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

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.

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

depression is associated with impaired mother-infant attachment, and children of depressed mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater risk of psychopathology in later life [15-17]. Despite breastfeeding having short and long term health benefits for both mother and baby [18], the UK has one of the lowest rates of breastfeeding worldwide, especially in young white women from disadvantaged social groups [19].

We compared the sociodemographic and health profiles of mothers who had spent time in care as a child to mothers who had not. We also looked at the relationship between the mothers spending time in care with the likelihood of the outcomes of smoking during pregnancy, the presence of symptoms of maternal depression and the uptake of breastfeeding.

METHODS

Millennium Cohort Study

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

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

Time spent in care as a child

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 in care. 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. We classed mothers who had spent any amount of time in 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' 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 achieve 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)	No (n= 18,201)	
	% [95% CI]	% [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 [6.8,1525]	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)	No (n=18,201)	
	% [95% CI]	% [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			
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	<0.001
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 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			
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]	

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)*

[f]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. 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

study is that a large number of women with a history in care may not be included in the MCS, due to not agreeing to take part or being ineligible because their own children had been taken into care.

However, although we can compare our prevalence to estimates of children currently in care, it is not possible to obtain estimates of how many women of child bearing age at the time of our cohort may have been in care during their childhoods without prevalence data of looked after children from the 1960s to the 1990s.

Potential mechanisms and policy implications

The population of this study are women born between the 1960's and mid-1980s, and their children who are now 13-14 years old. The findings of this study have relevance to these children as they enter adolescence and adulthood, as evidence suggests that activity in the early years can have lasting effects on health and psychosocial functioning [26-28]

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

However, one may argue that it is not necessarily helpful to make this distinction. One of the aims of the social care system is to reduce the social disadvantage that the child experienced on entering care, and idealistically improve their life circumstances in order for the child to have a better start in life. Our results show that the UK still has a long way to go in reducing the long term disadvantage experienced by children in care. Of particular concern is the evidence presented here that suggests that this disadvantage persists to child bearing age and is associated with maternal behaviours and outcomes that have the potential to affect the health and wellbeing of their children.

It is known that maternal smoking, depression and breast feeding rates are potentially modifiable behaviours with appropriate screening, education and support from healthcare professionals. Tools exist to screen for and identify perinatal depression, and there are ways that women with depression can be supported and treated [29]. Likewise, smoking in pregnancy and breastfeeding can be asked about and women who would like to change their current behaviours can be supported to change [19 30 31]. Pregnancy and early motherhood is a time when women who are often otherwise healthy have a large amount of contact with health care services. These results suggest that it may be worthwhile to pay particular attention to women who have a history in being in care when they present to health and social care services during pregnancy and early motherhood. Currently a history of time in care is not part of the routine information collected during prenatal visits. It has been suggested that a wider range of socio-demographic information should be collected in order to create a deeper understanding of the individual mother's needs [9].

The best way to use this information for policy changes is yet to be determined. Interventions aimed at improving the educational and emotional outcomes for looked after children are varied, despite difficulties in producing sustained improvement. Educational and emotional outcomes for looked after children in European countries such as Denmark, Germany and Norway are better than those

in the UK. The use of the social pedagogy approach has been accredited for some of these differences. This approach emphasises emotional warmth and personal development. Information on how the health and emotional wellbeing of looked after children can perpetuate cycles of deprivation may add to this body of research. [32]

Future research

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

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

Conclusions

Findings from the Millennium Cohort Study indicate that mothers with a history of spending time in care are disadvantaged socially and economically when compared to other mothers even after they have left care and during their children's infancy. We looked in more detail at smoking during pregnancy, symptoms of depression in early motherhood and whether breast feeding was initiated, and found that mothers who had spent time in care were more likely to smoke during pregnancy and have symptoms of depression. This is consistent with previous research suggesting that social 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/.

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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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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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11th April, 2014

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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.

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.

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].

In a review of maternal predictors for child health status, emotional wellbeing, and educational attainment, Keirnan and Mensah found that mothers who had been looked after 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 [7]. 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 and symptoms of maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16]. Maternal depression is associated with impaired mother-infant attachment, and children of depressed mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater risk of psychopathology in later life [17-19]. Despite breastfeeding having short and long term health benefits for both mother and baby [20], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white women from disadvantaged social groups [21].

We compared the sociodemographic and health profiles of mothers who had been looked after as a child either with foster parents or in a children's home to mothers who had not. We also looked at the relationship between the mothers who had been placed with foster parents or in a children's home with the likelihood of the outcomes of smoking during pregnancy, the presence of symptoms of maternal depression and the uptake of breastfeeding.

METHODS

Millennium Cohort Study

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

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

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].

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

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 [30], 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".

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: age at delivery, ethnic group, social class, household income, education, family status, parity, smoking during pregnancy, symptoms of depression, mode fo delivery, gestational age, birth weight, and duration of feeding.

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 included 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 [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 achieve 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

	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 [6.8,1525]	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 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			
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	<0.001
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)*

[f]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 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 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 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

prematurity [33], and the high rate of antenatal smoking in this group. 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 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.

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

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

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

Potential mechanisms and policy implications

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

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

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

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

The best way to use this information for policy change is yet to be determined. Interventions aimed at improving the educational and emotional outcomes for looked after children are varied, despite difficulties in producing sustained improvement. Educational and emotional outcomes for looked after children in European countries such as Denmark, Germany and Norway are better than those in the UK. The use of the social pedagogy approach has been accredited for some of these differences. This approach emphasises emotional warmth and personal development. Information

on how the health and emotional wellbeing of looked after children can perpetuate cycles of deprivation may add to this body of research. [50]

Future research

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

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

Conclusions

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

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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/.

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Pregnancy associated outcomes in women who spent some of their childhood ~~in care~~looked after by local authorities: findings from the UK Millennium 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 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 analyse~~i~~s, ~~W~~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, ~~W~~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

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~~been looked after.

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.

ARTICLE SUMMARY

This study uses the UK Millennium Cohort ~~s~~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].

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~~been looked after 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 [7]. 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~~,~~ and symptoms of maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16]. Maternal depression is associated with impaired mother-infant attachment, and children of depressed mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater risk of psychopathology in later life [17-19]. Despite breastfeeding having short and long term health benefits for both mother and baby [20], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white women from disadvantaged social groups [21].

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

METHODS

Millennium Cohort Study

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

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

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, ~~M~~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 ~~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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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].
Birthweight was classified as ≥2.5kg ('normal'), or <2.5kg ('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'.

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 [30], 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~~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.
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".
~~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: age at delivery, ethnic group, social class, household income, education, family status, parity, smoking during pregnancy, symptoms of depression, mode fo delivery, gestational age, birth weight, and duration of feeding. ~~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. 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 ~~P~~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 1.6~~5~~% 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 t~~T~~able 1).

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

Time looked after~~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~~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 achieve a high level of education, compared with the rest of the cohort (t~~T~~able 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~~Time in Care~~ Yes (n= 291) % [95% CI]	No (n= 18,201) % [95% CI)	P value
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 [6.8,1525]	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~~ 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			
Kept smoking during	58.0 [50.5,65.1]	20.8 [19.6,22.1]	<0.001

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			
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]	

~~**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**~~			
~~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 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 4~~5~~ 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 4~~5~~). 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 4~~5~~ - 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~~

	%[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)*

[f]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.

~~-~~The~~se~~ ~~is~~ 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

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.

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

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

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

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

~~The proportion of women with missing data was small.~~

Potential mechanisms and policy implications

The population of this study are women born between the 1960's and mid-1980s, and their children who are now 13-14 years old. The findings of this study have relevance to these children as they enter adolescence and adulthood, as evidence suggests that activity in the early years can have lasting effects on health and psychosocial functioning [37-39]. Unfortunately the outcomes for looked after children in the UK remains poor, both during their childhood, and when they enter

adult life[5 40 41]. ~~An~~The increased policy focus on the early years, education and integrated care in recent times may have helped to improve outcomes for these children[42].

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

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

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

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

Future research

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

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

Conclusions

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

Contributors: All contributors (SB, MQ, RG) made substantial contributions to conception and design, acquisition of data, and interpreted the data. SB did the initial analysis of the data and wrote the first draft of the article. SB, RG and MQ revised the article critically for important intellectual content; and all authors (SB, MQ, RG) approved of the version to be published.
~~Contributors: All contributors participated in the design and the interpretation of the findings. SB analysed the data and drafted the manuscript. All authors critically reviewed the manuscript and approved the final version.~~

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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/.

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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.

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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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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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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.

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.

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].

In a review of maternal predictors for child health status, emotional wellbeing, and educational attainment, Keirnan and Mensah found that mothers who had been 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 [7]. 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, low birth weight, breastfeeding initiation and symptoms of maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16] Low birth weight is associated with worse childhood and adult health and social outcomes, and is thought to be influenced by both biological and social factors [17-19]. The prevention of low birth weight through health and social interventions in order to reduce health inequalities at an intergenerational level is an important goal of public health. Maternal depression is associated with impaired mother-infant attachment, and children of depressed mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater risk of psychopathology in later life [20-22]. Despite breastfeeding having short and long term health benefits for both mother and baby [23], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white women from disadvantaged social groups [24].

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

METHODS

Millennium Cohort Study

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

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

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 in care. 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 [27]. 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.

Breastfeeding

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 [28 29], a tool used within the Millennium Cohort Study to provide a measure of depression or psychological distress [30]. It is a self-report tool phrased in plain language. There is no specified time frame over which participants are asked to report their symptoms, but the emphasis is on the recent past.

Birth outcomes

Information on baby's birth weight, gestation and delivery method was obtained by self reporting. Previous studies have shown that there is 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 ≥2.5kg ('normal'), or <2.5kg ('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 was analysed as 'white' or 'other ethnic group'. 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'.
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

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

We then used logistic regression to estimate odds ratios for a history of time spent in care and the outcomes of smoking during pregnancy, birth weight, breastfeeding initiation and symptoms of depression, with adjustment for potential confounding factors. A plausible model was developed based on background literature and included the following potential confounders: age at delivery, ethnic group, social class, household income, education. 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. All of these potential confounders were significantly associated with the outcome (indicated by Wald, P <0.05) after controlling for other factors in the model. 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 with narrower confidence intervals .

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

The "unexposed" group were used as the reference for these analyses.

For univariable analysis, those with missing outcomes of smoking during pregnancy, low birth weight and any breastfeeding following birth were excluded (7 (0.04%), 21 (0.1%) 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 in care were not more likely to have missing data in this variable than those who had not been in care. 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.

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

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 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 Yes (n= 291) % [95% CI]	 No (n= 18,201) % [95% CI]	P value
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 [6.8,1525]	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			
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	<0.001
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			
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

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)*

[f]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 in care, 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 in care is associated with social disadvantage and adverse maternal outcomes. Previous studies have shown that children who have been in care are more likely to become teenage parents.

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.

The worse birth outcomes in terms of birth weight and prematurity found in the exposed group could be in part a result of the association between antenatal smoking with low birth weight and prematurity [37], and the high rate of antenatal smoking in this group. Younger mothers are more likely to have an unassisted birth [38], 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. There is likely to be an association between social class and mode of delivery, but previous studies are conflicting in describing this effect. Whilst some studies find an increased rate of caesarean section with area level deprivation [39 40], others find a more complicated relationship between age at first delivery, education, social class and mode of delivery, with primigradiva women from a lower socioeconomic class having a higher rate of planned caesarean section or instrumental delivery [41], whilst others still have found that individuals with a higher socioeconomic class have a higher rate of elective caesarean section, those with a lower socioeconomic class have a higher rate of emergency caesarean section [42].

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.

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

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

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

Potential mechanisms and policy implications

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

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

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

It is known that maternal smoking, birth weight, depression and breastfeeding rates are potentially modifiable outcomes with appropriate screening, education and support from healthcare professionals. Tools exist to screen for and identify perinatal depression, and there are ways that women with depression can be supported and treated [54]. Likewise, smoking in pregnancy and breastfeeding can be asked about and women who would like to change their current behaviours can be supported to change [24 55-57]. Historically and recently, improving birth weight is a public health priority in the UK [58 59]. Pregnancy and early motherhood is a time when women who are often otherwise healthy have a large amount of contact with health care services. These results suggest that it may be worthwhile to pay particular attention to women who have a history of being in care when they present to health and social care services during pregnancy and early motherhood. Currently a history of time in care is not part of the routine information collected during prenatal visits. It has been suggested that a wider range of socio-demographic information should be collected in order to create a deeper understanding of the individual mother's needs [7].

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

Future research

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

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

Conclusions

Findings from the Millennium Cohort Study indicate that mothers with a history of spending time in care are more disadvantaged socially and economically when compared to other mothers even after they have left care and during their children's infancy. We looked in more detail at smoking during pregnancy, low birth weight, symptoms of depression in early motherhood and whether breastfeeding was initiated, and found that mothers who had been in care were more likely to

smoke during pregnancy and have symptoms of depression. This is consistent with previous research suggesting that social and health disadvantages faced by children in care persist into adult life.

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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/.

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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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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.

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.

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~~d~~ 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].

In a review of maternal predictors for child health status, emotional wellbeing, and educational attainment, Keirnan and Mensah found that mothers who had been ~~looked after~~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 [7]. 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, low birth weight, breastfeeding initiation and symptoms of maternal depression. Smoking during pregnancy can lead to poor outcomes for mothers and babies [16]. Low birth weight is associated with worse childhood and adult health and social outcomes, and is thought to be influenced by both biological and social factors [17-19]. The prevention of low birth weight through health and social interventions in order to reduce health inequalities at an intergenerational level is an important goal of public health. Maternal depression is associated with impaired mother-infant attachment, and children of depressed mothers are at a greater risk of deficits in social and cognitive function, along with being at a greater risk of psychopathology in later life [20-22]. Despite breastfeeding having short and long term health benefits for both mother and baby [23], the UK has one of the lowest rates of breastfeeding worldwide, especially in young, white women from disadvantaged social groups [24].

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

METHODS

Millennium Cohort Study

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

interviewers to capture sociodemographic and health information when their children were 9 months old, with subsequent follow up at 3, 5 and 7 years.

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

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~~in care. 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 [27]. 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.

Breastfeeding

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 [28 29], a tool used within the Millennium Cohort Study to provide a measure of depression or psychological distress [30]. It is a self-report tool phrased in plain language. There is no specified time frame over which participants are asked to report their symptoms, but the emphasis is on the recent past. ~~.~~

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 ≥2.5kg ('normal'), or <2.5kg ('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

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

We then used logistic regression to estimate odds ratios for a history of time spent in care and the outcomes of smoking during pregnancy, birth weight, breastfeeding initiation and symptoms of depression, with adjustment for potential confounding factors. A plausible model was developed based on background literature and included the following potential confounders: age at delivery, ethnic group, social class, household income, education. 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. All of t~~T~~hese potential confounders ~~included~~ were significantly associated with the outcome (indicated by Wald, P <0.05) after controlling for other factors in the model.~~I~~ ~~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 with narrower confidence intervals .

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

~~The potential confounders included 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.~~

For univariable analysis, those with missing outcomes of smoking during pregnancy, low birth weight and any breastfeeding following birth were excluded (7 (0.04%), 21 (0.1%) 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 in care were not more likely to have missing data in this variable than those who had not been in care. 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.

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

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

Time ~~looked after~~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 ~~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	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 [6.8,1525]	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)	**No (n=18,201)**	
	% [95% CI]	% [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			
Kept smoking during pregnancy	58.0 [50.5,65.1]	20.8 [19.6,22.1]	<0.001
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)~~	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	~~(18,488)~~	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	~~(17,766)~~	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.~~19~~-4.0~~3.96~~)	1.98 (1.4-2.7)*

[f]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

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 in part a result of the association between antenatal smoking with low birth weight and prematurity [37], and the high rate of antenatal smoking in this group. Younger mothers are more likely to have an unassisted birth [38], 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. There is likely to be an association between social class and mode of delivery, but previous studies are conflicting in describing this effect. Whilst some studies find an increased rate of caesarean section with area level deprivation [39 40], others find a more complicated relationship between age at first delivery, education, social class and mode of delivery, with primigradiva women from a lower socioeconomic class having a higher rate of planned caesarean section or instrumental delivery [41], whilst others still have found that individuals with a higher socioeconomic class have a higher rate of elective caesarean section, those with a lower socioeconomic class have a higher rate of emergency caesarean section [42].

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.

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

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

However, although we can compare our prevalence to estimates of children currently in care, it is not possible to obtain estimates of how many women of child bearing age at the time of our cohort may have been in care during their childhoods without prevalence data of ~~looked after~~ children in care from the 1960s to the 1990s.Therefore, we are unable to say what the likely proportion of women who would have been excluded would be. However, it is possible that women who were excluded due to having their own children taken into care may be more likely to have had worse

social outcomes than those who entered the cohort. We would assume that if the data on these women had been captured, the results of this study would have been more extreme. A systematic review of the characteristics of families whose children were taken into care showed that a low socioeconomic status was the factor most associated with this outcome [43]. This systematic review noted a large variation by country in the factors associated with families requiring children to be placed in care, and that only one study was found from the UK. This and subsequent studies suggest that in the UK, children who have been taken into care are more likely to have had mothers who were younger, have a history of substance misuse or mental illness, live in a deprived neighbourhood, are from a lower social class, and live in overcrowded or rented accommodation [3 44].

Potential mechanisms and policy implications

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

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

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

It is known that maternal smoking, birth weight, depression and breastfeeding rates are potentially modifiable outcomes ~~behaviours~~ with appropriate screening, education and support from healthcare professionals. Tools exist to screen for and identify perinatal depression, and there are ways that women with depression can be supported and treated [54]. Likewise, smoking in pregnancy and breastfeeding can be asked about and women who would like to change their current behaviours

can be supported to change [24 55-57]. Historically and recently, improving birth weight is a public health priority in the UK [58 59]. Pregnancy and early motherhood is a time when women who are often otherwise healthy have a large amount of contact with health care services. These results suggest that it may be worthwhile to pay particular attention to women who have a history of~~in~~ being in care when they present to health and social care services during pregnancy and early motherhood. Currently a history of time in care is not part of the routine information collected during prenatal visits. It has been suggested that a wider range of socio-demographic information should be collected in order to create a deeper understanding of the individual mother's needs [7].

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

Future research

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

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

Conclusions

Findings from the Millennium Cohort Study indicate that mothers with a history of spending time ~~as a looked after child~~ in care are more disadvantaged socially and economically when compared to other mothers even after they have left care and during their children's infancy. We looked in more detail at smoking during pregnancy, low birth weight, symptoms of depression in early motherhood and whether breastfeeding was initiated, and found that mothers who had been ~~looked after~~in care were more likely to smoke during pregnancy and have symptoms of depression. This is consistent with previous research suggesting that social and health disadvantages faced by ~~looked after~~ children in care 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/.

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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	2,3
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.