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Prenatal Marijuana Exposure Predicts Marijuana Use in Young Adulthood

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1. Introduction

Data from the U.S. National Survey on Drug Use and Health (NSDUH) show that, among those 18 to 25 years of age, 52% have ever used marijuana, 32% have used marijuana within the past year, and 19% in the past month (SAMHSA, 2013). The use of marijuana peaks in the early 20s, which overlaps with the average age of first birth (23 years) (Martinez et al., 2012). This, together with the recent increase in marijuana use (SAMHSA, 2013), an increase in the strength of marijuana (Mehmedic, 2010), and the legalization of marijuana in several states, makes marijuana use during pregnancy a significant concern. It is not known whether prenatal exposure to marijuana predicts marijuana use among the offspring in young adulthood.

Use of marijuana during pregnancy has been shown to disrupt the endogenous cannabinoid system (ECS) in the developing fetus, which is important in the development of the CNS and is associated with progenitor cell migration and differentiation, neuronal migration, development of axonal pathways, and the creation of functional synapses (Gaffuri et al., 2012; Wu et al., 2011). When an exogenous cannabinoid such as marijuana is consumed, the main psychoactive ingredient, delta-9-tetrahydrocannabinol (THC), enters the mother's bloodstream and crosses the placenta (Sundram, 2006). THC interacts with the cannabinoid receptors in the ECS and affects brain development, putting the offspring at risk for

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problems with emotion regulation, memory, and depression (Jutras-Aswad et al., 2009). The research described in this manuscript addresses whether prenatal marijuana exposure (PME) is associated with increased use of marijuana in the offspring.

There are two birth cohorts with published findings on long-term outcomes of PME: the Maternal Health Practices and Child Development (MHPCD) Study and the Ottawa Prenatal Prospective Study (OPPS). These studies have found that PME predicts deficits in memory and attention, increases in impulsivity and hyperactivity, and symptoms of anxiety and depression in childhood, as well as delinquent behavior in adolescence (Day et al., 2011; Day et al., 1994; Fried et al., 1992; Fried & Watkinson, 1990; Fried & Watkinson, 2001; Goldschmidt et al., 2000; Goldschmidt et al., 2004; Gray et al., 2005; Leech et al., 1999). In addition, findings published from the MHPCD cohort demonstrated that PME significantly predicted early onset of marijuana use, defined as initiation of marijuana in the offspring by age 14, as well as the frequency of marijuana use (Day et al., 2006). In the OPPS study, PME predicted age of initiation of marijuana, but did not predict frequency of marijuana use in offspring between the ages of 16 and 21 years (Porath & Fried, 2005). Additionally, in this report, an interaction was found with gender; males initiated marijuana at a faster rate than females.

Other factors also influence marijuana initiation and use. Environmental and genetic factors, marijuana and other substance use by the mother or father, family conflict, change in maternal marital status, parental supervision and control, and peer marijuana use predict increased substance use, including marijuana use (Agrawal & Lynskey, 2006; Day et al., 2006; Hayatbakhsh et al., 2008; Hayatbakhsh et al., 2009; Perkonigg et al., 2008; Richardson et al., 2013; von Sydow et al., 2002). Characteristics of the individual including psychological status and behavior also play significant roles in the onset of substance use (Hayatbakhsh et al., 2009; Kilpatrick et al., 2000; Perkonigg et al., 2008).

These analyses will explore the effects of PME on marijuana use in young adulthood. This association is important because levels of substance use are highest during young adulthood (Spoth et al., 2009). It is also a time when the offspring are reproducing and are at risk of prenatally exposing another generation to marijuana. We hypothesize that: 1) PME will predict offspring marijuana use in early adulthood; 2) the association between PME and offspring use will remain significant after controlling for other factors that are significantly associated with marijuana use in young adulthood; and 3) the relations between PME and offspring marijuana use will be moderated by gender and race.

2. Method

2.1. Sample description

The data for this study come from the Maternal Health Practices and Child Development (MHPCD) study at the University of Pittsburgh. This is a longitudinal study of the effects of prenatal exposure to marijuana and alcohol on offspring development. Participants were recruited from the prenatal clinic at Magee-Womens Hospital in Pittsburgh, PA. Recruitment took place from 1982–1985. To be eligible, women had to speak English, be at

least 18 years of age, and in their fourth or fifth gestational month. There were 1,360 women who completed the initial interview. The refusal rate was 15%.

After the initial interview, two cohorts were selected. One was composed of women who used marijuana at least two times per month in the first trimester and a random sample of those women who reported they used marijuana less often or none at all. The second was composed of women who drank three or more alcoholic drinks per week in the first trimester and a random sample of those women who drank less than this amount or not at all. Sampling was done with replacement, allowing women to be eligible for both cohorts. Both studies followed the same protocol, which allowed the study cohorts to be combined for analysis. The combined cohort was 829 women, with 48% overlap between the alcohol and marijuana cohorts.

The women enrolled in the MHPCD study were interviewed again in their seventh gestational month. Subsequent assessments of mothers and offspring were conducted at birth, and at 8 and 18 months, 3, 6, 10, 14, 16, and 22 years of age. At each phase of data collection, information was gathered about maternal psychological, social, and environmental factors, demographic status, substance use, and the cognitive, behavioral, psychological, and physical development of the offspring.

The birth cohort consisted of 763 live singleton infants. Loss of participants from the enrolled cohort of 829 women resulted from 8 mothers who refused the delivery assessment, 16 pairs were lost to follow-up, and 21 pairs moved out of the area. Other exclusions included 18 offspring due to early fetal death, 2 offspring due to multiple gestation birth, and one offspring was placed for adoption and could not be followed. Only mother-child pairs who completed the assessment at birth were selected for follow-up.

At the 22-year phase, 608 offspring participated in the assessment, representing 80% of the birth cohort. Of the 155 who did not participate, 30 refused, 3 had been adopted and could not be located, 18 were institutionalized in either jail or a rehabilitation facility, 56 were lost to follow-up, 29 moved out of the area, 11 died, and 8 could not participate due to low cognitive functioning. In addition, 14 offspring had incomplete data and 5 were excluded because they reported that they had not used marijuana but tested positive for the substance on a urine screen. This resulted in a final sample size of 589, representing 77% of the birth cohort. Those who were included in the analysis did not differ from those who were not included in the analysis (n=174) based on first trimester maternal characteristics including age, race, education, marital status, household income, and substance use.

3. Measures

3.1. Demographic Status

Maternal age, education, employment, and income were assessed at each phase. Offspring gender was ascertained by physical exam at birth. Race was self-reported by the offspring during the 22-year assessment.

3.2. Substance Use

The mothers provided information about their marijuana use at each interview. Assessments during pregnancy covered the previous trimester. At follow-up phases, the past year was evaluated. Questions measured usual, maximum, and minimum quantity and frequency of marijuana, hashish, and sinsemilla (Day & Robles, 1989). The quantities of hashish and sinsemilla were converted to account for their higher THC content. One joint of sinsemilla was equal to two joints of marijuana, one joint or bowl of hashish was equal to three joints of marijuana (Gold, 1989; Hawks, 1986). A blunt was coded as four joints. Marijuana use was calculated as average daily joints (ADJ: number of joints/week × 4 weeks/month ÷ 31 days/month). An ADJ of 0.4 is equivalent to using three joints per week and an ADJ of 0.89 is equivalent to using one joint per day. First trimester marijuana use was used in these analyses because the prevalence of marijuana use decreased substantially across pregnancy, from 41% in the first trimester to 18% in the third trimester. For descriptive analyses, use was defined as no use, <3 times per week, and ≥3 times per week. At 22 years, marijuana use among the offspring was measured with the same questions used for the mothers.

Measurement of alcohol use was done with parallel questions as above for marijuana and was defined as the average number of drinks or average daily volume (ADV). Cigarette use was expressed as the number of cigarettes smoked per day. Use of other illicit drugs excluding marijuana, such as amphetamines and barbiturates, was dichotomized as use/no use due to the low frequency of use in this sample.

Covariates were identified from the literature and prior findings of this cohort. We used maternal age, race, years of education, and household income from the first interview. The mothers completed the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), an assessment of depressive symptoms, and the State-Trait Anxiety Inventory (Spielberger, 1970) that assessed anxiety and hostility.

At 22 years, the offspring reported whether their mothers, fathers, or siblings had a history of problems with alcohol or drugs. A dichotomous variable for family history of problematic use was created to represent the presence of problems in first degree relatives. Offspring also provided information about their age, education, occupation, income, and their use of other substances.

Informed consent was obtained from the mothers at each phase of the study and from the women and their offspring at 22 years. This study was approved by the Magee-Womens Hospital Human Subjects Review Board and by the Institutional Review Board of the University of Pittsburgh. A Certificate of Confidentiality was also obtained from the National Institutes of Health to ensure that the data would be protected from legal actions.

4. Analyses

Missing data were filled in using multiple imputations by chained equations (MICE). MICE can perform imputation of continuous, dichotomous, and ordinal variables (Royston & White, 2011). Ten data sets were imputed to ensure that the efficiency of the estimates was

above 95% (Rubin, 1987). Our efficiency, with 16% missing, was 98%. The final analysis was done using the pooled estimates of the imputed datasets.

The distributions of marijuana and alcohol variables were examined. Out of range values for marijuana were set to 10.0 joints per day and the out of range values for alcohol use were set to 8.0 drinks per day.

Descriptive statistics were generated to explore the associations between the variables considered for these analyses. Correlations, chi-squares, and t-tests were used for categorical variables and analysis of variance (ANOVA) was used for continuous variables. For continuous variables that were not normally distributed, we used the Mann-Whitney U test or the Kruskal-Wallis test. Cohen's d and Cramer's V were calculated to assess effect size.

A univariate ordinal logistic regression model was used to evaluate the association between PME and offspring use. Covariates that were significantly associated with the exposure and the outcome at $p<0.05$ were identified and included in the final model. We also hypothesized that the association between PME and offspring use would be moderated by gender and race. An interaction term was created between PME and each moderator. Moderation was tested separately for each term to avoid oversaturation of the final model.

5. Results

5.1 Description of the Study Sample

At the first interview, the women were, on average, 23 years of age (range: 18–42 years). Fifty-one percent of the women were African American, 32% were married (Table 1). The women had completed an average of 11.8 years of education and 25% were in school and/or working outside the home. The sample was low income, with an average family income of $400/month in 1982–1985 dollars. The mothers had average CES-D depression, STPI anxiety, and STPI hostility scores of 20.9, 17.7, and 18.7, respectively. Alcohol use was reported by 64% and the ADV was 0.55. Marijuana use was reported by 41% of the women and the ADJ was 0.37. Fifty-three percent of the women smoked cigarettes, 4% used cocaine, and 9% used other illicit drugs excluding marijuana and cocaine.

Mothers who used marijuana heavily during the first trimester were more likely to be African American, unmarried, not working or in school, and to have a lower monthly household income compared to light/moderate users and non-users (Table 2). They had higher levels of alcohol, tobacco, and other illicit substance use compared to light/moderate users and non-users. There were no significant differences by age at the first trimester visit, years of education completed, depression, anxiety, or hostility scores, or average cigarettes smoked per day.

At birth, 47% of the offspring were males (Table 1). The average gestational length was 40 weeks and 8% of the infants were preterm (<37 weeks). The average birth weight was 3.20 kg and 10% were low birth weight (<2500g). None of these characteristics differed by levels of first trimester marijuana exposure (Table 2).

At the 22-year assessment, the offspring were an average of 22.8 years old (range 21–26) and 56% were African American (Table 1). The average number of years of education was 12.8 although only 86% had completed high school. Sixty-one percent were working and/or in school and had a mean monthly personal income of $969. Thirty-five percent were living with their mother or caregiver. Only 6% of the offspring were married and 36% had at least one child. Over 80% of the offspring had initiated cigarette and marijuana use and 99% had used alcohol. In the past year, 43% percent of the offspring smoked tobacco cigarettes, 50% used marijuana, 92% drank alcohol, 6.6% used cocaine, and 14% used other illicit drugs excluding marijuana and cocaine. Forty-seven percent of the offspring reported that a first degree relative had problems with alcohol or drugs.

At the 22-year assessment, offspring with PME were younger and more likely to be African American than those without PME (Table 2). There were no significant differences by level of PME in years of education, personal income, percent working or in school, marital status, living with a mother or caregiver, or having at least one child. There were also no significant differences by level of PME in family history of drug or alcohol problems, initiation or past-year use of cigarettes, alcohol, cocaine, or other illicit drugs.

5.2. Subject Characteristics by Level of PME

Offspring across all levels of PME had a higher percentage of marijuana initiation and a higher frequency of marijuana use compared to those without PME (Table 2). There was a significant difference in the unadjusted relationship between PME and offspring frequency of marijuana use (Table 3, p=0.001). Further, those in the highest level of PME were also the most likely to use marijuana more heavily.

5.3. Regression Analyses

Model 1 tested the crude association between PME and offspring marijuana use (Table 4). This association was significant (p = 0.003; OR = 1.28 (95% CI: 1.09–1.51)): For each joint/day increase in PME, the odds of the offspring being in a higher category of marijuana use increased by 1.28.

In Model 2 (Table 4), PME remained a significant predictor of offspring marijuana use (p = 0.019; OR = 1.22 (95% CI: 1.02–1.44), controlling for first trimester alcohol exposure and offspring race, gender, and age at the 22-year assessment. Adjusting for these covariates, a one unit increase in PME increased the odds of being in a higher category of use by 1.22.

The last aim of this paper was to evaluate whether gender and race moderated the association between PME and offspring use at 22 years (Table 5). Neither gender nor race was a significant moderator of the association between PME and offspring frequency of marijuana use at 22 years.

6. Discussion

The aim of this study was to evaluate whether PME was a significant predictor of offspring marijuana use in young adulthood. We found that the association between PME and offspring marijuana use in young adulthood was significant after controlling for prenatal

alcohol exposure, offspring race, gender, and age, the significant covariates identified in initial analyses. Family history of substance use problems was not a significant predictor of marijuana use in young adulthood. This may reflect the fact that marijuana use is a common behavior and/or that the effects of genetic factors vary by the stage the subject is in in the progression from use to abuse (Agrawal & Lynskey, 2006). Studies that have found significant family associations were largely done on subjects with abuse or Cannabis Use Disorder.

These findings build on prior reports from this study. When the offspring were 14 years old, PME was a significant predictor of use and early onset of use after adjusting for covariates (Day et al., 2006). At 22 years, even given the increased prevalence of use, PME continues to predict use. The consistency of this association may be evidence of a biological change in those with PME. This, however, awaits further research on the direct effects of PME on the brain.

Further, we determined that gender and race did not moderate the association between PME and offspring marijuana use at 22 years. Porath and Fried (2005) reported that gender modified the association between PME and offspring frequency of marijuana use in the OPPS sample. The difference in findings between studies may be due to the difference in cohort characteristics or the broader age span in the OPPS analysis. We also found that, although marijuana use was more common among African American mothers, race did not moderate the association between PME and offspring frequency of marijuana use.

This study has several strengths. The study had a large sample size of 589 mother-child pairs and excellent follow-up rates: 77% of the birth cohort was included in this analysis. Second, this study recruited approximately equal numbers of African American and Caucasian women, allowing for an analysis of a racially balanced sample. Third, the data for this study were obtained prospectively, which minimizes recall bias.

There are also some limitations to these analyses. This sample is composed of low income women, and the results may not be generalizable to women in higher socioeconomic groups. Further, the results do not control for other factors associated with substance use such as genetics or exposure to violence. Additionally, maternal marijuana use during pregnancy was ascertained by self-report. However, a bogus pipeline procedure was used to encourage accurate reporting from mothers at the first prenatal visit, and a urine screen was part of the study protocol for the offspring at the 22-year visit. Among offspring who reported they did not use marijuana, only 2% screened positive. Among those who reported that they used marijuana in the past year, 64% had positive results on the urine screen. Further, among those who screened positive, 97% reported use. While the results of the urine screen only reflect recent marijuana use, they do suggest that participants are being honest about their use. Further, the staff members who interviewed the participants were comfortable asking questions about the sensitive topics (e.g., substance use, psychosocial factors) and followed an established protocol for the sequence of questioning. In addition, a National Institutes of Health Certificate of Confidentiality was obtained for this study because of the sensitive nature of topics discussed. This Certificate offers protection from the release of identifying

information when requested through court order or subpoena and provided research participants a sense of confidentiality and safety.

7. Conclusions

PME predicted offspring marijuana use in young adulthood, controlling for other significant covariates. As the rate of marijuana use increases and as marijuana is legalized in more states, prenatal exposure to marijuana will become an increasing problem. These and other findings on the effects of PME suggest that women who are about to become pregnant or those who are pregnant should be cautioned about use of marijuana during pregnancy.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- The effect of prenatal marijuana exposure (PME) on marijuana use in young adulthood is not known.
- Offspring and their mothers were followed from the fourth gestational month through 22 years.
- PME predicted marijuana use in the offspring at 22 years controlling for covariates.
- PME is associated with subsequent marijuana use in young adulthood, which has important implications for public health given the recent trend toward legitimization of marijuana use.

Table 1

Sample Characteristics

	N=589 Mean (SD) or Percent
Maternal Characteristics at the First Trimester Visit	
Age (years)	23 (4.0)
Race (% African American)	51%
Marital status (% married)	32%
Education (years)	11.8 (1.4)
Employment status (% in school and/or working outside the home)	25.5%
Household income (average)	$400 (61.4)
Depression (mean CES-D score)	20.9 (8.6)
Anxiety (mean STPI score)	17.7 (4.7)
Hostility (mean STPI score)	18.7 (5.8)
Any alcohol use (%)	64%
Average daily volume of alcohol	0.55 (1.1)
Any marijuana use (%)	41%
Average daily joints of marijuana	0.37 (0.9)
Any cigarette use (%)	53%
Average daily cigarettes	8.2 (11.4)
Any cocaine use (%)	3.7%
Any other illicit drug use (%)	8.8%
Offspring Characteristics at Birth	
Gender (% male)	47%
Gestational age (mean weeks)	39.8 (2.2)
Preterm birth (% <37 weeks)	8%
Birth weight (mean kg)	3.2 (0.6)
Low birth weight (%<2500g)	10%
Offspring Characteristics at 22 Years	
Age (years)	22.8 (0.7)
Race (% African American)	56%
Education (mean years)	12.8 (1.6)
Completed high school (%)	86%
Work status (% working and/or in school)	61%
Personal income (mean US$/month)	969.46 (861.1)
Lives with mother or caregiver (%)	35%
Marital status (% married)	6%
Has at least one child (%)	36%
Initiated cigarettes (%)	82%
Initiated marijuana (%)	83%

	N=589 Mean (SD) or Percent
Initiated alcohol (%)	99%
Past-year cigarette smoker (%)	43%
Past-year marijuana user (%)	50%
Past-year alcohol user (%)	92%
Any cocaine use in past year (%)	6.6%
Any other illicit drug use in past year (%)	13.7%
Family history of alcohol or drug problems (%)	47%

Table 2

Sample Characteristics by Level of First Trimester Marijuana Use

	Maternal Marijuana Use				
	No use[a] (n=347)	Light to moderate use[b] (n=165)	Heavy use[c] (n=77)	p-value[d]	Effect size[e]
Maternal Characteristics at the First Trimester Visit					
Age (mean years)	23.3	22.6	22.8	0.16	0.006
Race (% African American)	45.5	52.7	75.3	<0.001	0.196
Education (mean years)	11.8	11.8	11.7	0.760	0.001
Marital status (% married)	37.5	27.3	18.2	0.001	0.150
Employment status (% in school or working outside the home)	25.4	30.9	14.3	0.022	0.114
Household income (%<US$400/month)	57.1	64.6	73.3	0.020	0.117
Depression (mean CES-D score)	20.8	21.1	21.3	0.894	<0.001
Anxiety (mean STPI score)	17.6	17.9	18.0	0.627	0.002
Hostility (mean STPI score)	18.3	19.1	19.8	0.063	0.009
Any alcohol use (%)	55.3	78.2	74.0	<0.001	0.222
Average daily volume of alcohol	0.40	0.75	0.78	<0.001	0.027
Any cigarette use (%)	47.3	60.0	64.9	0.002	0.144
Average daily cigarettes	7.7	8.6	9.4	0.410	0.003
Any cocaine use (%)	1.7	5.4	9.1	0.003	0.139
Any other drug use (%)	6.9	9.7	15.6	0.047	0.102
Offspring Characteristics at Birth					
Gender (% male)	47.8	47.3	44.2	0.842	0.024
Gestational age (mean weeks)	39.7	39.9	39.8	0.460	0.003
Preterm birth (% <37 weeks)	8.4	8.5	6.5	0.849	0.024
Birth weight (mean kg)	3.2	3.2	3.1	0.172	0.006
Low birth weight (%<2500g)	9.5	10.9	10.4	0.880	0.021
Offspring Characteristics at 22 Years					
Age (mean years)	22.9.8	22.8	22.7.0	0.020	0.013
Race (% African American)	51.6	55.1	79.2	<0.001	0.183

	Maternal Marijuana Use				
	No use[a] (n=347)	**Light to moderate use[b] (n=165)**	**Heavy use[c] (n=77)**	**p-value[d]**	**Effect size[e]**
Education (mean years)	12.8	12.9	12.4	0.056	0.010
Personal income (mean US$/month)	1006	969	800	0.308	0.006
Work status (% working or in school)	61.9	63.6	51.9	0.195	0.075
Marital status (% married)	5.5	7.9	3.9	0.403	0.056
Lives with mother or caregiver (%)	37.2	30.3	33.8	0.306	0.063
Has at least one child (%)	36.0	34.6	45.4	0.231	0.071
Family history of alcohol or drug problems (%)	45.4	46.3	54.6	0.341	0.061
Initiated cigarettes (%)	80.4	83.0	84.4	0.618	0.040
Past-year cigarette use (%)	41.2	43.6	53.2	0.156	0.080
Average daily cigarettes	4.0	4.6	5.5	0.138	0.005
Initiated alcohol (%)	98.8	100.0	98.7	0.372	0.058
Past-year alcohol use (%)	92.2	93.3	92.2	0.898	0.019
Average daily volume of alcohol	1.5	1.8	1.6	0.124	0.005
Initiated marijuana (%)	79.2	87.3	90.9	0.011	0.124
Past-year marijuana use (%)	44.1	56.9	62.3	0.002	0.147
Average daily joints of marijuana	0.70	0.67	1.70	<0.001	0.028
Past-year cocaine use (%)	5.5	7.9	9.1	0.383	0.057
Past-year other illicit drug use (%)	12.1	14.6	19.5	0.222	0.072

[a] Zero joints per day

[b] Less than one joint per day

[c] One or more joints per day

[d] ANOVA for continuous variables, Kruskal-Wallis test for skewed variables, χ^2 test for dichotomous variables

[e] Eta^2 for continuous variables, Cramer's V for dichotomous variables; absolute value reported

Table 3

First Trimester Marijuana Exposure by Frequency of Offspring Marijuana Use at 22 Years.

	Offspring Frequency of Marijuana Use				
First Trimester Maternal Marijuana Use	**No Use (n=294)**	**Using less than three times per week (n=173)**	**Using three times per week or more (n=122)**	**p-value[d]**	**Effect size[e]**
None[a] (n, %)	194 (66)	99 (57)	54 (44)		
Light to moderate[b] (n, %)	71 (24)	50 (29)	44 (36)	0.001	0.123
Heavy[c] (n, %)	29 (10)	24 (14)	24 (20)		

[a] Zero joints per day

[b] Less than one joint per day

[c] One or more joints per day

[d] χ^2 test

[e] Cramer's V

Table 4

Ordinal Logistic Regression Models Evaluating the Association between Prenatal Marijuana Exposure and Frequency of Offspring Marijuana Use.

	Model 1 (McFadden's R^2=0.007)			Model 2 (McFadden's R^2=0.033)		
Variable	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**
Prenatal marijuana exposure	0.003	1.28	1.09–1.51	0.019	1.22	1.03–1.44
Prenatal alcohol exposure				0.010	1.19	1.04–1.36
Offspring race				0.013	0.66	0.48–0.92
Offspring gender				0.000	1.91	1.39–2.62
Offspring age at assessment				0.030	0.77	0.61–0.97

Table 5

Ordinal Logistic Regression Models Testing Moderation of Prenatal Marijuana Exposure and Frequency of Offspring Marijuana Use.

	Model 3 (McFadden's R^2=0.035)			Model 4 (McFadden's R^2=0.033)		
Variable	**p-value**	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**
Prenatal marijuana exposure	0.364	1.10	0.89–1.37	0.067	1.19	0.99–1.42
Prenatal alcohol exposure	0.009	1.20	1.05–1.37	0.011	1.19	1.04–1.36
Offspring race	0.014	0.67	0.48–0.92	0.009	0.63	0.45–0.89
Offspring gender	0.002	1.73	1.23–2.43	0.000	1.91	1.39–2.62
Offspring age at assessment	0.027	0.77	0.61–0.97	0.033	0.78	0.61–0.98
PME × gender	0.144	1.30	0.91–1.85			
PME × race				0.446	1.18	0.77–1.82