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Original Research

Short-Term Natural Course of Depressive Symptoms and Family-Related Stress in Adolescents After Separation From Father

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Objective: To determine if separation from a father is associated with short-term changes in mental health or substance use in adolescents.

Methods: Every 3 months, during a 5-year period, we followed 1160 Grade 7 students participating in the Nicotine Dependence in Teens Study who were living with both parents. Participants who reported not living with their father for 6 or more consecutive months during follow-up were categorized as separated from father. Pooled regressions within the framework of generalized estimating equations were used to model the associations between separation from father and indicators of mental health (depressive symptoms, and worry and [or] stress about family relationships or the family situation) and substance use (alcohol use and cigarette smoking) 4 to 6 and 7 to 9 months postseparation, controlling for age, sex, and baseline level of the outcome variable.

Results: Compared with adolescents living with both parents, adolescent offspring separated from their fathers were more likely to report depressive symptoms (β = 0.17, 95% CI 0.01 to 0.33) 4 to 6 months postseparation, as well as worry and (or) stress about their parents separating or divorcing (OR 2.39, 95% CI 1.29 to 4.43), a new family (OR 4.25, 95% CI 2.33 to 7.76), and the family financial situation (OR 2.35, 95% CI 1.53 to 3.60). Separation from father was also marginally significantly related to worry and (or) stress about their relationship with their father (OR 1.53; 95% CI 0.98 to 2.39). At 7 to 9 months postseparation, separation from father continued to be associated with worry and (or) stress about their parents separating or divorcing, a new family, and the family financial situation. Separation from father was no longer associated with worry and (or) stress about their relationship with their father, but it was associated with worry and (or) stress about their relationship with their mother. Separation from father was not related to use of alcohol or cigarettes.

Conclusion: Adolescent offspring experienced family-related stress and transient depression symptoms in the 4- to 9-month period following separation from their fathers.

Cours naturel à court terme des symptômes dépressifs et du stress lié à la famille chez les adolescents après la séparation du père

Objectif : Déterminer si la séparation du père est associée à des changements à court terme de la santé mentale ou de l'utilisation de substances des adolescents.

Méthodes : Tous les 3 mois, durant une période de 5 ans, nous avons suivi 1160 élèves de 7e année qui participaient à l'Étude NICO et qui vivaient avec leurs deux parents. Les

participants qui ont déclaré ne pas vivre avec leur père pendant 6 mois consécutifs ou plus durant le suivi ont été catégorisés comme étant séparés du père. Des régressions empilées dans le cadre d'équations d'estimation généralisées ont servi à modéliser les associations entre la séparation du père et les indicateurs de santé mentale (symptômes dépressifs, et inquiétude et [ou] stress au sujet des relations familiales ou de la situation familiale) et l'utilisation de substances (consommation d'alcool et tabagisme) de 4 à 6 mois et de 7 à 9 mois après la séparation, en contrôlant pour l'âge, le sexe, et le niveau de départ de la variable dépendante.

Résultats : Comparés aux adolescents vivant avec leurs deux parents, les adolescents séparés de leur père étaient plus susceptibles de signaler des symptômes dépressifs (β = 0,17; IC à 95 % 0,01 à 0,33) de 4 à 6 mois après la séparation, ainsi que de l'inquiétude et (ou) du stress au sujet de la séparation ou du divorce de leurs parents (RC 2,39; IC à 95 % 1,29 à 4,43), d'une nouvelle famille (RC 4,25; IC à 95 % 2,33 à 7,76), et de la situation financière familiale (RC 2.35; IC à 95 % 1,53 à 3,60). La séparation du père était aussi significativement mais marginalement liée à l'inquiétude et (ou) au stress au sujet de leur relation avec leur père (RC 1,53; IC à 95 % 0,98 à 2,39). À 7 à 9 mois après la séparation, la séparation du père était encore associée à l'inquiétude et (ou) au stress au sujet de la séparation ou du divorce des parents, d'une nouvelle famille et de la situation financière familiale. La séparation du père n'était plus associée à l'inquiétude et (ou) au stress au sujet de leur relation avec leur père, mais elle était associée à l'inquiétude et (ou) au stress au sujet de leur relation avec leur mère. La séparation du père n'était pas liée à l'usage d'alcool ou de cigarettes.

Conclusion : Les enfants adolescents éprouvaient un stress lié à la famille et des symptômes dépressifs transitoires dans la période de 4 à 9 mois suivant la séparation de leur père.

In part because of a 2-fold increase in divorce rates in the past 50 years, 2-parent families have decreased from 85% to 69% of all families, and about 26% of all children now live with a single parent.[1] In 2011 in Canada, single-parent families accounted for 16% of all Census families, with 8 of 10 single-parent families headed by women.[2] Because early attachment experiences with primary caregivers establish an internal working model for adult relationships,[3] there is concern about how this shift in family structure will affect the burden related to the mental health of offspring. Animal studies report high susceptibility to stress in rodents raised without a caring mother.[4] In humans, parental neglect is linked to neurodevelopmental and mental health disorders in children that persist into adulthood.[5,6] In particular, absence of the mother or disruption of maternal care during childhood and adolescence is linked to depression,[7] anxiety,[8] and personality disorders.[9]

While not as frequently studied as maternal care, absence of fathers also has repercussions on the well-being and adjustment of offspring.[10–16] In California mice, a monogamous species in which fathers are active in pup development, removal of the father induced synaptic changes in prefrontal cortex functions as well as abnormalities in social behaviours in offspring.[17] In humans, fatherless daughters mature earlier,[18] have earlier intercourse,[19] and reproduce earlier[20] than girls in 2-parent families. Being fatherless before age 7 among boys is associated with early reproduction, while absence of fathers between ages 11 and 16 is associated with delayed puberty.[21]

Psychological and psychiatric attributes also appear to differ between offspring with fathers present or absent. Participants with absent fathers had lower levels of achievement motivation, competitiveness, desire for mastery, perseverance, and willingness to endure negative consequences. In addition, they showed increases in negative ego-strength dimensions of social alienation and self-centredness.[22] Absent fathers are associated with drug use in African-American boys, although not in girls,[23] and military children whose fathers were absent for at least 1 month during the previous 12 months had higher depression and anxiety.[24]

While there are many cross-sectional investigations in small select samples, a recent review[16] underscored the need for large population-based longitudinal studies of the impact of family dissolution on children, which include consideration of the relationship between children and noncustodial parents. Therefore, the objective of our study was to compare short-term changes in mental health indicators (depressive symptoms, and family-related worry

Clinical Implication

- Clinicians can reassure parents and adolescents that increased depression symptoms among adolescent offspring, postseparation, may be transient.

Limitations

- All measures were based on self-report, which are subject to misclassification.
- The number of participants who were separated from their fathers was relatively small, thus precluding study of sex differences.

Abbreviations

GEE	generalized estimating equation
MI	multiple imputation
NDIT	Nicotine Dependence in Teens

and [or] stress) and substance use (alcohol use and cigarette smoking) between participants living with both parents and those separated from their fathers. We hypothesized that adolescents separated from their fathers experience, in the short term, declines in mental health indicators and increases in substance use.

Methods

Data were drawn from the NDIT Study, a prospective cohort investigation of 1294 students initially aged between 12 and 13 years, recruited in a 2-year range, 1999–2000, from all Grade 7 classes in a convenience sample of 10 secondary schools in Montreal.[25] Schools were selected to represent a mix of English and French schools, with students of upper, middle, and lower socioeconomic status, and located in urban, suburban, and rural areas. Data were first collected in 1999 in self-report questionnaires administered in class. Follow-up questionnaire data were collected every 3 months during the 10-month school year for the next 5 years (from 1999/2000 to 2004/2005) until participants completed secondary school, for a total of 20 survey cycles per student. In addition, parents completed mailed self-report questionnaires in 2009/2010. Parents and guardians provided written informed consent for their child to participate. The study was approved by the Direction de santé publique de Montreal-Centre, the McGill University Institutional Review Board, and the Ethics Research Committee of the Centre de Recherche du Centre Hospitalier de l'Université de Montréal.

Study Variables

Separation From Father

Whether participants were living with their biological father or step-father was measured in each cycle by "This chart asks about the adults with whom you live. If you live in more than one household (part time with your mom and part time with your dad), check ALL the boxes that apply [. . .] Do you live with your [. . .]" biological father; step-father (yes, no). Separation from father was coded yes if a participant who had previously been living with his or her father responded no to living with either their biological father or step-father in 2 or more subsequent consecutive cycles (that is, about 6 months). Separation from father was coded no if the participant reported living with both parents for at least 1 of 2 consecutive surveys. We used 6 months to define separation from father because numerous participants reported not living with their father in a specific cycle, but 3 months later they were back living with them.

Mental Health and Substance Use

Outcome measures included indicators of mental health and substance use. Frequency of depressive symptoms was measured in a validated 6-item scale,[26,27] which assessed how often (never, rarely, sometimes, or often) in the past 3 months participants experienced any of the following: felt too tired to do things; had trouble going to sleep or staying asleep; felt unhappy, sad, or depressed; felt hopeless about the future; felt nervous or tense; and worried too much about things. The depression symptom score, obtained by dividing the sum of the scores for the 6 items by the number of items responded to, ranged from 1 to 4, with higher values indicating more frequent depressive symptoms.

Data on worry and (or) stress related to relationships and specific life circumstances were collected in a 13-item adaptation of a scale that has been used in several population-based surveys of adolescents in Quebec.[28] We elected to study 6 of the 13 items that related directly to family disruption. Specifically, participants reported if they had been worried or stressed (not at all or not applicable, a little bit, quite a bit, or a whole lot) in the past 3 months by any of the following: your relationship with your father; your relationship with your mother; your relationship with your brother(s) and (or) sister(s); your parents separating or divorcing; your new family (parents remarried); and financial problems in your family. Responses for each item were coded no (not at all or not applicable) or yes (a little bit, quite a bit, or a whole lot).

Participants reported for each of the 3 months preceding each cycle, the number of days on which they had smoked during the month and the number of cigarettes smoked per day on average during that month. The 3-month test–retest reliability for these 2 items were adequate ($\kappa = 0.78$ and 0.75, respectively).[29] The total number of cigarettes smoked per month in each of the previous 3 months was calculated by multiplying the number of days on which the respondent had smoked during the month by the number of cigarettes smoked per day on average, on the days during which they had smoked. Herein, we report the mean number of cigarettes smoked per month based on cigarette consumption in the past 3 months.

Frequency of alcohol use was measured by the following question: "During the past 3 months, how often did you drink alcohol (beer, wine, hard liquor)?" Frequency of alcohol use was coded on a 5-point scale (never; a bit to try; once or a couple of times a month; once or a couple of times a week; or usually every day), with higher values indicating higher frequency of alcohol consumption.

Other Variables

Sociodemographic data (that is, age of participant, sex, number of siblings, language spoken at home [French, English, French and English, or other], born in Canada [yes, no]) were collected at cohort inception. Data on parents' ages, education, divorced (yes, no), and income were drawn from parent questionnaires.

Data Analysis

The analytic database included all participants who, at cohort inception, were living with both their mother or step-mother and their father or step-father ($n = 1115$ of 1294 participants) as well as all participants with missing data on living with their father or step-father ($n = 45$). Our strategy

was to study change in the value of the indicators of mental health and substance use before and after separation from the father, and to contrast this change with the so-called normal course of these indicators as measured among participants who remained living with both parents. To this end, for each participant, we identified subsets of 4 consecutive cycles from among the possible 20 cycles.

Within each subset, we drew data on covariates as well as initial measures of the outcome from the first of the 4 cycles, which, herein, we refer to as baseline. Data on separation from father (yes, no) were drawn from the second and third cycles within the subset, and data on the final outcome variables were drawn from the fourth cycle in the subset. We collapsed the values obtained from 4 consecutives cycles into 1 observation. Participants whose fathers were present in all cycles could contribute as many observations as they had to the analytic database in each of the 4 consecutive cycles (up to a maximum of 17 observations). Once a participant contributed an observation in which separation from father was coded yes, we excluded all subsequent observations for that participant. A total of 60 to 61 participants per multiple imputation data set were excluded because their follow-up was shorter than 4 cycles, thus they could not contribute a complete observation.

Treatment of Missing Values

The median (interquartile range) of the percentage distribution of values missing for each variable in each cycle (excluding cycles when values were missing by design) was 4.6% (IQR 2.8%); minimum = 0, maximum = 57% (online eAppendix 1). Unless data are missing completely at random, then performing the analysis on only the observed data will likely produce biased results, in addition to loss in statistical power to detect associations.[30] Both empirical and theoretical studies have shown that the extent of the bias may be important.[31,32]

Missing values in this analysis were imputed within the range of surveys available for each of the 1160 participants who reported living with both parents or had missing data on father living at home at cohort inception (for example, if a participant completed the questionnaires for surveys 4 to 18, then imputation was applied to surveys 4 to 18 only). Specifically, missing values were handled, based on a priori decisions, in 2 steps. First, partial carry forward was only applied to variables derived from questions included in selected cycles and thus were missing by design in the other cycles. For such variables, we carried forward the observed values up to the survey in which it was (supposed to be) measured next, but not beyond. Values at cycles prior to the survey in which they were first measured were left missing. For example, novelty-seeking was only measured in cycles 14 and 18 and had missing values in the other cycles by design. We carried forward the observed value at cycle 14 up to cycle 17, and left the values for survey 1 to 13 as missing.

We then applied bootstrapped-based MI[33] on the remaining missing values. MI deals with missing values by creating several copies of the data set (10 in this current analysis) and, in each copy, replacing missing values by random draws from the estimated distribution of each variable. Estimated distributions are derived from both the observed values of the variable as well as their association with other variables in the data set.[32] Hence, in each imputed data set, missing values are replaced by values predicted by the data in hand. The regression model of interest is then estimated in each imputed data set and the coefficients and standard error are pooled using the so-called Rubin's rule.[34] Unlike conventional imputation methods that assume that there is no uncertainty in imputation, in MI, the uncertainty introduced by replacing missing values by predictions is accounted for in the inference. Hence *P* values and confidence intervals obtained from MI are more conservative than those obtained using other means of inference.

The sample sizes of the final 10 MI sets ranged from 1146 to 1157 participants, and included 123 to 133 participants who were separated from their fathers for at least 2 consecutive cycles. Values generated to replace the missing values in the variable indicating whether the father was present varied from one imputation set to another, which produced different numbers of participants who were separated from their fathers.

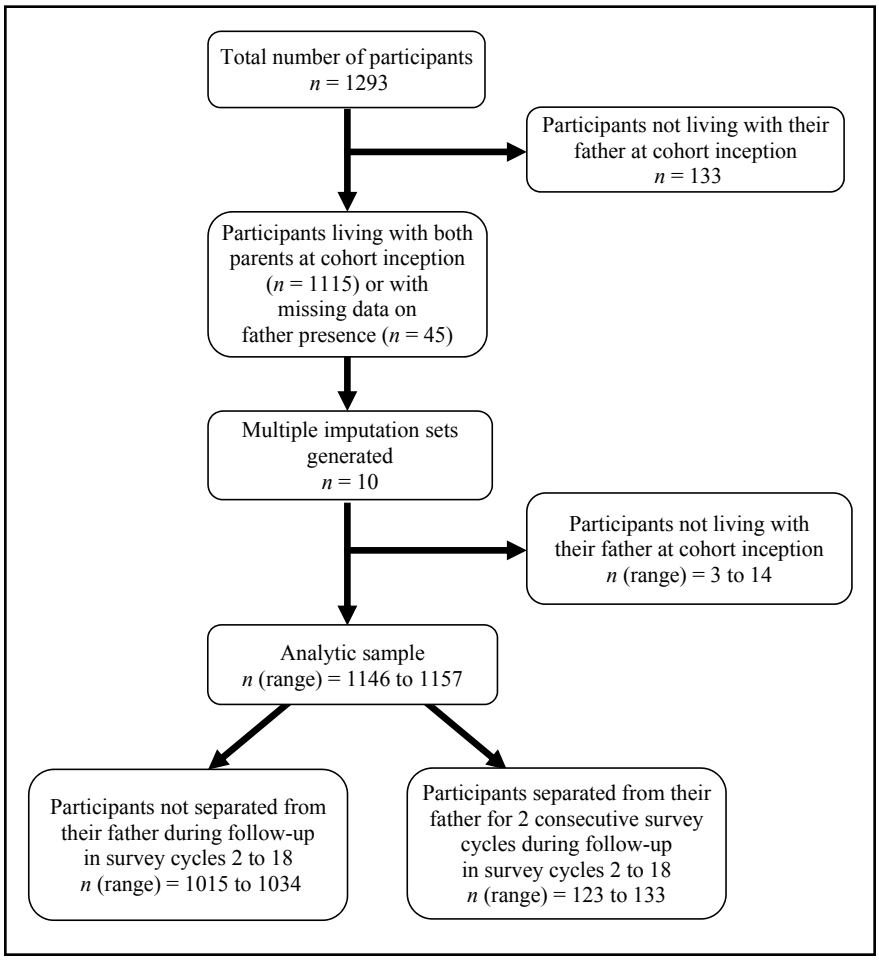
Multivariate Analysis

Pooled regression models within the framework of GEEs were used to model the association between separation from father and each outcome (logistic for binary outcomes and ordinary least squares for continuous outcomes). Clustering induced by analyzing multiple cycles in the same participant was accounted for using an exchangeable correlation matrix. Robust (sandwich) estimators of standard errors were used in the inference. Models were estimated on each MI set and combined using Rubin's rule.[35] Crude and adjusted models were estimated for each outcome. Multivariable models regressed the outcome (measured in the last of the set of 4 cycles) on the value of separation from father (yes, no) determined based on data from the 2 cycles preceding the outcome, and adjustment variables measured in the first cycle of the set of 4 cycles. Multivariable models adjusted for age, sex, and the baseline value of the outcome variable. The analyses were undertaken using R (version 2.14.1), the Amelia II (version 1.6.4) package for MI, and the Generalized Estimating Equation (version 1.1–6) package for GEE models.[36–38]

Results

Figure 1 describes the derivation of the analytic database. A total of 134 of the 1294 NDIT Study participants (10%) were excluded because, at cohort inception, they were not living with their biological father or step-father. Compared with participants living with both parents, excluded participants were older; a lower proportion had university-educated mothers; 67% lived in homes in which the parents

Figure 1 Derivation of the analytic sample, Nicotine Dependence in Teens Study, 1999/2000 to 2004/2005



were divorced, compared with 28% of those living with both parents; they reported depressive symptoms more frequently; they reported more worry and (or) stress about their relationships with their parents, their parents separating or divorcing and the family financial situation; and they reported higher cigarette consumption (Table 1).

In the analytic sample of 1146 to 1157 adolescents (that is, the range in the sample size generated using MI in the 10 data sets) who were living with both parents, 123 to 133 (9.7% to 10.4%) experienced the separation from father exposure during follow-up. Table 2 describes the evolution of the outcome scores over time. At baseline, scores on several mental health indicators were already higher among participants who were eventually separated from their fathers. These participants also reported relatively high cigarette consumption. While the scores were generally stable over time among participants living with both parents, they worsened among those separated from their fathers, except for cigarettes smoked per month, which increased by about 7 cigarettes in both groups.

The multivariate results (Table 3) were generally concordant with the univariate findings. Compared with participants living with both parents, those separated from their fathers reported higher levels of depression 4 to 6 months postseparation. In addition, they were statistically significantly more likely to report worry and (or) stress about their parents separating or divorcing, about a new family, and about the family financial situation. While the odds of reporting worry and (or) stress about their relationship with their father was 53% higher among participants separated from their father, the result was marginally significant (OR 1.53; 95% CI 0.98 to 2.39). In the multivariate modelling, neither alcohol use nor cigarette smoking was significantly different at follow-up in the 2 groups.

With several interesting exceptions, an analysis in which we examined the outcomes 2 cycles postseparation yielded similar findings (Table 4). Exceptions included that, 7 to 9 months postseparation, level of depressive symptoms was not different in the 2 groups. In addition, the association between separation from father and worry or stress about relationship with father was not significant, while the association between separation from father and the relationship with the mother was significant.

Table 1 Comparison of characteristics measured at cohort inception of participants retained for analysis (that is, participants living with both parents) with participants not retained (that is, participants not living with their fathers) in the Nicotine Dependence in Teens Study, 1999/2000 to 2004/2005

	Participant retained for analysis		
Variable	Yes n = 1160[a]	No n = 133[a]	P[b]
Sex, male, %	48.8	42.9	0.19
Age, years, mean (SD)	12.7 (0.5)	12.9 (0.7)	0.10
French spoken at home, %	51.1	50.4	0.18
Born in Canada, %	92.3	90.2	0.39
Age of mother, years, mean (SD)	51.0 (7.4)	49.8 (9.0)	0.57
Age of father, years, mean (SD)	53.7 (6.9)	55.9 (9.3)	0.59
Number of siblings, mean (SD)	1.8 (1.2)	2.0 (1.8)	0.89
Parents divorced, %	28.2	66.7	<0.001
Mother university-educated, %	45.7	32.6	0.02
Father university-educated, %	46.1	41.4	0.48
Mental health symptoms, mean (SD)			
Depressive symptoms	2.1 (0.6)	2.2 (0.7)	0.02
Stress, mean (SD)			
Relationship with father	1.4 (0.7)	1.7 (1.0)	<0.001
Relationship with mother	1.3 (0.6)	1.6 (0.9)	<0.001
Relationship with siblings	1.6 (0.8)	1.7 (0.9)	0.17
Parents separating or divorcing	1.2 (0.5)	1.3 (0.7)	0.002
New family (parents remarried)	1.1 (0.4)	1.2 (0.7)	0.03
Family financial problem	1.3 (0.7)	1.6 (0.8)	<0.001
Substance use, mean (SD)			
Frequency of alcohol use	1.6 (0.8)	1.7 (0.8)	0.22
Number of cigarettes smoked per month in past 3 months	8.8 (55.0)	22.0 (98.7)	0.006

[a] Data measured at cohort inception prior to multiple imputation.

[b] P values for nonparametric tests are reported for continuous variables.

In sensitivity analyses, we re-estimated selected models with an autoregressive correlation structure, which did not alter the estimates noticeably (results not shown).

Discussion

While numerous studies have investigated the association between parental separation or divorce and mental health in offspring,[39,40] few longitudinal studies examine the short-term effects of separation from the father. In our longitudinal study, we tested if separation from the father is associated with depressive symptoms, stress, or substance use among adolescents. Because of the relatively frequent follow-up, we were able to observe the natural course of apparent effects up to 9 months postseparation.

Compared with adolescents living with both parents, those separated from their fathers reported higher levels of depressive symptoms and family-related stress 4 to 6 months postseparation. However, 7 to 9 months postseparation, elevated levels of depression and father-related stress were no longer detected, although stress related to parental divorce, a new family, and the family financial situation remained relatively high. In addition, these adolescents reported significantly higher worry and (or) stress related to their relationship with their mothers. There was no association between separation from the father and substance use in this analysis.

It is not surprising that there is a short-term increase in depressive and stress symptoms among adolescents shortly after separation. Tension, hostility, anger, and discord within the family likely increases among all family members during this difficult transition, as well as worry and anxiety about the future. Our findings suggesting short-term increases in depression and stress support those of others[41–43] who reported higher depressive symptoms among adolescents whose fathers were absent during childhood.

However, in our study, depressive symptoms and father-related stress decreased 7 to 9 months after separation, which could reflect adaptation to, or even acceptance of, the father leaving. Adaptation to life events usually occurs within several months of the event.[44] It is possible that after

separation, the level of discord in the household decreased, which, in turn, led to fewer symptoms. Alternatively, by mid-to-late adolescence some young people have attained healthy coping skills, such as actively seeking support and (or) a healthy distraction.[45] They may also possess other resilience or protective factors, such as attachment to other caring adults, a positive outlook, or motivation for achievement and healthy cognitive development.[46] Normalization of depressive and father-related stress 7 to 9 months postseparation may reflect acceptance of change that was feared or anticipated, or viewed positively or perhaps impartially. Indeed, it has been reported that contact with fathers becomes less frequent after divorce, such that one-fifth of children living with their mothers after divorce had not seen their fathers in the previous year.[47] Wallerstein and Blakeslee[48] found that 3 of 4 children felt rejected by the noncustodial parent 10 years after divorce.

Increased worry about parental divorce and a new family are reasonable preoccupations among adolescents recently separated from their fathers. Similarly, preoccupation about the family financial situation suggests that adolescents are well aware of the economic impact of family dissolution. Many studies support that absence of fathers and living in monoparental families are linked to a higher risk of poverty.[49]

While father-related stress apparently declined over time, adolescents separated from their fathers reported higher worry and (or) stress related to their relationships with their mothers 7 to 9 months postseparation. Mothers may take on new roles of monitoring or disciplining adolescent children after the father leaves, and these adjustments may cause tension. Alternatively, the increased burden on mothers after family dissolution may cause anxiety among offspring.

In contrast to at least one previous report,[50] our data suggest that adolescents do not increase substance use in the short term after their father leaves home. It is possible that substance use is viewed negatively and shunned by adolescents if substance misuse in fathers underpins marital discord and precipitates the father leaving. Alternatively, adolescents in single-parent families may need to increase their responsibilities at home (for example, babysitting siblings and working part time) and therefore have fewer opportunities to socialize with friends who use substances. While we cannot rule out that these behaviours developed subsequently, it may be reassuring to parents and clinicians that substance use among adolescents does not increase, in the short term, postseparation.

Limitations of our analysis include use of self-report data, which are subject to misclassification. In

Table 2 Mean (SD) scores[a] for mental health symptoms and substance use of participants living with both parents and those separated from their fathers at baseline and follow-up (after separation from the father among participants separated from their fathers) in the Nicotine Dependence in Teens Study, 1999/2000 to 2004/2005

Variable	Participants not separated from fathers n = 14 225 to 14 433		Participants separated from fathers n = 117 to 126	
	Baseline	Follow-up	Baseline	Follow-up
Depressive symptoms	2.0 (0.7) to 2.0 (0.7)	2.0 (0.8) to 2.0 (0.8)	2.1 (0.7) to 2.1 (0.7)	2.1 (0.9) to 2.2 (0.9)
Stress				
Relationship with father	1.3 (0.7) to 1.4 (0.7)	1.4 (0.7) to 1.4 (0.7)	1.4 (0.7) to 1.6 (0.9)	1.5 (0.8) to 1.7 (10.0)
Relationship with mother	1.3 (0.7) to 1.3 (0.7)	1.3 (0.7) to 1.4 (0.7)	1.3 (0.8) to 1.5 (0.9)	1.5 (0.9) to 1.7 (10.0)
Relationship with siblings	1.4 (0.7) to 1.4 (0.7)	1.4 (0.7) to 1.4 (0.7)	1.3 (0.7) to 1.4 (0.8)	1.4 (0.8) to 1.6 (10.0)
Parents separating or divorcing	1.1 (0.5) to 1.2 (0.5)	1.1 (0.5) to 1.1 (0.5)	1.4 (0.8) to 1.2 (0.5)	1.3 (0.7) to 1.5 (0.8)
New family (parents remarried)	1.1 (0.3) to 1.1 (0.3)	1.1 (0.3) to 1.1 (0.3)	1.1 (0.8) to 1.2 (0.6)	1.2 (0.6) to 1.3 (0.8)
Family financial problem	1.3 (0.6) to 1.3 (0.6)	1.3 (0.7) to 1.3 (0.7)	1.4 (0.8) to 1.6 (0.9)	1.7 (10.0) to 1.7 (1.0)
Substance use				
Frequency of alcohol use	2.0 (1.1) to 2.0 (1.1)	2.1 (1.1) to 2.2 (1.2)	1.9 (1.1) to 2.1 (1.1)	2.1 (1.2) to 2.4 (1.2)
Number of cigarettes smoked per month	19.9 (96.7) to 21.4 (102.1)	27.0 (113.0) to 28.5 (117.6)	33.4 (143.7) to 60.8 (190.6)	40.6 (125.1) to 62.9 (194.8)

[a] Values reported were averaged across the 10 data sets generated using multiple imputation.

Table 3 Crude and adjusted beta coefficient or odds ratio (95% confidence interval) for separation from father[a] for mental health symptoms and substance use 4 to 6 months postseparation (*n* = 14 351 to 14 550) in the Nicotine Dependence in Teens Study, 1999/2000 to 2004/2005

Variable	β_{crude} (95% CI)	β_{adj} (95% CI)[b]	OR_{crude} (95% CI)	OR_{adj} (95% CI)[b]
Mental health symptoms				
Depressive symptoms	0.19 (0.01 to 0.36)	0.17 (0.01 to 0.33)	n/a	n/a
Stress				
Relationship with father	n/a	n/a	1.56 (0.99 to 2.44)	1.53 (0.98 to 2.39)
Relationship with mother	n/a	n/a	1.51 (0.91 to 2.50)	1.55 (0.92 to 2.58)
Relationship with siblings	n/a	n/a	1.14 (0.70 to 1.84)	1.15 (0.71 to 1.85)
Parents separating or divorcing	n/a	n/a	2.56 (1.38 to 4.73)	2.39 (1.29 to 4.43)
New family (parents remarried)	n/a	n/a	4.16 (2.27 to 7.60)	4.25 (2.33 to 7.76)
Family financial problem	n/a	n/a	2.31 (1.52 to 3.50)	2.35 (1.53 to 3.60)
Substance use				
Frequency of alcohol use	0.10 (–0.16 to 0.35)	0.13 (–0.12 to 0.39)	n/a	n/a
Number of cigarettes smoked per month	19.30 (–15.61 to 54.13)	12.63 (–17.71 to 42.97)	n/a	n/a

[a] Reference category: no

[b] Model adjusted for baseline value of the outcome variables, sex and age.

n/a = not applicable

Table 4 Crude and adjusted beta coefficient or odds ratio (95% confidence interval) for separation from father[a] for mental health symptoms and substance use 7 to 9 months postseparation (*n* = 13 288 to 13 477) in the Nicotine Dependence in Teens Study, 1999/2000 to 2004/2005

Variable	β_{crude} (95% CI)	β_{adj} (95% CI)[b]	OR_{crude} (95% CI)	OR_{adj} (95% CI)[b]
Mental health symptoms				
Depressive symptoms	0.12 (–0.05 to 0.29)	0.11 (–0.03 to 0.25)	n/a	n/a
Stress				
Relationship with father	n/a	n/a	1.31 (0.84 to 2.05)	1.30 (0.83 to 2.05)
Relationship with mother	n/a	n/a	1.57 (1.02 to 2.42)	1.64 (1.05 to 2.56)
Relationship with siblings	n/a	n/a	0.97 (0.60 to 1.56)	0.98 (0.61 to 1.59)
Parents separating or divorcing	n/a	n/a	2.07 (1.22 to 3.52)	2.00 (1.17 to 3.40)
New family (parents remarried)	n/a	n/a	4.50 (2.53 to 7.99)	4.73 (2.65 to 8.42)
Family financial problem	n/a	n/a	1.77 (1.13 to 2.78)	1.79 (1.15 to 2.80)
Substance use				
Frequency of alcohol use	0.10 (–0.16 to 0.36)	0.13 (–0.13 to 0.39)	n/a	n/a
Number of cigarettes smoked per month	21.94 (–17.95 to 61.82)	16.77 (–20.20 to 53.73)	n/a	n/a

[a] Reference category: no.

[b] Model adjusted for baseline value of the outcome variables, sex and age.

n/a = not applicable

particular, 27% to 29% of participants reported not living with their father in one cycle, but were living with him in the subsequent cycle. To exclude short-term separations, our designation of separation from father required that participants report not living with their father for at least 6 months. The number of participants whose fathers left home was relatively small. However, we used MI to assure that all available data were used. No data were collected about reasons for the separation (for example, couple conflict, illness, and work displacement). Residual confounding by unknown or unmeasured variables is possible, although we controlled for baseline levels of the outcomes, which likely took into account any important confounding. Finally, several studies[43,51] support sex differences in this association, although others[52] do not. Our sample size was not large enough to study sex differences.

Conclusion

Our findings suggest that adolescents experience family-related stress and transient depression symptoms in the 4- to 9-month period postseparation from their fathers but no increase in alcohol or cigarette use. Parents and adolescents can be reassured that depression symptoms among adolescents postseparation are often transient. However, family members, teachers, coaches, friends, and health care providers should remain vigilant to depression symptoms and stress in adolescents postseparation, and, if needed, provide formal (that is, counselling or supportive therapy) or informal support (that is, increased time spent in supportive and [or] healthy environments, or extra-curricular activities with friends) to help adolescents cope. Support may also help prevent progression to more severe mental health problems.

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References

1. Schor EL. Family pediatrics: report of the Task Force on the Family. Pediatrics. 2003;111(6 Pt 2):1541–1571.
2. Statistics Canada. Portrait of families and living arrangements in Canada: families, households, and marital status, 2011 Census of population. population. Catalogue no 98-312-X2011001. Minister of Industry [Internet]. Ottawa (ON): Statistics Canada; 2012 [cited 2015 Apr 1]. Available from: http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011001-eng.pdf.
3. Dykas MJ, Ehrlich KB, Cassidy J. Links between attachment and social information processing: examination of intergenerational processes. Adv Child Dev Behav. 2011;40:51–94.
4. Caldji C, Diorio J, Meaney MJ. Variations in maternal care in infancy regulate the development of stress reactivity. Biol Psychiatry. 2000;48(12):1164–1174.
5. Bowlby J. Attachment theory and its therapeutic implications. Adolesc Psychiatry. 1978;6:5–33.
6. Tyrka AR, Price LH, Gelernter J, et al. Interaction of childhood maltreatment with the corticotropin-releasing hormone receptor gene: effects on hypothalamic-pituitary-adrenal axis reactivity. Biol Psychiatry. 2009;66(7):681–685.
7. Bowlby J. Maternal care and mental health. Bull WHO. 1951;3(3):355–534.
8. Bifulcoa A, Harris T, Brown GW. Mourning or early inadequate care? Reexamining the relationship of maternal loss in childhood with adult depression and anxiety. Dev Psychopathol. 1992;4(3):433–449.
9. Zanarini MC. Childhood experiences associated with the development of borderline personality disorder. Psychiatr Clin North Am. 2000;23(1):89–101.
10. Dunn J, Cheng H, O'Connor TG, et al. Children's perspectives on their relationships with their nonresident fathers: influences, outcomes and implications. J Child Psychol Psychiatry. 2004;45(3):553–566.
11. Dunn J. Annotation: children's relationships with their non-resident fathers. J Child Psychol Psychiatry. 2004;45(4):659–671.
12. Swallow V, Macfadyen A, Santacroce SJ, et al. Fathers' contributions to the management of their child's long-term medical condition: a narrative review of the literature. Health Expect. 2012;15(2):157–175.
13. Flouri E. Fathers' behaviors and children's psychopathology. Clin Psychol Rev. 2010;30(3):363–369.
14. Bogels S, Phares V. Fathers' role in the etiology, prevention and treatment of child anxiety: a review and new model. Clin Psychol Rev. 2008;28(4):539–558.
15. Reeb BT, Conger KJ. Mental health service utilization in a community sample of rural adolescents: the role of father–offspring relations. J Pediatr Psychol. 2011;36(6):661–668.
16. Hetherington EM, Stanley-Hagan M. The adjustment of children with divorced parents: a risk and resiliency perspective. J Child Psychol Psychiatry. 1999;40(1):129–140.
17. Bambico FR, Lacoste B, Hattan PR, et al. Father absence in the monogamous California mouse impairs social behavior and modifies dopamine and glutamate synapses in the medial prefrontal cortex. Cereb Cortex. 2013;25(5):1163–1175.
18. Moffitt TE, Caspi A, Belsky J, et al. Childhood experience and the onset of menarche: a test of a sociobiological model. Child Dev. 1992;63(1):47–58.
19. Mendle J, Harden KP, Turkheimer E, et al. Associations between father absence and age of first sexual intercourse. Child Dev. 2009;80(5):1463–1480.
20. Nettle D, Coall DA, Dickins TE. Birthweight and paternal involvement predict early reproduction in British women: evidence from the National Child Development Study. Am J Human Biol. 2010;22(2):172–179.
21. Sheppard P, Sear R. Father absence predicts age at sexual maturity and reproductive timing in British men. Biol Lett. 2012;8(2):237–240.
22. Fry PS, Scher A. The effects of father absence on children's achievement motivation, ego-strength, and locus-of-control orientation: a five-year longitudinal assessment. Br J Dev Psychol. 1984;2(2):167–178.
23. Mandara J, Murray CB. Father's absence and African American adolescent drug use. J Divorce Remarriage. 2006;46(1–2):1–12.
24. Jensen PS, Grogan D, Xenakis SN, et al. Father absence: effects on child and maternal psychopathology. J Am Acad Child Adolesc Psychiatry. 1989;28(2):171–175.
25. O'Loughlin JL, Dugas EN, O'Loughlin EK, et al. Incidence and determinants of cigarette smoking initiation in young adults. J Adolesc Health. 2014;54(1):26–32, e4.
26. Choi WS, Pierce JP, Gilpin EA, et al. Which adolescent experimenters progress to established smoking in the United States. Am J Prev Med. 1997;13(5):385–391.
27. Kandel DB, Davies M. Epidemiology of depressive mood in adolescents: an empirical study. Arch Gen Psychiatry. 1982;39(10):1205–1212.

28. Deschesnes M, Schaefer C. Style de vie des jeunes du secondaire en Outaouais. Tome 1. Hull (QC): Direction de la santé publique. Régie Régionale de la santé et des services sociaux de l'Outaouais et les Centres jeunesse de l'Outaouais; 1997.
29. Eppel A, O'Loughlin J, Paradis G, et al. Reliability of self-reports of cigarette use in novice smokers. Addict Behav. 2006;31(9):1700–1704.
30. Little RJA, Rubin DB. Statistical analysis with missing data. New York (NY): J Wiley & Sons; 1987.
31. Sterne JAC, White IR, Carlin JB, et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ. 2009;338:b2393.
32. Donders AR, van der Heijden GJ, Stijnen T, et al. Review: a gentle introduction to imputation of missing values. J Clin Epidemiol. 2006;59(10):1087–1091.
33. Honaker J, King G. What to do about missing values in time series cross-section data. Am J Politic Sci. 2010;54(2):561–581.
34. Schafer JL, Graham JW. Missing data: our view of the state of the art. Psychol Methods. 2002;7(2):147–177.
35. Rubin DB. Multiple imputation for nonresponse in surveys. New York (NY): J Wiley & Sons; 1987.
36. R Development Core Team. R: a language and environment for statistical computing. Vienna (AT): R Foundation for Statistical Computing; 2011.
37. Honaker J, King G, Blackwell M. Amelia II: a program for missing data. J Stat Softw. 2011;45(7):1–47.
38. Choirat C, Honaker J, Imai K, et al. Zelig: everyone's statistical software, version 5.0-3 [Internet]. [place of publication and publisher unknown]; 2015 [cited 2015 Apr 1]. Available from: http://ZeligProject.org.
39. Nunes-Costa RA, Lamela DJ, Figueiredo BF. Psychosocial adjustment and physical health in children of divorce. J Pediatr (Rio J). 2009;85(5):385–396.
40. Kelly JB. Children's adjustment in conflicted marriage and divorce: a decade review of research. J Am Acad Child Adolesc Psychiatry. 2000;39(8):963–973.
41. Culpin I, Heron J, Araya R, et al. Father absence and depressive symptoms in adolescence: findings from a UK cohort. Psychol Med. 2013;43(12):2615–2626.
42. Fergusson DM, Horwood LJ, Lynskey MT. Parental separation, adolescent psychopathology, and problem behaviors. J Am Acad Child Adolesc Psychiatry. 1994;33(8):1122–1131.
43. Storksen I, Roysamb E, Moum T, et al. Adolescents with a childhood experience of parental divorce: a longitudinal study of mental health and adjustment. J Adolesc. 2005;28(6):725–739.
44. Thoits PA. Stress and health: major findings and policy implications. J Health Soc Behav. 2010;51 Suppl:S41–S53.
45. Garcia C. Conceptualization and measurement of coping during adolescence: a review of the literature. J Nurs Scholarsh. 2010;42(2):166–185.
46. Beardslee WR, Gladstone TR, O'Connor EE. Developmental risk of depression: experience matters. Child Adolesc Psychiatr Clin N Am. 2012;21(2):261–278, vii.
47. Emery RE, Coiro MJ. Divorce: consequences for children. Pediatr Rev. 1995;16(8):306–310.
48. Wallerstein JS, Blakeslee S. Second chances: men, women and children a decade after divorce. New York (NY): Ticknor & Fields; 1989.
49. Weitoft GR, Hjern A, Haglund B, et al. Mortality, severe morbidity, and injury in children living with single parents in Sweden: a population-based study. Lancet. 2003;361(9354):289–295.
50. Stern M, Northman JE, Van Slyck MR. Father absence and adolescent "problem behaviors": alcohol consumption, drug use and sexual activity. Adolescence. 1984;19(74):302–312.
51. Hetherington EM, Bridges M, Insabella GM. What matters? What does not? Five perspectives on the association between marital transitions and children's adjustment. Am Psychol. 1998;53(2):167–184.
52. Allison PD, Furstenberg FF. How marital dissolution affects children: variations by age and sex. Dev Psychol. 1989;25(4):540–549.

Erratum

Takeuchi Hiroyoshi, Suzuki T, Remington G, et al. Antipsychotic polypharmacy and corrected QT interval: a systematic review. Can J Psychiatry. 2015;60(5):215–222.

It has come to the authors' attention that their article included an error in Table 1, on page 218. In the column "Mean QTc baseline to end point difference, ms (within-group difference)", for the study by Ziegenbein et al, the entry should read "n/a (ns)". *The Canadian Journal of Psychiatry* regrets the error and any inconvenience it might have caused.