

Maternal Cannabis Use During a Child's Lifetime
Associated With Earlier InitiationNatasha A. Sokol, ScD,¹ Cassandra A. Okechukwu, ScD,² Jarvis T. Chen, ScD,²
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Introduction: Earlier cannabis initiation is associated with more severe neuropsychiatric and social consequences. The authors investigated whether mothers' cannabis use is associated with earlier cannabis initiation by their children.

Methods: Mother and child data were from the National Longitudinal Survey of Youth 1979 (1980–1998 waves) and Child and Young Adults (1988–2014 waves) cohorts, respectively. Cox proportional hazard models assessed the effect of maternal cannabis use prior to a child's adolescence on the child's risk of subsequent cannabis initiation. Models were stratified by race and child's age category (6–16, 17–24, ≥ 25 years). Adjusted analyses controlled for sociodemographic variables. Analyses were conducted in 2017.

Results: Median age of cannabis initiation for children of maternal ever users was age 16 years compared with age 18 years among children of maternal never users. Children of 1-year and multiple-year users were at increased risk of cannabis initiation between ages 6 and 16 years (hazard ratio=1.38, $p<0.001$, and hazard ratio = 1.45, $p<0.001$, respectively). Effects were slightly stronger among non-Hispanic non-black children.

Conclusions: As cannabis legalization expands across the U.S., adult use may become increasingly normative. This study indicates that maternal cannabis use may be a risk factor for early initiation among their offspring. Preventive interventions should consider strategies to delay initiation among children of cannabis users.

Am J Prev Med 2018;000(000):1–11. © 2018 American Journal of Preventive Medicine. Published by Elsevier Inc. All rights reserved.

INTRODUCTION

Cannabis is the most widely used illicit substance in the U.S.^{1,2} In a regulatory sea change, adult medical and recreational use and possession have recently been decriminalized or legalized in number of U.S. states. To date, 31 jurisdictions allow cannabis use as prescribed by a physician for medical treatment.³ Of these, nine have legalized non-medical recreational use and possession for adults.³ Only 16 states maintain fully prohibitionist policies.³

The likelihood of experiencing health consequences associated with cannabis use is strongly associated with age at initiation.^{4–6} The vast majority of those seeking treatment for cannabis use (the second most common drug for which individuals seek treatment after alcohol)⁷ initiate prior to age 17 years.⁸ Among cannabis users, earlier initiation is

associated with increased risk of anxiety and depressive disorders.^{9–14} Child and adolescent cannabis use is associated with impairments in attention, concentration, decision making, and working memory, and increased impulsivity, which may persist for weeks after use,^{14–17} with evidence that some cognitive effects, including reductions in IQ,¹⁸ may linger into adulthood.^{14,19–22} These cognitive

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0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2018.06.023>

impairments are important because they may undermine academic performance, limiting educational attainment during a critical period, and thus may impact cognition, income, and employment throughout the life course.^{6,23,24} The relationship between earlier initiation and long-term social consequences associated with cannabis use may be further mediated by the increased likelihood of developing dependence, or progressing to long-term, regular or heavy use among individuals who initiate prior to adulthood.^{14,25–27} Among cannabis users, early initiation may also increase risk of the development of psychosis among predisposed individuals.^{6,16,19,20,28,29} Research has frequently noted differences in propensity for many of these adverse outcomes between those who initiated prior to age 16 or 17 years compared with those who initiated later.^{6,8,30,31}

Cannabis has recognized therapeutic benefits, including in the treatment of glaucoma, nausea, AIDS-associated anorexia and wasting syndrome, chronic pain, inflammatory conditions, multiple sclerosis, and epilepsy.³² There is also evidence that the availability of legal medical and recreational cannabis may reduce population opioid overdose deaths.^{33,34} Cannabis arrests account for more than half of all drug arrests in the U.S., and cannabis possession is a major driver of racial disparities in arrest and incarceration.³⁵ For these reasons, total cannabis prohibition may not be consistent with public health objectives.

Instead, given the neurocognitive, health, and social consequences associated with early use, delaying initiation may be an important but undervalued public health goal. However, there is limited research to directly inform this approach. Research that examines age at cannabis initiation is needed.^{31,36–38} Prior work in this area has noted an increased likelihood for cannabis use and dependence among the offspring of cannabis-using parents;^{39–46} however, this research has often relied on homogeneous samples,^{40–52} retrospective child reports of parent marijuana use,^{46,53} or cross-sectional data.^{45,54} In light of the changing regulatory environment, research on the influence of parental cannabis use on children's propensity for early initiation is crucial for understanding and mitigating potential harm.

This study examines the association between maternal cannabis use during a child's early life and a child's age at first use, using a nationally representative longitudinal cohort of mothers and their children. Using survival methods, analyses tested for a relationship between maternal cannabis use between a child's birth and age 12 years and subsequent child use and compared median age at first cannabis use and risk of using prior to age 17 years across levels of exposure.

METHODS

Study Sample

The study sample included women enrolled in the 1979 National Longitudinal Survey of Youth (NLSY79) and their biological children in the NLSY Children and Young Adults cohort (NLSYCYA). The NLSY79 is a nationally representative sample of individuals aged 14 to 21 years living in the U.S. in 1979 ($n = 12,686$, 49.53% women). Participants were initially interviewed annually, and interviews have continued biennially since 1994.^{55–57}

The NLSYCYA began enrollment of all biological children aged 0–23 years born to women in the NLSY79 in 1986. As of 2014, the NLSYCYA had surveyed 11,512 children aged 0–41 years born to 6,283 NLSY79 mothers. Administration is biennial until age 30 years, then reduced to once every 4 years.

Children who were aged <12 years by 1998 (the most recent year in which the NLSY79 assessed cannabis use) were dropped from the sample ($n = 5,704$) to ensure that all children had equal opportunity for exposure (birth to age 12 years). From the remaining 6,438 mother–child dyads, mothers and children for whom maternal use or child's age at initiation could not be determined were excluded. The final analytic sample consisted of 4,440 children born to 2,586 mothers.

Measures

All variables were self-reported. The exposure variable was maternal cannabis use between a child's birth and age 12 years. Children were considered at risk for exposure beginning at birth, and ending at their age at initiation, or at age 12 years, whichever occurred first. A child who initiated cannabis prior to their mother's first cannabis use during the child's lifetime was considered unexposed at the time of initiation. NLSY79 participants were asked five questions to characterize past-year cannabis use between 1980 and 1998 (Appendix Figure 1, available online), which were used to generate two variables characterizing maternal cannabis use during the defined exposure period. First, a binary variable identified ever users as any mother who ever reported using any cannabis during the exposure period. If a mother reported no use during this period, she was considered a never user. A separate three-level categorical variable was created and coded zero for never users; one if mothers reported use during 1 year of the exposure period (1-year users); and two if mothers reported use during >1 year of the exposure period (multiple-year users).

Child's age at cannabis initiation (ACI) was generated from seven NLSYCYA items (Appendix Table 1, available online), assessed on even years from 1988 to 2014. A child was considered to have initiated in the first year they reported having ever used cannabis, after exclusively reporting having never used in prior surveys. The NLSYCYA also assessed ACI retrospectively, using the survey item, *How old were you when you first used marijuana?* ACI was derived from retrospective report if the respondent initiated prior to enrollment; or the respondent was not surveyed, or skipped or refused cannabis-related questions on at least 1 survey year immediately prior to the first reported use. Retrospective report was used to determine ACI for 23 respondents (0.77%). The final analytic sample of 4,440 excluded 142 (3.10%) dyads based on an arbitrary cutoff of age ≥ 6 years for child's ACI, as the authors considered voluntary, self-initiated use prior to pri-

mary school unlikely and reports sufficiently aberrant or implausible as to misinform analyses.

All covariates were identified a priori based on their potential to confound the relationship of interest. All covariates took on baseline values (child's age 6 years) unless otherwise noted.

Mothers reported educational attainment as the highest grade they completed, which was categorized (less than high school, high school, some college, college or more). Mother's marital status was categorical (never married, married with spouse present, other). Mother's age at child's birth was binary (≥ 20 years, <20 years). Net-family income was reported continuously and adjusted to March 2017 values using the Bureau of Labor Statistics inflation calculator.⁵⁸ Values were arranged into quintiles (1 = lowest, 5 = highest). A binary variable indicated whether mothers ever misused prescription drugs or used any illicit drug other than cannabis during the 12-year exposure period (never used, used ≥ 1 time). Mothers were considered smokers if they reported smoking >100 cigarettes in their lifetime and daily or occasional smoking in the 1992 survey. Binge drinking was modeled as the number of days in the past week on which mothers drank four or more alcoholic drinks. Neighborhood environment was assessed using a five-level item that asked mothers, *How would you rate your neighborhood as a place to raise children?* Response options: 1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor. Because this variable was measured biennially from 1992 to 1998, the earliest available response within the defined exposure period was used.

Child's race as reported by the NLSYCYA was categorical (Hispanic; black; non-Hispanic, non-black [NHNB]). Gender was binary (male, female). Child behavior was assessed using raw scores from the Behavioral Problems Index (BPI), and cognitive performance was assessed using standardized scores from the Peabody Picture Vocabulary Test (PPVT), both described and validated elsewhere.^{59,60} For the BPI, mothers rate how often each of 28 statements about child behaviors is true of their child (1=often true, 2=sometimes true, 3=not true), and answers are summed, creating continuous score. The PPVT is administered by interviewers who read 175 words out loud and ask respondents to identify one of four pictures that accurately represents each word, generating a continuous score. For the purposes of these analyses, BPI and PPVT scores were arranged into quintiles. On the BPI, higher quintiles indicate less problem behavior. On the PPVT, higher quintiles indicate greater vocabulary.

Statistical Analysis

All analyses were performed in 2018 using Stata version, 15. Table 1 describes missingness and means or proportions for covariates. Missing values for all covariates other than the exposure and outcome were imputed using multiple imputation with chained equations, conditional on observed covariates under the assumption of missing at random.⁶¹ Imputed values were used only in parametric analyses.

Hazard ratios (HRs) associated with exposure to maternal use were generated using Cox proportional hazards models. Models were adjusted for all covariates, and interactions between (1) child's gender X maternal use, (2) child's race X maternal use, and (3) child's race X child's gender. Median age at cannabis initiation was defined as the earliest age by which the survivor function derived from this model was ≤ 0.50 , and was reported by

exposure status, race, and gender. After testing interactions, for ease of interpretation and to allow all covariates to vary by child's race and gender, stratified models were generated.

HRs associated with exposure to maternal cannabis use were independently assessed within categories of child's age: 6–16, 17–24, and ≥ 25 years. Adjusted and race-stratified models were run in each age category, allowing respondents to enter the risk set at the category's youngest age and censoring at its oldest age.

RESULTS

Overall, 2,983 (67.2%) children initiated cannabis use during the follow-up period (Table 1). About 1,053 (35.30%) of them had mothers who used cannabis during the exposure period. A crude Kaplan–Meier graph showed the median age of cannabis initiation for children whose mothers never used cannabis was 18 years, and the median age at initiation for children whose mothers used cannabis in 1 year or multiple years was 16 years (Appendix Figure 2, available online).

The unadjusted Cox proportional hazards model indicated that compared with those whose mothers never used cannabis during their childhood, the overall risk of cannabis initiation within the follow-up period was 44% greater among children whose mothers used during one survey year ($p < 0.001$), and 53% greater among children whose mothers used during multiple survey years ($p < 0.001$; Table 2).

In the adjusted Cox model, compared with children whose mothers never used cannabis, the risk of cannabis initiation among children whose mothers used cannabis in 1 year was 37% greater ($p < 0.001$) and the risk of initiation among children whose mothers used in multiple years was 44% greater ($p < 0.001$; Table 2). The relationship held in stratified models for black girls, and NHNB boys and girls. No association was found between maternal use on any 1 survey year and risk of initiation among black or Hispanic boys; or between maternal use on multiple survey years and risk of initiation among Hispanic girls (Table 3). In general, median age at initiation for children whose mothers used cannabis in 1 year or multiple years was younger than for children whose mothers never used. However, for black boys, the median age at initiation was 17 years for children of never and multiple-year users, and 16 years for children of 1-year users (Table 3).

In the adjusted Cox model limited to the youngest age category (6–16 years), maternal cannabis use in 1 year was associated with 38% greater risk of initiation ($p < 0.001$), and maternal use in multiple years was associated with a 45% greater risk ($p < 0.001$). The effect of maternal use on initiation held across all race strata (Table 4).

Table 1. Sample Characteristics, NLSYCYA, 1988–2014

Characteristics	Male	Female	All	Imputed
Ever used marijuana	1,654 (74.37)	1,329 (59.97)	2,983 (67.18)	0
Age (years) at first use, M (SD)	15.55 (2.91)	15.99 (3.13)	15.74 (3.02)	0
Raw BPI score, M (SD) ^a	21.68 (38.08)	20.33 (36.17)	21.00 (37.14)	1,595 (34.79)
Standardized PPVT score, M (SD) ^a	85.08 (21.27)	86.41 (20.05)	85.75 (20.67)	2,045 (44.60)
Race/ethnicity				0
Hispanic	521 (23.43)	466 (21.03)	987 (22.23)	—
Black	769 (34.58)	820 (37.00)	1,589 (35.79)	—
Non-Hispanic, non-black	934 (42.00)	930 (41.97)	1,864 (41.98)	—
How good is neighborhood for raising children ^b				185 (4.03)
Excellent	385 (17.94)	380 (17.91)	765 (17.92)	—
Very good	549 (25.58)	552 (26.01)	1,101 (25.80)	—
Good	531 (24.74)	515 (24.27)	1,046 (24.51)	—
Fair	478 (22.27)	463 (21.82)	941 (22.05)	—
Poor	203 (9.46)	212 (9.99)	415 (9.72)	—
Net family income, M (SD) ^{c,d}	49,354.75 (115,352.50)	49,351.27 (97,823.21)	49,353.02 (106,959.50)	204 (4.45)
Born to mother younger than 20 years old	676 (30.40)	673 (30.37)	1,349 (30.38)	0
Mother's marital status ^c				134 (2.92)
Never married	480 (22.14)	487 (22.56)	967 (22.35)	—
Married, spouse present	1,229 (56.69)	1,196 (55.40)	2,425 (56.04)	—
Other	459 (21.17)	476 (22.05)	935 (21.61)	—
Mother's highest grade completed ^c				0
Less than high school	643 (28.91)	657 (29.65)	1,300 (29.28)	—
High school	1,092 (49.10)	1,079 (48.69)	2,171 (49.90)	—
Some college	383 (17.22)	370 (16.70)	753 (16.96)	—
College or more	106 (4.77)	110 (4.96)	216 (4.86)	—
Mother used drugs other than marijuana	941 (43.56)	937 (43.36)	1,878 (43.46)	150 (3.27)
Mother is current smoker	743 (33.41)	703 (31.72)	1,446 (32.57)	570 (12.84)
Mother binge drank 1 or more days in past week	174 (7.82)	182 (8.21)	356 (8.22)	126 (2.84)
Mother's marijuana use category				1 (0.02)
Never user	1,319 (59.31)	1,326 (59.84)	2,645 (59.57)	—
1-year user	348 (15.65)	415 (18.73)	827 (18.63)	—
Multiple-year user	440 (19.78)	475 (21.44)	968 (21.80)	—
Total	2,224 (50.09)	2,216 (49.91)	4,440 (100.00)	—

Note: Values are n (%) unless otherwise indicated.

^aAt or before child's age 6 years.

^bEarliest rating.

^cAt child's age 6 years.

^dAdjusted to 2017 U.S. dollars.

BPI, Behavioral Problems Index; NLSYCYA, National Longitudinal Survey of Youth Children and Young Adults; PPVT, Peabody Picture Vocabulary Test.

Table 2. Hazard of Offspring Cannabis Initiation

Variables	Crude		Adjusted		With interactions	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Mother's cannabis use category (ref mother is never user)						
1-year user	1.44 (1.32, 1.58)	<0.001	1.37 (1.24, 1.51)	<0.001	1.36 (1.14, 1.62)	0.001
Multiple-year user	1.53 (1.40, 1.67)	<0.001	1.44 (1.30, 1.59)	<0.001	1.41 (1.19, 1.67)	<0.001
Child is female	0.69 (0.64, 0.74)	<0.001	0.69 (0.65, 0.75)	<0.001	0.72 (0.63, 0.83)	<0.001
Child's race (ref non-Hispanic, non-black)						
Hispanic	1.29 (1.17, 1.41)	<0.001	1.34 (1.22, 1.48)	<0.001	1.42 (1.22, 1.64)	<0.001
Black	0.99 (0.91, 1.08)	0.866	0.92 (0.83, 1.02)	0.096	1.19 (1.02, 1.38)	0.026
Mother's cannabis use X gender (ref never users)						
1-year user, female	—	—	—	—	1.20 (1.00, 1.45)	0.055
Multiple-year user, female	—	—	—	—	1.24 (1.04, 1.49)	0.017
Mother's cannabis use X child's race (ref never users)						
1 year, Hispanic	—	—	—	—	0.94 (0.74, 1.19)	0.604
1 year, black	—	—	—	—	0.82 (0.66, 1.02)	0.078
Multiple year, Hispanic	—	—	—	—	1.02 (0.79, 1.33)	0.867
Multiple year, black	—	—	—	—	0.82 (0.67, 0.99)	0.043
Child's race X child's gender (ref non-Hispanic, non-black)						
Hispanic, female	—	—	—	—	0.94 (0.78, 1.13)	0.500
Black, female	—	—	—	—	0.71 (0.60, 0.84)	<0.001
Income quintile (ref third quintile)						
First	1.13 (1.01, 1.27)	0.033	0.98 (0.86, 1.11)	0.713	0.98 (0.86, 1.11)	0.712
Second	1.14 (1.01, 1.27)	0.031	1.00 (0.88, 1.13)	0.966	0.99 (0.87, 1.13)	0.895
Fourth	0.95 (0.85, 1.07)	0.422	0.88 (0.78, 1.00)	0.049	0.88 (0.78, 0.99)	0.040
Fifth	1.00 (0.88, 1.12)	0.948	1.01 (0.90, 1.14)	0.882	1.01 (0.90, 1.14)	0.882
BPI quintile (ref third quintile)						
First	0.77 (0.68, 0.87)	<0.001	0.86 (0.76, 0.98)	0.022	0.87 (0.76, 0.99)	0.033
Second	0.91 (0.80, 1.03)	0.132	0.99 (0.87, 1.13)	0.915	1.00 (0.88, 1.14)	0.974
Fourth	0.86 (0.76, 0.97)	0.013	0.91 (0.80, 1.03)	0.145	0.91 (0.81, 1.04)	0.155
Fifth	0.79 (0.70, 0.89)	<0.001	0.80 (0.70, 0.92)	0.003	0.81 (0.71, 0.93)	0.003
PPVT quintile (ref third quintile)						
First	0.96 (0.80, 1.14)	0.627	0.91 (0.74, 1.12)	0.341	0.91 (0.74, 1.12)	0.332
Second	1.02 (0.89, 1.16)	0.790	1.01 (0.89, 1.15)	0.857	1.01 (0.89, 1.15)	0.866
Fourth	1.00 (0.87, 1.16)	0.979	1.00 (0.86, 1.16)	0.996	1.00 (0.86, 1.17)	0.970
Fifth	0.97 (0.85, 1.11)	0.659	1.02 (0.90, 1.16)	0.761	1.02 (0.90, 1.16)	0.736
Mother's highest completed level of education (ref high school)						
Less than high school	1.09 (1.00, 1.18)	0.050	1.06 (0.97, 1.16)	0.195	1.06 (0.97, 1.16)	0.224

(continued on next page)

Table 2. Hazard of Offspring Cannabis Initiation (continued)

Variables	Crude		Adjusted		With interactions	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Some college	1.02 (0.92, 1.13)	0.682	1.02 (0.92, 1.13)	0.689	1.03 (0.93, 1.14)	0.632
College graduate	0.65 (0.54, 0.79)	<0.001	0.72 (0.59, 0.89)	0.002	0.72 (0.59, 0.88)	0.001
Born to mother younger than 20 years	0.91 (0.84, 0.98)	0.014	0.80 (0.73, 0.87)	<0.001	0.79 (0.72, 0.86)	<0.001
Mother's marital status (ref married, spouse present)						
Never married	1.23 (1.13, 1.34)	<0.001	1.21 (1.07, 1.35)	0.002	1.21 (1.08, 1.36)	0.001
Other	1.19 (1.09, 1.31)	<0.001	1.12 (1.01, 1.24)	0.035	1.10 (1.00, 1.22)	0.061
Mother's neighborhood rating (ref very good)						
Excellent	0.90 (0.80, 1.01)	0.081	0.92 (0.82, 1.04)	0.186	0.93 (0.83, 1.04)	0.210
Good	1.04 (0.94, 1.16)	0.422	1.02 (0.92, 1.14)	0.664	1.03 (0.92, 1.14)	0.630
Fair	1.12 (1.00, 1.25)	0.043	1.07 (0.95, 1.20)	0.289	1.07 (0.95, 1.21)	0.269
Poor	1.31 (1.14, 1.49)	<0.001	1.20 (1.03, 1.39)	0.019	1.19 (1.03, 1.39)	0.020
Mother used drugs other than marijuana	1.48 (1.38, 1.59)	<0.001	1.26 (1.16, 1.36)	<0.001	1.25 (1.15, 1.36)	<0.001
Mother smoked cigarettes	1.34 (1.25, 1.45)	<0.001	1.16 (1.07, 1.26)	0.001	1.17 (1.07, 1.27)	<0.001
Past week number of days mother drank ≥ 4 drinks	1.06 (1.00, 1.12)	0.062	1.02 (0.95, 1.08)	0.598	1.01 (0.95, 1.08)	0.673

Note: Boldface indicates statistical significance ($p < 0.05$). BPI, Behavioral Problems Index; HR, hazard ratio; PPVT, Peabody Picture Vocabulary Test.

In the adjusted Cox model limited to the middle age category (17–24 years), maternal cannabis use in 1 year was associated with a 26% greater risk of initiation ($p=0.044$), and maternal cannabis use in multiple years was associated with a 49% greater risk ($p=0.001$). However, after race stratification, the relationship persisted only among black children whose mothers used in multiple years (HR=1.68, $p=0.001$) and NHNB children whose mothers used in 1-year (HR=1.51, $p=0.027$; Table 4).

In the adjusted Cox model limited to the oldest age category (≥ 25 years), maternal cannabis use in 1 year was associated with a 240% greater risk of initiation ($p=0.006$), but maternal cannabis use in multiple years did not show a statistically significant association with initiation during this period. Because of the low number of initiation events among Hispanic children in this time category ($n=2$), estimation of HRs associated with maternal use was not possible; however, maternal cannabis use in 1 year was associated with a sixfold increase in the risk of cannabis initiation among NHNB children (Table 4).

DISCUSSION

These analyses demonstrate an increased likelihood of cannabis initiation among children whose mothers used cannabis during their lifetimes. Children who were exposed to maternal cannabis use were also more likely to initiate cannabis prior to age 17 years, and initiated earlier on average. Effect sizes remained relatively stable following adjustment for social environmental factors.

There was also some evidence that race may have modified the effect of maternal cannabis use on child cannabis initiation, with the strongest and most consistent effects observed among NHNB children. Although the current analyses could not explain this difference, it is an important area for future inquiry, particularly given the major racial inequities in the legal consequences for cannabis use.³⁵

This study is the first of which the authors are aware to demonstrate a relationship between maternal cannabis use during a child's lifetime and earlier cannabis initiation, using a nationally representative longitudinal cohort. Previous analytic techniques have modeled cannabis use as a binary outcome.^{39,44,53,62,63} Some research has investigated the intergenerational transmission of use by modeling parent use as any use during the parent's lifetime.^{39,44} Other research reporting child perceptions of parent use may not accurately reflect actual parent use.^{26,46,53,64} Further, research using community- or school-based samples, which may induce selection bias, may not allow for adequate adjustment for potentially confounding demographic and socioenvironmental variables.^{62,63} This study is strengthened by its use of

Table 3. HR and Median Age at Cannabis Initiation by Race, Gender, and Maternal Cannabis Use

Variables	Boys			Girls		
	HR (95% CI)	p-value	Median age (years) at initiation ^a	HR (95% CI)	p-value	Median age (years) at initiation ^a
Hispanic						
Never	ref		16	ref		17
1 year	1.28 (0.96, 1.71)	0.091	15	1.40 (1.02, 1.93)	0.035	16
Multiple years	1.76 (1.22, 2.52)	0.002	15	1.11 (0.75, 1.65)	0.603	16
Black						
Never	ref		17	ref		Never ^b
1 year	1.19 (0.95, 1.50)	0.131	16	1.40 (1.09, 1.80)	0.008	18
Multiple years	1.27 (1.01, 1.58)	0.037	17	1.63 (1.28, 2.08)	<0.001	18
Non-Hispanic, non-black						
Never	ref		17	ref		20
1 year	1.32 (1.07, 1.65)	0.011	16	1.49 (1.18, 1.87)	0.001	17
Multiple years	1.35 (1.09, 1.66)	0.005	16	1.72 (1.35, 2.18)	<0.001	16

Note: Boldface indicates statistical significance ($p < 0.05$).

^aAge at which survival reaches 0.50 or lower, estimated from adjusted Cox model with interactions between maternal cannabis use and race, maternal cannabis use and gender, and race and gender.

^bSurvival never reaches 0.50 during the study period.

HR, hazard ratio.

survival methods, which enabled analyses that may inform efforts to delay rather than prevent initiation. This is particularly important, given research demonstrating the relative importance of age at initiation on the likelihood of experiencing cannabis-related consequences, and the demonstrated therapeutic benefits of adult cannabis use. The study design further allowed for examination of the roles of race and gender in these relationships, and adjustment for important socioenvironmental factors.

Although the effect of exposure to maternal cannabis use resulted in differences in average ACI of only 1 or 2 years, the health implications may be substantial nonetheless. A recent literature review noted a negative relationship between age of cannabis initiation and severity of, and impairment from, psychotic symptoms.³⁰ Research has also documented poorer cognitive performance among chronic cannabis smokers who initiated before age 16 years compared with those who initiated after 16 years.³¹ A review of cannabis-related admissions to substance use treatment indicated that individuals who initiated prior to age 17 years make up the vast majority of these cases,⁸ and other research has demonstrated an association between initiation prior to 17 years and certain cognitive deficits apparent as early as age 20 years.⁶ Analyses demonstrating lower ACI among children of maternal cannabis users, increased risk of early initiation among children of ever users, and decreased risk of early initiation among never users, suggest that maternal cannabis use during a child's lifetime may have important implications for life course health.

Limitations

Although mothers' cannabis use during children's lifetimes was measured, whether the child was aware of the use could not be determined. The measurement of maternal cannabis use does not measure frequency or severity, but persistence. For example, a mother who used every day for 1 year and quit would be categorized as a 1-year user, whereas a mother who used one time in 2 separate years would be categorized as a multiple-year user. The NLSYCYA only surveyed women and their biological children, and results cannot be generalized to other parents. Because the authors were unwilling to assume cannabis-related survey items were missing at random (a required assumption for multiple imputation), a large proportion of respondents were excluded due to missing data, which may raise concerns about the representativeness of the analytic sample.

CONCLUSIONS

Delaying initiation may be an important means of preventing health consequences associated with cannabis use. Developing a deeper and more nuanced understanding of risk factors for early initiation is a critical step in intervention design and delivery. In a regulatory environment where increasing normalization of adult use is anticipated,⁶⁵ these findings indicate multiple potential pathways for future research and intervention. Incorporating maternal cannabis use into the collective understanding of the important risk factors for early initiation may aid in the identification of at-risk youth for

Table 4. HRs Associated With Maternal Cannabis Use Stratified by Child's Race and Age

Variables	All ages (2,979 initiation events)		6–16 years (1,952 initiation events)		17–24 years (641 initiation events)		25 years (36 initiation events)	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Mother's cannabis use (ref never users)								
All races (crude)								
1 year	1.44 (1.32, 1.58)	<0.001	1.51 (1.35, 1.69)	<0.001	1.28 (1.04, 1.58)	0.021	2.50 (1.21, 5.19)	0.014
Multiple years	1.53 (1.40, 1.67)	<0.001	1.60 (1.44, 1.77)	<0.001	1.45 (1.19, 1.76)	<0.001	0.88 (0.30, 2.57)	0.819
All races (adjusted) ^a								
1 year	1.37 (1.24, 1.51)	<0.001	1.38 (1.22, 1.56)	<0.001	1.26 (1.01, 1.58)	0.044	3.40 (1.43, 8.09)	0.006
Multiple years	1.44 (1.30, 1.59)	<0.001	1.45 (1.28, 1.64)	<0.001	1.49 (1.18, 1.87)	0.001	1.40 (0.42, 4.66)	0.587
Hispanic ^b								
1 year	1.34 (1.09, 1.65)	0.005	1.30 (1.03, 1.65)	0.030	1.43 (0.80, 2.55)	0.225	— ^c	—
Multiple years	1.43 (1.11, 1.84)	0.006	1.41 (1.07, 1.87)	0.016	2.00 (0.95, 4.20)	0.068	— ^c	—
Black ^b								
1 year	1.27 (1.08, 1.50)	0.005	1.41 (1.14, 1.74)	0.002	1.08 (0.77, 1.53)	0.657	2.55 (0.59, 11.07)	0.210
Multiple years	1.40 (1.19, 1.64)	<0.001	1.29 (1.04, 1.59)	0.021	1.68 (1.22, 2.31)	0.001	1.12 (0.18, 7.05)	0.901
Non-Hispanic, non-black ^b								
1 year	1.41 (1.21, 1.65)	<0.001	1.35 (1.12, 1.63)	0.002	1.51 (1.05, 2.16)	0.027	6.00 (1.45, 24.81)	0.014
Multiple years	1.52 (1.30, 1.77)	<0.001	1.64 (1.37, 1.97)	<0.001	1.12 (0.74, 1.68)	0.602	1.70 (0.26, 11.12)	0.577

Note: Boldface indicates statistical significance ($p < 0.05$).

^aAdjusted for child's gender, child's race, adjusted family income quintile, PPVT quintile, BPI quintile, mother's education, mother's age at child's birth, mother's marital status, mothers neighborhood rating, mother's use of illicit drugs other than cannabis, mother's cigarette smoking, and mother's binge drinking.

^bAdjusted for all covariates except child's race.

^cOmitted due to insufficient cell size.

BPI, Behavioral Problems Index; HR, hazard ratio; PPVT, Peabody Picture Vocabulary Test.

more tailored or intensive prevention strategies. But interventions may also be directed toward cannabis-using parents. Research may seek to understand best practices for preventing early initiation among children of cannabis-using parents, which may include either decreasing or pausing use, reducing the visibility of use until children are older, training cannabis-using parents to address the issue of cannabis use with children, or developing and providing tools and resources for effective parenting while using cannabis. To better inform these interventions, further investigation of critical periods for exposure and mechanisms for this effect, and of other factors that exerted an effect on early initiation in this study (i.e., other maternal drug use, family structure) are necessary. In the meantime, pediatricians and adolescent health providers may consider screening for parent cannabis use, and equipping parents with existing evidence-based strategies to manage their own use and delay their child's initiation.

ACKNOWLEDGMENTS

This work was supported by National Institute of Drug Abuse (NIDA) Ruth L. Kirschstein National Research Service Award Individual Predoctoral Fellowship #1F31DA039586-01 and NIDA grant #R03DA038697. The content is solely the responsibility of the authors and does not necessarily reflect the views of NIDA or NIH.

All work was completed in the Department of Social and Behavioral Sciences at the Harvard T.H. Chan School of Public Health.

The authors would like to acknowledge Dr. Stephen Gilman for his valuable feedback on this manuscript.

NS oversaw all aspects of research and writing, and takes full and final responsibility for this manuscript. She prepared, performed, and interpreted all analyses, and conceptualized the research question and design. CO assisted with writing the manuscript, and collaborated on research design. JC guided the analytic approach, and provided critical feedback throughout the writing process. SS provided methodologic feedback and critical feedback on the final manuscript. VR collaborated on the conceptualization of the research question and interpretation of the results, and assisted in the writing of the manuscript. All authors were involved in reviewing and editing the final paper.

Statistical programming support was provided by data science specialist Simo Goshev at the Institute for Quantitative Social Science at Harvard University.

No financial disclosures were reported by the authors of this paper.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.amepre.2018.06.023](https://doi.org/10.1016/j.amepre.2018.06.023).

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