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Predictors of Substance Use Latent Classes Among American Indian Youth Attending Schools On or Near Reservations

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Abstract

Background and Objectives: Identical latent classes of substance use for 7 to 8 grade and 9 to 12 grade American Indian (AI) youth living on or near reservations suggest that patterns of substance use are established early among these youth. This study examines relationships of substance-related factors to latent class membership and whether these relationships differ by grade group.

Methods: In-school surveys were administered to 1503 7 to 8 grade and 1995 9 to 12 grade students from 46 schools on or near reservations during the 2009/2010 to 2012/2013 school years. Four-class latent class models of substance use were specified and five classes of substance-related factors (peers, substance availability, perceived harm, family, early initiation), plus grade level and gender, were evaluated as predictors.

Results: For 7 to 8 grade students, substance-related factors differentiated nonusers from users, while for 9 to 12 graders, these factors also differentiated types of users. Early initiation and peer factors were strongly related to class membership, while other factors were less strongly related.

Discussion and Conclusions: Early initiation of alcohol or marijuana is strongly related to being in a substance-using class for AI youth. Because these youth tend to initiate use earlier than other US youth, prevention resources should be targeted to reaching them and their families before age 12.

Scientific Significance: Predictors of latent classes of substance use were identified for reservation-based AI youth. While the classes were identical for 7 to 8 grade and 9 to 12 grade youth, predictors varied across grade group, which may inform how best to develop prevention efforts unique to middle and high school AI youth.

INTRODUCTION

Multiple Substance Use and Its Outcomes

Studies of adolescent substance use typically focus on individual substances. But adolescents do not limit use to a single substance, and may experiment or consistently use multiple substances.^{1,2} Numerous negative outcomes are associated with concurrent use of

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

multiple substances including high school noncompletion,³ depression,⁴ and cognitive impairments.⁵

Latent Class Analysis and American Indian Substance Use

Latent class analysis (LCA), as applied to substance use, identifies homogenous groups who report similar responses to substance use items and use (or do not use) in similar ways. This method, applied to adolescents, typically finds three to four classes including nonusers, variations on alcohol and marijuana classes, and polysubstance classes.⁶

American Indian (AI) adolescent substance use exceeds other ethnic/racial groups of US adolescents.^{7,8} Kulis et al⁹ and Stanley and Swaim¹⁰ examined latent classes of current use among urban and reservation AI adolescents, respectively. Kulis et al⁹ identified four classes among 8th, 10th, and 12th-graders: (1) nonusers, (2) alcohol, tobacco, and/or marijuana users, (3) not alcohol (tobacco + marijuana, little alcohol use, higher rates of prescription, OTC, inhalants, and other illicit drug use compared to class 2), and (4) polysubstance users (highest rates of all types of substances). Stanley and Swaim¹⁰ identified four identical classes across middle and high school reservation-based AI students: (1) nonusers, (2) marijuana and cigarette users, (3) alcohol, marijuana, and cigarette users, and (4) polysubstance users. Similarity between older and younger reservation AI students raises concerns that patterns of substance use are established early. However, it is not known whether similar factors predict class membership across age group. For AI youth, substance use begins earlier than for non-Indian youth.¹¹ Furthermore, early initiation has serious consequences. In a longitudinal study of AI youth spanning ages 11 to 20, early use of alcohol was a strong predictor of an alcohol use disorder.¹² Given the similarity in latent class structure for these two age groups of AI youth, we examine whether substance-related factors (peer influences, perceived availability, perceived harm, family attitudes toward and communication about substance use, and early initiation) differentially predict class membership for middle versus high school students.

Substance-Related Latent Class Predictors

Multiple studies indicate that adolescent substance use is multidetermined, cutting across several dimensions of predictive factors.¹³ Some risk and protective factors are more distal and not substance-related, for example, general family communication, while other factors are substance-related and hence more proximal, for example, family communication about substance use. This study focuses on more proximal, substance-related factors where potential predictors come from our previous research with AI youth,^{11,14,15} and closely resemble variables found by others to predict use among AI youth.¹⁶ These variables are not unique to this group, but relationships to substance use may vary across AI and other cultural groups. While this list of predictors is not exhaustive, it covers a broad range of dimensions (individual, social, and community).

Peer Influences—Peers exert influence, increasing or decreasing risk for substance use, in various ways including using substances and encouraging or discouraging use. Among AI youth, Greenfield et al¹⁷ found that indigenous youth were at increased risk for conduct or

alcohol use disorder if they had peers who engaged in deviant behaviors, including substance use.

Perceived Availability—Generally, availability increases risk for use on reservations,¹⁸ but limited availability, such as lower access to alcohol on dry reservations, may increase risk for frequent and heavy drinking.¹⁹

Perceived Harm—There is a persistent inverse relationship between perceived harm and substance use among adolescents in general²⁰ and for AI youth.¹⁴

Family Influences—Family disapproval of substance use directly reduces risk for alcohol and marijuana use.¹⁴ Among urban AI youth, higher levels of perceived family norms against alcohol use protect against use during middle school²¹ while more permissive norms regarding tobacco use increases risk for smoking.²² Research also supports the protective effects of parents communicating clearly their disapproval of substance use.²³

Early Initiation—Early use of marijuana relates to earlier onset of alcohol use, heavy drinking, and heavy cannabis use,²⁴ while early use of alcohol predicts escalating alcohol use through adolescence²⁵ and more cigarette and marijuana use.²⁶ AI youth are at an elevated risk for early initiation of substance use,^{11,27} but relationships between early initiation and latent classes are unknown.

Grade Level

Youth alter their appraisal of substance use with increasing exposure,²⁸ and risk factors may change in their predictive ability across this developmental period. Among reservation-dwelling AI adolescents, similar classes of substance-using groups were identified across age groups.¹⁰ What remains unknown is whether, across middle and high school, latent classes are differentially associated with these predictors.

METHODS

Data are from an investigation of substance use among AI youth attending schools on or near reservations. Procedures for recruiting schools and administering surveys can be found in Stanley and Swaim.¹⁰

Participants

Data were from 46 middle and high schools across the United States that participated during the 2009 to 2013 school years. Students in grades 7 to 12, self-identifying as AI, were included and divided into two grade groups: 7 to 8 grades (1503 students) and 9 to 12 grades (1995 students).

Measures

Students completed the American Drug & Alcohol Survey, which demonstrates reliability and validity with minority and nonminority youth.²⁹ Multiitem scales were summed and divided by number of items.

Peer Use—The alcohol-related peer scale included three items (“How often have your friends asked you to get drunk?”; “How many of your friends get drunk ... once in a while, almost every weekend?”; Cronbach’s $\alpha = 0.77$). The marijuana-related peer scale included two items (“How many of your friends use marijuana?”; “How often have your friends asked you to use marijuana?”; $\alpha = 0.76$). Items were measured on a four-point scale.

Substance Availability—Perceived availability of cigarettes, alcohol, and marijuana were each measured with one item: how easy do you think it would be for you to get (cigarettes, alcohol, and marijuana) if you wanted some? (1 = probably impossible; 5 = very easy). Perceived availability of other drugs was measured by the average response for nine different substances ($\alpha = 0.96$).

Perceived Harm—Perceived harm of alcohol and marijuana were measured with two items each: how much do you think people harm themselves if they ... use alcohol regularly, get drunk regularly? (1 = no harm; 4 = a lot of harm; $\alpha = 0.74$) and, for marijuana, use marijuana 1 to 2 times, use marijuana regularly? ($\alpha = 0.88$). The item measuring perceived harm of using alcohol 1 to 2 times had little variation so was excluded, thus setting a higher bar for perceived harm of alcohol than for marijuana to better differentiate classes.

Family Measures—Four items comprised family attitudes toward substance use: how much would your family care if you ... drank alcohol, got drunk, used marijuana, used other drugs? ($\alpha = 0.93$). Family communication about substance use was measured with five items: how much has your family talked to you about the dangers of ... smoking cigarettes, drinking alcohol, getting drunk, using marijuana, using other drugs? ($\alpha = 0.95$), with responses ranging from not at all (1) to a lot (4).

Early Initiation—Early alcohol intoxication and early marijuana use were assessed by asking age of first getting drunk and age of first using marijuana. Intoxication was used as age of first alcohol use was not asked. Early initiators were age 12 or younger and coded as 1 (otherwise = 0).

Data Analysis

Four latent classes of current substance use were identified for each grade group as reported in Stanley and Swaim¹⁰: nonusers (NU); alcohol, marijuana and cigarettes (AMjC) users; marijuana and cigarettes (MjC) users; and polysubstance users (Poly). Polysubstance use was defined as multiple use that included one other substance in addition to alcohol, marijuana, and cigarettes. For each grade group, a four-class model was specified, and covariates described above, along with grade and sex (female as the referent), were included as auxiliary variables (predictors of latent class status). All covariates were included simultaneously, controlling for relationships of all other covariates. Analyses were completed using Mplus (Version 8.0).³⁰ A 3-step approach³¹ was used to estimate relationships between latent class status and the predictors as this approach outperforms the pseudo class approach.³²

Odds ratios (OR) and 95% confidence intervals (CI) are presented by grade group for three sets of models. The first set of models compares three classes of users (MjC, AMjC, and

Poly) to nonusers. The second set of models compares two user groups—AMjC and Poly—to MjC; the third model compares AMjC to Poly.

Missing Data Procedures

Missing data were handled using multiple imputation with 10 imputations, analyzed within Mplus and combined as described by Rubin.³³

RESULTS

Table 1 presents means and standard deviations for predictor variables by grade group. Rates of early initiation were higher for 7 to 8 grade students (herein 7 to 8 students) compared to 9 to 12 grade students (herein 9-12 students), likely due to the high dropout rate among AI youth³⁴ where dropouts are more likely to use more heavily and be early initiators. Tables 2 and 3 present OR for predictors by age group. Because the tables report results for identical sets of variables, we describe them by variable.

Results for Grade in School and Sex

Grade differentiated class membership for 7 to 8 students in comparing nonusers to AMjC users where a grade increase was associated with increased odds of membership in the AMjC group ($OR_{7-8} = 2.0$ [95% CI, 1.2–3.4]). In addition, females were less likely than males to be classified into AMjC, compared to nonusers ($OR = 0.5$ [95% CI, 0.2–0.96]).

Peer Factors

For 7 to 8 students, peer alcohol use related positively to membership in each of the three user classes compared to the nonuser class, with the largest OR for the Poly class ($OR = 5.7$ [95% CI, 2.4–13.6]). In addition, peer alcohol use predicted being in the Poly class as compared to the MjC class ($OR = 2.6$ [95% CI, 1.3–5.3]). For 9 to 12 students, peer alcohol use predicted classification in the AMjC class ($OR = 3.4$ [95% CI, 2.4–4.9]) and the Poly class ($OR = 6.1$ [95% CI, 3.0–12.4]) as compared to nonusers but not the MjC class. In addition, peer alcohol use positively predicted being in the AMjC class ($OR = 3.1$ [95% CI, 2.2–4.2]) and the Poly class ($OR = 5.5$ [95% CI, 3.2–9.6]) as compared to the MjC class. For both grade groups, peer marijuana use positively predicted being in each user class, excepting 7 to 8 students in the AMjC class. The highest ORs were found for the Poly class ($OR_{7-8} = 3.7$ [95% CI, 1.9–7.3]; $OR_{9-12} = 8.2$ [95% CI, 3.3–20.5]) compared to nonusers. In addition, for 9 to 12 students, this predictor was associated with a lower likelihood of being in the AMjC class as compared to the MjC class ($OR = 0.4$ [95% CI, 0.3–0.7]) and with a greater likelihood of being in the Poly class as compared to the AMjC class ($OR = 4.9$ [95% CI, 1.9–12.9]).

Perceived Availability

For 7 to 8 students, greater perceived availability of cigarettes increased risk for classification in the MjC class ($OR = 1.6$ [95% CI, 1.2–2.3]) compared to the nonuser class while greater other drug availability predicted lower likelihood for being in the AMjC class as compared to the nonuser class ($OR = 0.6$ [95% CI, 0.5–0.9]). For this grade group, perceived marijuana availability and perceived alcohol availability were not predictive.

Perceived availability was more predictive for 9 to 12 students. Greater perceived alcohol availability increased likelihood for classification in the AMjC class compared to the nonuser class (OR = 1.8 [95% CI, 1.4–2.2]) and compared to the MjC class (OR = 1.8 [95% CI, 1.3–2.5]). Perceived cigarette availability increased likelihood for classification in the MjC class as compared to the nonuser class (OR = 1.5 [95% CI, 1.2–2.0]) and decreased likelihood of classification in the MjC class as compared to the AMjC class (OR = 0.7 [95% CI, 0.5–0.9]). Finally, other drug availability decreased the likelihood of classification in the MjC class (OR = 0.8 [95% CI, 0.7–0.9]) and in the AMjC class (OR = 0.7 [95% CI, 0.5–0.9]), as compared to nonusers.

Perceived Harm

For 7 to 8 students, increased perceived harm from alcohol use reduced likelihood for classification in the user groups, compared to nonusers, but did not significantly predict classification for one user group compared to another. Similarly, for 9 to 12 students, increased perceived harm from alcohol use decreased likelihood of classification in user groups as compared to the nonuser group, but also decreased likelihood of classification into the Poly class compared to the MjC class (OR = 0.4 [95% CI, 0.3–0.6]) and the AMjC class (OR = 0.4 [95% CI, 0.3–0.7]). Perceived harm of marijuana use was negatively related to classification in the MjC class for both grade groups, in addition to being negatively related to classification in the AMjC class compared to the nonuser class for 9 to 12 students.

Family

Negative family attitudes toward substance use was not predictive among 7 to 8 students with the exception of making membership in the AMjC class less likely compared to nonusers. Conversely, negative family attitudes reduced the likelihood of being in any 9 to 12 user class, but it was not related to classification into one user group compared to another. Family communication about substance use was not significantly related to latent class membership in either grade group.

Early Initiation

Early initiation of alcohol intoxication raised the likelihood of classification in the AMjC class (OR_{7–8} = 3.6 [95% CI, 1.1–11.6]; OR_{9–12} = 6.1 [95% CI, 2.9–12.6]) and the Poly class (OR_{7–8} = 14.1 [95% CI, 3.5–56.8]; OR_{9–12} = 5.6 [95% CI, 2.1–14.4]), and the MjC class for 9 to 12 students. In addition, early marijuana use raised the likelihood of classification in one of the user groups compared to the nonuser group for both grade groups, with especially high odds ratios for membership in the Poly class (OR_{7–8} = 12.1 [95% CI, 2.8–53.0]; OR_{9–12} = 14.3 [95% CI, 5.8–34.4]). For 7 to 8 students, it was not related to being classified into one user group versus another, but that was not the case for 9 to 12 students, where early marijuana use decreased the likelihood of being in the AMjC class compared to the MjC class (OR = 0.5 [95% CI, 0.3–0.9]) and increased the likelihood of being in the Poly class compared to the MjC class (OR = 3.2 [95% CI, 1.4–7.3]) and the AMjC class (OR = 5.9 [95% CI, 2.3–15.0]).

DISCUSSION

Discussion of Study Findings

This study explored relationships between potential substance use predictors and latent substance use classes for two grade groups of AI adolescents attending schools on or near reservations. For 7 to 8 students, predictors generally did not relate to membership in one user group vs another, but instead differentiated nonusers from users. Among 9 to 12 students, predictors differentiated nonusers from users and one user class from another.

Early intoxication and early marijuana use consistently and strongly predicted latent class membership for both grade groups. In particular, early intoxication predicted membership in classes including alcohol (Poly and AMjC), with especially large relationships found for the polysubstance group compared to the nonuser group. Early marijuana initiation also showed significant relationships to class membership with more relationships for 9 to 12 students. For 7 to 8 students, early marijuana initiation distinguished each user group from nonusers, with the greatest relationships for MjC users and polysubstance users. That was also true for 9 to 12 students, in addition to early marijuana initiation having a large, positive relationship to membership in the polysubstance group compared to other user groups and having a positive relationship to membership in the MjC class compared to the AMjC class. Related to this finding, the MjC class had a higher percentage of more frequent users (three times or more in the last month) as compared to the AMjC class. Thus, individuals with early initiation of marijuana, but not of alcohol, may be at greater risk of using marijuana more often by 9 to 12 grades but may be less likely to use alcohol.

Early initiation is predictive of negative outcomes³⁵ perhaps in part, due to early initiators being more likely to be polysubstance users, which is also linked to negative outcomes. AI youth report earlier onset of drinking, intoxication, and marijuana use compared to other groups of youth,¹¹ thus increasing the risk of polysubstance use and subsequent negative outcomes.

Peer substance use factors related significantly to latent class membership although differentially between alcohol and marijuana. For marijuana, higher peer marijuana use increased likelihood of being in any user group compared to the nonuser group while higher peer alcohol use increased likelihood of membership in classes that included alcohol use (AMjC and Poly). This is consistent with the latent class structure where all user groups included marijuana, but only two included alcohol. This suggests that peer influence is not generalized to any substance use, but is substance-specific. Among 9 to 12 students, higher peer marijuana use increased likelihood of membership in the MjC class compared to the AMjC class.

While adolescents view various illicit substances as differentially harmful, relationships are consistently reported between levels of perceived harm and levels of use.³⁶ Our results indicate that perceived harm relates also to type of use. In general, perceived harm had more significant relationships to class membership for 9 to 12 students, and perceived harm of alcohol had more significant relationships to class membership than perceived harm of

marijuana. Marijuana is viewed by many reservation youth as normative and less dangerous than alcohol.¹⁵

The failure of negative family attitudes toward substance use to predict class membership among 7 to 8 students was surprising. Generally, parental antisubstance use norms enhance youths' antisubstance norms and decrease use.¹⁴ However, during middle school, family influences are waning and peer influences are waxing.

Family communication about the dangers of substance use did not predict any latent class membership. Substance-specific communication between parents and youth has been found to increase adoption of antisubstance norms and less use among youth.³⁷ However, among a national sample of AI youth, it was found that when other family factors were controlled, family communication failed to predict marijuana use.¹⁴ Others found that AI parents can be more responsible for providing support and encouragement, while extended families assume the role of discipline, such as communicating dangers of substance use.³⁸ We asked specifically about parent communication, which may have obscured effects due to extended family communications.

Though there were several significant relationships between availability and class membership, availability was not generally a strong predictor, especially for 7 to 8 students. Availability is not necessarily unimportant in predicting adolescent substance use but other variables, especially peer use, may be accounting for shared variance. To explore this, we removed peer factors and found several changes in significance levels for availability factors (with few other changes in the models). Marijuana availability became a significant predictor of membership in the 9 to 12 MjC and Poly classes and the 7 to 8 AMjC class compared to the nonuser classes while other drug availability became a significant negative predictor of membership in the 7 to 8 MjC class compared to the nonuser class. However, availability was still not a strong predictor compared to other variables, especially for 7 to 8 students.

Finally, sex and grade were generally unrelated to class membership, the only exceptions being that 7 to 8 grade females were more likely than males to be in the AMjC class compared to nonusers as were 8th graders as compared to 7th graders. The gender results are consistent with Kulis et al⁹ who found the distribution of urban AI adolescents across latent classes did not vary by gender. In addition, a systematic review by Tomczyk et al¹ found that gender was not clearly linked to polysubstance use, and in most studies reviewed, was not linked to membership in other user groups.

Results indicated that early initiation was a strong predictor of class membership; however, some variables that are predicted by early initiation (eg, peer use) may be less predictive of class membership if early initiation is accounting for shared variance. To explore this, we analyzed class membership without early initiation and found few substantive changes to odds ratios or significance levels. For 9 to 12 students, there were no changes in significance levels for perceived harm, perceived availability, or peer factors. However, family attitudes toward substance use became a significant predictor of membership in the Poly class compared to the MjC and AMjC classes. For 7 to 8 students, substantive changes were for

comparing nonusers to polysubstance users, where perceived harm of marijuana and family communication became significantly related to polysubstance use. These results indicate that early initiation is a robust predictor of membership and a key target for prevention efforts.

Study Limitations

Because the data were cross-sectional, causality from predictors to latent class membership cannot be inferred. Also, because the primary sampling unit was the school, adolescents who dropped out of school were not available to complete the survey. This should not affect 7 to 8 findings, but for 9 to 12, inclusion of dropouts would likely reduce the nonuser class size and change relationship strengths because students dropping out are likely to use substances at higher levels and have early initiation.³⁴ With respect to measures, several predictor variables were one-item measures (eg, availability). However, one-item measures can be reliable where a holistic impression is informative.

CONCLUSIONS

These results have important implications for targeting prevention for AI youth. Early initiation of alcohol and marijuana were strongly related to class membership, especially polysubstance use. Because AI youth are especially at risk of early initiation, prevention resources should be targeted to reaching AI youth and their families before age 12. Although peer substance use factors also related significantly to class membership, this represents a difficult target for prevention efforts, as peer networks and associated substance use are already established by middle school.

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TABLE 1.

Means and standard deviations for predictor variables

Predictors	7–8 grades	9–12 grades
Peer factors ^a		
Peer alcohol factors	2.0 (0.8)	2.3 (0.08)
Peer marijuana factors	2.4 (1.0)	2.6 (0.9)
Availability factors ^b		
Alcohol availability	3.2 (1.6)	3.9 (1.3)
Marijuana availability	3.4 (1.6)	4.0 (1.4)
Cigarette availability	3.5 (1.7)	4.1 (1.4)
Other drug availability	1.9 (1.2)	2.3 (1.2)
Perceived harm factors ^a		
Perceived harm alcohol	3.0 (0.9)	3.3 (0.7)
Perceived harm marijuana	2.7 (1.3)	2.4 (1.2)
Family factors ^a		
Attitude toward substance use	3.5 (0.9)	3.6 (0.7)
Communication about substance use	3.2 (1.0)	3.1 (0.9)
Early initiation		
Early intoxication	0.24 (0.4)	0.14 (0.3)
Early marijuana	0.43 (0.5)	0.26 (0.4)

^aScale ranges from 1 to 4.^bScale ranges from 1 to 5.

TABLE 2.

Odds ratios (95% CI) of the association between predictors and latent classes for American Indian middle school students

	Reference category					
	Nonusers			MjC		
	MjC	AMjC	Poly	AMjC	Poly	AMjC Poly
Predictors						
Grade	1.02 (0.53–1.95)	2.00 (1.17–3.41) *	2.07 (0.80–5.36)	1.96 (1.00–3.85)	2.03 (0.80–5.14)	1.03 (0.45–2.39)
Sex (referent = male)	0.75 (0.34–1.65)	0.45 (0.21–0.96) *	0.44 (0.17–1.18)	0.61 (0.30–1.21)	0.59 (0.25–1.42)	0.98 (0.44–2.21)
Peer factors						
Peer alcohol factors	2.20 (1.17, 4.12) *	3.56 (2.02–6.27) **	5.73 (2.41–13.60) **	1.62 (0.87–3.04)	2.61 (1.28–5.30) **	1.61 (0.65–3.97)
Peer marijuana factors	2.42 (1.41–4.15) **	2.19 * (1.36–3.55)	3.73 (1.90–7.30) **	0.91 (0.44–1.87)	1.54 (0.77–3.08)	1.70 (0.77–3.76)
Availability factors						
Alcohol availability	0.88 (0.63–1.25)	1.33 (0.95–1.85)	1.37 (0.76–2.45)	1.50 (0.96–2.34)	1.55 (0.90–2.69)	1.03 (0.53–1.99)
Marijuana availability	1.18 (0.82–1.69)	1.12 (0.74–1.69)	1.22 (0.71–2.09)	0.95 (0.59–1.55)	1.03 (0.62–1.71)	1.08 (0.54–2.16)
Cigarette availability	1.62 (1.15–2.29) *	1.31 (1.01–1.70)	1.24 (0.83–1.87)	0.81 (0.61–1.08)	0.77 (0.57–1.04)	0.95 (0.65–1.38)
Other drug availability	0.78 (0.56–1.09)	0.64 (0.45–0.90) **	1.00 (0.58–1.74)	0.82 (0.52–1.30)	1.29 (0.82–2.04)	1.58 (0.88–2.82)
Perceived harm factors						
Perceived harm alcohol	0.62 (0.44–0.88) **	0.53 (0.36–0.79) ***	0.37 (0.18–0.74) **	0.85 (0.55–1.33)	0.59 (0.31–1.12)	0.69 (0.31–1.55)
Perceived harm marijuana	0.73 (0.56–0.95) *	0.81 (0.61–1.08)	0.77 (0.56–1.07)	1.12 (0.82–1.51)	1.06 (0.78–1.46)	0.95 (0.66–1.38)
Family factors						
Attitude toward substance use	0.95 (0.68–1.31)	0.82 (0.59–1.15) *	0.73 (0.44–1.22)	0.87 (0.61–1.24)	0.77 (0.49–1.19)	0.89 (0.56–1.40)
Communication about substance use	0.85 (0.63–1.16)	0.82 (0.57–1.18)	0.72 (0.48–1.06)	0.97 (0.63–1.48)	0.84 (0.54–1.30)	0.87 (0.56–1.36)
Early initiation						

	Reference category					
	Nonusers			MjC		
	MjC	AMjC	Poly	AMjC	Poly	AMjC Poly
Early intoxication	1.51 (0.40–5.62)	3.64 (1.14–11.56)**	14.10 (3.50–56.80)**	2.41 (1.20–4.85)*	9.34 (2.84–30.68)**	3.87 (1.14–13.11)*
Early marijuana	12.05 (5.99–24.26)**	5.64 (2.38–13.35)**	12.13 (2.78–52.98)**	0.47 (0.21–1.05)	1.01 (0.26–3.88)	2.15 (0.49–9.41)

Early initiation = age 12 or younger.

Abbreviations: AMjC, alcohol, marijuana, cigarettes; MjC, marijuana, cigarettes; Poly, polysubstance.

* <0.05.

** <0.01.

TABLE 3.

Odds ratios (95% confidence interval) of the association between predictors and latent classes for American Indian high school students

	Reference category					
	Nonusers			MjC		
	MjC	AMjC	Poly	AMjC	Poly	AMjC
Predictors						
Grade	0.98 (0.84–1.15)	1.18 (0.96–1.45)	1.01 (0.77–1.33)	1.20 (0.93–1.54)	1.03 (0.79–1.35)	0.86 (0.63–1.18)
Sex (referent = male)	1.00 (0.58–1.74)	1.26 (0.88–1.81)	0.71 (0.26–1.92)	1.26 (0.76–2.11)	0.71 (0.32–1.55)	0.56 (0.33–1.41)
Peer factors						
Peer alcohol factors	1.11 (0.74, 1.67)	3.41 (2.40–4.86)**	6.14 (3.03–12.44)**	3.07 (2.23–4.23)**	5.53 (3.20–9.55)**	1.80 (0.90–3.59)
Peer marijuana factors	4.07 (2.72–6.08)**	1.68 (1.04–2.73)*	8.22 (3.30–20.48)**	0.41 (0.25–0.69)**	2.02 (0.99–4.11)	4.88 (1.85–12.85)**
Availability factors						
Alcohol availability	0.99 (0.74–1.32)	1.78 (1.42–2.23)**	1.21 (0.57–2.57)	1.80 (1.29–2.51)**	1.22 (0.64–2.44)	0.68 (0.29–1.60)
Marijuana availability	1.23 (0.91–1.679)	0.88 (0.74–1.04)	1.19 (0.55–2.57)	0.71 (0.54–0.96)*	0.96 (0.50–1.85)	1.35 (0.61–3.00)
Cigarette availability	1.52 (1.16–1.99)**	1.04 (0.91–1.19)	1.59 (0.76–3.31)	0.68 (0.52–0.89)**	1.04 (0.46–2.36)	1.53 (0.72–3.53)
Other drug availability	0.79 (0.66–0.94)**	0.66 (0.49–0.88)**	0.88 (0.61–1.26)	0.84 (0.69–1.02)	1.11 (0.78–1.58)	1.32 (0.95–1.84)
Perceived harm factors						
Perceived harm alcohol	0.66 (0.51–0.86)**	0.66 (0.49–0.88)**	0.28 (0.17–0.45)**	0.99 (0.72–1.36)	0.42 (0.28–0.62)**	0.42 (0.26–0.68)**
Perceived harm marijuana	0.68 (0.56–0.83)**	0.71 (0.58–0.87)**	0.80 (0.48–1.33)	1.04 (0.82–1.32)	1.18 (0.78–1.77)	1.13 (0.71–1.78)
Family factors						
Attitude toward substance use	0.61 (0.45–0.82)**	0.63 (0.43–0.90)*	0.45 (0.31–0.64)**	1.02 (0.65–1.62)	0.73 (0.53–1.00)	0.72 (0.45–1.14)
Communication about substance use	1.11 (0.88–1.39)	0.94 (0.75–1.19)	0.87 (0.67–1.13)	0.85 (0.62–1.17)	0.78 (0.60–1.03)	0.92 (0.65–1.29)
Early initiation						

	Reference category					
	Nonusers			MJC		
	MJC	AMJC	Poly	AMJC	Poly	AMJC
Early intoxication	2.61 (1.21–5.66) *	6.05 (2.91–12.59) **	5.55 (2.14–14.39) **	2.31 (1.51–3.54) **	2.12 (1.17–3.85) *	0.92 (0.46–1.83)
Early marijuana	4.46 (3.22–6.18) **	2.42 (1.36–4.29) **	14.27 (5.76–35.36) **	0.54 (0.34–0.86) **	3.20 (1.40–7.28) **	5.90 (2.33–14.97) **

Early initiation = age 12 or younger.

Abbreviations: AMJC, alcohol, marijuana, cigarettes; MJC, marijuana, cigarettes; Poly, polysubstance

* <0.05

** <0.01.