Parental separation in childhood and adult smoking in the 1958 British birth cohort

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Abstract

Background: Parental separation or divorce is a known risk factor for poorer adult health. One mechanism may operate through the uptake of risky health behaviours, such as smoking. This study investigated the association between parental separation and adult smoking in a large British birth cohort and also examined potential socioeconomic, relational and psychosocial mediators. Differences by gender and timing of parental separation were also assessed.

Methods: Multiply-imputed data on 11,375 participants of the National Child Development Study (the 1958 British birth cohort) were used. A series of multinomial logistic regression models were estimated to investigate the association between parental separation (0-16 years) and adult smoking status (age 42), and the role of potential socioeconomic, relational and psychosocial mediators.

Results: Parental separation in childhood was associated with an increased risk of being a current (RRR=2.14, 95% CI: 1.77, 2.60) or ex-smoker (RRR=1.50, 95% CI: 1.22, 1.85) at age 42. This association remained after consideration of potential socioeconomic, psychosocial, and relational mediators. Relational (parent-child relationship quality, parental involvement and adult partnership status) and socioeconomic factors (overcrowding, financial hardship, housing tenure, household amenities, free school meal receipt and educational attainment) appeared to be the most important of the groups of mediators investigated. No differences by gender or the timing of parental separation were observed.

Conclusion: Parental separation experienced in childhood was associated with increased risk of smoking. Families undergoing separation should be further supported in order to prevent the uptake of smoking and to prevent later health problems.

Keywords smoking; parental divorce; National Child Development Study; child adversity

INTRODUCTION

Parental separation, defined as the separation of parents regardless of legal marital status, occurring in childhood has previously been linked to poorer physical and psychological health across the life course.[1–3] In 2013, almost 115,000 couples divorced in the UK, of whom 48% had children.[4] These divorces involved almost 95,000 children, a figure that has greatly increased over recent decades in the UK and across Europe,[4,5] and disproportionately affected more disadvantaged families.[6] One mechanism by which the association between parental separation and poorer adult health might operate is through the increased uptake smoking behaviours.[7] For example, a study using the Terman Life Cycle Study showed that the increased mortality risk of women who experienced parental divorce was partially mediated through smoking.[8]

Previous studies have investigated the association between childhood adversities, including parental separation, and adult smoking. A recent cross-sectional study found increased smokeless tobacco use amongst adults who experienced parental separation in childhood.[9] Similarly a study of school students found family disruption was associated with increased smoking.[10] Also evidence from the US Adverse Childhood Experiences study showed heightened risk of being a smoker amongst participants who experienced parental separation.[11] Whilst these studies have shown a link between parental separation and smoking, few have used longitudinal data or investigated the potential mechanisms. An exception to this used British birth cohort data to investigate the association between parental divorce and adult smoking. Using the 1946 British birth cohort, Kuh and Maclean[12] showed that parental divorce was associated with increased risk of smoking by age 36, however these analyses were limited to women. There is a suggestion from previous work that the association between parental separation and adult smoking might differ for men and women, with men being more likely to engage in risky health behaviours as a consequence of childhood adversity.[13] Also the association between parental divorce and physical health problems has been shown to be stronger for men, partially explained by substance use, including smoking.[14] There is

also an indication that boys are more likely to engage in risky health behaviours when parental supervision levels are low.[15]

There are several possible explanations for the observed association between parental separation and adult smoking. Firstly, socioeconomic circumstances may play a role. Parental separation most frequently results in single mother headed households, which are known to be more financially disadvantaged than other household types.[16] Parental separation can also affect educational attainment,[17,18] mediated through family income and the need for the child to enter employment.[18] These factors in turn are associated with smoking.[19] Furthermore, educational attainment and material disadvantage were found to be amongst the most important mediators of associations between parental separation and health.[2,3] It is also possible that prior socioeconomic circumstances affect the risk of parental separation.[20] Secondly there may be a role for psychosocial factors such as child psychosocial adjustment and adult psychological distress. There is a well-established association between parental separation and life course psychological wellbeing,[17] and also between psychological distress and smoking.[21] Thirdly relational factors, such as parent-child relationship quality,[22] parental involvement[23] and adult partnerships[24] are all known to be affected by parental separation . These factors in turn may influence the propensity to smoke.[25,26]

The outcomes of parental separation might also depend upon the timing at which parental separation occurred. Studies which have investigated the psychological sequelae of parental separation found that the younger the child, the greater the impact.[17] No studies to our knowledge have investigated the importance of timing of parental separation for smoking.

The aim of this study was to investigate the association between parental separation in childhood and adult smoking in a large British birth cohort. Possible explanations for an association were

explored, focussing on socioeconomic, relational and psychosocial mechanisms. Differences by gender and timing of parental separation were also assessed.

METHODS

Data

This study used data from the National Child Development Study (the 1958 British cohort study). The cohort comprised all babies born in Great Britain in one week of 1958 (n=17,415, 98.2% of target).[27] Participants were surveyed on health, social, economic and developmental factors on many occasions since birth: ages 7, 11, 16, 23, 33, 42, 44/45, 46, 50 and 55 years. The present study used information on participants up to age 42 when more detailed information on smoking was collected. The observed sample at age 42 was 11,419 (70.3% of target). Ethical approval for the study was acquired and informed consent obtained from all participants.[28]

Measures

Parental separation

To ascertain whether participants had experienced parental separation, analyses were restricted to children born to mothers who were in a relationship at time of the cohort member's birth (n=16,734, 96.1%). Information on parental separation or divorce was subsequently obtained from ages 7, 11 and 16 on who the parental figures were. In addition to a binary (yes/no) measure of parental separation, we also derived a variable capturing the timing of parental separation which was limited to the data collections (timing variable categorised as: 0-7 years, 8-11 years and 12-16 years).

Adult smoking status

Adult smoking status was obtained from age 42. Participants were asked 'Would you say that: 1) You've never smoked cigarettes; 2) you used to smoke cigarettes but don't at all now; 3) You now

smoke cigarettes occasionally but not every day; 4) You smoke cigarettes every day?' Responses were categorised as current smoker (regular and occasional), ex-smoker or never-smoker.

Mediators

Three groups of mediating variables were considered – socioeconomic, psychosocial and relational factors. Socioeconomic factors comprised of childhood indicators from the age 16 survey: overcrowding (<1.5 persons per room or ≥1.5 persons per room), financial hardship experienced in the past year (yes/no), receipt of free school meals (yes/no), housing tenure (owner occupied/mortgaged, social housing, privately-rented or other), and access to basic household amenities (created by summing responses for individual amenities – access to a bathroom, indoor lavatory and hot water supply, each coded as 0=sole use, 1=shared or no access, total score ranged from 0=sole access to all to 3=shared or no access to all). Educational attainment, measured as highest qualification obtained by age 23 years, was also included and categorised as no qualification, Certificate of Secondary Education or Ordinary-Level qualification, Advanced-level qualification, or higher qualification. These socioeconomic indicators were chosen to reflect long-term disadvantage, compared to other measures such as income and work status, which may only capture socioeconomic conditions at a single point in time.

Psychosocial mediators included the mother-reported Rutter behaviour scale as an indicator of psychosocial adjustment at age 16. This scale comprised 29 items (coded 0=doesn't apply, 1=applies somewhat, or 2=completely applies) which were summed to create a total score which was positively-skewed. Rutter's Malaise Inventory at age 42 was used as an indicator of adult psychological distress. This comprised 24 items covering emotional disturbance and somatic symptoms.[29]

Relational mediators included a measure of parent-child relationship quality at age 16. The child was asked to rate whether they got on well with their mother and father. The responses to each were on a 5-point Likert scale (very true to very untrue). The average was taken of the two items and just one used where only one parent was present. An indicator of mother and father involvement in the child's education, rated by the child's teacher, was also used at age 16(categorised as overly involved, very interested, some interest, or showed little to no interest). Finally the partnership status of the cohort member at age 42 was included (married, cohabiting, single (never married), or separated/divorced/widowed).

Covariates

Other covariates included were gender and potential confounders and selection factors. These included an indicator of childhood socioeconomic position (father's social class at birth – Registrar General's Social Class schema: I professional, II higher managerial/technical, IIINM skilled non-manual, IIIM skilled manual, IV semi-skilled manual, or V unskilled manual), whether the mother smoked during pregnancy, maternal educational level (left education at minimum school leaving age or stayed beyond minimum leaving age), and maternal and paternal age at birth of the cohort child.

Statistical analyses

Missing data

In order to minimise bias introduced by missing data, multiple imputation by chained equations was conducted to impute missing information. Twenty imputed datasets were created. The imputation models included all analysis variables, as well as auxiliary variables found to predict non-response. The approach of multiple imputation followed by deletion[30] was employed imputing missing information for all participants with partnered mother (see above) but then excluding those with missing data on smoking (final analytic sample = 11,375, 99.6% of those observed at age 42). Further description of the response rates and attrition over time can be found in Plewis et al.[31] The

proportion of participants missing data on each variable plus a comparison of observed and imputed values are reported in table 1.

Statistical analyses

The association between parental separation and smoking was tested using multinomial logistic regression. 'Never-smoker' and 'No parental separation' were used reference categories. A series of models were run. Firstly the crude association was estimated (m1). Secondly potential confounders and pre-separation selection factors were included (father's social class, maternal smoking during pregnancy, maternal education, maternal and paternal age at birth, m2). The investigation of potential mediators was then conducted by entering each group of mediators (socioeconomic, psychosocial and relational) one at a time into m2 (i.e. also including confounders and pre-separation selection factors). M3 included socioeconomic factors, m4 included relational factors and m5 included psychosocial factors of interest. A final model (m6) was run which included all potential mediating variables simultaneously. Gender differences were tested throughout by inclusion of a gender-separation interaction term. We also assessed whether the timing of parental separation was important for adult smoking but substituting in the parental separation timing variable.

RESULTS

Tables 1 and 2 shows the distribution of all analysis variables. Parental separation was experienced by 13.4% of the sample. Almost one-third of participants were smokers at age 42 (30.2%), and a quarter (25.2%) were ex-smokers. The proportion of current smokers was higher amongst those who experienced parental separation (43.8% vs. 28.6%), although there was little difference in ex-smokers. Those who experienced parental separation tended to come from more disadvantaged circumstances as indicated by father's social class, mother's education, and lower parental ages. Participants who experienced parental separation were also more likely to have a mother who smoked during pregnancy.

With respect to socioeconomic mediators, children who experienced parental separation were more likely to live in overcrowded accommodation, to have experienced financial hardship, have received free school meals, less likely to have lived in owner occupied housing and been more likely to have lived in social housing, and to have shared or no access to basic household amenities. Holding no educational qualifications was also more common amongst those who experienced parental separation (24.2% vs. 12.6%). With regards to relational factors there were few descriptive differences in parent-child relationship quality between those who did and did not experience parental separation. Conversely those whose parents were still together had higher levels of teacher-reported paternal and maternal involvement. Participants who experienced parental separation were more likely to be divorced or separated, and less likely to be married, by age 42. Finally with respect to psychosocial mediators, there was no descriptive difference in malaise inventory scores at age 42 between those who had and had not experienced parental separation; however, on a descriptive level, Rutter behaviour scores were higher at age 16 amongst those who did not experience parental separation.

Parental separation and adult smoking

Table 3 shows the association between parental separation and adult smoking status. No gender differences were found therefore all results are presented for men and women together. Participants who experienced parental separation were more than twice as likely to be a smoker (RRR=2.25, 95% CI: 1.87, 2.71) and were also more likely to be an ex-smoker (RRR=1.47, 95% CI: 1.20, 1.81) (m1). This increased risk of being a current or an ex-smoker remained upon inclusion of potential confounders and pre-separation selection factors (m2) (father's social class, mother smoked during pregnancy, mother's education, and parental ages at birth of cohort member). We found no differences by the timing of parental separation (results not presented).

Potential mediators

After inclusion of socioeconomic factors (m3) there was some reduction in the effect estimates, however there was still an increased risk of having been a smoker amongst those participants who experienced parental separation in childhood (current smoker, RRR: 1.73, 95% CI: 1.38, 2.18; ex-smoker, RRR: 1.40, 95% CI: 1.11, 1.76). M4 included relational factors (parent-child relationship quality, partnership status and parental involvement). Again the effect estimate was reduced but remained statistically significant (current smoker, RRR: 1.72, 95% CI: 1.41, 2.10; ex-smoker, RRR: 1.30, 95% CI: 1.05, 1.61). Inclusion of psychosocial factors of interest (m5) did not reduce the increased risk of smoking as much as socioeconomic or relational factors. Finally, m6 included all analysis variables simultaneously, suggesting that socioeconomic, relational and psychosocial factors included in this study partially explained the association between parental separation in childhood and adult smoking status. However, participants who experienced parental separation were still more likely to be an ex-smoker (RRR=1.28, 95% CI: 1.01, 1.63) or a current smoker (RRR=1.58, 95% CI: 1.26, 1.99). When comparing the attenuation observed upon inclusion of each group of mediating variables, the reduction observed for relational and socioeconomic factors was the greatest in this study.

DISCUSSION

Using data from a large British birth cohort we have shown that parental separation in childhood was associated with an increased risk of being a current or ex-smoker by mid-adulthood. This finding supports previous work[11,32,33] and extends this to the UK context with a longitudinal study design. The association between parental separation and adult smoking did not differ for men and women in our study. This is similar to other studies[32] who found that men and women were similarly likely to smoke as a consequence of parental divorce. We found no differences by timing of parental separation, consistent with previous work looking at other physical health measures in this

cohort, such as inflammation.[2] It should be noted that our analyses of timing were limited to the data collections and we did not have data on the specific age at which separation occurred.

We investigated potential socioeconomic, psychosocial and relational mediators of the association between parental separation and adult smoking and found the association was partially, but not fully, explained. Relational and socioeconomic factors appeared to explain more of the association than other factors examined. Further investigations revealed that of the relational mediators, the parental involvement measures were responsible for much of this attenuation. The social control of risky health behaviours may be reduced following parental separation, partly as a consequence of reduced parental emotional and physical availability.[34] Previous work has shown that single-parent households, the most common short-term outcome of parental separation, had the lowest levels of parental supervision.[15] Low parental supervision was in turn related to increased alcohol and drug use, particularly amongst boys. With respect to socioeconomic mediators, educational attainment was responsible for the greatest reduction in association here. This is consistent with previous research with this cohort using different outcomes, such as markers of chronic inflammation[2] and psychological distress.[3]

After adjustment for all mediators simultaneously there was still an association between parental separation and smoking. This may be because we omitted additional mediating factors, such as coping styles, family conflict, and self-medication which we were not able to capture using our data. For instance, an Icelandic study found the association between parental divorce and adolescent smoking was explained by family relationship variables, including inter-parental and parent-child conflict,[35] neither of which were available here. It is also possible that the outstanding association between parental separation and adult smoking may be due to residual confounding.

Strengths and limitations of this study

This study is not without its limitations. Firstly, smoking status was self-reported; however this is known to be a generally reliable measure.[36] We also did not have data on smoking initiation and it is possible that participants who experienced parental separation were early initiators.[37] The association between parental separation and smoking remained after consideration of all mediators of interest. The remaining associated might be explained by residual confounding or by other mediators, such as coping styles, which we were not able to capture using these data. Our measure of adult psychological distress was assessed at the same time as smoking status and reverse causation cannot be ruled out. However there is greater support for psychological distress preceding smoking than vice versa.[38] The strengths of this study include the use of multiple imputation to reduce bias attributable to missing information. Multiple imputation assumes that data are 'missing at random', an assumption that is appropriate given the multidisciplinary scope and the ability to include many variables in the imputation models which account for the missingness mechanism. More complex methods are required where data are 'missing not at random'. It should be noted that those still in the study at age 42, and included in our analyses, were more advantaged and less likely to have experienced parental separation. We used a large, British birth cohort study, the results of which are likely to be attributable to men and women born in Great Britain of a similar age. Whilst there might be some concerns regarding the changing experience of parental divorce over time and the generalisability of these results to more recent cohorts, previous research has found that the impact of parental divorce has not reduced.[18,39] The use of longitudinal data meant that we were able to investigate potential mediating factors which were all prospectively-measured, therefore minimising recall bias.

In conclusion, we have shown that parental separation was associated with an increased risk of being a smoker using a large British birth cohort. This association was partially explained by socioeconomic, psychosocial and relational factors. Relational and socioeconomic factors were found to be particularly important. Therefore interventions which aim to support children with

separating parents may be fruitful in reducing later smoking risk. Research from the US has shown that community-based programmes for children with the aim to provide social support, encourage them to talk about their feelings, reduce feelings of isolation, develop coping skills, and help them adjust to their new circumstances, might be beneficial for preventing adverse outcomes, such as smoking uptake.[40]

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Conflicts of interest

None declared.

Keypoints

- Parental separation or divorce has previously been linked to poorer adult health. It is possible this works through the uptake of less healthy behaviours, such as smoking.
- Parental separation was associated with increased adult smoking, and this was found to be partly explained by socioeconomic circumstances, relational and psychosocial factors. Relational and socioeconomic factors were found to be particularly important.
- Interventions which aim to support children undergoing parental separation may be fruitful in minimising smoking uptake.

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Table 1. Distribution of parental separation, smoking, gender, and pre-separation variables, and comparison of observed and imputed data

		Observed		Imputed		
	Missingness[a]		**Overall**	**No separation**	**Parental separation**	**P value[b]**
	%	**%**	**%**	**%**	**%**	
Parental separation (0-16yrs)	30.0					
No		91.0	86.6			
Yes		9.0	13.4			
Smoking status (42yrs)	0					
Never smoked		44.6	44.6	46.1	31.4	<0.001
Ex-smoker		25.2	25.2	25.3	24.9	
Current smoker		30.2	30.2	28.6	43.8	
Gender	0					
Man		49.3	49.3	49.4	47.9	0.584
Woman		50.8	50.8	50.6	52.1	
Pre-separation risk factors						

Father's social class (0 yrs)	9.7					
I professional		4.6	4.5	4.7	3.1	<0.001
II managerial/technical		14.0	13.7	14.3	9.8	
IIINM skilled non-manual		10.2	11.6	11.4	12.5	
IIIM skilled manual		50.4	48.5	48.5	48.8	
IV semi-skilled manual		12.1	13.0	12.8	14.0	
V unskilled manual		8.7	8.8	8.3	11.7	
Mother smoked in pregnancy (0 yrs)	6.4					
No		67.0	67.1	68.0	31.1	<0.001
Yes		33.0	32.9	32.0	38.9	
Mother's education (0 yrs)	5.5					
Left at school leaving age		74.0	73.9	73.3	77.8	0.040
Stayed beyond school leaving age		26.0	26.1	26.7	22.3	
Mother's age at birth (0 yrs)	5.2					
Mean (SD)		27.5 (5.6)	27.5 (5.7)	27.8 (5.6)	25.5 (5.5)	<0.001

Father's age at birth (0 yrs)	8.3					
Mean (SD)		30.6 (6.4)	30.5 (6.4)	30.8 (6.3)	28.7 (6.4)	<0.001

[a]Expressed as proportion of those with complete data on outcome of smoking status at age 42

[b]P value for difference in distribution of each variable for child with separated vs. non-separated parents

Unless otherwise stated all data are presented as percentages as data are multiply imputed and therefore Ns vary across the 20 imputed datasets

Abbreviations: SD = standard deviation; IQR = interquartile range

Table 2. Distribution of socioeconomic, relational and psychosocial mediators

		Observed	Imputed			
	Missingness[a]		Overall	No separation	Parental separation	P value[b]
	%	%	%	%	%	
Socioeconomic & material factors						
Overcrowding (16 yrs)	26.8					<0.001
<1.5persons/room		88.7	88.6	88.4	84.4	
>=1.5persons/room		11.3	11.4	11.6	15.6	
Financial hardship (16 yrs)	27.8					
No		90.5	90.6	92.0	72.7	<0.001
Yes		9.5	9.4	8.0	27.4	
Free school meal receipt (16 yrs)	27.0					
No		90.9	90.6	92.9	65.3	<0.001
Yes		9.1	9.4	7.1	34.7	
Housing tenure (16 yrs)	26.1					

Owner occupied/mortgage		51.3	51.2	53.8	38.2	<0.001
Social housing		39.3	39.3	35.4	38.5	
Privately-rented		5.3	5.4	6.8	20.0	
Other		4.2	4.2	4.0	3.3	
Household amenities (16 yrs)	27.2					
Median [IQR]		0 [0, 0]	0 [0, 2]	0 [0, 1]	2 [0, 3]	<0.001
Educational attainment (23 yrs)	19.4					
No qualifications		12.6	14.2	12.6	24.2	<0.001
CSE/O-level		49.9	47.6	46.9	52.7	
A-level		17.7	20.2	21.0	14.5	
Higher/degree		19.8	18.0	19.5	8.6	
Relational factors						
Parent-child relationship quality (16 yrs)	24.4					
Median [IQR]		2 [1, 2]	2 [1,2]	2 [1,2]	2 [1.5, 2.5]	<0.001
Father involvement (16 yrs)	43.0					

Overly-involved		2.9	3.7	3.9	2.2	<0.001
Very interested		42.8	37.2	39.4	23.6	
Some interest		34.0	38.9	38.4	41.4	
Little interest		20.3	20.2	18.3	32.8	
Mother involvement (16 yrs)	36.6					
Overly-involved		2.3	3.5	3.6	2.2	<0.001
Very interested		44.3	39.5	41.8	25.5	
Some interest		36.0	39.5	38.9	42.9	
Little interest		17.5	17.6	15.7	29.4	
Partnership status (42 yrs)	0.4					
Married		71.0	71.0	71.5	67.3	0.001
Cohabiting		9.2	9.3	8.9	11.3	
Single, never married		8.7	8.7	8.8	8.0	
Separated/divorced/widowed		11.1	11.1	10.7	13.4	
Psychosocial factors						
Rutter behaviour scale (16 yrs)	0					

Median [IQR]		3 [0, 6]	3 [0, 6]	3 [0, 6]	0 [0, 4]	<0.001
Malaise Inventory (42 yrs)	1.0					
Median [IQR]		3 [1, 5]	3 [1, 5]	3 [1, 5]	3 [1, 6]	<0.001

[a]Expressed as proportion of those with complete data on outcome of smoking status at age 42

[b]P value for difference in distribution of each variable for child with separated vs. non-separated parents

Unless otherwise stated all data are presented as percentages as data are multiply imputed and therefore Ns vary across the 20 imputed datasets

Abbreviations: SD = standard deviation; IQR = interquartile range

Table 3. Results of multinomial logistic regression analyses testing association between parental separation and adult smoking

	Model 1 Crude association		**Model 2 (Model 1 + Confounders & pre-separation factors)**		**Model 3 (Model 2 + Socioeconomic factors)**		**Model 4 (Model 2 + Relational factors)**		**Model 5 (Model 2 + Psychosocial factors)**		**Model 6 Fully adjusted**	
Reference group = non-smokers	**Ex-smoker**	**Current smoker**	**Ex-smoker**	**Current smoker**	**Ex-smoker**	**Current smoker**	**Ex-smoker**	**Current smoker**	**Ex-smoker**	**Current smoker**	**Ex-smoker**	**Current smoker**
	RRR (95% CI)	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**	**RRR (95% CI)**
Parental separation												
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.47 (1.20, 1.81)	2.25 (1.87, 2.71)	1.50 (1.22, 1.85)	2.14 (1.77, 2.60)	1.40 (1.11, 1.76)	1.73 (1.38, 2.18)	1.30 (1.05, 1.61)	1.72 (1.41, 2.10)	1.52 (1.23, 1.88)	2.23 (1.84, 2.70)	1.28 (1.01, 1.63)	1.58 (1.26, 1.99)

Abbreviations: RRR = relative risk ratio

Model 1: crude association

Model 2: includes father's social class, mother smoked during pregnancy, mother's education, mother's age at birth, father's age at birth

Model 3: model 2 + overcrowding, financial hardship, household amenities, housing tenure, free school meal receipt, educational attainment

Model 4: model 2 + parent-child relationship quality, father's involvement, mother's involvement, partnership status

Model 5: model 2 + Rutter behaviour scale, malaise inventory

Model 6: includes all variables