.3) and were more likely to have symptoms of depression (adj. OR 1.98 95% CI 1.4-2.7) compared with women who had not been looked after.

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Conclusions

Our results suggest that these women carry social disadvantage into motherhood, with the potential of continuing the cycle of deprivation. There is a case for increasing our attention on this group who can be readily accessed by maternity and early years' services.

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ARTICLE SUMMARY

This study uses the UK Millennium Cohort Study to identify mothers who had spent part of their childhood in foster care or in a children's home. We looked at the difference in socio-demographic factors and health outcomes between these women and women who had not been foster care or a children's home during their childhood. We also looked at the likelihood of three health-related maternal outcomes: smoking in pregnancy, maternal depression and the initiation of breast feeding. Mothers who had spent part of their childhood in foster care or a children's home had worse health and social outcomes than those who had not.

Strengths and Limitations

- Nationally representative sample
- Potential selection bias against mothers who had been looked after and whose own children had been taken into care

INTRODUCTION

Children in the public care system are an important group for public health action. In the UK, although legislation differs between the nations, looked after children are generally children whose parental responsibility lies with the local authority, or is shared between parents and the local authority. This parental responsibility may result in a variety of care arrangements, such as foster care, placement in a children's home, or being placed with relatives. In the year ending March 2013, there were approximately 68 110 looked after children in England (57 per 10,000 children) [1 2] and it has been estimated that during their childhood, around 3% of children in England and Wales spend some time in care [3]. These children often come from vulnerable households, and have many risk factors for poor social, educational and health outcomes [2 4]. Many of these health, social, and psychological difficulties are related to the reasons for the child entering the care system. Sixty-two percent of these children entered the care system due to abuse or neglect, and for 3% of looked after children, their own health problems led to them entering care [2]. It is likely that these disadvantages continue into adult life for many of these children[5]. Despite these health and social disadvantages, there is very little evidence on the health status of this group. They are an underrepresented group in research as they are a highly mobile group, with issues of parental consent making enrolment into research studies difficult [6].

Few studies have used nationally representative samples focusing on health outcomes over the life course of looked after children [1 4 5]. Even fewer have investigated outcomes during pregnancy and early motherhood [7]. In particular, whether mothers with a history of time spent in care have adverse maternal and pregnancy outcomes is currently unknown.

Pregnancy and early motherhood is an important point in the life cycle: a time when women have a high level of contact with health and social care services. As a consequence there is potential to identify high risk women and provide interventions to improve pregnancy outcomes [8]. This may be particularly relevant to adults who have previously been looked after and who may have had a reduction in residential stability leading to disjointed health service access and reduced exposure to health advice and information. Measures have been proposed to improve outcomes for socially disadvantaged women such as multiagency working, tailored antenatal services, community based continuity of care schemes and Family Nurse Partnerships for young mothers [9 10].

Although previous work has looked at the associations between sexual risk behaviours and a history of time in care, very little evidence is available on the health status and maternal outcomes of these women. Previous research has shown that girls who are looked after by local authorities have worse sexual health outcomes than girls who had never been in care. Girls who have been in care have a greater risk of teenage pregnancy earlier age at first intercourse and an increased number of sexual partners compared to girls who had not spent any time in the care system [11-15]. In addition to a higher risk of teenage pregnancy and an increased number of sexual partners, Hobcraft (1998) found that girls who had been in care were at an increased risk of factors relating to social exclusion such as no qualifications, homelessness and poor quality housing [15].

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3 In a review of maternal predictors for child health status, emotional wellbeing, and educational
4 attainment, Keirnan and Mensah found that mothers who had been looked after before the age of
5 17 were more likely to report that their child was in fair or poor health rather than good or excellent
6 health, compared to mothers who had not lived away from home [7]. As far as we are aware,
7 investigation of maternal and pregnancy outcomes whilst accounting for possible confounding
8 factors such as socioeconomic class and maternal education has not previously been published.
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11 The early years have been shown to be crucial for positive child development. We chose to focus on
12 maternal indicators and behaviours that are likely to have an impact on child physical and mental
13 wellbeing: smoking during pregnancy, breastfeeding initiation and symptoms of maternal
14 depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16].
15 Maternal depression is associated with impaired mother-infant attachment, and children of
16 depressed mothers are at a greater risk of deficits in social and cognitive function, along with being
17 at a greater risk of psychopathology in later life [17-19]. Despite breastfeeding having short and long
18 term health benefits for both mother and baby [20], the UK has one of the lowest rates of
19 breastfeeding worldwide, especially in young, white women from disadvantaged social groups [21].
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23 We compared the sociodemographic and health profiles of mothers who had been looked after as
24 a child either with foster parents or in a children's home to mothers who had not. We also looked at
25 the relationship between the mothers who had been placed with foster parents or in a children's
26 home with the likelihood of the outcomes of smoking during pregnancy, the presence of symptoms
27 of maternal depression and the uptake of breastfeeding.
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31 32 **METHODS**

33 34 **Millennium Cohort Study**

35 The Millennium Cohort Study is a nationally representative cohort study of 18 818 infants from
36 18,553 families born in the UK [22]. A random two-stage sample of all infants born in the UK
37 between 2000 -2002, and who were alive and resident in the UK at 9 months was drawn from the
38 Department of Social Security Child Benefit Registers. Children born in England and Wales were
39 recruited between September 2000 and August 2001, and Children born in Scotland and Northern
40 Ireland were recruited between November 2000 and January 2002. Child Benefit Registers cover
41 virtually all children, but excludes those whose residence status is uncertain or temporary. Children
42 who had died within the first 9-10 months of life were excluded. These children are estimated to be
43 less than 1% of all births [23]. The study used stratified sampling by electoral ward, with
44 oversampling to ensure adequate representation of families living in poverty and those living in
45 areas with high ethnic minority populations. Parents and guardians were interviewed by trained
46 interviewers to capture sociodemographic and health information when their children were 9
47 months old, with subsequent follow up at 3, 5 and 7 years.
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51 This study was a cross sectional survey using the baseline questionnaire (9 months postnatally) of
52 the Millennium Cohort Study.
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Time spent in care as a child

The definition of a looked after child or a child in care varies between countries due to national legislation. In this cohort, mothers were asked the question “Before the age of 17 did you spend any time living away from both of your parents?” If they answered yes, they were asked to indicate the nature of the time spent away from home and the amount of time they spent away. Parents who had spent time in a children’s home or with foster parents run by either a local authority or a charitable organisation were coded as having been looked after. This group included women who were not sure whether their placement was managed by the local authority or another organisation. Although children’s homes and foster placements can be run by voluntary societies, the responsibility for the child still lies with the local authority [24]. We classed mothers who had spent any amount of time in foster care or a children’s home as the ‘exposed.’ group. The comparison (‘unexposed’) group consisted of all mothers who had answered “no” to the question “Before the age of 17 did you spend any time living away from both of your parents?”, or who had only spent time in a boarding school, prison or young offenders institution, or with relatives. Mothers who did not answer the question or who indicated that they were unsure of their answer were excluded.

Breast feeding

Mothers were asked if they ever tried to breastfeed their cohort baby. If they answered yes, they were asked when they last gave their baby breast milk. Their answer was converted into breastfeeding duration, and then categorised into ‘never’, ‘less than 2 months’ ‘over 2 and less than 4 months’ and ‘over 4 months.’ The information was also coded into a binary category of ‘never breastfed’ and ‘ever breastfed’.

Smoking during pregnancy

Maternal smoking was coded as ‘current non-smoker’, ‘smoked during pregnancy’, or ‘gave up smoking during pregnancy’. These categories were recoded as a binary outcome of ‘smoked during pregnancy’ and ‘did not smoke during pregnancy’.

Symptoms of depression

Symptoms of depression were measured using 9 questions of the validated Malaise Inventory [25-26].

Ethnicity

Ethnicity was analysed as ‘white’ or ‘other ethnic group’.

Parity and family status

Parity was the number of children the mother had (including the cohort member) and was coded as 1, 2, 3 or >3 children. Family status was categorised as ‘lone parent’, ‘cohabiting’ or ‘married’.

Birth outcomes

Information on baby’s birthweight, gestation and delivery method was obtained by self reporting. Previous studies have shown that there is a good association between mothers’ self-report of baby’s birthweight, gestation and mode of delivery compared to hospital records [27-29].

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3 Birthweight was classified as ≥ 2.5 kg ('normal'), or < 2.5 kg ('low').

4 Gestation was recorded in weeks and classified as < 28 weeks, 28-32 weeks, 33-36 weeks or ≥ 37
5 weeks.

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7 Mode of delivery was categorised as 'normal', 'instrumental' or 'caesarean'.
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9 **Potential confounding factors**

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11 Mother's age at the birth of the child, household socioeconomic class, household income and
12 mother's education were considered as potential confounding factors. Previous evidence suggests
13 that these factors are associated with poor perinatal outcomes [30], although there has been very
14 little previous evidence on how factors relating to time in care manifest in maternal and neonatal
15 outcomes. Household socioeconomic class was measured by taking the occupation of the parent
16 with the highest socioeconomic position according to the four UK National Statistics socioeconomic
17 categories. Household income was calculated from the self-reported data on the questionnaire.
18 Mother's education was determined by their highest attainment of a National Vocational
19 Qualification or equivalent group. These qualifications were grouped as follows: 'higher' (bachelor's
20 degree or equivalent), 'medium' (end of schooling at age 18, A'Level or equivalent), 'lower' (end of
21 compulsory schooling at age 16, GCSE or equivalent), or other.
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27 **Inclusion and exclusion criteria**

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29 The Millennium Cohort Study did not recruit families if the child had been taken into care at the time
30 of initial assessment.

31 One study participant who withdrew consent after the study began was excluded.
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34 For this analysis, mothers were included if they were the birth mother of the Millennium Cohort
35 Study participant. Mothers who did not answer the question of whether they lived away from home
36 were excluded, as were mothers who answered the question as "I don't know".
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39 Duplicate interviews were identified and excluded, removing the additional interviews of women
40 who had more than one child recruited into the study.
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43 **Statistical analysis**

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45 First, we compared the following characteristics of the "exposed" with "unexposed" groups using
46 the Chi-squared statistic: age at delivery, ethnic group, social class, household income, education,
47 family status, parity, smoking during pregnancy, symptoms of depression, mode of delivery,
48 gestational age, birth weight, and duration of feeding.
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51 We then used logistic regression to estimate odds ratios for a history of time spent in care and the
52 outcomes of smoking during pregnancy, breastfeeding initiation and symptoms of depression, with
53 adjustment for potential confounding factors. A plausible model was developed based on
54 background literature. From our initial model, only ethnicity was subsequently removed as its
55 inclusion did not have an appreciable effect on the result, and its removal appeared to make the
56 model more robust. The potential confounders included were significantly associated with the
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outcome (indicated by Wald, $P < 0.05$) after controlling for other factors in the model. The “unexposed” group were used as the reference for these analyses. Cases with missing data were excluded from regression analyses.

All analyses took into account the clustered stratified study design by using the survey commands in Stata version 13.0 [31]. Reported p values and confidence intervals account for clustering, and estimates of proportions and odd ratios are weighted by sampling weights [32].

RESULTS

Description of the cohort

There were 18,552 respondents of the baseline interview of the Millennium Cohort Study. Fifty-seven respondents who were not the natural mothers of the cohort baby were excluded, as were 3 interviews that did not have data relating to their time in care history. Therefore our study population included 18,492 natural mothers.

In the study population, there were 291 mothers who reported spending time in care as a child, which was 1.6% of the cohort (95% CI 1.3-1.8). Of the mothers who reported spending time in foster care or a children’s home, 75% spent a year or more in care (see table 1).

Table 1 - Distribution of time spent in care by the 291 mothers who reported being looked after

Time looked after	Frequency	Percent
Less than 3 months	38	13
3 months to 1 year	35	12
1-2 years	42	14
2-5 years	90	31
5 -10 years	44	15
> Over 10 years	42	15
Total	291	

These mothers were born in previous decades, with 5% born after 1980, 42% between 1970 and 1980, 50% between 1960 and 1970 and 4% born before 1960. Mothers who had been looked after were younger, less likely to achieve a high social class, less likely to have a high household income and less likely to have achieved a high level of education, compared with the rest of the cohort (table 2). They were also more likely to be a single parent, have a larger family and to smoke during their pregnancy (table 3). These differences were all statistically significant at the 5% level. There was no statistically significant association between ethnic group and reporting spending time in care. Although their babies were more likely to be born by normal vaginal delivery, they were more likely to have a low birth weight, but there were no statistically significant differences in the gestation at delivery when compared to non-exposed women (table 3).

Table 2 - Sociodemographic characteristics of women with and without a history of being looked after

Characteristic	Time looked after	P value
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	Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI]	
Age at delivery			<0.001
<20	11.1 [7.7,15.9]	4.9 [4.4,5.3]	
20-29	59.3 [52.3,65.9]	41.3 [39.6,43.0]	
30-39	28.6 [22.6,35.5]	50.3 [48.5,52.1]	
≥40	1.0 [0.3,3.9]	3.6 [3.3,4.0]	
Ethnic group			0.52
White	88.3 [82.3,92.5]	86.8 [84.3,88.9]	
Other ethnic group	11.7 [7.5,17.7]	13.2 [11.1,15.7]	
Social Class			<0.001
Managerial	17.3 [18.8,24.6]	44.9 [42.7,47.1]	
Intermediate occupations	16.0 [11.5,21.8]	19.6 [18.8,20.5]	
Routine and manual	51.3 [44.5,58.0]	30.8 [29.1,32.6]	
Never worked and long term unemployed	15.4 [11.2,20.9]	4.6 [4.0,5.4]	
Household income			<0.001
<£10,400	48.4 [41.3,55.4]	22.1 [20.7,23.6]	
£10,400-20,800	35.2 [28.7,42.2]	31.9 [30.3,33.4]	
£20,800 -31,200	9.5 [6.0,14.9]	22.1 [20.9,23.3]	
£31,200-52,000	5.3 [2.5,10.9]	17.0 [15.8,18.3]	
>£52,000	1.7 [0.7,4.2]	7.0 [5.6,8.6]	
Education			< 0.001
Higher	11.7 [7.2,18.5]	32.9 [30.7,35.1]	
Medium	7.5 [4.6,12.1]	14.3 [13.6,15.0]	
Lower	37.4 [31.6,43.6]	38.0 [36.3,39.7]	
Other	4.0 [1.8,8.7]	2.4 [2.1,2.8]	
Lone parent	10.4 [6.8,15.25]	3.5 [3.0,4.1]	<0.001

Table 3 - Pregnancy and neonatal characteristics of women with and without a history of being looked after

Characteristic	Time looked after		P value
	Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	
Parity			<0.001
1	28.7 [22.6,35.6]	41.4 [40.3,42.5]	
2	33.9 [28.2,40.2]	35.8 [34.9,36.7]	
3	17.7 [13.6,22.7]	15.0 [14.3,15.7]	
>3	19.7 [14.6,26.2]	7.9 [7.3,8.5]	
Smoking during pregnancy			<0.001
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	
Gave up	14.9 [10.4,21.1]	13.3 [12.5,14.1]	
Never smoked	27.1 [21.5,33.5]	65.9 [64.6,67.3]	
Symptoms of depression			<0.001
Yes	31.3 [25.4,37.8]	13.4 [12.7,14.1]	
No	68.7 [62.2,74.6]	86.6 [86.0,87.3]	
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	

33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
≥37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birthweight			0.009
≥2.5kg	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
<2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breast feeding			
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	<0.001
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Multivariable analysis

Analysis of women excluded from the regression model due to missing data revealed that only a few women were excluded from the analysis of smoking during pregnancy and any breastfeeding following birth (7 (0.04%) and 4 respectively (0.02%)); all these excluded women were from the 18,201 'unexposed' group. However, 726 women were excluded due to missing data on symptoms of depression (Malaise Inventory score). Women who had been looked after were not more likely to have missing data in this variable than those who had not been looked after. In those who had spent some of their childhood in care, 11 out of the 291 women had missing data (3.9%). There were no statistically significant differences between those who had missing data and those who did not in terms of age, income, social class and education. Of the women who had not spent any time in care, 715 of the 18,201 women had missing data for symptoms of depression (4.0%). Those who had missing data were more likely to be in a lower social class, have a lower income and to have lower or no qualifications (please see tables s1-3 in the supplementary information.)

Table 4 shows the odds ratios for the association between having been looked after and smoking during pregnancy, breastfeeding and symptoms of postnatal depression. Women who had been looked after were more likely to smoke during pregnancy (OR 3.0) compared with women who had not been looked after, even after adjusting for possible confounding factors. They were also less likely to initiate breastfeeding compared with women who had not been looked after, although this effect was smaller and not statistically significant after adjusting for other factors (table 4). Women who had been looked after were more likely to have symptoms of depression (OR 1.98), even after controlling for possible confounding factors.

Table 4 - Unadjusted and adjusted odds ratios (95% CI) for smoking during pregnancy, any breastfeeding and symptoms of depression among mothers according to a history of being looked after

	% ^f of participants (n)	Unadjusted (95% CI)	Adjusted (95% CI)
Mother smoked during pregnancy	(18,485)		
No time spent in care	20.8 (4,051)	1	1
Any time spent in care	58.0 (173)	5.3 (3.9-7.1)	3.0 (2.1-4.3)*

Any breastfeeding	(18,488)		
No time spent in care	69.7 (11,988)	1	1
Any time spent in care	53.5 (156)	0.5 (0.4-0.7)	1.1 (0.7-1.4)*
Symptoms of depression	(17,766)		
No time spent in care	13.4 (2,566)	1	1
Any time spent in care	31.3 (87)	2.94 (2.19-3.96)	1.98 (1.4-2.7)*

^fWeighted percentages

*Adjusted for maternal age, income, education and social class

DISCUSSION

Summary of findings

In our study, which represents the mothers of babies born in the UK during 2001-2002, 1.6% of women in this cohort had spent some of their childhood in the care system, either with foster parents or in a children's home. The majority of these women had spent a year or more in care. The mothers in our study who had spent some of their childhood as a looked after child were disadvantaged in terms of social and economic factors when compared to the mothers who had not. They were more likely to smoke during their pregnancy and have symptoms of depression. This likelihood persisted after adjusting for confounding factors. In univariable analysis, they were less likely to breastfeed, but this effect did not persist after adjusting for confounding factors. These results suggest that women with a history of time in foster care or a children's home carry social disadvantage into adulthood and motherhood..

Comparison with other studies

As far as we are aware, this study is one of the first to look at health status and maternal outcomes of pregnant women who have previously been in care. The links between social disadvantage and being a looked after child, and the links between social disadvantage and poor maternal outcomes are well documented. It is not surprising that the findings of this study show that being a looked after child is associated with social disadvantage and adverse maternal outcomes. Previous studies have shown that looked after children are more likely to become teenage mothers. Compared to previous estimates of the number of children in England in care at any one time, our estimate is considerably lower. Simkiss et al. [3], suggest that 3% of children in the UK have spent some time in care. Our estimate may be low because we have missed many mothers who have previously been in care, which could be due to them declining to take part, or because their children had been taken into care. If this is the case, then these mothers are likely to be different to those who agreed to the recruitment of their children. It is likely that the families who were not recruited into the Millennium Cohort Study were more unstable than those who were, or who had a greater distrust of institutions.

The worse birth outcomes in terms of birth weight and prematurity found in the exposed group could be a result of the association between antenatal smoking with low birth weight and

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3 prematurity [33], and the high rate of antenatal smoking in this group. Younger mothers are more
4 likely to have a unassisted birth [34], and we postulate that the higher proportion of normal
5 deliveries seen in the exposed group is associated with the lower average age of women in this
6 group.
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10 **Strengths and limitations**

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12 A strength of this study is the use of Millennium Cohort Study data, a nationally representative
13 sample which ensured adequate representation from socially disadvantaged groups and people from
14 ethnically diverse backgrounds. Using this cohort allowed us to capture women who had previously
15 been in care during their adult lives, which can be otherwise difficult to do.
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19 The amount of missing data was small: except in the multivariable analysis using the Malaise
20 Inventory score as an outcome, the negligible amount of missing data would be unlikely to affect the
21 results. For the outcome of symptoms of depression, 3.9% of the data was missing, and it is possible
22 that the worse social characteristics of the women without information on their Malaise Inventory
23 score may have led to a small increase in the estimation of the effect of being in care in the adjusted
24 model.
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28 A major limitation of this study is that a large number of women with a history in care may not be
29 included in the MCS, due to not agreeing to take part or being ineligible because their own children
30 had been taken into care. Furthermore, information on the childhood socioeconomic status of the
31 mothers was not available.
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34 However, although we can compare our prevalence to estimates of children currently in care, it is
35 not possible to obtain estimates of how many women of child bearing age at the time of our cohort
36 may have been in care during their childhoods without prevalence data of looked after children from
37 the 1960s to the 1990s. Therefore, we are unable to say what the likely proportion of women who
38 would have been excluded would be. However, it is possible that women who were excluded due to
39 having their own children taken into care may be more likely to have had worse social outcomes
40 than those who entered the cohort. We would assume that if the data on these women had been
41 captured, the results of this study would have been more extreme. A systematic review of the
42 characteristics of families whose children were taken into care showed that a low socioeconomic
43 status was the factor most associated with this outcome [35]. This systematic review noted a large
44 variation by country in the factors associated with families requiring children to be placed in care,
45 and that only one study was found from the UK. This and subsequent studies suggest that in the UK,
46 children who have been taken into care are more likely to have had mothers who were younger,
47 have a history of substance misuse or mental illness, live in a deprived neighbourhood, are from a
48 lower social class, and live in overcrowded or rented accommodation [36].
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55 **Potential mechanisms and policy implications**

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3 The population of this study are women born between the 1960's and mid-1980s, and their children
4 who are now 13-14 years old. The findings of this study have relevance to these children as they
5 enter adolescence and adulthood, as evidence suggests that activity in the early years can have
6 lasting effects on health and psychosocial functioning [37-39]. Unfortunately the outcomes for
7 looked after children in the UK remains poor, both during their childhood, and when they enter
8 adult life[5 40 41]. The increased policy focus on the early years, education and integrated care in
9 recent times may have helped to improve outcomes for these children[42].
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13 From this study it is not possible to determine whether the social disadvantage is a direct
14 antecedent to being in care, or whether being in care led to subsequent social disadvantage. The
15 question remains whether being in care confers a disadvantage in terms of maternal behaviours and
16 outcomes over and above the social and economic disadvantage.
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19 However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of
20 the social care system is to reduce the social disadvantage that the child experienced on entering
21 care, and idealistically improve their life circumstances in order for the child to have a better start in
22 life. The UK still has a long way to go in reducing the long term disadvantage experienced by
23 children in care. Of particular concern is the evidence presented here that suggests that this
24 disadvantage persists to child bearing age and is associated with maternal behaviours and outcomes
25 that have the potential to affect the health and wellbeing of their children. In addition to the legacy
26 of early and continuing social disadvantage such as low household income, low educational
27 attainment and reduced employment opportunities, there are aspects of care itself that may have
28 an effect on the maternal outcomes studied such as residential instability, disrupted parental
29 attachments and difficulties in resolving past history when faced with having children of one's own
30 [12 43-45].
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35 It is known that maternal smoking, depression and breast feeding rates are potentially modifiable
36 behaviours with appropriate screening, education and support from healthcare professionals. Tools
37 exist to screen for and identify perinatal depression, and there are ways that women with
38 depression can be supported and treated [46]. Likewise, smoking in pregnancy and breastfeeding
39 can be asked about and women who would like to change their current behaviours can be supported
40 to change [21 47-49]. Pregnancy and early motherhood is a time when women who are often
41 otherwise healthy have a large amount of contact with health care services. These results suggest
42 that it may be worthwhile to pay particular attention to women who have a history in being in care
43 when they present to health and social care services during pregnancy and early motherhood.
44 Currently a history of time in care is not part of the routine information collected during prenatal
45 visits. It has been suggested that a wider range of socio-demographic information should be
46 collected in order to create a deeper understanding of the individual mother's needs [7].
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51 The best way to use this information for policy change is yet to be determined. Interventions aimed
52 at improving the educational and emotional outcomes for looked after children are varied, despite
53 difficulties in producing sustained improvement. Educational and emotional outcomes for looked
54 after children in European countries such as Denmark, Germany and Norway are better than those
55 in the UK. The use of the social pedagogy approach has been accredited for some of these
56 differences. This approach emphasises emotional warmth and personal development. Information
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3 on how the health and emotional wellbeing of looked after children can perpetuate cycles of
4 deprivation may add to this body of research. [50]
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7 **Future research**

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9 There has been an increased focus on the outcomes for looked after children, particularly over the
10 past decade[51 52]. Therefore outcomes for looked after children could be very different for women
11 previously in care who are pregnant currently, as compared to those pregnant 10 years ago. It would
12 be useful to look at the current health outcomes of mothers previously in care and their children in
13 order to see if presently there are inequities, and if whether these inequities are reducing.
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17 Information is currently collected by the Department of Education on the educational outcomes of
18 looked after children, and this research has been used to target interventions at increasing their
19 educational attainment [53]. Berridge argues that focusing on these educational targets alone are
20 not enough, and a theory and approach that encompasses a wide view of the challenges faced by
21 looked after children is needed [54]. We argue that the mental and physical health of looked after
22 children during pregnancy is an area that should be added as a piece of this policy puzzle.
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25 **Conclusions**

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27 Findings from the Millennium Cohort Study indicate that mothers with a history of spending time as
28 a looked after child disadvantaged socially and economically when compared to other mothers even
29 after they have left care and during their children's infancy. We looked in more detail at smoking
30 during pregnancy, symptoms of depression in early motherhood and whether breast feeding was
31 initiated, and found that mothers who had been looked after were more likely to smoke during
32 pregnancy and have symptoms of depression. This is consistent with previous research suggesting
33 that social and health disadvantages faced by looked after children persist into adult life.
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3 **Contributors:** All contributors (SB, MQ, RG) made substantial contributions to conception and
4 design, acquisition of data, and interpreted the data. SB did the initial analysis of the data and wrote
5 the first draft of the article. SB, RG and MQ revised the article critically for important intellectual
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7

8
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11

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13

14
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16 require ethical approval. Ethical approval for the Millennium Cohort Study was granted from the
17 multi-centre research ethics committee.
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20 **Data sharing:** The datasets are available on the UK Data Archive. Further information about the
21 study and data can be found at www.cls.ioe.ac.uk/.
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References

1. Martin A, Ford T, Goodman R, et al. Physical illness in looked-after children: a cross-sectional study. *Archives of disease in childhood* 2013 doi: 10.1136/archdischild-2013-303993[published Online First: Epub Date]].
2. Department of Education. Children looked after in England (including adoption and care leavers) year ending 31 March 2013. London: Office of National Statistics, 2014.
3. Simkiss DE, Spencer NJ, Stallard N, et al. Health service use in families where children enter public care: a nested case control study using the General Practice Research Database. *BMC health services research* 2012;**12**:65 doi: 10.1186/1472-6963-12-65[published Online First: Epub Date]].
4. Department of Education. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2013. London: Office of National Statistics, 2014.
5. Viner RM, Taylor B. Adult health and social outcomes of children who have been in public care: population-based study. *Pediatrics* 2005;**115**(4):894-9 doi: 10.1542/peds.2004-1311[published Online First: Epub Date]].
6. Ford T, Vostanis P, Meltzer H, et al. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British journal of psychiatry : the journal of mental science* 2007;**190**:319-25 doi: 10.1192/bjp.bp.106.025023[published Online First: Epub Date]].
7. Keirnan K, Mensah F. Maternal indicators in pregnancy and childhood infancy that signal future outcomes for children's development, behaviour and health: evidence from the Millennium Cohort Study: Department of Social Policy and Social Work, University of York, 2010.
8. National Institute for Health and Clinical Excellence (NICE). Pregnancy and complex social factors: A model for service provision for pregnant women with complex social factors - guidance (CG110) 2010.
9. Department of Health. Maternity Standard, National Service Framework for Children, Young People and Maternity Services, 2004.
10. Department of Health. Healthy lives, healthy people : our strategy for public health in England. Cm. Norwich: Stationery Office, 2010:96 p.
11. Carpenter SC, Clyman RB, Davidson AJ, et al. The association of foster care or kinship care with adolescent sexual behavior and first pregnancy. *Pediatrics* 2001;**108**(3):E46
12. Svoboda DV, Shaw TV, Barth RP, et al. Pregnancy and parenting among youth in foster care: A review. *Children and Youth Services Review* 2012;**34**(5):867-75 doi: 10.1016/j.childyouth.2012.01.023[published Online First: Epub Date]].
13. Vinnerljung B, Franzén E, Danielsson M. Teenage parenthood among child welfare clients: A Swedish national cohort study of prevalence and odds. *Journal of Adolescence* 2007;**30**(1):97-116
14. Polit DF, Morton TD, White CM. Sex, Contraception and Pregnancy Among Adolescents in Foster Care. *Family Planning Perspectives* 1989;**21**(5):203-08 doi: 10.2307/2135572[published Online First: Epub Date]].
15. Hobcraft J. Intergenerational and Life-Course Transmission of Social Exclusion: Influences and Childhood Poverty, Family Disruption and Contact with the Police: Centre for Analysis of Social Exclusion, LSE, 1998.
16. Whitworth M, Dowswell T. Routine pre-pregnancy health promotion for improving pregnancy outcomes. *The Cochrane database of systematic reviews* 2009(4):CD007536 doi: 10.1002/14651858.CD007536.pub2[published Online First: Epub Date]].

17. Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics* 2006;**118**(2):659-68 doi: 10.1542/peds.2005-2948[published Online First: Epub Date]].
18. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal* 2002;**23**(1-2):145-63 doi: 10.1002/imhj.10009[published Online First: Epub Date]].
19. Canadian Paediatric Society. Maternal depression and child development. *Paediatrics & child health* 2004;**9**(8):575-98
20. National Institute for Health and Clinical Excellence (NICE). Maternal and child nutrition: NICE, 2008.
21. Dyson. Promotion of breast feeding initiation and duration: evidence into practice briefing: NICE, 2006.
22. Centre for Longitudinal Studies. The age 9 months survey of the MCS (2001- 2002), 20.
23. Office of National Statistics. Infant and perinatal mortality 2001: health areas, England and Wales. *Health Statistics Quarterly* 2002;**15**
24. Department of Education. Improving the adoption system and services for looked after children: Policy, 2014.
25. Rodgers B, Pickles A, Power C, et al. Validity of the Malaise Inventory in general population samples. *Social psychiatry and psychiatric epidemiology* 1999;**34**(6):333-41
26. McGee R, Williams S, Silva PA. An evaluation of the Malaise Inventory. *Journal of psychosomatic research* 1986;**30**(2):147-52
27. Tate AR, Dezateux C, Cole TJ, et al. Factors affecting a mother's recall of her baby's birth weight. *International journal of epidemiology* 2005;**34**(3):688-95 doi: 10.1093/ije/dyi029[published Online First: Epub Date]].
28. Poulsen G, Kurinczuk JJ, Wolke D, et al. Accurate reporting of expected delivery date by mothers 9 months after birth. *Journal of clinical epidemiology* 2011;**64**(12):1444-50 doi: 10.1016/j.jclinepi.2011.03.007[published Online First: Epub Date]].
29. Quigley MA, Hockley C, Davidson LL. Agreement between hospital records and maternal recall of mode of delivery: evidence from 12 391 deliveries in the UK Millennium Cohort Study. *BJOG : an international journal of obstetrics and gynaecology* 2007;**114**(2):195-200 doi: 10.1111/j.1471-0528.2006.01203.x[published Online First: Epub Date]].
30. Marmot M, International Balzan Foundation. *Fair society, healthy lives*.
31. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [program], 2013.
32. Hanson K, ed. *Millennium cohort study, first, second and third surveys: a guide to the datasets*. 3rd ed. London: Centre for Longitudinal Studies, Institute of Education, 2008.
33. Cnattingius S. The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research* 2004;**6**(Suppl 2):S125-S40 doi: 10.1080/14622200410001669187[published Online First: Epub Date]].
34. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a systematic review. *Birth (Berkeley, Calif.)* 2010;**37**(3):219-26 doi: 10.1111/j.1523-536X.2010.00409.x[published Online First: Epub Date]].
35. Simkiss DE, Stallard N, Thorogood M. A systematic literature review of the risk factors associated with children entering public care. *Child: Care, Health and Development* 2013;**39**(5):628-42 doi: 10.1111/cch.12010[published Online First: Epub Date]].
36. Bebbington A, Miles. The Background of Children who enter Local Authority Care. *British Journal of Social Work* 1989;**19**(1):349-68
37. Dixon J. Young people leaving care: health, well-being and outcomes. *Child & Family Social Work* 2008;**13**(2):207-17 doi: 10.1111/j.1365-2206.2007.00538.x[published Online First: Epub Date]].

- 1
- 2
- 3 38. Barker DJ. The origins of the developmental origins theory. *Journal of internal medicine* 2007;**261**(5):412-7 doi: 10.1111/j.1365-2796.2007.01809.x[published Online First: Epub
- 4 Date]].
- 5
- 6 39. Peruzzi A. From Childhood Deprivation to Adult Social Exclusion: Evidence from the 1970 British
- 7 Cohort Study. *Soc Indic Res* 2014;1-19 doi: 10.1007/s11205-014-0581-2[published Online
- 8 First: Epub Date]].
- 9
- 10 40. Department of Health. *Statutory guidance on promoting the health and well-being of looked*
- 11 *after children* 2009
- 12 41. National Institute for Health and Clinical Excellence (NICE). *Looked after children and young*
- 13 *people, 2010.*
- 14 42. Science BBo. *Growing up in the UK: Ensuring a healthy future for our children* British Medical
- 15 Association, 2013.
- 16 43. Dregan A, Gulliford MC. Foster care, residential care and public care placement patterns are
- 17 associated with adult life trajectories: population-based cohort study. *Social psychiatry and*
- 18 *psychiatric epidemiology* 2012;**47**(9):1517-26 doi: 10.1007/s00127-011-0458-5[published
- 19 Online First: Epub Date]].
- 20 44. Pryce JM, Samuels GM. Renewal and Risk: The Dual Experience of Young Motherhood and Aging
- 21 Out of the Child Welfare System. *Journal of Adolescent Research* 2010;**25**(2):205-30 doi:
- 22 10.1177/0743558409350500[published Online First: Epub Date]].
- 23 45. Maxwell A, Proctor J, Hammond L. 'Me and My Child': Parenting Experiences of Young Mothers
- 24 Leaving Care. *Adoption & Fostering* 2011;**35**(4):29-40 doi:
- 25 10.1177/030857591103500404[published Online First: Epub Date]].
- 26 46. Nylen KJ, Moran TE, Franklin CL, et al. Maternal depression: A review of relevant treatment
- 27 approaches for mothers and infants. *Infant Mental Health Journal* 2006;**27**(4):327-43 doi:
- 28 10.1002/imhj.20095[published Online First: Epub Date]].
- 29 47. National Institute for Health and Clinical Excellence (NICE). *CG45 Antenatal and postnatal mental*
- 30 *health: clinical management and service guidelines, 2010.*
- 31 48. National Institute for Health and Clinical Excellence (NICE). *PH26 Quitting smoking in pregnancy*
- 32 *and following childbirth, 2010.*
- 33 49. Lumley J, Chamberlain C, Dowswell T, et al. Interventions for promoting smoking cessation
- 34 during pregnancy. *The Cochrane database of systematic reviews* 2009(3):CD001055 doi:
- 35 10.1002/14651858.CD001055.pub3[published Online First: Epub Date]].
- 36 50. Boddy J, Statham J, McQuail S, et al. *Workign at the 'edges' of care? European models of support*
- 37 *for young people and families: Thomas Coram Research Unit, Institute of Education,*
- 38 *University of London, 2009.*
- 39 51. Chief Secretary to the Treasury. *Every child matters, 2003.*
- 40 52. Polnay L, Ward H. Promoting the health of looked after children. *Government proposals demand*
- 41 *leadership and a culture change. Bmj* 2000;**320**(7236):661-2
- 42 53. Social Exclusion Unit. *A better education for children in care: Social Exclusion Unit, 2003.*
- 43 54. Berridge D. Theory and explanation in child welfare: education and looked-after children. *Child &*
- 44 *Family Social Work* 2007;**12**(1):1-10 doi: 10.1111/j.1365-2206.2006.00446.x[published
- 45 Online First: Epub Date]].
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7 **Pregnancy associated outcomes in women who spent some**
8 **of their childhood ~~in care~~looked after by local authorities:**
9 **findings from the UK Millennium Cohort Study.**
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ABSTRACT

Objectives

There has been very little description of the health and social outcomes at pregnancy and early motherhood of girls who were previously ~~looked after by local authorities in care.~~ The objectives of this study were to compare the sociodemographic and health profiles of mothers who had ~~spent time in a children's home or with foster parents spent time in care~~ as a child to mothers who had not. In particular, to examine associations between ~~the mothers being looked after spending time in care with and~~ the likelihood of smoking during pregnancy, the presence of symptoms of maternal depression and the initiation of breastfeeding.

Design

A retrospective cross sectional study using the baseline questionnaire of the Millennium Cohort Study.

Setting

The UK.

Participants

A nationally representative study of 18,492 mothers of babies born in the UK during 2000-2002. ~~These mothers were born between the 1960 and the mid 1990s.~~

Exposure

A history of ~~being a looked after a being a looked after~~ child.

Primary and secondary outcome measures

1. The likelihood of smoking during pregnancy
2. Symptoms of maternal depression
3. The initiation of breastfeeding

Results

~~In univariable analysis,~~ Women who had ~~spent time in care been looked after~~ were significantly less likely to be of higher social class, to live in a high-income household or to have achieved a high level of education. They were more likely to have a low birth weight baby and be a single parent. ~~In multivariable analysis,~~ Women who had ~~been a looked after child spent time in care~~ were ~~3 times~~ more likely to smoke during pregnancy (adj. OR 3.0 95% CI 2.14, 4.3) and were ~~more twice as~~ likely

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7 to have symptoms of depression (adj. OR 1.98 95% CI 1.4-2.7) compared with women who had not
8 ~~spent time in care~~ been looked after.
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10 11 **Conclusions**

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13 Our results suggest that these women carry social disadvantage into motherhood, with the potential
14 of continuing the cycle of deprivation. There is a case for increasing our attention on this group who
15 can be readily accessed by maternity and early years' services.
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ARTICLE SUMMARY

This study uses the UK Millennium Cohort Study to identify mothers who had spent part of their childhood in foster care or in a children's home ~~as a looked after child~~. We looked at the difference in socio-demographic factors and health outcomes between these women and women who had not been foster care or a children's home ~~in care~~ during their childhood. We also looked at the likelihood of three health-related maternal outcomes: smoking in pregnancy, maternal depression and the initiation of breast feeding. Mothers who had spent part of their childhood in foster care or a children's home ~~care~~ had worse health and social outcomes than those who had not.

Strengths and Limitations

- Nationally representative sample
- Potential selection bias against mothers who had spent time in care ~~been looked after~~ and whose own children had been taken into care

INTRODUCTION

Children ~~in the public care system looked after by local authorities are~~ are an important group for public health action. In the UK, although legislation differs between the nations, looked after children are generally children whose parental responsibility lies with the local authority, or is shared between parents and the local authority. This parental responsibility may result in a variety of care arrangements, such as foster care, placement in a children's home, or being placed with relatives. In the year ending March 2013, there were approximately 68 110 looked after children in England (57 per 10,000 children) [1 2] and it has been estimated that during their childhood, around 3% of children in England and Wales spend some time in care [3]. These children often come from vulnerable households, and have many risk factors for poor social, educational and health outcomes [2 4]. Many of these health, social, and psychological difficulties are related to the reasons for the child entering the care system. Sixty-two percent of these children entered the care system due to abuse or neglect, and for 3% of looked after children, their own health problems led to them entering care [2]. It is likely that these disadvantages continue into adult life for many of these children[5]. Despite these health and social disadvantages, there is very little evidence on the health status of this group. They are an underrepresented group in research as they are a highly mobile group, with issues of parental consent making enrolment into research studies difficult [6].

Few studies have used nationally representative samples focusing on health outcomes over the life course of looked after children [1 4 5]. Even fewer have investigated outcomes during pregnancy and early motherhood [7]. In particular, whether mothers with a history of time spent in care have adverse maternal and pregnancy outcomes is currently unknown.

Pregnancy and early motherhood is an important point in the life cycle: a time when women have a high level of contact with health and social care services. As a consequence there is potential ~~for to~~ identify high risk women and provide interventions to improve pregnancy outcomes [8]. This may be particularly relevant to interventions to break the cycle of deprivation, especially with adults who have previously ~~spent time in care been~~ looked after and who may have had a reduction in residential stability leading to disjointed health service access and reduced exposure to health advice and information. Measures have been proposed to improve outcomes for socially disadvantaged women such as multiagency working, tailored antenatal services, community based continuity of care schemes and Family Nurse Partnerships for young mothers [9 10].

Although previous work has looked at the associations between sexual risk behaviours and a history of time in care, very little evidence is available on the health status and maternal outcomes of these women. Previous research has shown that girls who are looked after by local authorities have worse sexual health outcomes than girls who had never been in care. Girls who have been in care have a greater risk of teenage pregnancy earlier age at first intercourse and an increased number of sexual partners compared to girls who had not spent any time in the care system [11-15]. In addition to a higher risk of teenage pregnancy and an increased number of sexual partners, Hobcraft (1998) found that girls who had been in care were at an increased risk of factors relating to social exclusion such as no qualifications, homelessness and poor quality housing [15].

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7 In a review of maternal predictors for child health status, emotional wellbeing, and educational
8 attainment, Keirnan and Mensah found that mothers who had spent time in care been looked after
9 before the age of 17 were more likely to report that their child was in fair or poor health rather than
10 good or excellent health, compared to mothers who had not lived away from home [7]. As far as we
11 are aware, investigation of maternal and pregnancy outcomes whilst accounting for possible
12 confounding factors such as socioeconomic class and maternal education has not previously been
13 published.

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15 The early years have been shown to be crucial for positive child development. We chose to focus on
16 maternal indicators and behaviours that are likely to have an impact on child physical and mental
17 wellbeing: smoking during pregnancy, breastfeeding initiation, and symptoms of maternal
18 depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16].
19 Maternal depression is associated with impaired mother-infant attachment, and children of
20 depressed mothers are at a greater risk of deficits in social and cognitive function, along with being
21 at a greater risk of psychopathology in later life [17-19]. Despite breastfeeding having short and long
22 term health benefits for both mother and baby [20], the UK has one of the lowest rates of
23 breastfeeding worldwide, especially in young, white women from disadvantaged social groups [21].

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25 We compared the sociodemographic and health profiles of mothers who had spent time in care been
26 looked after as a child either with foster parents or in a children's home to mothers who had not.
27 We also looked at the relationship between the mothers spending time in care who had been placed
28 with foster parents or in a children's home -with the likelihood of the outcomes of smoking during
29 pregnancy, the presence of symptoms of maternal depression and the uptake of breastfeeding.
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32 33 METHODS

34 35 Millennium Cohort Study

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37 The Millennium Cohort Study is a nationally representative cohort study of 18 818 infants from
38 18,553 families born in the UK [22]. A random two-stage sample of all infants born in the UK
39 between 2000 -2002, and who were alive and resident in the UK at 9 months was drawn from the
40 Department of Social Security Child Benefit Registers. Children born in England and Wales were
41 recruited between September 2000 and August 2001, and Children born in Scotland and Northern
42 Ireland were recruited between November 2000 and January 2002. Child Benefit Registers cover
43 virtually all children, but excludes those whose residence status is uncertain or temporary. Children
44 who had died within the first 9-10 months of life were excluded. These children are estimated to be
45 less than 1% of all births [23]. The study used stratified sampling by electoral ward, with
46 oversampling to ensure adequate representation of families living in poverty and those living in
47 areas with high ethnic minority populations. Parents and guardians were interviewed by trained
48 interviewers to capture socio-demographic and health information when their children were 9
49 months old, with subsequent follow up at 3, 5 and 7 years.
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53 This study was a cross sectional survey using the baseline questionnaire (9 months postnatally) of
54 the Millennium Cohort Study.
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Time spent in care as a child

The definition of a looked after child or a child in care varies between countries due to national legislation. In this cohort, Mmothers were asked the question “Before the age of 17 did you spend any time living away from both of your parents?” If they answered yes, they were asked to indicate the nature of the time spent away from home and the amount of time they spent spent in care away. Parents who had spent time in a children’s home or with foster parents run by either a local authority or a charitable organisation were coded as having spent time in care been looked after. This group included women who were not sure whether their placement was managed by the local authority or another organisation. Although children’s homes and foster placements can be run by voluntary societies, the responsibility for the child still lies with the local authority [24]. We classed mothers who had spent any amount of time in foster care or a children’s home care as the “exposed.” group. The comparison (“unexposed.”) group consisted of all mothers who had answered “no” to the question “Before the age of 17 did you spend any time living away from both of your parents?”, or who had only spent time in a boarding school, prison or young offenders institution, or with relatives. Mothers who did not answer the question or who indicated that they were unsure of their answer were excluded.

Breast feeding

Mothers were asked if they ever tried to breastfeed their cohort baby. If they answered yes, they were asked when they last gave their baby breast milk. Their answer was converted into breastfeeding duration, and then categorised into ‘never’, ‘less than 2 months’ ‘over 2 and less than 4 months’ and ‘over 4 months.’ The information was also coded into a binary category of ‘never breastfed’ and ‘ever breastfed’.

Smoking during pregnancy

Maternal smoking was coded as ‘current non-smoker’, ‘smoked during pregnancy’, or ‘gave up smoking during pregnancy’. These categories were recoded as a binary outcome of ‘smoked during pregnancy’ and ‘did not smoke during pregnancy’.

Symptoms of depression

Symptoms of depression were measured using 9 questions of the validated Malaise Inventory [25 26].

Ethnicity

Ethnicity was analysed as ‘white’ or other ethnic group non-white.

Parity and family status

Parity was the number of children the mother had (including the cohort member) and was coded as 1, 2, 3 or >3 children. Family status was categorised as ‘lone parent’, ‘cohabiting’ or ‘married’.

Birth outcomes

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7 Information on baby's birthweight, gestation and delivery method was obtained by self reporting.
8 Previous studies have shown that there is a good association between mothers' self-report of baby's
9 birthweight, gestation and mode of delivery compared to hospital records [27-29].
10 Birthweight was classified as ≥ 2.5 kg ('normal'), or < 2.5 kg ('low').
11 Gestation was recorded in weeks and classified as < 28 weeks, 28-32 weeks, 33-36 weeks or ≥ 37
12 weeks.
13 Mode of delivery was categorised as 'normal', 'instrumental' or 'caesarean'.

14 15 **Potential confounding factors**

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17 Mother's age at the birth of the child, household socioeconomic class, household income and
18 mother's education were considered as potential confounding factors. Previous evidence suggests
19 that these factors are associated with poor perinatal outcomes [30], although there has been very
20 little previous evidence on how factors relating to time in care manifest in maternal and neonatal
21 outcomes. Household socioeconomic class was measured by taking the occupation of the parent
22 with the highest socioeconomic position according to the four UK National Statistics socioeconomic
23 categories. Household income was calculated from the self-reported data on the questionnaire.
24 Mother's education was determined by their highest attainment of a National Vocational
25 Qualification or equivalent group. These qualifications were grouped as follows: 'higher' (bachelor's
26 degree or equivalent), 'medium' (end of schooling at age 18, A'Level or equivalent), 'lower' (end of
27 compulsory schooling at age 16, GCSE or equivalent), or other/lower.

28 29 30 **Inclusion and exclusion criteria**

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32 The Millennium Cohort Study did not recruit families if the child had been taken into care at the time
33 of initial assessment.

34 One study participant who withdrew consent after the study began was excluded.

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36 For this analysis, mothers were included if they were the birth mother of the Millennium Cohort
37 Study participant. Mothers who did not answer the question of whether they lived away from home
38 were excluded, as were mothers who answered the question as "I don't know".

39 One study participant who withdrew consent after the study began was excluded.

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41 Duplicate interviews were identified and excluded, removing the additional interviews of women
42 who had more than one child recruited into the study.

43 44 45 **Statistical analysis**

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47 First, we compared the following characteristics of the "exposed" with "unexposed" groups using
48 the Chi-squared statistic: age at delivery, ethnic group, social class, household income, education,
49 family status, parity, smoking during pregnancy, symptoms of depression, mode fo delivery,
50 gestational age, birth weight, and duration of feeding. gestational age (coded in weeks), birth
51 weight (below 2.5Kg or below 2.5 Kg), mode of delivery (normal, instrumental, caesarean section),
52 parity (1, 2, 3 or > 3 previous children), and family status (lone parent, cohabiting, or married).

We then used logistic regression to estimate odds ratios for a history of time spent in care and the outcomes of smoking during pregnancy, breastfeeding initiation and symptoms of depression, with adjustment for potential confounding factors. A plausible model was developed based on background literature. From our initial model, only ethnicity was subsequently removed as its inclusion did not have an appreciable effect on the result, and its removal appeared to make the model more robust. The potential confounders ~~were~~ included ~~were if they were~~ significantly associated with the outcome (indicated by Wald, $P < 0.05$) after controlling for other factors in the model. The “unexposed” group were used as the reference for these analyses. Cases with missing data were excluded from regression analyses.

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All analyses took into account the clustered stratified study design by using the survey commands in Stata version 13.0 [31]. Reported p values and confidence intervals account for clustering, and estimates of proportions and odd ratios are weighted by sampling weights [32].

RESULTS

Description of the cohort

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There were 18,552 respondents of the baseline interview of the Millennium Cohort Study. Fifty-seven respondents who were not the natural mothers of the cohort baby were excluded, as were 3 interviews that did not have data relating to their time in care history. Therefore our study population included 18,492 natural mothers.

In the study population, there were 291 mothers who reported spending time in care as a child, which was 1.65% of the cohort (95% CI 1.3-1.8). Of the mothers who reported spending time in foster care or a children’s home, 75% spent a year or more in care (see Table 1).

Table 1 - Distribution of time spent in care by the 291 mothers who reported being looked after spending time in care

<u>Time looked after in care</u>	Frequency	Percent
Less than 3 months	38	13
3 months to 1 year	35	12
1-2 years	42	14
2-5 years	90	31
5 -10 years	44	15
> Over 10 years	42	15
Total	291	

These mothers were born in previous decades, with 5% born after 1980, 42% between 1970 and 1980, 50% between 1960 and 1970 and 4% born before 1960. Mothers who had spent time in care been looked after were younger, less likely to achieve a high social class, less likely to have a high household income and less likely to have achieved a high level of education, compared with the rest of the cohort (Table 2). They were also more likely to be a single parent, have a larger family

and to smoke during their pregnancy (table 3). These differences were all statistically significant at the 5% level. There was no statistically significant association between ethnic group and reporting spending time in care. These differences were all statistically significant at the 5% level. Although their babies were more likely to be born by normal vaginal delivery, they were more likely to have a low birth weight, but there were no statistically significant differences in the gestation at delivery when compared to non-exposed women (table 34).

Table 2 - Socio-demographic characteristics of women with and without a history of being looked after time spent in care

Characteristic	Time looked after in Care		P value
	Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI]	
Age at delivery			<0.001
<20	11.1 [7.7,15.9]	4.9 [4.4,5.3]	
20-29	59.3 [52.3,65.9]	41.3 [39.6,43.0]	
30-39	28.6 [22.6,35.5]	50.3 [48.5,52.1]	
≥40	1.0 [0.3,3.9]	3.6 [3.3,4.0]	
Ethnic group			0.52
White	88.3 [82.3,92.5]	86.8 [84.3,88.9]	
Other ethnic group	11.7 [7.5,17.7]	13.2 [11.1,15.7]	
Social Class			<0.001
Managerial	17.3 [18.8,24.6]	44.9 [42.7,47.1]	
Intermediate occupations	16.0 [11.5,21.8]	19.6 [18.8,20.5]	
Routine and manual	51.3 [44.5,58.0]	30.8 [29.1,32.6]	
Never worked and long term unemployed	15.4 [11.2,20.9]	4.6 [4.0,5.4]	
Household income			<0.001
<£10,400	48.4 [41.3,55.4]	22.1 [20.7,23.6]	
£10,400-20,800	35.2 [28.7,42.2]	31.9 [30.3,33.4]	
£20,800 -31,200	9.5 [6.0,14.9]	22.1 [20.9,23.3]	
£31,200-52,000	5.3 [2.5,10.9]	17.0 [15.8,18.3]	
>£52,000	1.7 [0.7,4.2]	7.0 [5.6,8.6]	
Education			< 0.001
Higher	11.7 [7.2,18.5]	32.9 [30.7,35.1]	
Medium	7.5 [4.6,12.1]	14.3 [13.6,15.0]	
Lower	37.4 [31.6,43.6]	38.0 [36.3,39.7]	
Other	4.0 [1.8,8.7]	2.4 [2.1,2.8]	
Lone parent	10.4 [6.8,15.25]	3.5 [3.0,4.1]	<0.001

Table 3 - Pregnancy and neonatal and maternal characteristics of women with and without a history of being looked after time spent in care

Characteristic	Time looked after in Care		P value
	Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	
Parity			<0.001
1	28.7 [22.6,35.6]	41.4 [40.3,42.5]	
2	33.9 [28.2,40.2]	35.8 [34.9,36.7]	
3	17.7 [13.6,22.7]	15.0 [14.3,15.7]	
>3	19.7 [14.6,26.2]	7.9 [7.3,8.5]	
Smoking during pregnancy			<0.001
Kept smoking during	58.0 [50.5,65.1]	20.8 [19.6,22.1]	

pregnancy			
Gave up	14.9 [10.4,21.1]	13.3 [12.5,14.1]	
Never smoked	27.1 [21.5,33.5]	65.9 [64.6,67.3]	
Symptoms of depression			<0.001
Yes	31.3 [25.4,37.8]	13.4 [12.7,14.1]	
No	68.7 [62.2,74.6]	86.6 [86.0,87.3]	
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	
33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
≥37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birthweight			0.009
≥2.5kg	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
<2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breast feeding			<0.001
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Table 4 – Birth and neonatal outcomes for women with and without a history of time spent in care

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Characteristic	Time in Care Yes (n=291) % [95% CI]	No (n=18,201) % [95% CI]	P-value
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	
33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
≥37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birthweight			0.009
2.5kg or above	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
Below 2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breast feeding			<0.001
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Multivariable Analysis of modifiable outcomes

Analysis of women excluded from the regression model analysis due to missing data revealed that only a few women were excluded from the analysis of smoking during pregnancy and any breastfeeding following birth (7 (0.04%) and 4 respectively (0.02%)); all these excluded women were from the 18,201 'unexposed' group. However, 726 women were excluded due to missing data on symptoms of depression (Malaise Inventory score). Women who had been looked after were not more likely to have missing data in this variable than those who had not been looked after. In those who had spent some of their childhood in care, 11 out of the 291 women had missing data (3.9%). There were no statistically significant differences between those who had missing data and those who did not in terms of age, income, social class and education. Of the women who had not spent any time in care, 715 of the 18,201 women had missing data for symptoms of depression (4.0%). Those who had missing data were more likely to be in a lower social class, have a lower income and to have lower or no qualifications (please see tables s1-3 in the supplementary information.)

Table 45 shows the odds ratios for the association between having spent time in care been looked after and smoking during pregnancy, breastfeeding and symptoms of postnatal depression. Women who had spent time in care been looked after were 3 times more likely to smoke during pregnancy (OR 3.0) compared with women who had not spent time in care been looked after, even after adjusting for possible confounding factors. They were also less likely to initiate breastfeeding compared with women who had not spent time in care been looked after, although this effect was smaller and not statistically significant after adjusting for other factors (table 45). Women who had spent time in care been looked after were more twice as likely to have symptoms of depression (OR 1.98), even after controlling for possible confounding factors.

Table 45 - Unadjusted and adjusted odds ratios (95% CI) for smoking during pregnancy, any breastfeeding and symptoms of depression among mothers according to previous time a history of being looked after spent in care

	% [†] of participants (n)	Unadjusted (95% CI)	Adjusted (95% CI)
Mother smoked during pregnancy	(18,485)		
No time spent in care	20.8 (4,051)	1	1
Any time spent in care	58.0 (173)	5.3 (3.9-7.1)	3.0 (2.1-4.3)*
Any breastfeeding	(18,488)		
No time spent in care	69.7 (11,988)	1	1
Any time spent in care	53.5 (156)	0.5 (0.4-0.7)	1.1 (0.7-1.4)*
Symptoms of depression	(17,766)		
No time spent in care	13.4 (2,566)	1	1
Any time spent in care	31.3 (87)	2.94 (2.19-3.96)	1.98 (1.4-2.7)*

[†]Weighted percentages

*Adjusted for maternal age, income, education and social class

DISCUSSION

Summary of findings

In our study, which represents the mothers of babies born in the UK during 2001-2002, 1.6% of women in this cohort had spent some of their childhood in the care system, either with foster parents or in a children's home. The majority of these women had spent a year or more in care. The mothers in our study who had spent some of their childhood as a looked after child in care were disadvantaged in terms of social and economic factors when compared to the mothers who had not spent time in care. They were more likely to smoke during their pregnancy and have symptoms of depression. This likelihood persisted after adjusting for confounding factors. In univariable analysis, they were less likely to breastfeed, but this effect did not persist after adjusting for confounding factors.

-These results suggests that these women with a history of time in foster care or a children's home carry social disadvantage into adulthood and motherhood, with the potential of continuing the cycle of deprivation.

Comparison with other studies

As far as we are aware, this study is one of the first to look at health status and maternal outcomes of pregnant women who have previously been in care. The links between social disadvantage and being a looked after child, and the links between social disadvantage and poor maternal outcomes are well documented. It is not surprising that the findings of this study show that being a looked after child and is associated with social disadvantage and adverse maternal outcomes. Previous studies have shown that looked after children are more likely to become teenage mothers. Compared to previous estimates of the number of children in England in care at any one time, our estimate is considerably lower. Simkiss et al. [3], suggest that 3% of children in the UK have spent some time in care. Our estimate may be low because we have missed many mothers who have previously been in care, which could be due to them declining to take part, or because their children had been taken into care. If this is the case, then these mothers are likely to be different to those who agreed to the recruitment of their children. It is likely that the families who were not recruited into the Millennium Cohort Study were more unstable than those who were, or who had a greater distrust of institutions.

The worse birth outcomes in terms of birth weight and prematurity found in the exposed group could be a result of the association between antenatal smoking with low birth weight and prematurity [33], and the high rate of antenatal smoking in this group [35]. Younger mothers are more likely to have a unassisted birth [34], and we postulate that the higher proportion of normal deliveries seen in the exposed group is associated with the lower average age of women in this group.

Strengths and limitations

A strength of this study is the use of Millennium Cohort Study data, a nationally representative sample which ensured adequate representation from socially disadvantaged groups and people from

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7 ethnically diverse backgrounds. Using this cohort allowed us to capture women who had previously
8 been in care during their adult lives, which can be otherwise difficult to do.

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10 The amount of missing data was small; and in all but except in the multivariable analysis using the
11 Malaise Inventory score as an outcome, the negligible amount of missing data would be unlikely to
12 affect the results. For the outcome of symptoms of depression, 3.9% of the data was missing, and it
13 is possible that the worse social characteristics of the women without information on their Malaise
14 Inventory score may have led to a small increase in the estimation of the effect of being in care in
15 the adjusted model.

16
17 A major limitation of this study is that a large number of women with a history in care may not be
18 included in the MCS, due to not agreeing to take part or being ineligible because their own children
19 had been taken into care. Furthermore, information on the childhood socioeconomic status of the
20 mothers was not available.

21
22 However, although we can compare our prevalence to estimates of children currently in care, it is
23 not possible to obtain estimates of how many women of child bearing age at the time of our cohort
24 may have been in care during their childhoods without prevalence data of looked after children from
25 the 1960s to the 1990s. Therefore, we are unable to say what the likely proportion of women who
26 would have been excluded would be. However, it is possible that these women who were excluded
27 due to having their own children taken into care are may be more likely to have had worse social
28 outcomes than those who entered the cohort. We would assume that if the data on these women
29 had been captured, the results of this study would have been more extreme. A systematic review of
30 the characteristics of families whose children were taken into care showed that a low socioeconomic
31 status was the factor most associated with this outcome [35]. This systematic review noted a large
32 variation by country in the factors associated with families requiring children to be placed in care,
33 and that only one study was found from the UK. This and subsequent studies suggest that in the UK,
34 children who have been taken into care are more likely to have had mothers who were younger,
35 have a history of substance misuse or mental illness, live in a deprived neighbourhood, are from a
36 lower social class, and live in overcrowded or rented accommodation [3 36].

37
38 Another limitation of this study was the absence of information on the childhood socioeconomic
39 status of the mothers, which was a potential confounder.

40
41 The proportion of women with missing data was small.

42 43 44 45 46 **Potential mechanisms and policy implications**

47
48 The population of this study are women born between the 1960's and mid-1980s, and their children
49 who are now 13-14 years old. The findings of this study have relevance to these children as they
50 enter adolescence and adulthood, as evidence suggests that activity in the early years can have
51 lasting effects on health and psychosocial functioning [37-39]. Unfortunately the outcomes for
52 looked after children in the UK remains poor, both during their childhood, and when they enter
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7 [adult life](#)[5 40 41]. [An](#)[The increased policy focus on the early years, education and integrated care in](#)
8 [recent times may have helped to improve outcomes for these children](#)[42].
9

10 From this study it is not possible to determine whether the social disadvantage is a direct
11 antecedent to being in care, or whether being in care led to subsequent social disadvantage. The
12 question remains whether being in care confers a disadvantage in terms of maternal behaviours and
13 outcomes over and above the social and economic disadvantage.
14

15 However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of
16 the social care system is to reduce the social disadvantage that the child experienced on entering
17 care, and idealistically improve their life circumstances in order for the child to have a better start in
18 life. ~~Our results show that t~~he UK still has a long way to go in reducing the long term disadvantage
19 experienced by children in care. Of particular concern is the evidence presented here that suggests
20 that this disadvantage persists to child bearing age and is associated with maternal behaviours and
21 outcomes that have the potential to affect the health and wellbeing of their children. [In addition to](#)
22 [the legacy of early and continuing social disadvantage such as low household income, low](#)
23 [educational attainment and reduced employment opportunities, there are aspects of care itself that](#)
24 [may have an effect on the maternal outcomes studied such as residential instability, disrupted](#)
25 [parental attachments and difficulties in resolving past history when faced with having children of](#)
26 [one's own](#) [12 43-45].
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28

29 It is known that maternal smoking, depression and breast feeding rates are potentially modifiable
30 behaviours with appropriate screening, education and support from healthcare professionals. Tools
31 exist to screen for and identify perinatal depression, and there are ways that women with
32 depression can be supported and treated [46]. Likewise, smoking in pregnancy and breastfeeding
33 can be asked about and women who would like to change their current behaviours can be supported
34 to change- [21 47-49]. Pregnancy and early motherhood is a time when women who are often
35 otherwise healthy have a large amount of contact with health care services. These results suggest
36 that it may be worthwhile to pay particular attention to women who have a history in being in care
37 when they present to health and social care services during pregnancy and early motherhood.
38 Currently a history of time in care is not part of the routine information collected during prenatal
39 visits. It has been suggested that a wider range of socio-demographic information should be
40 collected in order to create a deeper understanding of the individual mother's needs [7].
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42

43 The best way to use this information for policy changes is yet to be determined. Interventions aimed
44 at improving the educational and emotional outcomes for looked after children are varied, despite
45 difficulties in producing sustained improvement. Educational and emotional outcomes for looked
46 after children in European countries such as Denmark, Germany and Norway are better than those
47 in the UK. The use of the social pedagogy approach has been accredited for some of these
48 differences. This approach emphasises emotional warmth and personal development. Information
49 on how the health and emotional wellbeing of looked after children can perpetuate cycles of
50 deprivation may add to this body of research. [50]
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53 Future research

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7 There has been an increased focus on the outcomes for looked after children, particularly over the
8 past decade[51 52]. Therefore outcomes for looked after children could be very different for women
9 previously in care who are pregnant currently, as compared to those pregnant 10 years ago. It would
10 be useful to look at the current health outcomes of mothers previously in care and their children in
11 order to see if presently there are inequities, and if whether these inequities are reducing.

12
13 Information is currently collected by the Department of Education on the educational outcomes of
14 looked after children, and this research has been used to target interventions at increasing their
15 educational attainment [53]. Berridge argues that focusing on these educational targets alone are
16 not enough, and a theory and approach that encompasses a wide view of the challenges faced by
17 looked after children is needed [54]. We argue that the mental and physical health of looked after
18 children during pregnancy is an area that should be added as a piece of this policy puzzle.

20 21 Conclusions

22
23 Findings from the Millennium Cohort Study indicate that mothers with a history of spending time as
24 a looked after child in care are disadvantaged socially and economically when compared to other
25 mothers even after they have left care and during their children's infancy. We looked in more detail
26 at smoking during pregnancy, symptoms of depression in early motherhood and whether breast
27 feeding was initiated, and found that mothers who had spent time in care been looked after were
28 more likely to smoke during pregnancy and have symptoms of depression. This is consistent with
29 previous research suggesting that social and health disadvantages faced by looked after children
30 persist into adult life.

31
32
33 Contributors: All contributors (SB, MQ, RG) made substantial contributions to conception and
34 design, acquisition of data, and interpreted the data. SB did the initial analysis of the data and wrote
35 the first draft of the article. SB, RG and MQ revised the article critically for important intellectual
36 content; and all authors (SB, MQ, RG) approved of the version to be published.

37 ~~Contributors: All contributors participated in the design and the interpretation of the findings. SB~~
38 ~~analysed the data and drafted the manuscript. All authors critically reviewed the manuscript and~~
39 ~~approved the final version.~~

40
41 Funding: This research received no specific grant from any funding agency in the public, commercial
42 or not-for-profit sectors.

43 Competing interests: None.

44 Ethical approval: This research involved secondary analysis of the MCS and therefore did not require
45 ethical approval. Ethical approval for the Millennium Cohort Study was granted from the multi-
46 centre research ethics committee.

47 Data sharing: The datasets are available on the UK Data Archive. Further information about the
48 study and data can be found at www.cls.ioe.ac.uk/.

51 52 References

1. Martin A, Ford T, Goodman R, et al. Physical illness in looked-after children: a cross-sectional study. *Archives of disease in childhood* 2013 doi: 10.1136/archdischild-2013-303993[published Online First: Epub Date]].
2. Department of Education. Children looked after in England (including adoption and care leavers) year ending 31 March 2013. London: Office of National Statistics, 2014.
3. Simkiss DE, Spencer NJ, Stallard N, et al. Health service use in families where children enter public care: a nested case control study using the General Practice Research Database. *BMC health services research* 2012;**12**:65 doi: 10.1186/1472-6963-12-65[published Online First: Epub Date]].
4. Department of Education. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2013. London: Office of National Statistics, 2014.
5. Viner RM, Taylor B. Adult health and social outcomes of children who have been in public care: population-based study. *Pediatrics* 2005;**115**(4):894-9 doi: 10.1542/peds.2004-1311[published Online First: Epub Date]].
6. Ford T, Vostanis P, Meltzer H, et al. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British journal of psychiatry : the journal of mental science* 2007;**190**:319-25 doi: 10.1192/bjp.bp.106.025023[published Online First: Epub Date]].
7. Keirnan K, Mensah F. Maternal indicators in pregnancy and childhood infancy that signal future outcomes for children's development, behaviour and health: evidence from the Millennium Cohort Study: Department of Social Policy and Social Work, University of York, 2010.
8. National Institute for Health and Clinical Excellence (NICE). Pregnancy and complex social factors: A model for service provision for pregnant women with complex social factors - guidance (CG110) 2010.
9. Department of Health. Maternity Standard, National Service Framework for Children, Young People and Maternity Services, 2004.
10. Department of Health. Healthy lives, healthy people : our strategy for public health in England. Cm. Norwich: Stationery Office, 2010:96 p.
11. Carpenter SC, Clyman RB, Davidson AJ, et al. The association of foster care or kinship care with adolescent sexual behavior and first pregnancy. *Pediatrics* 2001;**108**(3):E46
12. Svoboda DV, Shaw TV, Barth RP, et al. Pregnancy and parenting among youth in foster care: A review. *Children and Youth Services Review* 2012;**34**(5):867-75 doi: 10.1016/j.childyouth.2012.01.023[published Online First: Epub Date]].
13. Vinnerljung B, Franzén E, Danielsson M. Teenage parenthood among child welfare clients: A Swedish national cohort study of prevalence and odds. *Journal of Adolescence* 2007;**30**(1):97-116
14. Polit DF, Morton TD, White CM. Sex, Contraception and Pregnancy Among Adolescents in Foster Care. *Family Planning Perspectives* 1989;**21**(5):203-08 doi: 10.2307/2135572[published Online First: Epub Date]].
15. Hobcraft J. Intergenerational and Life-Course Transmission of Social Exclusion: Influences and Childhood Poverty, Family Disruption and Contact with the Police: Centre for Analysis of Social Exclusion, LSE, 1998.
16. Whitworth M, Dowswell T. Routine pre-pregnancy health promotion for improving pregnancy outcomes. *The Cochrane database of systematic reviews* 2009(4):CD007536 doi: 10.1002/14651858.CD007536.pub2[published Online First: Epub Date]].
17. Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics* 2006;**118**(2):659-68 doi: 10.1542/peds.2005-2948[published Online First: Epub Date]].
18. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal* 2002;**23**(1-2):145-63 doi: 10.1002/imhj.10009[published Online First: Epub Date]].

19. Canadian Paediatric Society. Maternal depression and child development. *Paediatrics & child health* 2004;**9**(8):575-98
20. National Institute for Health and Clinical Excellence (NICE). Maternal and child nutrition: NICE, 2008.
21. Dyson. Promotion of breast feeding initiation and duration: evidence into practice briefing: NICE, 2006.
22. Centre for Longitudinal Studies. The age 9 months survey of the MCS (2001- 2002), 20.
23. Office of National Statistics. Infant and perinatal mortality 2001: health areas, England and Wales. *Health Statistics Quarterly* 2002;**15**
24. Department of Education. Improving the adoption system and services for looked after children: Policy, 2014.
25. Rodgers B, Pickles A, Power C, et al. Validity of the Malaise Inventory in general population samples. *Social psychiatry and psychiatric epidemiology* 1999;**34**(6):333-41
26. McGee R, Williams S, Silva PA. An evaluation of the Malaise Inventory. *Journal of psychosomatic research* 1986;**30**(2):147-52
27. Tate AR, Dezateux C, Cole TJ, et al. Factors affecting a mother's recall of her baby's birth weight. *International journal of epidemiology* 2005;**34**(3):688-95 doi: 10.1093/ije/dyi029[published Online First: Epub Date]|.
28. Poulsen G, Kurinczuk JJ, Wolke D, et al. Accurate reporting of expected delivery date by mothers 9 months after birth. *Journal of clinical epidemiology* 2011;**64**(12):1444-50 doi: 10.1016/j.jclinepi.2011.03.007[published Online First: Epub Date]|.
29. Quigley MA, Hockley C, Davidson LL. Agreement between hospital records and maternal recall of mode of delivery: evidence from 12 391 deliveries in the UK Millennium Cohort Study. *BJOG : an international journal of obstetrics and gynaecology* 2007;**114**(2):195-200 doi: 10.1111/j.1471-0528.2006.01203.x[published Online First: Epub Date]|.
30. Marmot M, International Balzan Foundation. *Fair society, healthy lives*.
31. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [program], 2013.
32. Hanson K, ed. *Millennium cohort study, first, second and third surveys: a guide to the datasets*. 3rd ed. London: Centre for Longitudinal Studies, Institute of Education, 2008.
33. Cnattingius S. The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research* 2004;**6**(Suppl 2):S125-S40 doi: 10.1080/14622200410001669187[published Online First: Epub Date]|.
34. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a systematic review. *Birth (Berkeley, Calif.)* 2010;**37**(3):219-26 doi: 10.1111/j.1523-536X.2010.00409.x[published Online First: Epub Date]|.
35. Simkiss DE, Stallard N, Thorogood M. A systematic literature review of the risk factors associated with children entering public care. *Child: Care, Health and Development* 2013;**39**(5):628-42 doi: 10.1111/cch.12010[published Online First: Epub Date]|.
36. Bebbington A, Miles. The Background of Children who enter Local Authority Care. *British Journal of Social Work* 1989;**19**(1):349-68
37. Dixon J. Young people leaving care: health, well-being and outcomes. *Child & Family Social Work* 2008;**13**(2):207-17 doi: 10.1111/j.1365-2206.2007.00538.x[published Online First: Epub Date]|.
38. Barker DJ. The origins of the developmental origins theory. *Journal of internal medicine* 2007;**261**(5):412-7 doi: 10.1111/j.1365-2796.2007.01809.x[published Online First: Epub Date]|.
39. Peruzzi A. From Childhood Deprivation to Adult Social Exclusion: Evidence from the 1970 British Cohort Study. *Soc Indic Res* 2014:1-19 doi: 10.1007/s11205-014-0581-2[published Online First: Epub Date]|.
40. Department of Health. Statutory guidance on promoting the health and well-being of looked after children 2009

41. National Institute for Health and Clinical Excellence (NICE). Looked after children and young people, 2010.
42. Science BBo. *Growing up in the UK: Ensuring a healthy future for our children* British Medical Association, 2013.
43. Dregan A, Gulliford MC. Foster care, residential care and public care placement patterns are associated with adult life trajectories: population-based cohort study. *Social psychiatry and psychiatric epidemiology* 2012;**47**(9):1517-26 doi: 10.1007/s00127-011-0458-5[published Online First: Epub Date]].
44. Pryce JM, Samuels GM. Renewal and Risk: The Dual Experience of Young Motherhood and Aging Out of the Child Welfare System. *Journal of Adolescent Research* 2010;**25**(2):205-30 doi: 10.1177/0743558409350500[published Online First: Epub Date]].
45. Maxwell A, Proctor J, Hammond L. 'Me and My Child': Parenting Experiences of Young Mothers Leaving Care. *Adoption & Fostering* 2011;**35**(4):29-40 doi: 10.1177/030857591103500404[published Online First: Epub Date]].
46. Nylen KJ, Moran TE, Franklin CL, et al. Maternal depression: A review of relevant treatment approaches for mothers and infants. *Infant Mental Health Journal* 2006;**27**(4):327-43 doi: 10.1002/imhj.20095[published Online First: Epub Date]].
47. National Institute for Health and Clinical Excellence (NICE). CG45 Antenatal and postnatal mental health: clinical management and service guidelines, 2010.
48. National Institute for Health and Clinical Excellence (NICE). PH26 Quitting smoking in pregnancy and following childbirth, 2010.
49. Lumley J, Chamberlain C, Dowswell T, et al. Interventions for promoting smoking cessation during pregnancy. *The Cochrane database of systematic reviews* 2009(3):CD001055 doi: 10.1002/14651858.CD001055.pub3[published Online First: Epub Date]].
50. Boddy J, Statham J, McQuail S, et al. Workign at the 'edges' of care? European models of support for young people and families: Thomas Coram Research Unit, Institute of Education, University of London, 2009.
51. Chief Secretary to the Treasury. Every child matters, 2003.
52. Polnay L, Ward H. Promoting the health of looked after children. Government proposals demand leadership and a culture change. *Bmj* 2000;**320**(7236):661-2
53. Social Exclusion Unit. A better education for children in care: Social Exclusion Unit, 2003.
54. Berridge D. Theory and explanation in child welfare: education and looked-after children. *Child & Family Social Work* 2007;**12**(1):1-10 doi: 10.1111/j.1365-2206.2006.00446.x[published Online First: Epub Date]].

Table s1. Women with data missing for the variable 'symptoms of depression'

	Women previously looked after	Women not previously looked after
Data on symptoms of depression	280	17,486
No data	11	715
% with missing data	3.9	4.0

Table s2. Characteristics of women previously been in care with missing data compared to those with data

Variable	% with data	% with missing data	P Value
Maternal age			0.6
<20	10.6	25.1	
20-29	59.5	53.6	
30-39	28.9	21.2	
>40	1.0	0	
Social class			0.2
Managerial	18.1	0	
Intermediate	16.2	10.5	
Routine	51.2	54.3	
Never worked	14.6	35.2	
Education			
Higher	12.2	0	0.5
Medium	7.4	10.8	
Lower	38.1	21.5	
Other	4.15	0	
None	38.1	67.7	
Household Income			0.6
<£10,400	47.3	75.2	
10,400-20,800	35.6	24.8	
£20,800 -31,200	9.9	0	
£31,200-52,000	5.5	0	
>£52,000	1.7	0	

Table s3. Characteristics of women not previously been in care with missing data compared to those with data

Variable	% with data	% missing – women not in care	P value
Maternal age			<.001
<20	4.9	4.1	
20-29	4.09	52.6	
30-39	50.6	39.2	
>40	3.6	4.2	
Social class			<0.001
Managerial	45.7	17.8	
Intermediate	19.7	17.6	
Routine	30.4	45.0	
Never worked	4.2	19.6	
Education			<0.001
Higher	33.4	14.7	
Medium	14.5	7.7	
Lower	38.5	20.1	
Other	2.1	13.2	
None	11.6	44.3	
Household Income			<0.001
<£10,400	21.6	44.5	
10,400-20,800	31.7	38.9	
£20,800 -31,200	22.4	8.8	
£31,200-52,000	17.4	3.4	
>£52,000	7.0	4.5	

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2,3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5,6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7,8
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6,8
		(b) For matched studies, give matching criteria and number of exposed and unexposed	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	6,8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	8
		(d) If applicable, explain how loss to follow-up was addressed	n/a
		(e) Describe any sensitivity analyses	n/a
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	9
		(c) Consider use of a flow diagram	9
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9,10
		(b) Indicate number of participants with missing data for each variable of interest	11
		(c) Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	Report numbers of outcome events or summary measures over time	n/a
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11
		(b) Report category boundaries when continuous variables were categorized	7,10
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	13,14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Pregnancy associated outcomes in women who spent some of their childhood looked after by local authorities: findings from the UK Millennium Cohort Study

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3 **Pregnancy associated outcomes in women who spent some**
4 **of their childhood looked after by local authorities: findings**
5 **from the UK Millennium Cohort Study.**
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ABSTRACT

Objectives

There has been very little description of the health and social outcomes at pregnancy and early motherhood of girls who were previously looked after by local authorities. The objectives of this study were to compare the sociodemographic and health profiles of mothers who had spent time in a children's home or with foster parents as a child to mothers who had not. In particular, to examine associations between being looked after and the likelihood of smoking during pregnancy, birth weight, the presence of symptoms of maternal depression and the initiation of breastfeeding.

Design

A retrospective cross sectional study using the baseline questionnaire of the Millennium Cohort Study.

Setting

The UK.

Participants

A nationally representative study of 18,492 mothers of babies born in the UK during 2000-2002.

Exposure

A history of spending time in a children's home or with foster parents.

Outcome measures

1. Smoking during pregnancy
2. Low birth weight
3. Symptoms of maternal depression
4. Initiation of breastfeeding

Results

In univariable analyses, women who had been looked after were significantly less likely to be of higher social class, live in a high-income household or have achieved a high level of education. They were more likely to have a low birth weight baby and be a single parent. In multivariable analysis, women who had been looked after were more likely to smoke during pregnancy (adj. OR 3.0 95% CI 2.14, 4.3) and were more likely to have symptoms of depression (adj. OR 1.98 95% CI 1.4-2.7) compared with women who had not been looked after.

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Conclusions

Our results suggest that these women carry social disadvantage into motherhood, with the potential of continuing the cycle of deprivation. There is a case for increasing our attention on this group who can be readily accessed by maternity and early years' services.

For peer review only

ARTICLE SUMMARY

This study uses the UK Millennium Cohort Study to identify mothers who had spent part of their childhood in foster care or in a children's home. We looked at the difference in sociodemographic factors and health outcomes between these women and women who had not been in foster care or a children's home during their childhood. We also looked at the likelihood of three health-related maternal outcomes: smoking in pregnancy, birth weight, maternal depression and the initiation of breastfeeding. Mothers who had spent part of their childhood in foster care or a children's home had worse health and social outcomes than those who had not.

Strengths and Limitations

- Nationally representative sample
- Potential selection bias against mothers who had been in care and whose own children had been taken into care

INTRODUCTION

Children in the public care system are an important group for public health action. In the UK, although legislation differs between the nations, looked after children (also called children in care) are generally children whose parental responsibility lies with the local authority, or is shared between parents and the local authority. This parental responsibility may result in a variety of care arrangements, such as foster care, placement in a children's home, or being placed with relatives. In the year ending March 2013, there were approximately 68 110 looked after children in England (57 per 10,000 children) [1 2] and it has been estimated that during their childhood, around 3% of children in England and Wales spend some time in care [3]. These children often come from vulnerable households, and have many risk factors for poor social, educational and health outcomes [2 4]. Many of these health, social, and psychological difficulties are related to the reasons for the child entering the care system. Sixty-two percent of these children entered the care system due to abuse or neglect, and for 3% of looked after children, their own health problems led to them entering care [2]. It is likely that these disadvantages continue into adult life for many of these children[5]. Despite these health and social disadvantages, there is very little evidence on the health status of this group. They are an underrepresented group in research as they are a highly mobile group, with issues of parental consent making enrolment into research studies difficult [6].

Few studies have used nationally representative samples focusing on health outcomes over the life course of children who have been in care [1 4 5]. Even fewer have investigated outcomes during pregnancy and early motherhood [7]. In particular, whether mothers with a history of time spent in care have adverse maternal and pregnancy outcomes is currently unknown.

Pregnancy and early motherhood is an important point in the life cycle: a time when women have a high level of contact with health and social care services. As a consequence there is potential to identify high risk women and provide interventions to improve pregnancy outcomes [8]. This may be particularly relevant to adults who have previously been in care and who may have had a reduction in residential stability leading to disjointed health service access and reduced exposure to health advice and information. Measures have been proposed to improve outcomes for socially disadvantaged women such as multiagency working, tailored antenatal services, community based continuity of care schemes and Family Nurse Partnerships for young mothers [9 10].

Although previous work has looked at the associations between sexual risk behaviours and a history of time in care, very little evidence is available on the health status and maternal outcomes of these women. Previous research has shown that girls who have been in care have worse sexual health outcomes than girls who have never been in care. Girls who have been in care have a greater risk of teenage pregnancy earlier age at first intercourse and an increased number of sexual partners compared to girls who had not spent any time in the care system [11-15]. In addition to a higher risk of teenage pregnancy and an increased number of sexual partners, Hobcraft (1998) found that girls who had been in care were at an increased risk of factors relating to social exclusion such as no qualifications, homelessness and poor quality housing [15].

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3 In a review of maternal predictors for child health status, emotional wellbeing, and educational
4 attainment, Keirnan and Mensah found that mothers who had been in care before the age of 17
5 were more likely to report that their child was in fair or poor health rather than good or excellent
6 health, compared to mothers who had not lived away from home [7]. As far as we are aware,
7 investigation of maternal and pregnancy outcomes whilst accounting for possible confounding
8 factors such as socioeconomic class and maternal education has not previously been published.
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11 The early years have been shown to be crucial for positive child development. We chose to focus on
12 maternal indicators and behaviours that are likely to have an impact on child physical and mental
13 wellbeing: smoking during pregnancy, low birth weight, breastfeeding initiation and symptoms of
14 maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies
15 [16] Low birth weight is associated with worse childhood and adult health and social outcomes, and
16 is thought to be influenced by both biological and social factors [17-19]. The prevention of low birth
17 weight through health and social interventions in order to reduce health inequalities at an
18 intergenerational level is an important goal of public health. Maternal depression is associated with
19 impaired mother-infant attachment, and children of depressed mothers are at a greater risk of
20 deficits in social and cognitive function, along with being at a greater risk of psychopathology in later
21 life [20-22]. Despite breastfeeding having short and long term health benefits for both mother and
22 baby [23], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white
23 women from disadvantaged social groups [24].
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28 We compared the sociodemographic and health profiles of mothers who had been in care as a child
29 either with foster parents or in a children's home to mothers who had not. We also looked at the
30 relationship between the mothers who had been placed with foster parents or in a children's home
31 with the likelihood of the following selected outcomes: smoking during pregnancy, birth weight, the
32 presence of symptoms of maternal depression and the uptake of breastfeeding.
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37 **METHODS**

38 **Millennium Cohort Study**

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40 The Millennium Cohort Study is a nationally representative cohort study of 18 818 infants from
41 18,553 families born in the UK [25]. A random two-stage sample of all infants born in the UK
42 between 2000 -2002, and who were alive and resident in the UK at 9 months was drawn from the
43 Department of Social Security Child Benefit Registers. Children born in England and Wales were
44 recruited between September 2000 and August 2001, and Children born in Scotland and Northern
45 Ireland were recruited between November 2000 and January 2002. Child Benefit Registers cover
46 virtually all children, but excludes those whose residence status is uncertain or temporary. Children
47 who had died within the first 9-10 months of life were excluded. These children are estimated to be
48 less than 1% of all births [26]. The study used stratified sampling by electoral ward, with
49 oversampling to ensure adequate representation of families living in poverty and those living in
50 areas with high ethnic minority populations. Parents and guardians were interviewed by trained
51 interviewers to capture sociodemographic and health information when their children were 9
52 months old, with subsequent follow up at 3, 5 and 7 years.
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4 This study was a cross sectional survey using the baseline questionnaire (9 months postnatally) of
5 the Millennium Cohort Study.
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7 8 **Time spent in care as a child**

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10 The definition of a looked after child or a child in care varies between countries due to national
11 legislation. In this cohort, mothers were asked the question “Before the age of 17 did you spend any
12 time living away from both of your parents?” If they answered yes, they were asked to indicate the
13 nature of the time spent away from home and the amount of time they spent away. Parents who
14 had spent time in a children’s home or with foster parents run by either a local authority or a
15 charitable organisation were coded as having been in care. This group included women who were
16 not sure whether their placement was managed by the local authority or another organisation.
17 Although children’s homes and foster placements can be run by voluntary societies, the
18 responsibility for the child still lies with the local authority [27]. We classed mothers who had spent
19 any amount of time in foster care or a children’s home as the ‘exposed.’ group. The comparison
20 (‘unexposed’) group consisted of all mothers who had answered “no” to the question “Before the
21 age of 17 did you spend any time living away from both of your parents?”, or who had only spent
22 time in a boarding school, prison or young offenders institution, or with relatives. Mothers who did
23 not answer the question or who indicated that they were unsure of their answer were excluded.
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29 **Breastfeeding**

30 Mothers were asked if they ever tried to breastfeed their cohort baby. If they answered yes, they
31 were asked when they last gave their baby breast milk. Their answer was converted into
32 breastfeeding duration, and then categorised into ‘never’, ‘less than 2 months’ ‘over 2 and less than
33 4 months’ and ‘over 4 months.’ The information was also coded into a binary category of ‘never
34 breastfed’ and ‘ever breastfed’.
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38 **Smoking during pregnancy**

39 Maternal smoking was coded as ‘current non-smoker’, ‘smoked during pregnancy’, or ‘gave up
40 smoking during pregnancy’. These categories were recoded as a binary outcome of ‘smoked during
41 pregnancy’ and ‘did not smoke during pregnancy’.
42
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44 **Symptoms of depression**

45 Symptoms of depression were measured using 9 questions of the validated Malaise Inventory [28
46 29], a tool used within the Millennium Cohort Study to provide a measure of depression or
47 psychological distress [30]. It is a self-report tool phrased in plain language. There is no specified
48 time frame over which participants are asked to report their symptoms, but the emphasis is on the
49 recent past.
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52 **Birth outcomes**

53 Information on baby’s birth weight, gestation and delivery method was obtained by self reporting.
54 Previous studies have shown that there is good agreement between mothers’ self-report of baby’s
55 birth weight, gestation and mode of delivery compared to hospital records [31-33].
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3 Birth weight was classified as ≥ 2.5 kg ('normal'), or < 2.5 kg ('low'). Gestation was recorded in weeks
4 and classified as < 28 weeks, 28-32 weeks, 33-36 weeks or ≥ 37 weeks. Mode of delivery was
5 categorised as 'normal', 'instrumental' or 'caesarean'.
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8 **Sociodemographic factors**

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10 Ethnicity was analysed as 'white' or 'other ethnic group'. Parity was the number of children the
11 mother had (including the cohort member) and was coded as 1, 2, 3 or > 3 children. Family status
12 was categorised as 'lone parent', 'cohabiting' or 'married'.
13

14 Household socioeconomic class was measured by taking the occupation of the parent with the
15 highest socioeconomic position according to the four UK National Statistics socioeconomic
16 categories. Household income was calculated from the self-reported data on the questionnaire.
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18 Mother's education was determined by their highest attainment of a National Vocational
19 Qualification or equivalent group. These qualifications were grouped as follows: 'higher' (bachelor's
20 degree or equivalent), 'medium' (end of schooling at age 18, A Level or equivalent), 'lower' (end of
21 compulsory schooling at age 16, GCSE or equivalent), or other.
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24 **Inclusion and exclusion criteria**

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26 The Millennium Cohort Study did not recruit families if the child had been taken into care at the time
27 of initial assessment. One study participant who withdrew consent after the study began was
28 excluded.
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32 For this analysis, mothers were included if they were the birth mother of the Millennium Cohort
33 Study participant. Mothers who did not answer the question of whether they lived away from home
34 were excluded, as were mothers who answered the question as "I don't know".
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37 **Statistical analysis**

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39 First, we compared the following characteristics of the 'exposed' with 'unexposed' groups using the
40 Chi-squared statistic: age at delivery, ethnic group, social class, household income, education, family
41 status, parity, smoking during pregnancy, symptoms of depression, mode of delivery, gestational
42 age, birth weight, and duration of feeding.
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46 We then used logistic regression to estimate odds ratios for a history of time spent in care and the
47 outcomes of smoking during pregnancy, birth weight, breastfeeding initiation and symptoms of
48 depression, with adjustment for potential confounding factors. A plausible model was developed
49 based on background literature and included the following potential confounders: age at delivery,
50 ethnic group, social class, household income, education. Previous evidence suggests that these
51 factors are associated with poor perinatal outcomes [34], although there has been very little
52 previous evidence on how factors relating to time in care manifest in maternal and neonatal
53 outcomes. All of these potential confounders were significantly associated with the outcome
54 (indicated by Wald, $P < 0.05$) after controlling for other factors in the model. Ethnicity was
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3 subsequently removed as its inclusion did not have an appreciable effect on the result, and its
4 removal appeared to make the model more robust with narrower confidence intervals .
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7 For birth weight, the same potential confounders were considered together with gestational age and
8 smoking during pregnancy. The following variables were significantly associated with the outcome
9 (indicated by Wald, $P < 0.05$) after controlling for other factors in the model: gestational age,
10 education, ethnicity and maternal age. As smoking during pregnancy is likely to be in the causal
11 chain of low birth weight, the model was considered with and without this variable to see what
12 extent the effect on birth weight is mediated by smoking.
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16 The “unexposed” group were used as the reference for these analyses.
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19 For univariable analysis, those with missing outcomes of smoking during pregnancy, low birth weight
20 and any breastfeeding following birth were excluded (7 (0.04%), 21 (0.1%) and 4 respectively
21 (0.02%)); all these excluded women were from the 18,201 ‘unexposed’ group. However, 726 women
22 were excluded due to missing data on symptoms of depression (Malaise Inventory score). Women
23 who had been in care were not more likely to have missing data in this variable than those who had
24 not been in care. In those who had spent some of their childhood in care, 11 out of the 291 women
25 had missing data (3.9%). There were no statistically significant differences between those who had
26 missing data and those who did not in terms of age, income, social class and education. Of the
27 women who had not spent any time in care, 715 of the 18,201 women had missing data for
28 symptoms of depression (4.0%). Those who had missing data were more likely to be in a lower social
29 class, have a lower income and to have lower or no qualifications.
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33 For multivariable analysis, complete case analysis was undertaken. Those excluded due to missing
34 data were less than 10% of the cohort, with resulting sample size ranging from 16,351-18,238 (table
35 4).
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38 All analyses took into account the clustered stratified study design by using the survey commands in
39 Stata version 13.0 [35]. Reported p values and confidence intervals account for clustering, and
40 estimates of proportions and odd ratios are weighted by sampling weights [36].
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43 RESULTS

44 Description of the cohort

45
46 There were 18,552 respondents of the baseline interview of the Millennium Cohort Study. Fifty-
47 seven respondents who were not the natural mothers of the cohort baby were excluded, as were 3
48 interviews that did not have data relating to their time in care history. Therefore our study
49 population included 18,492 natural mothers.
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54 In the study population, there were 291 mothers who reported spending time in care as a child,
55 which was 1.6% of the cohort (95% CI 1.3-1.8). Of the mothers who reported spending time in foster
56 care or a children’s home, 75% spent a year or more in care (see table 1).
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Table 1 - Distribution of time spent in care by the 291 mothers who reported being in care

Time in care	Frequency	Percent
Less than 3 months	38	13
3 months to 1 year	35	12
1-2 years	42	14
2-5 years	90	31
5 -10 years	44	15
> Over 10 years	42	15
Total	291	

These mothers were born in previous decades, with 5% born after 1980, 42% between 1970 and 1980, 50% between 1960 and 1970 and 4% born before 1960. Mothers who had been in care were younger, less likely to achieve a high social class, less likely to have a high household income and less likely to have achieved a high level of education, compared with the rest of the cohort (table 2). They were also more likely to be a single parent, have a larger family and to smoke during their pregnancy (table 3). These differences were all statistically significant at the 5% level. There was no statistically significant association between ethnic group and reporting spending time in care. Although their babies were more likely to be born by normal vaginal delivery, there were no statistically significant differences in the gestation at delivery when compared to non-exposed women (table 3).

Table 2 - Sociodemographic characteristics of women with and without a history of being in care

Characteristic	Time in care		P value
	Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI]	
Age at delivery			<0.001
<20	11.1 [7.7,15.9]	4.9 [4.4,5.3]	
20-29	59.3 [52.3,65.9]	41.3 [39.6,43.0]	
30-39	28.6 [22.6,35.5]	50.3 [48.5,52.1]	
≥40	1.0 [0.3,3.9]	3.6 [3.3,4.0]	
Ethnic group			0.52
White	88.3 [82.3,92.5]	86.8 [84.3,88.9]	
Other ethnic group	11.7 [7.5,17.7]	13.2 [11.1,15.7]	
Social Class			<0.001
Managerial	17.3 [18.8,24.6]	44.9 [42.7,47.1]	
Intermediate occupations	16.0 [11.5,21.8]	19.6 [18.8,20.5]	
Routine and manual	51.3 [44.5,58.0]	30.8 [29.1,32.6]	
Never worked and long term unemployed	15.4 [11.2,20.9]	4.6 [4.0,5.4]	
Household income			<0.001
<£10,400	48.4 [41.3,55.4]	22.1 [20.7,23.6]	
£10,400-20,800	35.2 [28.7,42.2]	31.9 [30.3,33.4]	
£20,800 -31,200	9.5 [6.0,14.9]	22.1 [20.9,23.3]	
£31,200-52,000	5.3 [2.5,10.9]	17.0 [15.8,18.3]	
>£52,000	1.7 [0.7,4.2]	7.0 [5.6,8.6]	
Education			< 0.001
Higher	11.7 [7.2,18.5]	32.9 [30.7,35.1]	
Medium	7.5 [4.6,12.1]	14.3 [13.6,15.0]	
Lower	37.4 [31.6,43.6]	38.0 [36.3,39.7]	
Other	4.0 [1.8,8.7]	2.4 [2.1,2.8]	
Lone parent	10.4 [6.8,15.25]	3.5 [3.0,4.1]	<0.001

Table 3 - Pregnancy and neonatal characteristics of women with and without a history of being in care

Characteristic	Time in care Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	P value
Parity			<0.001
1	28.7 [22.6,35.6]	41.4 [40.3,42.5]	
2	33.9 [28.2,40.2]	35.8 [34.9,36.7]	
3	17.7 [13.6,22.7]	15.0 [14.3,15.7]	
>3	19.7 [14.6,26.2]	7.9 [7.3,8.5]	
Smoking during pregnancy			<0.001
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	
Gave up	14.9 [10.4,21.1]	13.3 [12.5,14.1]	
Never smoked	27.1 [21.5,33.5]	65.9 [64.6,67.3]	
Symptoms of depression			<0.001
Yes	31.3 [25.4,37.8]	13.4 [12.7,14.1]	
No	68.7 [62.2,74.6]	86.6 [86.0,87.3]	
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	
33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
≥37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birth weight			0.009
≥2.5kg	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
<2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breastfeeding			<0.001
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Multivariable analysis

Table 4 shows the odds ratios for the association between having been in care and smoking during pregnancy, breastfeeding and symptoms of postnatal depression. Women who had been in care were more likely to smoke during pregnancy (OR 3.0) compared with women who had not been in care, even after adjusting for possible confounding factors. Their babies were more likely to have a low birth weight (OR 1.8), although this effect was not statistically significant after controlling for confounding factors. They were also less likely to initiate breastfeeding compared with women who had not been in care, although again, this effect was not statistically significant after adjusting for other factors (table 4). Women who had been in care were more likely to have symptoms of depression (OR 2.0), even after controlling for possible confounding factors.

Table 4 - Unadjusted and adjusted odds ratios (95% CI) for smoking during pregnancy, low birth weight, any breastfeeding and symptoms of depression among mothers according to a history of being in care

	% ^f of participants (n)	Unadjusted (95% CI)	Adjusted (95% CI)
Mother smoked during pregnancy		n= 18,485	n=16,902
No time spent in care	20.8 (4,051)	1	1
Any time spent in care	58.0 (173)	5.3 (3.9-7.1)	3.0 (2.1-4.3)*
Low birth weight		n= 18,471	n=18,238
No time spent in care	6.7 (1,293)	1	1
Any time spent in care	11.5 (34)	1.8 (1.2-2.8)	1.4(0.6-2.8) [~] 1.7 (0.9-3.4) ⁺
Any breastfeeding		n= 18,488	n=16,905
No time spent in care	69.7 (11,988)	1	1
Any time spent in care	53.5 (156)	0.5 (0.4-0.7)	1.1 (0.7-1.4)*
Symptoms of depression		n= 17,766	n=16,351
No time spent in care	13.4 (2,566)	1	1
Any time spent in care	31.3 (87)	2.9 (2.2-4.0)	1.98 (1.4-2.7)*

^fWeighted percentages

*Adjusted for maternal age, income, education and social class

[~]Adjusted for maternal age, education, ethnicity, gestational age and smoking during pregnancy

⁺ Adjusted for maternal age, income, education, social class, gestational age and ethnicity

DISCUSSION

Summary of findings

In our study, which represents the mothers of babies born in the UK during 2001-2002, 1.6% of women in this cohort had spent some of their childhood in the care system, either with foster parents or in a children's home. The majority of these women had spent a year or more in care. The mothers in our study who had spent some of their childhood as a looked after child were disadvantaged in terms of social and economic factors when compared to the mothers who had not. They were more likely to smoke during their pregnancy and have symptoms of depression. This likelihood persisted after adjusting for confounding factors. In univariable analysis, they were more likely to have a low birth weight baby and less likely to breastfeed, but this effect did not persist after adjusting for confounding factors.

These results suggest that women with a history of time in foster care or a children's home carry social disadvantage into adulthood and motherhood.

Comparison with other studies

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3 As far as we are aware, this study is one of the first to look at health status and maternal outcomes
4 of pregnant women who have previously been in care. The links between social disadvantage and
5 being in care, and the links between social disadvantage and poor maternal outcomes are well
6 documented. It is not surprising that the findings of this study show that being in care is associated
7 with social disadvantage and adverse maternal outcomes. Previous studies have shown that children
8 who have been in care are more likely to become teenage parents.

9
10 Compared to previous estimates of the number of children in England in care at any one time, our
11 estimate is considerably lower. Simkiss et al. [3], suggest that 3% of children in the UK have spent
12 some time in care. Our estimate may be low because we have missed many mothers who have
13 previously been in care, which could be due to them declining to take part, or because their children
14 had been taken into care. If this is the case, then these mothers are likely to be different to those
15 who agreed to the recruitment of their children.

16
17 The worse birth outcomes in terms of birth weight and prematurity found in the exposed group
18 could be in part a result of the association between antenatal smoking with low birth weight and
19 prematurity [37], and the high rate of antenatal smoking in this group. Younger mothers are more
20 likely to have an unassisted birth [38], and we postulate that the higher proportion of normal
21 deliveries seen in the exposed group is associated with the lower average age of women in this
22 group. There is likely to be an association between social class and mode of delivery, but previous
23 studies are conflicting in describing this effect. Whilst some studies find an increased rate of
24 caesarean section with area level deprivation [39 40], others find a more complicated relationship
25 between age at first delivery, education, social class and mode of delivery, with primigravida women
26 from a lower socioeconomic class having a higher rate of planned caesarean section or instrumental
27 delivery [41], whilst others still have found that individuals with a higher socioeconomic class have a
28 higher rate of elective caesarean section, those with a lower socioeconomic class have a higher rate
29 of emergency caesarean section [42].

30 31 32 33 34 35 **Strengths and limitations**

36
37 A strength of this study is the use of Millennium Cohort Study data, a nationally representative
38 sample which ensured adequate representation from socially disadvantaged groups and people from
39 ethnically diverse backgrounds. Using this cohort allowed us to capture women who had previously
40 been in care during their adult lives, which can be otherwise difficult to do.

41
42 The amount of missing data was small: except in the multivariable analysis using the Malaise
43 Inventory score as an outcome, the negligible amount of missing data would be unlikely to affect the
44 results. For the outcome of symptoms of depression, 3.9% of the data was missing, and it is possible
45 that the worse social characteristics of the women without information on their Malaise Inventory
46 score may have led to a small increase in the estimation of the effect of being in care in the adjusted
47 model.

48
49 A major limitation of this study is that a large number of women with a history in care may not be
50 included in the MCS, due to not agreeing to take part or being ineligible because their own children
51 had been taken into care. Furthermore, information on the childhood socioeconomic status of the
52 mothers was not available.

1
2
3 However, although we can compare our prevalence to estimates of children currently in care, it is
4 not possible to obtain estimates of how many women of child bearing age at the time of our cohort
5 may have been in care during their childhoods without prevalence data of children in care from the
6 1960s to the 1990s. Therefore, we are unable to say what the likely proportion of women who would
7 have been excluded would be. However, it is possible that women who were excluded due to having
8 their own children taken into care may be more likely to have had worse social outcomes than those
9 who entered the cohort. We would assume that if the data on these women had been captured, the
10 results of this study would have been more extreme. A systematic review of the characteristics of
11 families whose children were taken into care showed that a low socioeconomic status was the factor
12 most associated with this outcome [43]. This systematic review noted a large variation by country in
13 the factors associated with families requiring children to be placed in care, and that only one study
14 was found from the UK. This and subsequent studies suggest that in the UK, children who have been
15 taken into care are more likely to have had mothers who were younger, have a history of substance
16 misuse or mental illness, live in a deprived neighbourhood, are from a lower social class, and live in
17 overcrowded or rented accommodation [3 44].

24 **Potential mechanisms and policy implications**

25
26 The population of this study are women born between the 1960's and mid-1980s, and their children
27 who are now 13-14 years old. The findings of this study have relevance to these children as they
28 enter adolescence and adulthood, as evidence suggests that activity in the early years can have
29 lasting effects on health and psychosocial functioning [45-47]. Unfortunately the outcomes for
30 looked after children in the UK remains poor, both during their childhood, and when they enter
31 adult life [5 48 49]. The increased policy focus on the early years, education and integrated care in
32 recent times may have helped to improve outcomes for these children [50].

33
34 From this study it is not possible to determine whether the social disadvantage is a direct
35 antecedent to being in care, or whether being in care led to subsequent social disadvantage. The
36 question remains whether being in care confers a disadvantage in terms of maternal behaviours and
37 outcomes over and above the social and economic disadvantage.

38
39 However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of
40 the social care system is to reduce the social disadvantage that the child experienced on entering
41 care, and idealistically improve their life circumstances in order for the child to have a better start in
42 life. The UK still has a long way to go in reducing the long term disadvantage experienced by
43 children in care. Of particular concern is the evidence presented here that suggests that this
44 disadvantage persists to child bearing age and is associated with maternal behaviours and outcomes
45 that have the potential to affect the health and wellbeing of their children. In addition to the legacy
46 of early and continuing social disadvantage such as low household income, low educational
47 attainment and reduced employment opportunities, there are aspects of care itself that may have
48 an effect on the maternal outcomes studied such as residential instability, disrupted parental
49 attachments and difficulties in resolving past history when faced with having children of one's own
50 [12 51-53].

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3 It is known that maternal smoking, birth weight, depression and breastfeeding rates are potentially
4 modifiable outcomes with appropriate screening, education and support from healthcare
5 professionals. Tools exist to screen for and identify perinatal depression, and there are ways that
6 women with depression can be supported and treated [54]. Likewise, smoking in pregnancy and
7 breastfeeding can be asked about and women who would like to change their current behaviours
8 can be supported to change [24 55-57]. Historically and recently, improving birth weight is a public
9 health priority in the UK [58 59]. Pregnancy and early motherhood is a time when women who are
10 often otherwise healthy have a large amount of contact with health care services. These results
11 suggest that it may be worthwhile to pay particular attention to women who have a history of being
12 in care when they present to health and social care services during pregnancy and early
13 motherhood. Currently a history of time in care is not part of the routine information collected
14 during prenatal visits. It has been suggested that a wider range of socio-demographic information
15 should be collected in order to create a deeper understanding of the individual mother's needs [7].
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20 The best way to use this information for policy change is yet to be determined. Interventions aimed
21 at improving the educational and emotional outcomes for looked after children are varied, despite
22 difficulties in producing sustained improvement. Educational and emotional outcomes for looked
23 after children in European countries such as Denmark, Germany and Norway are better than those
24 in the UK. The use of the social pedagogy approach has been accredited for some of these
25 differences. This approach emphasises emotional warmth and personal development. Information
26 on how the health and emotional wellbeing of looked after children can perpetuate cycles of
27 deprivation may add to this body of research [60].
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31 **Future research**

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34 There has been an increased focus on the outcomes for children in care, particularly over the past
35 decade[61 62]. Therefore outcomes for children in care could be very different for women
36 previously in care who are pregnant currently, as compared to those pregnant 10 years ago. It would
37 be useful to look at the current health outcomes of mothers previously in care and their children in
38 order to see if presently there are inequities, and if whether these inequities are reducing.
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41 Information is currently collected by the Department of Education on the educational outcomes
42 of children in care, and this research has been used to target interventions at increasing their
43 educational attainment [63]. Berridge argues that focusing on these educational targets alone are
44 not enough, and a theory and approach that encompasses a wide view of the challenges faced by
45 children in care is needed [64]. We argue that the mental and physical health of looked after
46 children during pregnancy is an area that should be added as a piece of this policy puzzle.
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50 **Conclusions**

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52 Findings from the Millennium Cohort Study indicate that mothers with a history of spending time in
53 care are more disadvantaged socially and economically when compared to other mothers even after
54 they have left care and during their children's infancy. We looked in more detail at smoking during
55 pregnancy, low birth weight, symptoms of depression in early motherhood and whether
56 breastfeeding was initiated, and found that mothers who had been in care were more likely to
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3 smoke during pregnancy and have symptoms of depression. This is consistent with previous research
4 suggesting that social and health disadvantages faced by children in care persist into adult life.
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8 **Contributors:** All contributors (SB, MQ, RG) made substantial contributions to conception and
9 design, acquisition of data, and interpreted the data. SB did the initial analysis of the data and wrote
10 the first draft of the article. SB, RG and MQ revised the article critically for important intellectual
11 content; and all authors (SB, MQ, RG) approved of the version to be published.
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13

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17

18 **Competing interests:** None.
19

20 **Ethical approval:** This research involved secondary analysis of the MCS and therefore did not
21 require ethical approval. Ethical approval for the Millennium Cohort Study was granted from the
22 multi-centre research ethics committee.
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25 **Data sharing:** The datasets are available on the UK Data Archive. Further information about the
26 study and data can be found at www.cls.ioe.ac.uk/.
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References

1. Martin A, Ford T, Goodman R, et al. Physical illness in looked-after children: a cross-sectional study. *Archives of disease in childhood* 2013 doi: 10.1136/archdischild-2013-303993[published Online First: Epub Date]].
2. Department of Education. Children looked after in England (including adoption and care leavers) year ending 31 March 2013. London: Office of National Statistics, 2014.
3. Simkiss DE, Spencer NJ, Stallard N, et al. Health service use in families where children enter public care: a nested case control study using the General Practice Research Database. *BMC health services research* 2012;**12**:65 doi: 10.1186/1472-6963-12-65[published Online First: Epub Date]].
4. Department of Education. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2013. London: Office of National Statistics, 2014.
5. Viner RM, Taylor B. Adult health and social outcomes of children who have been in public care: population-based study. *Pediatrics* 2005;**115**(4):894-9 doi: 10.1542/peds.2004-1311[published Online First: Epub Date]].
6. Ford T, Vostanis P, Meltzer H, et al. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British journal of psychiatry : the journal of mental science* 2007;**190**:319-25 doi: 10.1192/bjp.bp.106.025023[published Online First: Epub Date]].
7. Keirnan K, Mensah F. Maternal indicators in pregnancy and childhood infancy that signal future outcomes for children's development, behaviour and health: evidence from the Millennium Cohort Study: Department of Social Policy and Social Work, University of York, 2010.
8. National Institute for Health and Clinical Excellence (NICE). Pregnancy and complex social factors: A model for service provision for pregnant women with complex social factors - guidance (CG110) 2010.
9. Department of Health. Maternity Standard, National Service Framework for Children, Young People and Maternity Services, 2004.
10. Department of Health. Healthy lives, healthy people : our strategy for public health in England. Cm. Norwich: Stationery Office, 2010:96 p.
11. Carpenter SC, Clyman RB, Davidson AJ, et al. The association of foster care or kinship care with adolescent sexual behavior and first pregnancy. *Pediatrics* 2001;**108**(3):E46
12. Svoboda DV, Shaw TV, Barth RP, et al. Pregnancy and parenting among youth in foster care: A review. *Children and Youth Services Review* 2012;**34**(5):867-75 doi: 10.1016/j.childyouth.2012.01.023[published Online First: Epub Date]].
13. Vinnerljung B, Franzén E, Danielsson M. Teenage parenthood among child welfare clients: A Swedish national cohort study of prevalence and odds. *Journal of Adolescence* 2007;**30**(1):97-116
14. Polit DF, Morton TD, White CM. Sex, Contraception and Pregnancy Among Adolescents in Foster Care. *Family Planning Perspectives* 1989;**21**(5):203-08 doi: 10.2307/2135572[published Online First: Epub Date]].
15. Hobcraft J. Intergenerational and Life-Course Transmission of Social Exclusion: Influences and Childhood Poverty, Family Disruption and Contact with the Police: Centre for Analysis of Social Exclusion, LSE, 1998.
16. Whitworth M, Dowswell T. Routine pre-pregnancy health promotion for improving pregnancy outcomes. *The Cochrane database of systematic reviews* 2009(4):CD007536 doi: 10.1002/14651858.CD007536.pub2[published Online First: Epub Date]].
17. Aizer A, Currie J. The intergenerational transmission of inequality: Maternal disadvantage and health at birth. *Science* 2014;**344**(6186):856-61 doi: 10.1126/science.1251872[published Online First: Epub Date]].

18. Kramer MR. Determinants of low birth weight: methodological assessment and meta-analysis. *Bulletin of the World Health Organisation*, 1987:663-737.
19. Barker DJ. *Fetal and infant origins of adult disease*. London: BMJ Publications, 1992.
20. Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics* 2006;**118**(2):659-68 doi: 10.1542/peds.2005-2948[published Online First: Epub Date]].
21. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal* 2002;**23**(1-2):145-63 doi: 10.1002/imhj.10009[published Online First: Epub Date]].
22. Canadian Paediatric Society. Maternal depression and child development. *Paediatrics & child health* 2004;**9**(8):575-98
23. National Institute for Health and Clinical Excellence (NICE). Maternal and child nutrition: NICE, 2008.
24. Dyson. Promotion of breast feeding initiation and duration: evidence into practice briefing: NICE, 2006.
25. Centre for Longitudinal Studies. The age 9 months survey of the MCS (2001- 2002), 20.
26. Office of National Statistics. Infant and perinatal mortality 2001: health areas, England and Wales. *Health Statistics Quarterly* 2002;**15**
27. Department of Education. Improving the adoption system and services for looked after children: Policy, 2014.
28. Rodgers B, Pickles A, Power C, et al. Validity of the Malaise Inventory in general population samples. *Social psychiatry and psychiatric epidemiology* 1999;**34**(6):333-41
29. McGee R, Williams S, Silva PA. An evaluation of the Malaise Inventory. *Journal of psychosomatic research* 1986;**30**(2):147-52
30. Centre for Longitudinal Studies. MCS user guide: Psychological, developmental and health inventories. 2012
31. Tate AR, Dezateux C, Cole TJ, et al. Factors affecting a mother's recall of her baby's birth weight. *International journal of epidemiology* 2005;**34**(3):688-95 doi: 10.1093/ije/dyi029[published Online First: Epub Date]].
32. Poulsen G, Kurinczuk JJ, Wolke D, et al. Accurate reporting of expected delivery date by mothers 9 months after birth. *Journal of clinical epidemiology* 2011;**64**(12):1444-50 doi: 10.1016/j.jclinepi.2011.03.007[published Online First: Epub Date]].
33. Quigley MA, Hockley C, Davidson LL. Agreement between hospital records and maternal recall of mode of delivery: evidence from 12 391 deliveries in the UK Millennium Cohort Study. *BJOG : an international journal of obstetrics and gynaecology* 2007;**114**(2):195-200 doi: 10.1111/j.1471-0528.2006.01203.x[published Online First: Epub Date]].
34. Marmot M, International Balzan Foundation. *Fair society, healthy lives*.
35. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [program], 2013.
36. Hanson K, ed. *Millennium cohort study, first, second and third surveys: a guide to the datasets*. 3rd ed. London: Centre for Longitudinal Studies, Institute of Education, 2008.
37. Cnattingius S. The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research* 2004;**6**(Suppl 2):S125-S40 doi: 10.1080/14622200410001669187[published Online First: Epub Date]].
38. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a systematic review. *Birth (Berkeley, Calif.)* 2010;**37**(3):219-26 doi: 10.1111/j.1523-536X.2010.00409.x[published Online First: Epub Date]].
39. Barley K, Aylin P, Bottle A, et al. Social class and elective caesareans in the English NHS. *Bmj* 2004;**328**(7453):1399 doi: 10.1136/bmj.328.7453.1399[published Online First: Epub Date]].
40. Alves B, Sheikh A. Investigating the relationship between affluence and elective caesarean sections. *Bjog-an International Journal of Obstetrics and Gynaecology* 2005;**112**(7):994-96 doi: 10.1111/j.1471-0528.2005.00657.x[published Online First: Epub Date]].

- 1
- 2
- 3 41. Essex HN, Green J, Baston H, et al. Which women are at an increased risk of a caesarean section
- 4 or an instrumental vaginal birth in the UK: an exploration within the Millennium Cohort
- 5 Study. *BJOG: An International Journal of Obstetrics & Gynaecology* 2013;**120**(6):732-43 doi:
- 6 10.1111/1471-0528.12177[published Online First: Epub Date]].
- 7
- 8 42. Fairley L, Dundas R, Leyland AH. The influence of both individual and area based socioeconomic
- 9 status on temporal trends in Caesarean sections in Scotland 1980-2000. *Bmc Public Health*
- 10 2011;**11** doi: 10.1186/1471-2458-11-330[published Online First: Epub Date]].
- 11
- 12 43. Simkiss DE, Stallard N, Thorogood M. A systematic literature review of the risk factors associated
- 13 with children entering public care. *Child: Care, Health and Development* 2013;**39**(5):628-42
- 14 doi: 10.1111/cch.12010[published Online First: Epub Date]].
- 15
- 16 44. Bebbington A, Miles. The Background of Children who enter Local Authority Care. *British Journal*
- 17 *of Social Work* 1989;**19**(1):349-68
- 18
- 19 45. Dixon J. Young people leaving care: health, well-being and outcomes. *Child & Family Social Work*
- 20 2008;**13**(2):207-17 doi: 10.1111/j.1365-2206.2007.00538.x[published Online First: Epub
- 21 Date]].
- 22
- 23 46. Barker DJ. The origins of the developmental origins theory. *Journal of internal medicine*
- 24 2007;**261**(5):412-7 doi: 10.1111/j.1365-2796.2007.01809.x[published Online First: Epub
- 25 Date]].
- 26
- 27 47. Peruzzi A. From Childhood Deprivation to Adult Social Exclusion: Evidence from the 1970 British
- 28 Cohort Study. *Soc Indic Res* 2014;1-19 doi: 10.1007/s11205-014-0581-2[published Online
- 29 First: Epub Date]].
- 30
- 31 48. Department of Health. Statutory guidance on promoting the health and well-being of looked
- 32 after children 2009
- 33
- 34 49. National Institute for Health and Clinical Excellence (NICE). Looked after children and young
- 35 people, 2010.
- 36
- 37 50. Science BBo. *Growing up in the UK: Ensuring a healthy future for our children* British Medical
- 38 Association, 2013.
- 39
- 40 51. Dregan A, Gulliford MC. Foster care, residential care and public care placement patterns are
- 41 associated with adult life trajectories: population-based cohort study. *Social psychiatry and*
- 42 *psychiatric epidemiology* 2012;**47**(9):1517-26 doi: 10.1007/s00127-011-0458-5[published
- 43 Online First: Epub Date]].
- 44
- 45 52. Pryce JM, Samuels GM. Renewal and Risk: The Dual Experience of Young Motherhood and Aging
- 46 Out of the Child Welfare System. *Journal of Adolescent Research* 2010;**25**(2):205-30 doi:
- 47 10.1177/0743558409350500[published Online First: Epub Date]].
- 48
- 49 53. Maxwell A, Proctor J, Hammond L. 'Me and My Child': Parenting Experiences of Young Mothers
- 50 Leaving Care. *Adoption & Fostering* 2011;**35**(4):29-40 doi:
- 51 10.1177/030857591103500404[published Online First: Epub Date]].
- 52
- 53 54. Nylen KJ, Moran TE, Franklin CL, et al. Maternal depression: A review of relevant treatment
- 54 approaches for mothers and infants. *Infant Mental Health Journal* 2006;**27**(4):327-43 doi:
- 55 10.1002/imhj.20095[published Online First: Epub Date]].
- 56
- 57 55. National Institute for Health and Clinical Excellence (NICE). CG45 Antenatal and postnatal mental
- 58 health: clinical management and service guidelines, 2010.
- 59
- 60 56. National Institute for Health and Clinical Excellence (NICE). PH26 Quitting smoking in pregnancy
- and following childbirth, 2010.
- 57
- 58 57. Lumley J, Chamberlain C, Dowswell T, et al. Interventions for promoting smoking cessation
- 59 during pregnancy. *The Cochrane database of systematic reviews* 2009(3):CD001055 doi:
- 60 10.1002/14651858.CD001055.pub3[published Online First: Epub Date]].
58. Health Development Agency. Prevention of low birth weight: assessing the effectiveness of
- smoking cessation and nutritional interventions. London: National Health Service, 2003.
59. (NICE) NifHaCE. Clinical Commissioning Group Outcomes Indicator Set Rationale, 2014.

- 1
2
3 60. Boddy J, Statham J, McQuail S, et al. Workign at the 'edges' of care? European models of support
4 for young people and families: Thomas Coram Research Unit, Institute of Education,
5 University of London, 2009.
6
7 61. Chief Secretary to the Treasury. Every child matters, 2003.
8 62. Polnay L, Ward H. Promoting the health of looked after children. Government proposals demand
9 leadership and a culture change. Bmj 2000;**320**(7236):661-2
10
11 63. Social Exclusion Unit. A better education for children in care: Social Exclusion Unit, 2003.
12 64. Berridge D. Theory and explanation in child welfare: education and looked-after children. Child &
13 Family Social Work 2007;**12**(1):1-10 doi: 10.1111/j.1365-2206.2006.00446.x[published
14 Online First: Epub Date] | .
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For peer review only

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7 **Pregnancy associated outcomes in women who spent some**
8 **of their childhood looked after by local authorities: findings**
9 **from the UK Millennium Cohort Study.**
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ABSTRACT

Objectives

There has been very little description of the health and social outcomes at pregnancy and early motherhood of girls who were previously looked after by local authorities. The objectives of this study were to compare the sociodemographic and health profiles of mothers who had spent time in a children's home or with foster parents as a child to mothers who had not. In particular, to examine associations between being looked after and the likelihood of smoking during pregnancy, [birth weight](#), the presence of symptoms of maternal depression and the initiation of breastfeeding.

Design

A retrospective cross sectional study using the baseline questionnaire of the Millennium Cohort Study.

Setting

The UK.

Participants

A nationally representative study of 18,492 mothers of babies born in the UK during 2000-2002.

Exposure

A history of [spending time in a children's home or with foster parents](#), ~~being a looked after a child~~.

~~Primary and secondary o~~Outcome measures

1. ~~The likelihood of s~~Smoking during pregnancy
2. [Low birth weight](#)
3. ~~_____~~Symptoms of maternal depression
4. ~~The i~~Initiation of breastfeeding

Results

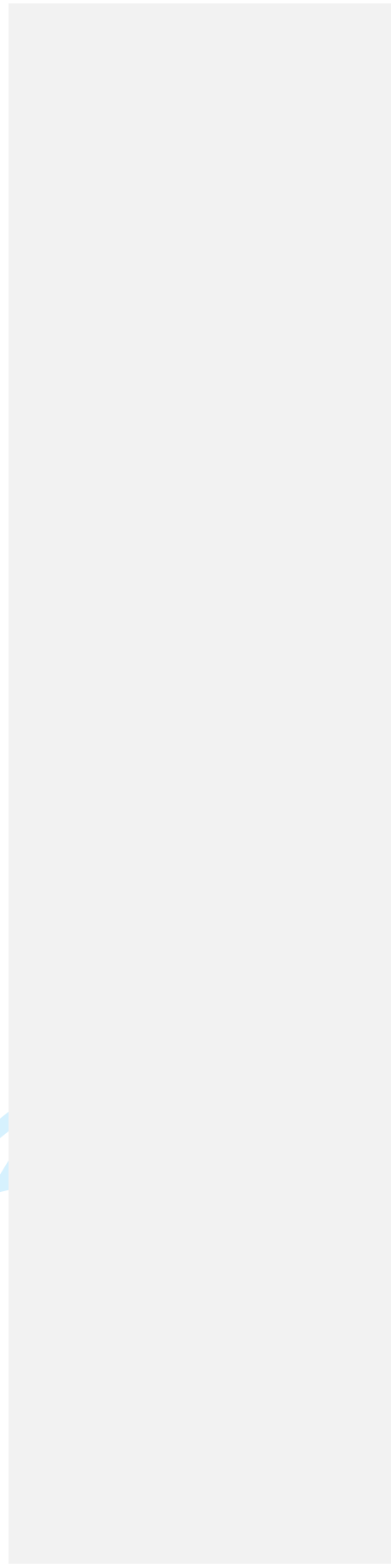
In univariable analyses, women who had been looked after were significantly less likely to be of higher social class, ~~to~~ live in a high-income household or ~~to~~ have achieved a high level of education. They were more likely to have a low birth weight baby and be a single parent. In multivariable analysis, women who had been ~~a~~ looked after ~~child~~ were ~~-~~more likely to smoke during pregnancy (adj. OR 3.0 95% CI 2.14, 4.3) and were more likely to have symptoms of depression (adj. OR 1.98 95% CI 1.4-2.7) compared with women who had not been looked after.

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Conclusions

Our results suggest that these women carry social disadvantage into motherhood, with the potential of continuing the cycle of deprivation. There is a case for increasing our attention on this group who can be readily accessed by maternity and early years' services.

For peer review only



ARTICLE SUMMARY

This study uses the UK Millennium Cohort Study to identify mothers who had spent part of their childhood in foster care or in a children's home. We looked at the difference in sociodemographic factors and health outcomes between these women and women who had not been in foster care or a children's home during their childhood. We also looked at the likelihood of three health-related maternal outcomes: smoking in pregnancy, [birth weight](#), maternal depression and the initiation of breastfeeding. Mothers who had spent part of their childhood in foster care or a children's home had worse health and social outcomes than those who had not.

Strengths and Limitations

- Nationally representative sample
- Potential selection bias against mothers who had been [in care looked after](#) and whose own children had been taken into care

INTRODUCTION

Children in the public care system are an important group for public health action. In the UK, although legislation differs between the nations, looked after children (also called children in care) are generally children whose parental responsibility lies with the local authority, or is shared between parents and the local authority. This parental responsibility may result in a variety of care arrangements, such as foster care, placement in a children's home, or being placed with relatives. In the year ending March 2013, there were approximately 68 110 looked after children in England (57 per 10,000 children) [1 2] and it has been estimated that during their childhood, around 3% of children in England and Wales spend some time in care [3]. These children often come from vulnerable households, and have many risk factors for poor social, educational and health outcomes [2 4]. Many of these health, social, and psychological difficulties are related to the reasons for the child entering the care system. Sixty-two percent of these children entered the care system due to abuse or neglect, and for 3% of looked after children, their own health problems led to them entering care [2]. It is likely that these disadvantages continue into adult life for many of these children[5]. Despite these health and social disadvantages, there is very little evidence on the health status of this group. They are an underrepresented group in research as they are a highly mobile group, with issues of parental consent making enrolment into research studies difficult [6].

Few studies have used nationally representative samples focusing on health outcomes over the life course of children who have been in care~~looked after children~~ [1 4 5]. Even fewer have investigated outcomes during pregnancy and early motherhood [7]. In particular, whether mothers with a history of time spent in care have adverse maternal and pregnancy outcomes is currently unknown.

Pregnancy and early motherhood is an important point in the life cycle: a time when women have a high level of contact with health and social care services. As a consequence there is potential to identify high risk women and provide interventions to improve pregnancy outcomes [8]. This may be particularly relevant to ~~adults~~ who have previously been in care~~looked after~~ and who may have had a reduction in residential stability leading to disjointed health service access and reduced exposure to health advice and information. Measures have been proposed to improve outcomes for socially disadvantaged women such as multiagency working, tailored antenatal services, community based continuity of care schemes and Family Nurse Partnerships for young mothers [9 10].

Although previous work has looked at the associations between sexual risk behaviours and a history of time in care, very little evidence is available on the health status and maternal outcomes of these women. Previous research has shown that girls who have been~~are looked after~~in care by local authorities ~~have ve~~ worse sexual health outcomes than girls who have~~ed~~ never been in care. Girls who have been in care have a greater risk of teenage pregnancy earlier age at first intercourse and an increased number of sexual partners compared to girls who had not spent any time in the care system [11-15]. In addition to a higher risk of teenage pregnancy and an increased number of sexual partners, Hobcraft (1998) found that girls who had been in care were at an increased risk of factors relating to social exclusion such as no qualifications, homelessness and poor quality housing [15].

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7 In a review of maternal predictors for child health status, emotional wellbeing, and educational
8 attainment, Keirnan and Mensah found that mothers who had been looked after in care before the
9 age of 17 were more likely to report that their child was in fair or poor health rather than good or
10 excellent health, compared to mothers who had not lived away from home [7]. As far as we are
11 aware, investigation of maternal and pregnancy outcomes whilst accounting for possible
12 confounding factors such as socioeconomic class and maternal education has not previously been
13 published.

14
15 The early years have been shown to be crucial for positive child development. We chose to focus on
16 maternal indicators and behaviours that are likely to have an impact on child physical and mental
17 wellbeing: smoking during pregnancy, low birth weight, breastfeeding initiation and symptoms of
18 maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies
19 [16]. Low birth weight is associated with worse childhood and adult health and social outcomes, and
20 is thought to be influenced by both biological and social factors [17-19]. The prevention of low birth
21 weight through health and social interventions in order to reduce health inequalities at an
22 intergenerational level is an important goal of public health. Maternal depression is associated with
23 impaired mother-infant attachment, and children of depressed mothers are at a greater risk of
24 deficits in social and cognitive function, along with being at a greater risk of psychopathology in later
25 life [20-22]. Despite breastfeeding having short and long term health benefits for both mother and
26 baby [23], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white
27 women from disadvantaged social groups [24].

28
29 We compared the sociodemographic and health profiles of mothers who had been looked after in
30 care as a child either with foster parents or in a children's home to mothers who had not. We also
31 looked at the relationship between the mothers who had been placed with foster parents or in a
32 children's home with the likelihood of the following selected outcomes: of smoking during
33 pregnancy, birth weight, the presence of symptoms of maternal depression and the uptake of
34 breastfeeding.

35 36 37 38 METHODS

39 40 Millennium Cohort Study

41
42 The Millennium Cohort Study is a nationally representative cohort study of 18 818 infants from
43 18,553 families born in the UK [25]. A random two-stage sample of all infants born in the UK
44 between 2000 -2002, and who were alive and resident in the UK at 9 months was drawn from the
45 Department of Social Security Child Benefit Registers. Children born in England and Wales were
46 recruited between September 2000 and August 2001, and Children born in Scotland and Northern
47 Ireland were recruited between November 2000 and January 2002. Child Benefit Registers cover
48 virtually all children, but excludes those whose residence status is uncertain or temporary. Children
49 who had died within the first 9-10 months of life were excluded. These children are estimated to be
50 less than 1% of all births [26]. The study used stratified sampling by electoral ward, with
51 oversampling to ensure adequate representation of families living in poverty and those living in
52 areas with high ethnic minority populations. Parents and guardians were interviewed by trained
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7 interviewers to capture sociodemographic and health information when their children were 9
8 months old, with subsequent follow up at 3, 5 and 7 years.

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10 This study was a cross sectional survey using the baseline questionnaire (9 months postnatally) of
11 the Millennium Cohort Study.

12 13 **Time spent in care as a child**

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15 The definition of a looked after child or a child in care varies between countries due to national
16 legislation. In this cohort, mothers were asked the question “Before the age of 17 did you spend any
17 time living away from both of your parents?” If they answered yes, they were asked to indicate the
18 nature of the time spent away from home and the amount of time they spent away. Parents who
19 had spent time in a children’s home or with foster parents run by either a local authority or a
20 charitable organisation were coded as having been looked-after in care. This group included women
21 who were not sure whether their placement was managed by the local authority or another
22 organisation. Although children’s homes and foster placements can be run by voluntary societies,
23 the responsibility for the child still lies with the local authority [27]. We classed mothers who had
24 spent any amount of time in foster care or a children’s home as the ‘exposed.’ group. The
25 comparison (‘unexposed’) group consisted of all mothers who had answered “no” to the question
26 “Before the age of 17 did you spend any time living away from both of your parents?”, or who had
27 only spent time in a boarding school, prison or young offenders institution, or with relatives.
28 Mothers who did not answer the question or who indicated that they were unsure of their answer
29 were excluded.

30 31 32 **Breastfeeding**

33 Mothers were asked if they ever tried to breastfeed their cohort baby. If they answered yes, they
34 were asked when they last gave their baby breast milk. Their answer was converted into
35 breastfeeding duration, and then categorised into ‘never’, ‘less than 2 months’ ‘over 2 and less than
36 4 months’ and ‘over 4 months.’ The information was also coded into a binary category of ‘never
37 breastfed’ and ‘ever breastfed’.

38 39 **Smoking during pregnancy**

40 Maternal smoking was coded as ‘current non-smoker’, ‘smoked during pregnancy’, or ‘gave up
41 smoking during pregnancy’. These categories were recoded as a binary outcome of ‘smoked during
42 pregnancy’ and ‘did not smoke during pregnancy’.

43 44 **Symptoms of depression**

45 Symptoms of depression were measured using 9 questions of the validated Malaise Inventory [28
46 29], a tool used within the Millennium Cohort Study to provide a measure of depression or
47 psychological distress [30]. It is a self-report tool phrased in plain language. There is no specified
48 time frame over which participants are asked to report their symptoms, but the emphasis is on the
49 recent past.

50 51 52 **Birth outcomes**

Information on baby's birth weight, gestation and delivery method was obtained by self reporting. Previous studies have shown that there is a good agreement between mothers' self-report of baby's birth weight, gestation and mode of delivery compared to hospital records [31-33]. Birth weight was classified as ≥ 2.5 kg ('normal'), or < 2.5 kg ('low'). Gestation was recorded in weeks and classified as < 28 weeks, 28-32 weeks, 33-36 weeks or ≥ 37 weeks. Mode of delivery was categorised as 'normal', 'instrumental' or 'caesarean'.

Sociodemographic factors

Ethnicity

Ethnicity was analysed as 'white' or 'other ethnic group'.

Parity and family status

Parity was the number of children the mother had (including the cohort member) and was coded as 1, 2, 3 or > 3 children. Family status was categorised as 'lone parent', 'cohabiting' or 'married'.

Potential confounding factors

~~Mother's age at the birth of the child, household socioeconomic class, household income and mother's education were considered as potential confounding factors. Previous evidence suggests that these factors are associated with poor perinatal outcomes [34], although there has been very little previous evidence on how factors relating to time in care manifest in maternal and neonatal outcomes.~~ Household socioeconomic class was measured by taking the occupation of the parent with the highest socioeconomic position according to the four UK National Statistics socioeconomic categories. Household income was calculated from the self-reported data on the questionnaire. Mother's education was determined by their highest attainment of a National Vocational Qualification or equivalent group. These qualifications were grouped as follows: 'higher' (bachelor's degree or equivalent), 'medium' (end of schooling at age 18, A-Level or equivalent), 'lower' (end of compulsory schooling at age 16, GCSE or equivalent), or other.

Inclusion and exclusion criteria

The Millennium Cohort Study did not recruit families if the child had been taken into care at the time of initial assessment. One study participant who withdrew consent after the study began was excluded.

For this analysis, mothers were included if they were the birth mother of the Millennium Cohort Study participant. Mothers who did not answer the question of whether they lived away from home were excluded, as were mothers who answered the question as "I don't know".

Statistical analysis

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7 First, we compared the following characteristics of the 'exposed' with 'unexposed' groups using the
8 Chi-squared statistic: age at delivery, ethnic group, social class, household income, education, family
9 status, parity, smoking during pregnancy, symptoms of depression, mode of delivery, gestational
10 age, birth weight, and duration of feeding.

11
12 We then used logistic regression to estimate odds ratios for a history of time spent in care and the
13 outcomes of smoking during pregnancy, birth weight, breastfeeding initiation and symptoms of
14 depression, with adjustment for potential confounding factors. A plausible model was developed
15 based on background literature and included the following potential confounders: age at delivery,
16 ethnic group, social class, household income, education. Previous evidence suggests that these
17 factors are associated with poor perinatal outcomes [34], although there has been very little
18 previous evidence on how factors relating to time in care manifest in maternal and neonatal
19 outcomes. All of these potential confounders included were significantly associated with the
20 outcome (indicated by Wald, P <0.05) after controlling for other factors in the model. From our
21 initial model, only Ethnicity was subsequently removed as its inclusion did not have an appreciable
22 effect on the result, and its removal appeared to make the model more robust with narrower
23 confidence intervals.

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27 For birth weight, the same potential in addition to the above confounding factors were
28 considered together with gestational age and smoking during pregnancy. The following variables
29 were significantly associated with the outcome (indicated by Wald, P <0.05) after controlling for
30 other factors in the model: gestational age, education, ethnicity and maternal age. As smoking
31 during pregnancy is likely to be in the causal chain of low birth weight, the model was considered
32 with and without this variable to see what extent the effect on birth weight is mediated by smoking.

33
34 ~~The potential confounders included were significantly associated with the outcome (indicated by~~
35 ~~Wald, P <0.05) after controlling for other factors in the model.~~ The "unexposed" group were used as
36 the reference for these analyses. ~~Cases with missing data were excluded from regression analyses.~~

37
38
39 For univariable analysis, those with missing outcomes of smoking during pregnancy, low birth weight
40 and any breastfeeding following birth were excluded (7 (0.04%), 21 (0.1%) and 4 respectively
41 (0.02%)); all these excluded women were from the 18,201 'unexposed' group. However, 726 women
42 were excluded due to missing data on symptoms of depression (Malaise Inventory score). Women
43 who had been in care were not more likely to have missing data in this variable than those who had
44 not been in care. In those who had spent some of their childhood in care, 11 out of the 291 women
45 had missing data (3.9%). There were no statistically significant differences between those who had
46 missing data and those who did not in terms of age, income, social class and education. Of the
47 women who had not spent any time in care, 715 of the 18,201 women had missing data for
48 symptoms of depression (4.0%). Those who had missing data were more likely to be in a lower social
49 class, have a lower income and to have lower or no qualifications.

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51
52 For multivariable analysis, complete case analysis was undertaken. Those excluded due to missing
53 data were less than 10% of the cohort, with resulting sample size ranging from 16,351-18,238 (table
54 4).

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All analyses took into account the clustered stratified study design by using the survey commands in Stata version 13.0 [35]. Reported p values and confidence intervals account for clustering, and estimates of proportions and odd ratios are weighted by sampling weights [36].

RESULTS

Description of the cohort

There were 18,552 respondents of the baseline interview of the Millennium Cohort Study. Fifty-seven respondents who were not the natural mothers of the cohort baby were excluded, as were 3 interviews that did not have data relating to their time in care history. Therefore our study population included 18,492 natural mothers.

In the study population, there were 291 mothers who reported spending time in care as a child, which was 1.6% of the cohort (95% CI 1.3-1.8). Of the mothers who reported spending time in foster care or a children's home, 75% spent a year or more in care (see table 1).

Table 1 - Distribution of time spent in care by the 291 mothers who reported being looked after in care

<u>Time looked after in care</u>	Frequency	Percent
Less than 3 months	38	13
3 months to 1 year	35	12
1-2 years	42	14
2-5 years	90	31
5 -10 years	44	15
> Over 10 years	42	15
Total	291	

These mothers were born in previous decades, with 5% born after 1980, 42% between 1970 and 1980, 50% between 1960 and 1970 and 4% born before 1960. Mothers who had been looked after in care were younger, less likely to achieve a high social class, less likely to have a high household income and less likely to have achieved a high level of education, compared with the rest of the cohort (table 2). They were also more likely to be a single parent, have a larger family and to smoke during their pregnancy (table 3). These differences were all statistically significant at the 5% level. There was no statistically significant association between ethnic group and reporting spending time in care. Although their babies were more likely to be born by normal vaginal delivery, ~~they were more likely to have a low birth weight, but,~~ there were no statistically significant differences in the gestation at delivery when compared to non-exposed women (table 3).

Table 2 - Sociodemographic characteristics of women with and without a history of being looked after in care

Characteristic	<u>Time looked after in care</u>		P value
	Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI]	
Age at delivery			<0.001

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7	<20	11.1 [7.7,15.9]	4.9 [4.4,5.3]	
8	20-29	59.3 [52.3,65.9]	41.3 [39.6,43.0]	
9	30-39	28.6 [22.6,35.5]	50.3 [48.5,52.1]	
10	≥40	1.0 [0.3,3.9]	3.6 [3.3,4.0]	
11	Ethnic group			0.52
12	White	88.3 [82.3,92.5]	86.8 [84.3,88.9]	
13	Other ethnic group	11.7 [7.5,17.7]	13.2 [11.1,15.7]	
14	Social Class			<0.001
15	Managerial	17.3 [18.8,24.6]	44.9 [42.7,47.1]	
16	Intermediate occupations	16.0 [11.5,21.8]	19.6 [18.8,20.5]	
17	Routine and manual	51.3 [44.5,58.0]	30.8 [29.1,32.6]	
18	Never worked and long term unemployed	15.4 [11.2,20.9]	4.6 [4.0,5.4]	
19	Household income			<0.001
20	<£10,400	48.4 [41.3,55.4]	22.1 [20.7,23.6]	
21	£10,400-20,800	35.2 [28.7,42.2]	31.9 [30.3,33.4]	
22	£20,800 -31,200	9.5 [6.0,14.9]	22.1 [20.9,23.3]	
23	£31,200-52,000	5.3 [2.5,10.9]	17.0 [15.8,18.3]	
24	>£52,000	1.7 [0.7,4.2]	7.0 [5.6,8.6]	
25	Education			< 0.001
26	Higher	11.7 [7.2,18.5]	32.9 [30.7,35.1]	
27	Medium	7.5 [4.6,12.1]	14.3 [13.6,15.0]	
28	Lower	37.4 [31.6,43.6]	38.0 [36.3,39.7]	
29	Other	4.0 [1.8,8.7]	2.4 [2.1,2.8]	
30	Lone parent	10.4 [6.8,15.25]	3.5 [3.0,4.1]	<0.001

Table 3 - Pregnancy and neonatal characteristics of women with and without a history of being

looked-after in care

Characteristic	Time looked-after in care		P value
	Yes (n= 291) % [95% CI]	No (n=18,201) % [95% CI]	
Parity			<0.001
1	28.7 [22.6,35.6]	41.4 [40.3,42.5]	
2	33.9 [28.2,40.2]	35.8 [34.9,36.7]	
3	17.7 [13.6,22.7]	15.0 [14.3,15.7]	
>3	19.7 [14.6,26.2]	7.9 [7.3,8.5]	
Smoking during pregnancy			<0.001
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	
Gave up	14.9 [10.4,21.1]	13.3 [12.5,14.1]	
Never smoked	27.1 [21.5,33.5]	65.9 [64.6,67.3]	
Symptoms of depression			<0.001
Yes	31.3 [25.4,37.8]	13.4 [12.7,14.1]	
No	68.7 [62.2,74.6]	86.6 [86.0,87.3]	
Mode of delivery			0.03
Normal	76.5 [70.0,81.8]	67.7 [66.7,68.8]	
Instrumental	7.6 [4.8,11.9]	10.3 [9.7,11.0]	
Caesarian	15.9 [11.5,21.6]	22.0 [21.2,22.8]	
Gestational age			0.86
<28 weeks	0.3 [0.1,1.0]	0.3 [0.2,0.4]	
28-32	1.5 [0.5,4.5]	1.2 [1.0,1.3]	
33-36	6.9 [4.2,11.2]	6.3 [5.9,6.8]	
≥37	91.2 [86.9,94.2]	92.2 [91.7,92.7]	
Birthweight†Birth weight			0.009

≥2.5kg	88.5 [83.2,92.3]	93.3 [92.9,93.7]	
<2.5kg	11.5 [7.7,16.8]	6.7 [6.3,7.1]	
Duration of breast feeding/breastfeeding			
Never breastfed	46.5 [39.5,53.6]	30.3 [28.6,32.0]	<0.001
Less than 2 months	27.8 [22.2,34.3]	26.4 [25.3,27.5]	
2 to 4 months	8.9 [5.9,13.3]	10.6 [10.1,11.2]	
More than 4 months	16.8 [12.0,22.9]	32.7 [30.7,34.8]	

Multivariable analysis

Analysis of women excluded from the regression model due to missing data revealed that only a few women were excluded from the analysis of smoking during pregnancy and any breastfeeding following birth (7 (0.04%) and 4 respectively (0.02%)); all these excluded women were from the 18,201 'unexposed' group. However, 726 women were excluded due to missing data on symptoms of depression (Malaise Inventory score). Women who had been looked after were not more likely to have missing data in this variable than those who had not been looked after. In those who had spent some of their childhood in care, 11 out of the 291 women had missing data (3.9%). There were no statistically significant differences between those who had missing data and those who did not in terms of age, income, social class and education. Of the women who had not spent any time in care, 715 of the 18,201 women had missing data for symptoms of depression (4.0%). Those who had missing data were more likely to be in a lower social class, have a lower income and to have lower or no qualifications (please see tables s1-3 in the supplementary information.)

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Table 4 shows the odds ratios for the association between having been looked after in care and smoking during pregnancy, breastfeeding and symptoms of postnatal depression. Women who had been looked after in care were more likely to smoke during pregnancy (OR 3.0) compared with women who had not been looked after in care, even after adjusting for possible confounding factors. Their babies were more likely to have a low birth weight (OR 1.8), although this effect was not statistically significant after controlling for confounding factors. They were also less likely to initiate breastfeeding compared with women who had not been looked after in care, although again, this effect was smaller and not statistically significant after adjusting for other factors (table 4). Women who had been looked after in care were more likely to have symptoms of depression (OR 2.01-98), even after controlling for possible confounding factors.

Table 4 - Unadjusted and adjusted odds ratios (95% CI) for smoking during pregnancy, low birth weight, any breastfeeding and symptoms of depression among mothers according to a history of being looked after in care

	% ^f of participants (n)	Unadjusted (95% CI)	Adjusted (95% CI)
Mother smoked during pregnancy	(18,485)	<u>n= 18,485</u>	<u>n=16,902</u>
No time spent in care	20.8 (4,051)	1	1
Any time spent in care	58.0 (173)	5.3 (3.9-7.1)	3.0 (2.1-4.3)*

<u>Low birth weight</u>		<u>n= 18,471</u>	<u>n=18,238</u>
<u>No time spent in care</u>	<u>6.7 (1,293)</u>	<u>1</u>	<u>1</u>
<u>Any time spent in care</u>	<u>11.5 (34)</u>	<u>1.8 (1.2-2.8)</u>	<u>1.4(0.6-2.8)[~]</u> <u>1.7 (0.9-3.4)[†]</u>
Any breastfeeding	(18,488)	<u>n= 18,488</u>	<u>n=16,905</u>
No time spent in care	69.7 (11,988)	1	1
Any time spent in care	53.5 (156)	0.5 (0.4-0.7)	1.1 (0.7-1.4) [*]
Symptoms of depression	(17,766)	<u>n= 17,766</u>	<u>n=16,351</u>
No time spent in care	13.4 (2,566)	1	1
Any time spent in care	31.3 (87)	2.9 (2. 219 <u>4.03-96</u>)	1.98 (1.4-2.7) [*]

[†]Weighted percentages

^{*}Adjusted for maternal age, income, education and social class

[~]Adjusted for maternal age, education, ethnicity, gestational age and smoking during pregnancy

[†] Adjusted for maternal age, income, education, social class, gestational age and ethnicity

DISCUSSION

Summary of findings

In our study, which represents the mothers of babies born in the UK during 2001-2002, 1.6% of women in this cohort had spent some of their childhood in the care system, either with foster parents or in a children's home. The majority of these women had spent a year or more in care. The mothers in our study who had spent some of their childhood as a looked after child were disadvantaged in terms of social and economic factors when compared to the mothers who had not. They were more likely to smoke during their pregnancy and have symptoms of depression. This likelihood persisted after adjusting for confounding factors. In univariable analysis, they were **more likely to have a low birth weight baby and** less likely to breastfeed, but this effect did not persist after adjusting for confounding factors.

These results suggests that women with a history of time in foster care or a children's home carry social disadvantage into adulthood and motherhood.-

Comparison with other studies

As far as we are aware, this study is one of the first to look at health status and maternal outcomes of pregnant women who have previously been in care. The links between social disadvantage and being **a looked after in care child**, and the links between social disadvantage and poor maternal outcomes are well documented. It is not surprising that the findings of this study show that being **a looked after in care child** is associated with social disadvantage and adverse maternal outcomes. Previous studies have shown that **looked after**-children **who have been in care** are more likely to become teenage **parents** ~~mothers~~.

Compared to previous estimates of the number of children in England in care at any one time, our estimate is considerably lower. Simkiss et al. [3], suggest that 3% of children in the UK have spent some time in care. Our estimate may be low because we have missed many mothers who have

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7 previously been in care, which could be due to them declining to take part, or because their children
8 had been taken into care. If this is the case, then these mothers are likely to be different to those
9 who agreed to the recruitment of their children. ~~It is likely that the families who were not recruited
10 into the Millennium Cohort Study were more unstable than those who were, or who had a greater
11 distrust of institutions.~~

12
13 The worse birth outcomes in terms of birth weight and prematurity found in the exposed group
14 could be in part a result of the association between antenatal smoking with low birth weight and
15 prematurity [37], and the high rate of antenatal smoking in this group. Younger mothers are more
16 likely to have an unassisted birth [38], and we postulate that the higher proportion of normal
17 deliveries seen in the exposed group is associated with the lower average age of women in this
18 group. There is likely to be an association between social class and mode of delivery, but previous
19 studies are conflicting in describing this effect. Whilst some studies find an increased rate of
20 caesarean section with area level deprivation [39 40], others find a more complicated relationship
21 between age at first delivery, education, social class and mode of delivery, with primigravida women
22 from a lower socioeconomic class having a higher rate of planned caesarean section or instrumental
23 delivery [41], whilst others still have found that individuals with a higher socioeconomic class have a
24 higher rate of elective caesarean section, those with a lower socioeconomic class have a higher rate
25 of emergency caesarean section [42].

26 27 28 **Strengths and limitations**

29
30 A strength of this study is the use of Millennium Cohort Study data, a nationally representative
31 sample which ensured adequate representation from socially disadvantaged groups and people from
32 ethnically diverse backgrounds. Using this cohort allowed us to capture women who had previously
33 been in care during their adult lives, which can be otherwise difficult to do.

34
35 The amount of missing data was small: except in the multivariable analysis using the Malaise
36 Inventory score as an outcome, the negligible amount of missing data would be unlikely to affect the
37 results. For the outcome of symptoms of depression, 3.9% of the data was missing, and it is possible
38 that the worse social characteristics of the women without information on their Malaise Inventory
39 score may have led to a small increase in the estimation of the effect of being in care in the adjusted
40 model.

41
42 A major limitation of this study is that a large number of women with a history in care may not be
43 included in the MCS, due to not agreeing to take part or being ineligible because their own children
44 had been taken into care. Furthermore, information on the childhood socioeconomic status of the
45 mothers was not available.

46
47 However, although we can compare our prevalence to estimates of children currently in care, it is
48 not possible to obtain estimates of how many women of child bearing age at the time of our cohort
49 may have been in care during their childhoods without prevalence data of looked-after_children in
50 care from the 1960s to the 1990s. Therefore, we are unable to say what the likely proportion of
51 women who would have been excluded would be. However, it is possible that women who were
52 excluded due to having their own children taken into care may be more likely to have had worse
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7 social outcomes than those who entered the cohort. We would assume that if the data on these
8 women had been captured, the results of this study would have been more extreme. A systematic
9 review of the characteristics of families whose children were taken into care showed that a low
10 socioeconomic status was the factor most associated with this outcome [43]. This systematic review
11 noted a large variation by country in the factors associated with families requiring children to be
12 placed in care, and that only one study was found from the UK. This and subsequent studies suggest
13 that in the UK, children who have been taken into care are more likely to have had mothers who
14 were younger, have a history of substance misuse or mental illness, live in a deprived
15 neighbourhood, are from a lower social class, and live in overcrowded or rented accommodation [3
16 44].
17

18 19 **Potential mechanisms and policy implications**

20
21 The population of this study are women born between the 1960's and mid-1980s, and their children
22 who are now 13-14 years old. The findings of this study have relevance to these children as they
23 enter adolescence and adulthood, as evidence suggests that activity in the early years can have
24 lasting effects on health and psychosocial functioning [45-47]. Unfortunately the outcomes for
25 looked after children in the UK remains poor, both during their childhood, and when they enter
26 adult life[5 48 49]. The increased policy focus on the early years, education and integrated care in
27 recent times may have helped to improve outcomes for these children[50].
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29

30 From this study it is not possible to determine whether the social disadvantage is a direct
31 antecedent to being in care, or whether being in care led to subsequent social disadvantage. The
32 question remains whether being in care confers a disadvantage in terms of maternal behaviours and
33 outcomes over and above the social and economic disadvantage.
34

35 However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of
36 the social care system is to reduce the social disadvantage that the child experienced on entering
37 care, and idealistically improve their life circumstances in order for the child to have a better start in
38 life. The UK still has a long way to go in reducing the long term disadvantage experienced by
39 children in care. Of particular concern is the evidence presented here that suggests that this
40 disadvantage persists to child bearing age and is associated with maternal behaviours and outcomes
41 that have the potential to affect the health and wellbeing of their children. In addition to the legacy
42 of early and continuing social disadvantage such as low household income, low educational
43 attainment and reduced employment opportunities, there are aspects of care itself that may have
44 an effect on the maternal outcomes studied such as residential instability, disrupted parental
45 attachments and difficulties in resolving past history when faced with having children of one's own
46 [12 51-53].
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49 It is known that maternal smoking, [birth weight](#), depression and [breastfeeding](#) rates are potentially
50 modifiable [outcomes behaviours](#) with appropriate screening, education and support from healthcare
51 professionals. Tools exist to screen for and identify perinatal depression, and there are ways that
52 women with depression can be supported and treated [54]. Likewise, smoking in pregnancy and
53 breastfeeding can be asked about and women who would like to change their current behaviours
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7 can be supported to change [24 55-57]. [Historically and recently, improving birth weight is a public](#)
8 [health priority in the UK](#) [58 59]. Pregnancy and early motherhood is a time when women who are
9 often otherwise healthy have a large amount of contact with health care services. These results
10 suggest that it may be worthwhile to pay particular attention to women who have a history ~~of~~
11 being in care when they present to health and social care services during pregnancy and early
12 motherhood. Currently a history of time in care is not part of the routine information collected
13 during prenatal visits. It has been suggested that a wider range of socio-demographic information
14 should be collected in order to create a deeper understanding of the individual mother's needs [7].
15

16 The best way to use this information for policy change is yet to be determined. Interventions aimed
17 at improving the educational and emotional outcomes for looked after children are varied, despite
18 difficulties in producing sustained improvement. Educational and emotional outcomes for looked
19 after children in European countries such as Denmark, Germany and Norway are better than those
20 in the UK. The use of the social pedagogy approach has been accredited for some of these
21 differences. This approach emphasises emotional warmth and personal development. Information
22 on how the health and emotional wellbeing of looked after children can perpetuate cycles of
23 deprivation may add to this body of research [60].
24

25 26 **Future research**

27
28 There has been an increased focus on the outcomes for ~~looked after~~ children [in care](#), particularly
29 over the past decade [61 62]. Therefore outcomes for ~~looked after~~ children [in care](#) could be very
30 different for women previously in care who are pregnant currently, as compared to those pregnant
31 10 years ago. It would be useful to look at the current health outcomes of mothers previously in care
32 and their children in order to see if presently there are inequities, and if whether these inequities
33 are reducing.
34

35
36 Information is currently collected by the Department of Education on the educational outcomes of
37 [children in care](#) ~~looked after children~~, and this research has been used to target interventions at
38 increasing their educational attainment [63]. Berridge argues that focusing on these educational
39 targets alone are not enough, and a theory and approach that encompasses a wide view of the
40 challenges faced by ~~looked after~~ children [in care](#) is needed [64]. We argue that the mental and
41 physical health of looked after children during pregnancy is an area that should be added as a piece
42 of this policy puzzle.
43

44 45 **Conclusions**

46
47 Findings from the Millennium Cohort Study indicate that mothers with a history of spending time ~~as~~
48 [a looked after child in care are more](#) disadvantaged socially and economically when compared to
49 other mothers even after they have left care and during their children's infancy. We looked in more
50 detail at smoking during pregnancy, [low birth weight](#), symptoms of depression in early motherhood
51 and whether [breastfeeding](#) was initiated, and found that mothers who had been ~~looked after~~ [in care](#)
52 were more likely to smoke during pregnancy and have symptoms of depression. This is consistent
53 with previous research suggesting that social and health disadvantages faced by ~~looked after~~
54 children [in care](#) persist into adult life.
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9 **Contributors:** All contributors (SB, MQ, RG) made substantial contributions to conception and
10 design, acquisition of data, and interpreted the data. SB did the initial analysis of the data and wrote
11 the first draft of the article. SB, RG and MQ revised the article critically for important intellectual
12 content; and all authors (SB, MQ, RG) approved of the version to be published.
13

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16

17 **Competing interests:** None.
18

19 **Ethical approval:** This research involved secondary analysis of the MCS and therefore did not
20 require ethical approval. Ethical approval for the Millennium Cohort Study was granted from the
21 multi-centre research ethics committee.
22

23 **Data sharing:** The datasets are available on the UK Data Archive. Further information about the
24 study and data can be found at www.cls.ioe.ac.uk/.
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53 **References**
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1. Martin A, Ford T, Goodman R, et al. Physical illness in looked-after children: a cross-sectional study. *Archives of disease in childhood* 2013 doi: 10.1136/archdischild-2013-303993[published Online First: Epub Date]].
2. Department of Education. Children looked after in England (including adoption and care leavers) year ending 31 March 2013. London: Office of National Statistics, 2014.
3. Simkiss DE, Spencer NJ, Stallard N, et al. Health service use in families where children enter public care: a nested case control study using the General Practice Research Database. *BMC health services research* 2012;**12**:65 doi: 10.1186/1472-6963-12-65[published Online First: Epub Date]].
4. Department of Education. Outcomes for Children Looked After by Local Authorities in England, as at 31 March 2013. London: Office of National Statistics, 2014.
5. Viner RM, Taylor B. Adult health and social outcomes of children who have been in public care: population-based study. *Pediatrics* 2005;**115**(4):894-9 doi: 10.1542/peds.2004-1311[published Online First: Epub Date]].
6. Ford T, Vostanis P, Meltzer H, et al. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British journal of psychiatry : the journal of mental science* 2007;**190**:319-25 doi: 10.1192/bjp.bp.106.025023[published Online First: Epub Date]].
7. Keirnan K, Mensah F. Maternal indicators in pregnancy and childhood infancy that signal future outcomes for children's development, behaviour and health: evidence from the Millennium Cohort Study: Department of Social Policy and Social Work, University of York, 2010.
8. National Institute for Health and Clinical Excellence (NICE). Pregnancy and complex social factors: A model for service provision for pregnant women with complex social factors - guidance (CG110) 2010.
9. Department of Health. Maternity Standard, National Service Framework for Children, Young People and Maternity Services, 2004.
10. Department of Health. Healthy lives, healthy people : our strategy for public health in England. Cm. Norwich: Stationery Office, 2010:96 p.
11. Carpenter SC, Clyman RB, Davidson AJ, et al. The association of foster care or kinship care with adolescent sexual behavior and first pregnancy. *Pediatrics* 2001;**108**(3):E46
12. Svoboda DV, Shaw TV, Barth RP, et al. Pregnancy and parenting among youth in foster care: A review. *Children and Youth Services Review* 2012;**34**(5):867-75 doi: 10.1016/j.childyouth.2012.01.023[published Online First: Epub Date]].
13. Vinnerljung B, Franzén E, Danielsson M. Teenage parenthood among child welfare clients: A Swedish national cohort study of prevalence and odds. *Journal of Adolescence* 2007;**30**(1):97-116
14. Polit DF, Morton TD, White CM. Sex, Contraception and Pregnancy Among Adolescents in Foster Care. *Family Planning Perspectives* 1989;**21**(5):203-08 doi: 10.2307/2135572[published Online First: Epub Date]].
15. Hobcraft J. Intergenerational and Life-Course Transmission of Social Exclusion: Influences and Childhood Poverty, Family Disruption and Contact with the Police: Centre for Analysis of Social Exclusion, LSE, 1998.
16. Whitworth M, Dowswell T. Routine pre-pregnancy health promotion for improving pregnancy outcomes. *The Cochrane database of systematic reviews* 2009(4):CD007536 doi: 10.1002/14651858.CD007536.pub2[published Online First: Epub Date]].
17. Aizer A, Currie J. The intergenerational transmission of inequality: Maternal disadvantage and health at birth. *Science* 2014;**344**(6186):856-61 doi: 10.1126/science.1251872[published Online First: Epub Date]].
18. Kramer MR. Determinants of low birth weight: methodological assessment and meta-analysis. *Bulletin of the World Health Organisation*, 1987:663-737.
19. Barker DJ. *Fetal and infant origins of adult disease*. London: BMJ Publications, 1992.

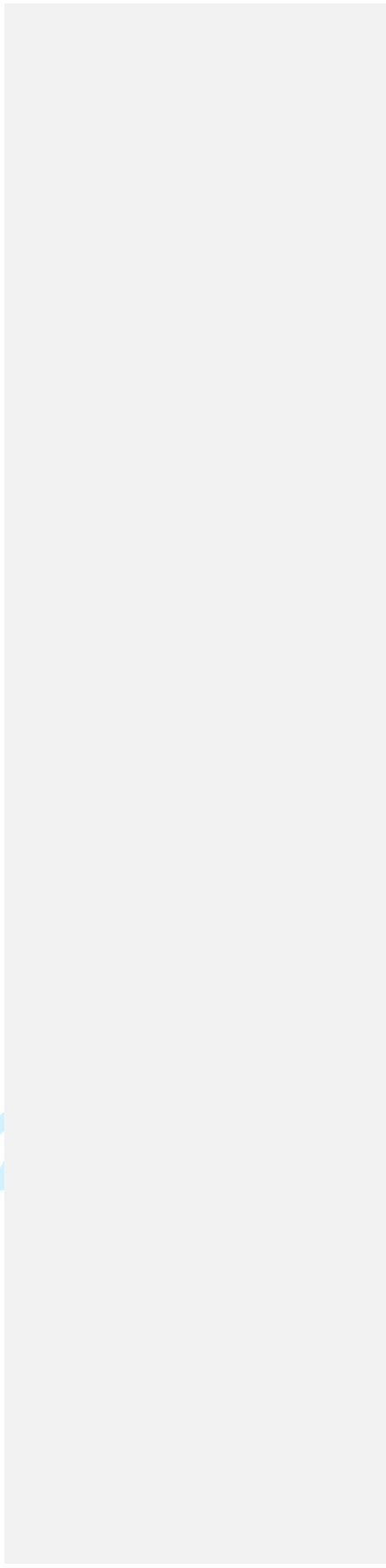
20. Paulson JF, Dauber S, Leiferman JA. Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics* 2006;**118**(2):659-68 doi: 10.1542/peds.2005-2948[published Online First: Epub Date] |.
21. Coyl DD, Roggman LA, Newland LA. Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal* 2002;**23**(1-2):145-63 doi: 10.1002/imhj.10009[published Online First: Epub Date] |.
22. Canadian Paediatric Society. Maternal depression and child development. *Paediatrics & child health* 2004;**9**(8):575-98
23. National Institute for Health and Clinical Excellence (NICE). Maternal and child nutrition: NICE, 2008.
24. Dyson. Promotion of breast feeding initiation and duration: evidence into practice briefing: NICE, 2006.
25. Centre for Longitudinal Studies. The age 9 months survey of the MCS (2001- 2002), 20.
26. Office of National Statistics. Infant and perinatal mortality 2001: health areas, England and Wales. *Health Statistics Quarterly* 2002;**15**
27. Department of Education. Improving the adoption system and services for looked after children: Policy, 2014.
28. Rodgers B, Pickles A, Power C, et al. Validity of the Malaise Inventory in general population samples. *Social psychiatry and psychiatric epidemiology* 1999;**34**(6):333-41
29. McGee R, Williams S, Silva PA. An evaluation of the Malaise Inventory. *Journal of psychosomatic research* 1986;**30**(2):147-52
30. Centre for Longitudinal Studies. MCS user guide: Psychological, developmental and health inventories. 2012
31. Tate AR, Dezateux C, Cole TJ, et al. Factors affecting a mother's recall of her baby's birth weight. *International journal of epidemiology* 2005;**34**(3):688-95 doi: 10.1093/ije/dyi029[published Online First: Epub Date] |.
32. Poulsen G, Kurinczuk JJ, Wolke D, et al. Accurate reporting of expected delivery date by mothers 9 months after birth. *Journal of clinical epidemiology* 2011;**64**(12):1444-50 doi: 10.1016/j.jclinepi.2011.03.007[published Online First: Epub Date] |.
33. Quigley MA, Hockley C, Davidson LL. Agreement between hospital records and maternal recall of mode of delivery: evidence from 12 391 deliveries in the UK Millennium Cohort Study. *BJOG : an international journal of obstetrics and gynaecology* 2007;**114**(2):195-200 doi: 10.1111/j.1471-0528.2006.01203.x[published Online First: Epub Date] |.
34. Marmot M, International Balzan Foundation. *Fair society, healthy lives*.
35. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [program], 2013.
36. Hanson K, ed. *Millennium cohort study, first, second and third surveys: a guide to the datasets*. 3rd ed. London: Centre for Longitudinal Studies, Institute of Education, 2008.
37. Cnattingius S. The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research* 2004;**6**(Suppl 2):S125-S40 doi: 10.1080/14622200410001669187[published Online First: Epub Date] |.
38. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: a systematic review. *Birth (Berkeley, Calif.)* 2010;**37**(3):219-26 doi: 10.1111/j.1523-536X.2010.00409.x[published Online First: Epub Date] |.
39. Barley K, Aylin P, Bottle A, et al. Social class and elective caesareans in the English NHS. *Bmj* 2004;**328**(7453):1399 doi: 10.1136/bmj.328.7453.1399[published Online First: Epub Date] |.
40. Alves B, Sheikh A. Investigating the relationship between affluence and elective caesarean sections. *Bjog-an International Journal of Obstetrics and Gynaecology* 2005;**112**(7):994-96 doi: 10.1111/j.1471-0528.2005.00657.x[published Online First: Epub Date] |.
41. Essex HN, Green J, Baston H, et al. Which women are at an increased risk of a caesarean section or an instrumental vaginal birth in the UK: an exploration within the Millennium Cohort

- Study. BJOG: An International Journal of Obstetrics & Gynaecology 2013;**120**(6):732-43 doi: 10.1111/1471-0528.12177[published Online First: Epub Date]].
42. Fairley L, Dundas R, Leyland AH. The influence of both individual and area based socioeconomic status on temporal trends in Caesarean sections in Scotland 1980-2000. BMC Public Health 2011;**11** doi: 10.1186/1471-2458-11-330[published Online First: Epub Date]].
43. Simkiss DE, Stallard N, Thorogood M. A systematic literature review of the risk factors associated with children entering public care. Child: Care, Health and Development 2013;**39**(5):628-42 doi: 10.1111/cch.12010[published Online First: Epub Date]].
44. Bebbington A, Miles. The Background of Children who enter Local Authority Care. British Journal of Social Work 1989;**19**(1):349-68
45. Dixon J. Young people leaving care: health, well-being and outcomes. Child & Family Social Work 2008;**13**(2):207-17 doi: 10.1111/j.1365-2206.2007.00538.x[published Online First: Epub Date]].
46. Barker DJ. The origins of the developmental origins theory. Journal of internal medicine 2007;**261**(5):412-7 doi: 10.1111/j.1365-2796.2007.01809.x[published Online First: Epub Date]].
47. Peruzzi A. From Childhood Deprivation to Adult Social Exclusion: Evidence from the 1970 British Cohort Study. Soc Indic Res 2014;1-19 doi: 10.1007/s11205-014-0581-2[published Online First: Epub Date]].
48. Department of Health. Statutory guidance on promoting the health and well-being of looked after children 2009
49. National Institute for Health and Clinical Excellence (NICE). Looked after children and young people, 2010.
50. Science BBo. *Growing up in the UK: Ensuring a healthy future for our children* British Medical Association, 2013.
51. Dregan A, Gulliford MC. Foster care, residential care and public care placement patterns are associated with adult life trajectories: population-based cohort study. Social psychiatry and psychiatric epidemiology 2012;**47**(9):1517-26 doi: 10.1007/s00127-011-0458-5[published Online First: Epub Date]].
52. Pryce JM, Samuels GM. Renewal and Risk: The Dual Experience of Young Motherhood and Aging Out of the Child Welfare System. Journal of Adolescent Research 2010;**25**(2):205-30 doi: 10.1177/0743558409350500[published Online First: Epub Date]].
53. Maxwell A, Proctor J, Hammond L. 'Me and My Child': Parenting Experiences of Young Mothers Leaving Care. Adoption & Fostering 2011;**35**(4):29-40 doi: 10.1177/030857591103500404[published Online First: Epub Date]].
54. Nylen KJ, Moran TE, Franklin CL, et al. Maternal depression: A review of relevant treatment approaches for mothers and infants. Infant Mental Health Journal 2006;**27**(4):327-43 doi: 10.1002/imhj.20095[published Online First: Epub Date]].
55. National Institute for Health and Clinical Excellence (NICE). CG45 Antenatal and postnatal mental health: clinical management and service guidelines, 2010.
56. National Institute for Health and Clinical Excellence (NICE). PH26 Quitting smoking in pregnancy and following childbirth, 2010.
57. Lumley J, Chamberlain C, Dowswell T, et al. Interventions for promoting smoking cessation during pregnancy. The Cochrane database of systematic reviews 2009(3):CD001055 doi: 10.1002/14651858.CD001055.pub3[published Online First: Epub Date]].
58. Health Development Agency. Prevention of low birth weight: assessing the effectiveness of smoking cessation and nutritional interventions. London: National Health Service, 2003.
59. (NICE) NifHaCE. Clinical Commissioning Group Outcomes Indicator Set Rationale, 2014.
60. Boddy J, Statham J, McQuail S, et al. Workign at the 'edges' of care? European models of support for young people and families: Thomas Coram Research Unit, Institute of Education, University of London, 2009.

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61. Chief Secretary to the Treasury. Every child matters, 2003.
62. Polnay L, Ward H. Promoting the health of looked after children. Government proposals demand leadership and a culture change. *Bmj* 2000;**320**(7236):661-2
63. Social Exclusion Unit. A better education for children in care: Social Exclusion Unit, 2003.
64. Berridge D. Theory and explanation in child welfare: education and looked-after children. *Child & Family Social Work* 2007;**12**(1):1-10 doi: 10.1111/j.1365-2206.2006.00446.x[published Online First: Epub Date]|.

For peer review only



STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2,3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5,6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7,8
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6,8
		(b) For matched studies, give matching criteria and number of exposed and unexposed	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6,7,8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7,8
Bias	9	Describe any efforts to address potential sources of bias	6,8
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7,8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8,9
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	9
		(d) If applicable, explain how loss to follow-up was addressed	n/a
		(e) Describe any sensitivity analyses	9
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	9
		(c) Consider use of a flow diagram	9
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9,10,11
		(b) Indicate number of participants with missing data for each variable of interest	9,12
		(c) Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	Report numbers of outcome events or summary measures over time	n/a
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12
		(b) Report category boundaries when continuous variables were categorized	7,8,10,11
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9,12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	13,14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.