

Changes in maternal marital status are associated with young adults' cannabis use: evidence from a 21-year follow-up of a birth cohort

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Background	Relatively little is known about why almost half of young adults in Australia have used cannabis. Because the upwards trend in use of cannabis has been coincident with an increase in marital breakdown, this study examines the relationship between marital status, marital changes, and the onset of cannabis use.
Methods	Data are from the Mater-University Study of Pregnancy (MUSP), a 21-year prospective study in Brisbane, Australia. The present study is based on the 3008 mothers and their children for whom there were complete follow-up data at 21 years. Outcomes were self-reported cannabis use at age 21 and early onset (before age 15) cannabis use as judged from a retrospective report obtained at 21 years. Analyses were conducted using multivariate binomial and multinomial logistic regression.
Results	Change in maternal marital status when the child was aged between 5 and 14 years was significantly associated with increased risk of cannabis use [odds ratio (OR) = 1.7; 95% confidence interval (95% CI) 1.4–2.0 for one or two marital changes and OR = 2.3; 95% CI 1.5–3.4 for three or more marital changes], after adjustment for a range of potential confounders.
Conclusion	Experience of changes in maternal marital status in mid- to late-childhood is a significant predictor of subsequent and early use of cannabis by the child. This holds true even after allowing for certain possible causes and consequences of marital breakdown.
Keywords	cannabis, early onset, marital status, marital change, young adults

Illicit drug use among adolescents and young adults has increased in recent years, with some characterizing this increase as an epidemic.^{1–3} In a national survey in 2004, about one in every three Australians aged 14 years and over reported having used cannabis at some time in their lives.⁴ Preceding the increase in cannabis use, there have been marked changes in the structure and stability of families in many western societies including rising rates of divorce, increases in the number of second or subsequent

marriages, and increasing proportions of children living in step-families.^{5–9} The historical coincidence of increasing marital breakdown and widespread use of cannabis by adolescents and young adults raises the possibility that the two phenomena may be related.

Despite differences in sampling procedures, level of control for potential confounders, and methods for obtaining information on substance use, cross-sectional and longitudinal studies are consistent in indicating that children and adolescents from families affected by divorce and remarriage show increased rates of adjustment problems and illicit drug use, in comparison with those from stable families.^{10–13}

Three causal pathways need to be considered. Firstly, the association between marital circumstances and child drug use

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might be coincidental rather than causal. Poverty (or young maternal age, related to poverty) is associated with increased rates of marital breakdown^{14–16} and with a greater propensity to be exposed to networks of illicit drug use. A second possibility is that maternal and/or child mental health may mediate the association between marital status and adolescent drug use.^{17,18} Both marital status^{19–21} and parental mental health²² are associated with child and adolescent psycho-behavioural problems and possibly uptake of illicit drugs.^{23,24} A third possible causal sequence is that drug use by family members, especially parents, may serve to initiate young adults into a drug using culture. In this hypothesized causal sequence, couples who use illicit drugs have a less stable family structure which is both a cause and consequence of illicit drug use, and may involve a domestic drug using culture which provides easier access to drugs for adolescents.^{25,26}

Several cross-sectional studies have examined the association between marital status and later use of illicit drugs by children.^{12,17,27–29} While these studies have generally compared married with non-married families, little is known about the effects of specific types of family structure, such as de facto relationships and families affected by separation, divorce or widowhood. However, longitudinal evidence on the subject is scant^{13,30} and no previous longitudinal studies have explored the association in an Australian context. In addition to the paucity of longitudinal evidence on the association between marital status and later cannabis use by the child, the impact of changes in marital status and whether these predict the age of starting to use cannabis remains unstudied. Using data from an Australian birth cohort, we test three specific questions. First, whether marital status or change in marital status, or both, predict cannabis use by children. If so, is there an association with starting to use cannabis in early adolescence? And finally, are any associations confounded or mediated by other explanatory factors?

Methods

Participants

The Mater-University Study of Pregnancy (MUSP)³¹ is a prospective study of women, and their offspring, who received antenatal care at one of the two major obstetric hospitals in Brisbane, Australia between 1981 and 1983. Of those who participated in the study, 7223 women gave birth to a live singleton baby, who neither died nor was adopted prior to leaving hospital. Mothers were re-interviewed at 3–5 days post-delivery and again when the child was 6 months, 5, 14, and 21 years of age.³² Written informed consent from the mother was obtained at all data collection phases and from the young adult at the 21 year follow-up. Ethics committee approval was obtained at each phase of the study from the Mater Hospital and the University of Queensland. The present study is based on a subsample of 3008 mothers and their children remaining in the study at 21 years and for whom there are complete follow-up data.

Measurement of outcome variable

Consumption of cannabis was retrospectively assessed at the 21-year follow-up of the child via a self-report questionnaire in

which participants were asked, 'In the last month, how often did you use cannabis, marijuana, pot, etc.?'. Options for response were: have never used, used every day, every few days, once or so, and not in the last month. A second question sought the age at which use of cannabis began. In most studies, early initiation to cannabis is defined as 14 or 15 years and younger.^{33–35} Further, evidence suggests that starting to use cannabis in early adolescence (<15 years) is strongly associated with later illicit drug use and the development of drug disorders.³⁶ Our theoretical approach involved categorization of cannabis use into early (<15 years) and late (15+) onset groups.

Measurement of main exposures

The main independent factors in the study included maternal marital status at 5 years of the child age and change in marital status between 5 and 14 years. Maternal marital status when the child was 5 years of age was self-reported from a list provided as single, living together, married, separated, divorced, or widowed. Subjects were subsequently classified into four categories; single, living together (de facto), married and separated/divorced/widowed (S/D/W). In order to measure changes in marital status between the 5- and 14-year phases, the mothers were asked to indicate each instance of separation, divorce and change in partner during the 7 years preceding the 14-year follow-up (three separate questions). We added together each individual's count of the number of divorces, separations, and changes of partner (range 0–6). The changes were then categorized as: no change, one or two changes, and three or more changes over that interval.

Measurement of potential confounders and other explanatory factors

The age of the mother at entry to the study was divided into five categories: 13–19, 20–24, 25–29, 30–34, and 35 years and over. In order to classify income, we selected the 25th centile at the 5-year follow-up as the cut-off below which gross family income was defined as 'low income'.

Maternal mental health at year 5 was assessed using the short form of the Delusions-Symptoms-States Inventory (DSSI).³⁷ All seven symptoms of DSSI address both the international classification of disease (ICD-10)³⁸ and Diagnostic and Statistical Manual of Mental Disorders (DSM-IV).³⁹ For the purpose of this study, mothers were classified as anxious or depressed if they reported three or more of seven symptoms related to anxiety or depression, respectively.

At the 5-year follow-up, parents completed the Child Behaviour Check List.⁴⁰ This has been widely used as a measure of child and adolescent behaviour problems in both clinical and research contexts. Subscales used in the current study included: internalizing behaviour (consisting of items addressing withdrawn behaviour, somatic complaints and anxious/depressive behaviour); aggression (assessed via a 10-item scale); and attention deficit hyperactivity disorder. In the current study, cases of child problem behaviours at the 5-year follow-up were defined using 10% cut-offs of scores on the relevant scale.⁴⁰

At the 5-year survey the women were asked how frequently they consumed alcohol (six pre-specified categories from never to daily) and how much they consumed on each occasion of drinking (six pre-specified categories from none to seven or more

drinks). These data were used to categorize the women into four categories (0 = abstainers, up to half a drink per day, between half and one drink per day, and one or more drinks per day). Mothers' current consumption of illicit drugs was sought by self-report at the 5-year follow-up. They were asked how often they had used cannabis in any form in the last month and classified into users/non-users.

Analysis of data

We used chi-square tests to examine the association between each potential explanatory factor and ever use of cannabis and age of starting use by the young adult. Then, using binary logistic regression, we fitted univariate and multivariate models to examine the relationship between maternal marital status at early stages of the child's life with subsequent use of cannabis by the child. A second series of binary logistic regressions examined the association between change in marital status and use of cannabis by the child. After examining the crude associations, we first adjusted for sex of the child, mother's age and family income (Model 1). Subsequent models progressively included maternal and child mental health at 5-years (Model 2), maternal substance use at 5-years (Model 3), and frequency of change in marital status between the 5- and 14-year follow-ups (Model 4).

Taking never-users of cannabis as the reference group, additional analyses were undertaken to examine the associations with age of initiation of cannabis use. We used multinomial logistic regression to examine the association between each of the independent factors and starting to use cannabis in early adolescence compared with late onset (at age 15 or above). We also conducted a sensitivity analysis to examine whether this association changes when 18 years is regarded as cut-off to define 'early onset'. Odds ratio (OR) and 95% confidence interval (95% CI) were used to estimate relative risks associated with explanatory factors.

Of the cohort of 4326 mother-child pairs at the 5-year follow-up, 3008 (70%) were retained at 21-year follow-up. Mothers who dropped out of the study by the 21-year follow-up were younger and more likely to be non-married at the 5-year follow-up. Loss to follow-up was also associated with change in marital status, low family income, and poorer maternal mental health ($P < 0.001$). In order to assess whether non-response biased our results, we used logistic regression (response vs non-response as outcome) to determine weights for each individual using the inverse-probability of response.⁴¹ A responder was a young adult whose mother had responded to all corresponding variables at the 5- and 14-year follow-ups while a non-responder was any other child in the 5-year follow-up cohort. The results from the inverse probability weighted analyses did not differ from the unweighted analyses presented here, suggesting that our results were not substantially affected by attrition bias.

Results

Overall, 48.6% (1462) of participants at age 21 reported having used cannabis at some time, about a quarter of whom started using before the age of 15. Table 1 describes the associations of a variety of maternal and child explanatory factors with use of cannabis and timing of initiation. Mother's age at the time child was born, sex of the child, maternal marital status, gross family

income, maternal depression, child aggression, maternal alcohol and illicit drug use at the 5-year follow-up, and change in marital status between 5- and 14-year follow-ups were significantly associated with cannabis use in children by age 21. Children whose mothers were married at the time of 5-year follow-up or who experienced no change in marital status between 5 and 14 years were less likely to report having used cannabis or early onset of its use. Children with aggressive behaviour or those of depressed mothers from low income families at 5 years were more likely to use cannabis by age 21. In addition, maternal use of illicit drugs and level of alcohol consumption at the 5-year follow-up was also directly associated with later cannabis use and early age of starting to use cannabis among the children.

Table 2 shows the multivariate associations between maternal marital status at the 5 year follow-up and self-reports of offspring's cannabis use by age 21. In Model 1, all categories of marital status at 5 years other than married were associated with elevated risk of ever use of cannabis and, with the exception of de facto status, the associations were a little stronger for early onset of cannabis use compared with late onset. Adjustment for the maternal and child mental health (Model 2) did not significantly change the magnitude of these associations, although there was a moderate decrease in the association of early onset of cannabis use with single and S/D/W. Further adjustment for maternal substance use at 5 years (Model 3) appeared to reduce the strength of the relationship for all categories. The associations were further attenuated as marital change was added to the model (Model 4), yielding non-significant relationships for almost all categories of marital status.

Table 3 shows the equivalent models for changes in maternal marital status between the 5- and 14-year follow-ups and the children's use of cannabis by the age 21. In Model 1, children whose mothers had any changes of marital status between 5- and 14-year follow-ups were more likely to report ever use of cannabis by age 21. The magnitude of relationship was sharply stronger for early onset of cannabis use, with OR = 2.1 (95% CI 1.6–2.8) for one or two changes and OR = 4.1 (95% CI 2.5–6.9) for three or more changes. Additional adjustment for maternal and child mental health (Model 2) did not qualitatively change the relationships. Adjustments for maternal alcohol and illicit drug use (Model 3) and marital status at 5 years (Model 4) had only limited impacts on these associations. Therefore, the association between number of marital changes and use of cannabis, particularly in early adolescence, remained independently significant.

Discussion

The marital status of the mothers and changes in marital status appear to predict child's uptake of cannabis. Mothers who were single at the 5-year follow-up were more likely to have children who subsequently used cannabis. However, control for maternal substance use eliminated the associations, suggesting that it is not single motherhood itself which predicts cannabis use. The children of mothers who described themselves as living in a de facto relationship at the 5-year follow-up also were more likely to try cannabis. This effect remained even after controlling for maternal substance use and change in maternal marital status. Mothers categorized as separated or widowed or divorced also

Table 1 Cumulative incidence of cannabis use by age 21 according to background factors

Explanatory factors	n Overall	Cannabis use by children and time of onset			P-value
		Never-used (%)	Early onset (%)	Late onset (%)	
	3008	51.4	11.5	37.1	
Mother's age at birth (years)					
<20	361	49.9	16.3	33.8	
20–24	1117	50.7	10.8	38.5	
25–29	950	51.6	10.6	37.8	
30–34	442	51.6	10.6	37.8	
35+	138	59.4	13.8	26.8	<0.05
Child's sex					
Male	1427	47.8	12.2	40.0	
Female	1581	54.6	10.9	34.4	<0.01
Marital status^a					
Married	2543	53.2	10.4	36.3	
Single	84	40.5	17.9	41.7	
De facto	155	40.0	13.5	46.5	
Separated/divorced/widowed	226	42.5	20.4	37.2	<0.001
Family income^a					
Low income	667	48.6	15.3	36.1	
Middle or high	2341	52.2	10.5	37.3	<0.01
Maternal mental health^{a,b}					
Depressed	266	42.1	17.7	40.2	<0.01
Anxious	755	47.7	12.5	39.9	0.062
Child behaviour^a					
Aggressive	309	44.3	16.8	38.8	<0.01
SAT ^c	205	52.7	15.6	31.7	0.085
Internalized	331	55.6	11.8	32.6	0.195
Maternal alcohol use^a					
Abstainer	607	62.4	8.2	29.3	
<0.5 glass per day	1888	50.1	12.0	37.9	
0.5–1 glass per day	307	46.3	13.0	40.7	
>1 glass per day	206	38.8	14.6	46.6	<0.001
Maternal illicit drug use^a					
No	2907	52.2	11.1	36.7	
Yes	101	28.7	23.8	47.5	<0.001
Change in marital status^d					
Nil change	2306	55.1	9.7	35.3	
1–2 changes	584	40.8	16.3	43.0	
3+ changes	118	32.2	24.6	43.2	<0.001

^a Measured at the 5-year follow-up.

^b Dichotomous variable—data are row% for positive stratum of 2 by 3 table.

^c Social, attention, and thought problems.

^d Number of divorces, separations or changes in partner between 5 and 14 years measured at the 14-year follow-up.

had children who were more likely to try cannabis. This effect disappeared, however, when we adjusted for change in maternal marital status, suggesting that it is not the marital status itself that influences children's cannabis use but rather it is the impact of the changes in maternal marital status a child has experienced.

The relationships with 'changes in marital status' during child development were sharply stronger than those observed for

maternal marital status at 5 years. Irrespective of the model being tested, and the variables for which we adjusted, the more changes in maternal marital status, the more likely the child was to try cannabis. Supplementary analysis indicated that both transition from married to S/D/W and change from S/D/W to married appear to be associated with a point estimate of increased risk of cannabis use by children, though the latter findings are

Table 2 Risk of cannabis ever use and time of onset according to marital status at 5-years adjusted for other variables (*n* = 3008)

Cannabis use by children and time of onset	Maternal marital status at 5 years							
	Married		Single		De facto		S/D/W ^a	
	OR	OR	95% CI	OR	95% CI	OR	95% CI	
Unadjusted								
Ever use ^b	1.0	1.7	1.1–2.6	1.7	1.2–2.4	1.5	1.2–2.0	
Early onset ^c	1.0	2.3	1.2–4.2	1.7	1.0–2.9	2.4	1.7–3.6	
Late onset ^c	1.0	1.5	0.9–2.4	1.7	1.2–2.4	1.3	1.0–1.7	
Adjusted for								
Model 1								
Mother's age, child's sex and family income at 5 years								
Ever use	1.0	1.7	1.1–2.7	1.8	1.3–2.5	1.6	1.2–2.1	
Early onset	1.0	1.9	1.0–3.6	1.6	0.9–2.7	2.2	1.4–3.4	
Late onset	1.0	1.6	1.0–2.7	1.8	1.3–2.6	1.4	1.0–1.9	
Model 2								
Previous and maternal and child mental health at 5 years								
Ever use	1.0	1.6	1.0–2.6	1.8	1.2–2.5	1.5	1.1–2.0	
Early onset	1.0	1.7	0.9–3.4	1.6	1.0–2.8	2.1	1.4–3.2	
Late onset	1.0	1.6	0.9–2.6	1.8	1.3–2.6	1.3	0.9–1.8	
Model 3								
Previous and maternal substance use at 5 years								
Ever use	1.0	1.3	0.8–2.1	1.6	1.1–2.3	1.4	1.0–1.9	
Early onset	1.0	1.4	0.7–2.7	1.5	0.9–2.5	1.9	1.2–2.9	
Late onset	1.0	1.3	0.8–2.2	1.6	1.1–2.4	1.2	0.9–1.7	
Model 4								
Previous and change in marital status between 5 and 14 years								
Ever use	1.0	1.2	0.8–2.0	1.5	1.1–2.1	1.1	0.8–1.5	
Early onset	1.0	1.3	0.6–2.5	1.4	0.8–2.3	1.4	0.9–2.2	
Late onset	1.0	1.2	0.7–2.0	1.5	1.1–2.2	1.0	0.7–1.4	

^a Separated, divorced, or widowed.

^b Relative risk of ever use of cannabis was obtained using binomial logistic regression with non-users as the comparison group.

^c Risk of early and late onset cannabis use was examined separately, using multinomial regression model and non-users as the comparison group.

associated with small numbers and are not statistically significant (data not shown).

Some of these findings support previous research but others are novel. Our data indicating that the children of mothers who were married when the children were 5 years old were less likely to use cannabis by the age of 21 are consistent with previous cross-sectional or short-term longitudinal findings that children and adolescents using illicit drugs are more likely to have single and divorced parents.^{12,13,28} Conversely, our finding that only the children of mothers in de facto relationships were significantly more likely to use cannabis when a range of potential other factors were included in the model is not consistent with the previous literature. However, none of the previous studies was large enough to examine the association between drug use and the various categories of maternal unpartnered status separately.

Our analyses of the sequelae of frequent marital change offer a new perspective on the consequences of family structure during development of the child. While there is some previous evidence

Table 3 Risk of cannabis ever use and time of onset according to change in marital status between 5- and 14-years adjusted for other variables (3008)

Cannabis use by children and time of onset	Changes in maternal marital status 5–14 years ^a					
	Nil	1–2		3+		
	OR	OR	95% CI	OR	95% CI	
Unadjusted						
Ever use ^b	1.0	1.8	1.5–2.1	2.6	1.7–3.8	
Early onset ^c	1.0	2.3	1.7–3.0	4.3	2.6–7.2	
Late onset ^c	1.0	1.6	1.4–2.0	2.1	1.4–3.2	
Adjusted for						
Model 1						
Mother's age, child's sex and family income at 5 years						
Ever use	1.0	1.8	1.5–2.1	2.6	1.7–3.8	
Early onset	1.0	2.1	1.6–2.8	4.1	2.5–6.9	
Late onset	1.0	1.7	1.4–2.1	2.1	1.4–3.3	
Model 2						
Previous and maternal and child mental health at 5 years						
Ever use	1.0	1.7	1.4–2.1	2.5	1.7–3.8	
Early onset	1.0	2.1	1.6–2.8	4.1	2.4–6.8	
Late onset	1.0	1.6	1.3–2.0	2.1	1.4–3.2	
Model 3						
Previous and maternal substance use at 5 years						
Ever use	1.0	1.7	1.4–2.1	2.3	1.5–3.5	
Early onset	1.0	2.0	1.5–2.7	3.7	2.2–6.2	
Late onset	1.0	1.6	1.3–2.0	1.9	1.2–3.0	
Model 4						
Previous and marital status at 5 years						
Ever use	1.0	1.7	1.4–2.0	2.3	1.5–3.4	
Early onset	1.0	1.9	1.4–2.6	3.5	2.1–6.0	
Late onset	1.0	1.6	1.3–2.0	1.9	1.2–3.0	

^a Number of divorces, separations or changes in partner during the interval.

^b Relative risk of ever use of cannabis was obtained using binomial logistic regression with non-users as the comparison group.

^c Risk of early and late onset cannabis use was examined separately, using multinomial regression model and non-users as the comparison group.

suggesting an association between marital changes and child adjustment,^{42,43} no previous study has examined the relationship of these changes in maternal marital status with use of cannabis and its early onset. Our study suggests that exposure to maternal marital change during childhood and early adolescence contributes to cannabis use and to early onset of such use by children. More frequent changes in marital status predict greater risk of both outcomes. We additionally conducted a sensitivity analysis in which we defined cannabis use <18 years as early onset and repeated the multinomial regressions. Our multivariate findings for early onset did not materially change compared with the previous results, though the point estimate was slightly attenuated. We also conducted a supplementary analysis to examine whether change in maternal marital status predicted young adults' frequency of use of cannabis at 21 years. Use of cannabis at least every few days exhibited a stronger relationship with more than two changes in maternal marital

status (OR = 2.7; 95% CI 1.5–4.7) than did occasional use (OR = 2.1; 95% CI 1.3–3.2). What is it about change in maternal marital circumstances that might account for the use of cannabis in children and, in particular, its early development?

One possible explanation is that children from families affected by frequent changes in marital status are at increased risk of developing mental health problems,^{10,11} and that these may lead to later use of cannabis. This led us to test whether adolescents' mental health mediates the current association. When the multivariate analysis was repeated after exclusion of adolescents with problem behaviours at 14 years the results were substantially identical, though the point estimate was slightly attenuated. Marital breakdown may also lead to negative socioeconomic consequences which can influence child development. However, our additional analysis examining the possible impact of economic status (at 14 years) on the pathway showed that the association of marital change and cannabis use is not explained by the presence of poverty during early adolescence. Further, in order to explore whether adolescents' alcohol use, tobacco use (or both) mediated the relationship between marital change and cannabis use, we conducted a supplementary analysis controlling for these variables. Although the strength of the primary relationship was slightly reduced after controlling smoking and drinking in adolescence, our results remained substantively unaltered.

Alternatively, change in marital status may lead to a variety of family structures such as divorced single-parent homes, or step-parent homes, each of which has been found to affect family relations and adolescent conduct.⁴⁴ Children of unstable families may be more affected in their academic performance and psychological well-being.⁴⁵ In addition, frequent changes in maternal marital status may also influence parent–child relationships and make adolescents more lonely or emotionally vulnerable,^{46,47} leaving them susceptible to peer influences and hence to use of illegal drugs.^{30,48} Thus, changes in maternal–child interaction may contribute to drug use by children. A more direct explanation for the results is that marital disruption and reconstruction affect parental supervision and control of the children.⁴⁹

The present study has some limitations. The MUSP has collected little information on parental monitoring and supervision during late childhood and early adolescence, or on

drug use by peers and siblings. Studies with the capacity to assess both parental disciplining style and peer influence in conjunction with marital change should attempt to ascertain whether our results are robust. Apart from the number of changes in marital status, the nature of specific transitions might be important, though some are complex. We were unable to assess the possible effects of particular changes in marital status or of their timings in those who had multiple changes. Studies with greater capacity to assess type of changes in marital status are needed to ascertain whether some transitions are associated with cannabis use at age 21, while others are not.

Another limitation is the sizeable loss to follow-up between the 5- and 21-year surveys. Compared with the 4326 subjects who provided information related to maternal and child explanatory factors at the 5- and 14-year follow-ups, 3008 (70%) young adults participated in the 21-year survey. However, as described in Methods, we have used inverse probability weighting to test for the possible impact of selective attrition on our findings. These additional analyses revealed no material change in our results. Restriction of the analyses to individuals with complete data may have led to an underestimation in the strength of particular associations, given that loss to follow-up is associated with non-married status and change in marital status.

Overall, our results show that while the marital status of a mother when the child is aged 5 years is associated with later use of cannabis by children, the magnitude of this relationship is partly a function of the maternal history of alcohol and illicit drug use. On the other hand, change in marital status has a strong relationship with both ever use and early onset of using cannabis by children. Use of cannabis and other illicit drugs is usually attributed to individual characteristics, and, if detected, the user bears the brunt of the judicial consequences. However, our data indicate that the rapidly changing demographic characteristics of contemporary societies may account for part of the recent increase in illicit drug use and early illicit drug use in these populations. Thus, drug use may be a consequence of the early-life background of the individual. The pathway linking family transition and drug use in young people needs to be better understood, in order to identify and test opportunities for prevention.

KEY MESSAGES

- This study provides a prospective test of the association of maternal marital status and changes in marital status with use of cannabis by children, and early onset of its use.
- Maternal marital status is not independently associated with later use of cannabis by children.
- Changes in maternal marital status predict use of cannabis and early onset of such use by children.

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