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The Role of Norms in Marijuana Use Among American Indian Adolescents

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Abstract

Introduction—American Indian adolescents residing on reservations report high levels of marijuana use. Understanding the relationships between normative mechanisms and marijuana use in this group can be especially important in designing effective strategies to prevent use.

Methods—Participants were 3,446 students identifying as American Indian in grades 7th – 12th across four academic years (2009–2012) from 45 schools. Multilevel logistic analysis was used to examine the relationships between lifetime, last month, and frequent marijuana use and measures of the normative environment.

Results—Descriptive and injunctive norms were distinctly and directly associated with all measures of marijuana use, with family injunctive norms showing a strong relationship to use (.49 < OR < .58 for a 9th grade student). Family injunctive norms moderated the relationship between descriptive norms and lifetime and last month use (OR = .79 and .82, respectively), with higher family disapproval associated with a weaker relationship between descriptive norms and use. Anticipatory socialization was positively related to all measures of marijuana use, with the relationship stronger for lifetime and last month use than for frequent use (OR=1.88, 1.74, and 1.30, respectively). A contextual variable of descriptive norms was related to lifetime and last month use (OR=1.66 and 1.51, respectively) but not frequent use.

Conclusions—These findings reinforce the importance of parental norms in reducing the likelihood of using marijuana. In addition, prevention strategies that increase the perception that healthy behaviors not involving marijuana use are an enjoyable way to socialize may be more effective in preventing occasional marijuana use.

Keywords

American Indian; marijuana use; adolescent substance use; injunctive norms; descriptive norms

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Compliance with Ethical Standards

Disclosure of potential conflicts of interest

The authors declare that they have no conflict of interest.

Ethical Approval

All procedures performed in this study were approved by an institutional IRB and were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Passive parental consent was obtained for the survey because all data is anonymous; students were informed that participation in the survey was voluntary.

American Indian (AI) adults and adolescents who reside on reservations report the highest levels of marijuana use among various ethnic/racial groups in the U.S. Stanley, Harness, Swaim, and Beauvais (2014) found that compared to findings from the Monitoring the Future (MTF) national survey on adolescents, AI 8th graders living on or near reservations were over 3 times more likely to have ever tried marijuana (52.8% vs. 16.4%), and 10th graders were nearly twice as likely (61.4% vs. 33.4%). Likewise, AI 8th and 10th graders were about 4 times as likely to have used marijuana in the past month as compared to their MTF counterparts, and 8% of the AI 8th graders and 14% of the 10th graders reported daily or near daily use compared to 1.3% and 3.6% of MTF 8th and 10th graders, respectively. NIDA Director Nora Volkow (2014) called these latter statistics “highly worrisome” due to the negative outcomes associated with heavy marijuana use. These include neurocognitive deficits (Bolla, Brown, Eldreth, Tate, & Cadet, 2002), reduced affective response (Gruber, Rogowska, & Yurgelun-Todd, 2009), lowered task performance associated with reduced motivation (Lane, Cherek, Pietras, & Steinberg, 2005), and a variety of psychosocial problems including school dropout, unemployment, and increased risk for delinquency (Fergusson, Boden, & Horwood, 2008; Green, Doherty, Stuart, & Ensminger, 2010; Green & Ensminger, 2006; Lynskey & Hall, 2000). With changing attitudes toward marijuana use, the wide availability of medical marijuana, and an increasing move toward legalization of adult recreational use, rising levels of use among adolescents could occur, though some evidence suggests no clear increases to date (Wall et al., 2016).

Because social norms have been found to be a strong predictor of alcohol and marijuana use, prevention strategies often rely on changing the normative environment of adolescents. The normative environment may play an especially important role in reservation-based AI adolescent marijuana use. Many reservations are relatively remote, with their populations made up of closely knit networks of extended families, friends, and neighbors. Attitudes and behaviors of those within these networks are observable to many, and information about attitudes and behaviors is spread both through these informal networks as well as formal mechanisms (Rowe, 1997). With relatively high rates of substance use among adults, marijuana use may be seen as widespread and not as damaging as use of other drugs prevalent on reservations, such as methamphetamine. In a recent study, Swaim, Stanley, and Beauvais (2013) found that AI adolescents did perceive weaker injunctive norms for marijuana use (i.e., less disapproval) from their peers and from adults in the community, as compared to White youth who attended the same schools. Thus, understanding the relationships between normative mechanisms and marijuana use in this group of youth can be especially important in designing effective strategies to prevent marijuana use.

The Influence of the Normative Environment

Most theories of adolescent substance use point heavily to social influences of family, friends, school and others on how likely an adolescent is to engage in substance use (Catalano & Hawkins, 1996; Oetting & Donnermeyer, 1998). In particular, the normative environment is seen as a key predictor of substance use behavior, and evidence backs this assertion. The concept of norms as refined by Cialdini, Reno, and Kallgren (1990) differentiates between descriptive and injunctive norms. *Descriptive norms* refer to

individuals' perceptions about the prevalence of a specific behavior in a particular population, usually one's peers, while *injunctive norms* are the perceived level of approval or disapproval of the behavior. Both types of norms have been found to be independently predictive of alcohol and marijuana use (Borsari & Carey, 2001; Larimer, Turner, Mallett, & Geisner, 2004; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). After finding significant relationships between descriptive and injunctive norms and college students' marijuana use, Neighbors, Geisner, and Lee (2008) reiterated the importance of distinguishing between injunctive and descriptive norms in predicting college students' marijuana use.

The Theory of Normative Social Behavior (TNSB) differentiates between descriptive norms and injunctive norms, and in particular, it identifies mechanisms that are hypothesized to moderate the relationship between descriptive norms and behavior, including injunctive norms, outcome expectations, and group identity. Recent studies have found supportive evidence for this theory (Dieterich, Swaim, & Beauvais, 2013; Lee, Geisner, Lewis, Neighbors, & Larimer, 2007; Neighbors et al., 2008; Rimal & Real, 2005). In particular, Dieterich, Swaim, and Beauvais (2013) examined composite measures of marijuana and inhalant use for American Indian youth and found that outcome expectancies (comprised of perceived benefits to self and others and anticipatory socialization) and injunctive norms moderated the relationships between descriptive norms and these composite substance use measures. However, this study did not examine unique measures of ever used or last month marijuana use or frequent use of marijuana, and it did not examine differential effects for specific types of outcome expectancies, including anticipatory socialization. Rimal and Real (2005) found that anticipatory socialization, i.e., the belief that alcohol enhances sociability when drinking alcohol in social contexts, is an important predictor of college students' intentions to use alcohol. Whether anticipatory socialization is a predictor of marijuana use among 7th – 12th graders is a crucial question.

Other theories, such as the social development model (Catalano & Hawkins, 1996), provide a solid theoretical framework for expecting that the normative school environment or school context is an important predictor of substance use. Such theories posit that the behavior of an individual student will vary as a function of the context or environment in which they live, where context may vary from family and friends to the larger but more distal contexts of neighborhood, school, community and beyond. Support for contextual effects has been found at a variety of levels. At the more distal level, Keyes et al. (2011) found a clustering of norms and attitudes regarding marijuana use by birth cohort, and this clustering had a significant and strong effect on individual marijuana use even after controlling for individual attitudes and perceptions of norms. More proximal to the individual, studies have shown that school climate, measured by aggregated perceptions of students at a school, also predicts student substance use. For example, Thrash and Warner (2016) found that the school normative climate predicted alcohol use, binge drinking, and marijuana use while Eisenberg, Toumbourou, Catalano, and Hemphill (2014) found that school-level descriptive norms, but not school-level injunctive norms, were significantly associated with tobacco and marijuana use after controlling for individual-level effects. Eisenberg et al. (2014) note the importance of descriptive social norms in the school context in adolescent substance use prevention efforts.

Framework for the current study

Building on the empirical and theoretical support for individual and contextual effects of normative factors, this study examines the extent to which normative mechanisms are related to the likelihood of ever trying marijuana, using marijuana in the past month, and the likelihood of being a frequent user of marijuana in the past month for 7th – 12th grade AI adolescents living on or near reservations. In particular, this study will examine the following research questions:

1. Using the Theory of Normative Behavior as a framework, what are the direct relationships of descriptive norms, parent and peer injunctive norms, and anticipatory socialization to the likelihood of ever using, last month use, and frequent use in the last month and do these relationships differ by type of use (ever, monthly, frequent)?
2. Do injunctive norms and anticipatory socialization moderate the relationship between descriptive norms and marijuana use?
3. Holding constant a student's own perceptions of the normative environment, do students who attend schools with higher levels of perceived marijuana use report higher likelihood of using marijuana? In other words, is there a contextual effect of perceived marijuana use by one's classmates on a student's likelihood of marijuana use?

Given the very high rates of marijuana use prevalent on or near American Indian reservations, answering these questions will further clarify the role of key social influences in Native youths' substance use decisions and identify more clearly how prevention efforts should be focused for this high risk population of youth.

Methods

Sample and Participants

This study uses survey data from 7th – 12th grade students in 45 schools surveyed across four academic years (2009–2012); this data is part of an ongoing epidemiological study of AI youth living on or near reservations. Each school appears only once within the data used for this study. Schools on or near American Indian reservations across six regions (Northeast, Northwest, Northern Plains, Southeast, Southwest, and Upper Great Lakes) with at least 20% AI students enrolled were sampled, with recruitment in each region approximating the percentage of AIs residing in that region. When a sampled school declined to participate, another school from that region was drawn. Depending on the year, approximately 20–40% of schools sampled agreed to participate, and on average, 80% of enrolled students (with a range of 66% to 100%) took the survey. Schools varied significantly in size and ethnic make-up, with the number of students in grades 7–12 varying between 13 and 852 students, and the percentage of AI students ranging between 21% and 100%, with a mean of 74% and with 76% of schools having more than 50% AI students. No schools in the Northeast participated in the survey; thus, the current sample included the following regional distribution of students: Northwest 3.3%, Northern Plains 51%, Southeast 3.6%, Southwest 30.7%, Upper Great Lakes 11.4%. Specific identities of tribes and reservations are kept

confidential. Overall, 60% of schools were located on or near reservations or tribal lands where the poverty level was more than twice the national rate, and the median household income was less than 60% of the national level. Schools received a comprehensive report of findings and \$500 compensation for participating.

Only students who self-identified as American Indian on the survey were included in this study, for a total sample size of 3,446 7th – 12th grade students (49.5% female). Students in the early grades are more likely to be considering initiation, as compared to students in the later grades, while students in the later grades are more likely to be considering maintenance or increase of marijuana use. By including students in this broad range of grades, we are able to examine whether relationships between normative factors and measures of use vary by grade.

Procedure

Permission for surveying was obtained prior to data collection from tribal authorities and/or the school board. All students in grades 7 – 12 in sampled schools were eligible for participation in the survey. Passive parental consent was obtained as parents were notified of survey administration via a media release and a letter mailed to all parents by the school that explained how to opt out their child out of the survey. Fewer than one percent of students did not complete the survey due to lack of parental consent. The survey was administered during normal classroom hours by either a teacher or school staff member trained in human subjects procedures. The survey took from 20–45 minutes to complete. No identifying information was collected from the students, and students could leave any question blank that they did not wish to answer. All procedures were approved by the university Institutional Review Board.

Measures

Self-report data were collected with The American Drug and Alcohol SurveyTM. This survey has been shown to be reliable and valid with both ethnic minority and majority youth (Oetting & Beauvais, 1990).

Outcome variables—Three binary outcome variables were constructed using the following two items: “Have you ever tried marijuana (pot, grass, hash, herb, etc.)?” and “How often in the last month have you used marijuana? (with responses of “none”, “1–2 times”, “3–9 times”, “10–19 times”, “20 or more times”, “several times every day”). Ever tried marijuana measured if the student responded “yes” to ever trying marijuana. Last month marijuana use measured if the student reported any use in the last month, and frequent marijuana use measured if the student reported using 10 times or more in the past month.

Normative mechanism variables—Descriptive norms was measured with one item (Thinking about your classmates, how often do you think the average student uses marijuana in a month?) with 5 response categories (never, 1 time, 2–4 times, 5–9 times, 10 or more times). Only one item is used because this item is part of a larger scale for descriptive norms for drug use.

Family injunctive norms were measured with the mean value of two items (“How much would your family care if you used marijuana?” and “How much would your family try to stop you from using marijuana?”) ($\alpha = .83$), both of which were on a 4-point scale (“a lot”, “some”, “not much”, and “not at all”). One item was used to assess student injunctive norms (“Most students think it is wrong for other students to use marijuana.”) measured on a 5-point Likert scale (“strongly disagree” to “strongly agree”). This item was part of a larger scale measuring injunctive norms for drug use; because we are only considering marijuana, the item relating to marijuana was used. Higher values for the injunctive norms measures reflect stronger disapproval against use.

Anticipatory socialization was measured with 4 items adapted from Rimal and Real (2005) - Using marijuana with friends is part of being in a group.”, “Students my age are expected to use marijuana.”, “Using marijuana is an important part of being with friends.” and “Using marijuana allows students to make friends.” ($\alpha = .92$). Item responses were based on a 5-point Likert scale (“strongly disagree” to “strongly agree”), with higher values indicating higher anticipatory socialization. All normative variables were grand mean centered.

A “contextual” (level-2) measure of the normative environment of the school was computed as the mean level of all students’ ratings of descriptive norms in a school (Raudenbush & Bryk, 2002). This variable was grand-mean centered.

Control variables—Gender was coded as a dichotomous variable with male as the reference group (female = 1) while grade was coded as an interval variable centered at grade 9.

Table 1 gives means and standard deviations of the outcome and independent variables for 3 grade groups – 7th – 8th, 9th – 10th, and 11th – 12th.

Analytic Strategy

Due to the nesting of students within schools, a multilevel analytic approach was used to account for the non-independence of observations using HLM6 (Raudenbush, Bryk, & Congdon, 2004). We used this approach to simultaneously model the effects of individual level-1 variables and the contextual school-level variable on the marijuana use outcome variables (ever tried marijuana, last month marijuana use, and frequent marijuana use). The multivariate hypothesis testing feature in HLM was used to examine the inclusion of random slopes; these slopes were fixed as these tests were non-significant. Thus, only the intercepts were specified as random. Frequent marijuana use was estimated using only students who had reported using marijuana in the last month. By using these students only, comparisons can be made between those who are classified as frequent users versus those who use monthly, but not frequently.

The following procedure was used for model estimation. First, models were estimated that included the level-1 control variables only of grade and gender, with the random intercept as noted above. The interaction term between grade and gender was not significant and therefore excluded from the models. Next, models were estimated that included all level-1 variables. Interaction terms between level-1 variables and control variables were tested in

groups by control variable. For example, to test whether gender moderated relationships between the independent variables and marijuana use, interaction terms between gender and the level-1 independent variables were included. The multivariate hypothesis testing feature in HLM was used to assess whether the variables as a group improved model fit. Where the group of variables did improve model fit, significance tests for each individual interaction term were conducted to assess which interactions should be included in the final model. In addition, interaction terms between descriptive norms and the injunctive and anticipatory socialization variables, as hypothesized by the Theory of Normative Behavior, were specifically tested. Finally, the contextual variable was entered, with subsequent testing for significance. As these multilevel models considered binary outcomes, models were specified using Bernoulli's logistic regression and estimated using EM Laplace iterations. Estimates reflect unit-specific odds ratios (OR).

The outcome variables had missing data of 1.5% – 1.7% while missing data for the normative variables ranged from 5.3% to 7.9%. Approximately 81% of observations had no missing data. To account for missing data at level 1, ten imputed data sets were created in IBM SPSS 23 using fully conditional specification with the Markov chain Monte Carlo (MCMC) algorithm (no missing data was present at level 2). The complete data sets were then analyzed in HLM, which allows for the combination of estimates from multiple imputations. Results presented below reflect these aggregated estimates.

Results

As shown in Table 1, nearly 35% of 7th and 8th graders reported using marijuana in the last month, and, of those, 35% reported using it more than 10 times in the last month. Interestingly, last month marijuana use was similar across the 3 grade groups. This is not true for ever use where a gradual increase is seen from 8th to 12th grade.

Ever Used Marijuana

In Table 2, Model 1 provides the unit-specific odds ratios (OR) and their confidence intervals (CI) for the control variables only (i.e., gender and grade). The likelihood of ever trying marijuana increased as grade increased (OR = 1.21) while no difference in lifetime marijuana use was found by gender.

Model 2 in Table 2 includes the normative independent variables, with significant interactions as found using multivariate hypothesis testing. The normative variables all showed a strong relationship to ever trying marijuana in the directions predicted by previous research, and as expected, a likelihood ratio test revealed a significantly better fit with the inclusion of these variables ($X^2(6) = 564.2$; $p < .0001$). Once these variables were included, the coefficient on grade became closer to zero and was only marginally significant. As found in Model 1, no significant gender difference in the likelihood of ever trying marijuana was found. One standard deviation increase in each of the normative variables - descriptive norms, student injunctive norms, family injunctive norms, and anticipatory socialization - was associated with relative odds of 1.81, .72, .62, and 2.03, respectively. Results also suggest that as grade increased, the relationship between family injunctive norms and reduced marijuana use became stronger, though the coefficient on this interaction term was

only marginally significant. Moderation of student injunctive norms and anticipatory socialization of the relationship between descriptive norms and ever trying marijuana use, as suggested by the TNSB, was rejected ($X^2(2) = 2.59$; $p = .27$), but family injunctive norms did moderate the relationship between these variables ($OR = .79$; $X^2(1) = 22.07$; $p < .001$). The relationship between descriptive norms and the likelihood of ever using marijuana was significantly weaker when there was greater disapproval by the family.

Finally, at level 2, the descriptive norms contextual variable was found to be significantly related to ever trying marijuana use ($OR = 1.66$; $p < .001$). A student attending a school with a mean descriptive norm level one standard deviation higher than the average across all schools had odds of trying marijuana 1.37 times higher than the odds of that same student attending a school with the average school descriptive norm level. The proportion variance explained in the intercept (Raudenbush & Bryk, 2002, p.85) by including this school-level variable was 47.9%; however, a significant residual portion remained unexplained.

Past Month Marijuana Use

Similar to lifetime marijuana use, results from Model 1 (Table 2) show that females and males did not differ significantly in their likelihood to use marijuana in the past month. However, as grade increased, there was a significant, but relatively small, increase in the likelihood to use marijuana in the past month.

Model 2 results for past month use were very similar to those for lifetime use. The normative variables all showed a strong relationship to using marijuana in the past month in the directions predicted by previous research, and also as expected, a likelihood ratio test revealed a significantly better fit with the inclusion of these variables ($X^2(7) = 542.6$; $p < .0001$). One standard deviation increase in each of the normative variables - descriptive norms, student injunctive norms, family injunctive norms, and anticipatory socialization - was associated with relative odds of 1.56, .71, .54, and 1.90, respectively. These are similar results to those for lifetime marijuana use. Results also suggest that as grade increased, the relationship between family injunctive norms and reduced marijuana use became stronger ($OR = .84$; $p < .0001$). Moderation of student injunctive norms and of anticipatory socialization on the relationship between descriptive norms and ever trying marijuana use, as suggested by the TNSB, was rejected ($X^2(2) = 4.36$; $p = .11$). However, family injunctive norms moderated the relationship ($OR = .82$; $p < .0001$), with higher family injunctive norms associated with a weaker relationship between descriptive norms and past month marijuana use ($X^2(1) = 21.7$; $p < .0001$).

Finally, level-2 results showed a significant contextual relationship between descriptive norms and past month marijuana use ($OR = 1.51$; $p = .006$), with the past month odds of using for a student attending a school with descriptive norms one standard deviation higher than the average across all schools 1.24 times higher than the odds of that same student attending a school with average school descriptive norms. The proportion variance explained in the intercept by including this variable was 29.9%, and a significant residual portion remained unexplained.

Frequent Marijuana Use

Results for frequent marijuana use compared students who have used 1 to 9 times in the past month with those who have used 10 times or more. Model 1 (Table 2) results differ from the results above in that females were significantly less likely to be frequent marijuana smokers while grade was not significantly related to frequent use for those who have smoked in the last month. Inclusion of the normative mechanisms significantly improved model fit ($X^2(4) = 128.6$; $p < .0001$) while at the same time resulting in a non-significant relationship between gender and frequent use. A one standard deviation increase in each of the normative variables - descriptive norms, student injunctive norms, family injunctive norms, and anticipatory socialization - was associated with relative odds of 1.58, .78, .60, and 1.35, respectively. The results are similar to those for lifetime and past month use for three of the four variables; however, for anticipatory socialization, the odds ratio dropped from 1.90 for past month use to 1.35 for frequent use.

Moderation of student and family injunctive norms and of anticipatory socialization on the relationship between descriptive norms and ever trying marijuana use, as proposed by the TNSB, was rejected ($X^2(3) = 0.80$; $p > .500$), and these interactions were, thus, excluded from the final model. Finally, no significant contextual relationship between descriptive norms and frequent marijuana use was found; however, we did include this variable in the final model.

Discussion

This paper examined the relationships between several normative measures for American Indian adolescents living on or near reservations and three measures of marijuana use. Both descriptive and injunctive norms were distinctly and directly associated with all measures of marijuana use. Higher descriptive norms in terms of perceptions of classmate use were positively related to use while higher injunctive norms (greater disapproval) for both family and classmates were negatively related to use. In addition, for lifetime and last month use, grade moderated the relationship between family injunctive norms, with family injunctive norms having a stronger relationship to likelihood of use at higher grades. As predicted by the TSNB, family injunctive norms moderated the relationship between descriptive norms and lifetime and last month use, with higher levels of family disapproval associated with a weaker relationship between descriptive norms and use. However, anticipatory socialization and classmate injunctive norms did not moderate the relationships between descriptive norms and marijuana use.

Descriptive norms had a significant positive relationship to all measures of marijuana use. Higher levels of perceived classmate use of marijuana were associated with higher probabilities of lifetime, last month, and frequent use. This study did not specifically calculate whether students overestimate their classmates' marijuana use as found for both alcohol and marijuana. However, comparing mean levels of past month marijuana use reported by students within a school with mean levels of perceived past month marijuana use by these students' classmates suggests a relatively large overestimation of classmates' use. For example, the average level of classmate past month use estimated by an 8th grader was two times per month while the average reported actual use was about once per month. For

10th graders, perceived use was nearly three times per month while average actual use was slightly over one time per month. As has been done for alcohol, this suggests using a descriptive norm prevention strategy, where students are educated that actual use is significantly less than perceived use. However, in the case of American Indian youth, relatively high numbers of youth reported using marijuana in the past month; for example, nearly 40% of 8th grade youth reported using in the past month, making past month marijuana use nearly equal to non-use. Thus, as with other youth, correcting perceptions is a potentially effective prevention strategy, but it must be pursued with caution and careful attention to messaging given the high rates of use among these students.

Family injunctive norms had a relatively strong relationship to all measures of marijuana use with odds ratios between .49 and .59. For a male in 9th grade with mean levels of all other variables, the mean probability of using in the past month increases from .29 with mean value of family injunctive norms to .43 for this same male but with a level of family injunctive norms one standard deviation below the mean. Likewise, the mean probability for this same male decreases to .19 for a level of family injunctive norms one standard deviation above the mean. In addition, unlike other normative predictors, the relationship between family injunctive norms and past month marijuana use was moderated by grade, with a stronger protective relationship between past month use and family injunctive norms at higher grades. This finding may be explained, in part, by the high dropout rate (Executive Office of the President, 2014) among AI youth compared to the national rate if students who have not dropped out are more likely to be influenced by family norms than those who have dropped out. However, LaBrie et al. (2010) did find that even for college students, perceived parental approval of marijuana use was significantly related to their own marijuana use (a composite measure for past month and past year), though this relationship was fully mediated by self-approval. These results lend support for targeting parents/families in prevention efforts for all middle and high school students. For ever tried and last month use, our study also found that family injunctive norms moderated the relationship between descriptive norms and use, where greater family disapproval of use weakened the positive relationship between perceived classmate use and own marijuana use for lifetime and last month use. This finding reinforces the importance of parental norms in reducing their child's likelihood of using marijuana. However, it must also be noted that with the relatively high rates of adult use of marijuana on reservations, manipulating parental norms may be more difficult than in other populations. More research on the formation and communication of parent injunctive norms in AI communities would be helpful in designing effective prevention strategies that seek to utilize the relationship between parent injunctive norms and youth marijuana use. In addition, due to the influence of extended family networks in AI communities, prevention strategies designed to highlight strong injunctive norms against marijuana use by respected community members, especially elders, may help serve the function of parent injunctive norms for youth in families where the disapproval of marijuana use is lacking. Native youth who spend more time with family and elders are less likely to become involved in problem behaviors (Zitrow, 1990), and inclusion of elders has been a key recommendation for prevention of pregnancy (Garwick, Rhodes, Peterson-Hickey, & Hellerstedt, 2008). Creative incorporation of elders into prevention efforts for marijuana,

particularly focused on communication and messaging regarding injunctive norms, may be fruitful.

For all measures of marijuana use, higher student injunctive norms (higher disapproval) was negatively related to marijuana use. For a male in 9th grade with mean levels of all other variables, the mean probability of using in the past month increases from .29 with mean value of student injunctive norms to .37 for this same male but with a level of student injunctive norms one standard deviation below the mean. Likewise, the mean probability for this same male decreases to .23 for a level of student injunctive norms one standard deviation above the mean. Note that the relationship between student injunctive norms and marijuana use is not as great as that for family injunctive norms when comparing one standard deviation differences in these variables. In addition, student injunctive norms did not moderate the relationship between descriptive norms and use, as family injunctive norms did. If a higher level of descriptive norms is sending a subtle message that the behavior is accepted (i.e., lower student injunctive norms), the moderation relationship may already be embedded in the estimated relationship between descriptive norms and marijuana use.

Our results for student injunctive norms differ somewhat from those of LaBrie, Hummer, Lac, and Lee (2010) who examined relationships between typical student, close friend, and parental injunctive norms on own approval and marijuana use. They found that perceived typical-student approval was not correlated to marijuana use, and thus suggested that unlike normative prevention/intervention strategies targeting alcohol use, strategies focused on changing typical student injunctive norms for marijuana use may not be effective for college students. However, their study focused on two groups of college students – one group sampled from a large public university and one group sampled from a mid-sized private university. That environment is quite different from the environment of our sample of 7th – 12th graders, where behavior and attitudes are more easily observed and students are more likely to know one another. However, whether these students overestimate classmate approval of marijuana use is not known, but this represents an important avenue for future research. In addition, given the relatively high rates of use and even greater perceptions of use, a prevention strategy based on deviance regulation theory may be effective (Blanton, Stuart, & Van den Eijnden, 2001; Dvorak, Pearson, Neighbors, & Martens, 2015). Such a strategy would target injunctive norms by emphasizing the desirable characteristics of non-users of marijuana (the “deviant” behavior).

Anticipatory socialization (e.g., using marijuana with friends is part of being in a group) was positively related to all three measures of marijuana use. However, the relationship was significantly greater for lifetime and last month use than for frequent use. Prevention strategies that focus on increasing the perception that healthy behaviors not involving marijuana use are an enjoyable way to socialize and make friends may be effective in preventing trying marijuana and using it occasionally, but not as effective in reducing frequent use.

Finally, the results showed a significant contextual effect of perceived marijuana use by one’s classmates for lifetime and past month use, but not for frequent use. A 9th grade male attending a school with the mean level of school descriptive norms, mean levels of

individual-level normative variables, and a random error of zero had a 15% less likelihood of marijuana use in the last month compared to a student with the same individual-level characteristics but who attends a school with school descriptive norms one standard deviation greater than the mean (probabilities of .29 versus .34, respectively). Thus, a school-level prevention strategy that focuses on changing its normative environment may not only decrease marijuana use by changing individual student perceptions of classmate use and approval of use, but may also add to individual effects through a change in the school's climate. This is consistent with research that has found that school-level prevention programs that target social influences, such as a school environment of disapproval (Kumar, O'Malley, Johnston, Schulenberg, & Bachman, 2002) or normative expectations (Cuijpers, 2002) are most effective. Given the high rates of adult marijuana use on reservations, changing the normative environment at school can be important, especially given that students spend a good part of their day at school. In addition, there is evidence that school-level prevention can lower the likelihood of early initiation of substance use for students who receive suboptimal parenting as it concerns substance use (Mrug, Gaines, Su, & Windle, 2010). Thus, although strong disapproval of marijuana use by the family was found to be associated with decreased marijuana use in this study, for those students with weak family disapproval, school-level normative prevention strategies may be especially critical in lowering marijuana use.

Limitations

Most importantly, because the sample is cross-sectional in nature, we cannot directly infer causality between variables where significant relationships were found, thus reducing the usefulness of implications for prevention strategies. In addition, although this study uses a large sample of AI adolescents living on or near reservations, it does not reflect a random sample of all schools on or near reservations due to voluntary participation, and thus, the results may differ from those obtained from all AI youth who live on or near reservations. However, this sample does represent the largest sample of AI adolescents living on or near reservations of which we are aware. In addition, because the survey took place in schools, the sample does not include adolescents who have dropped out of school and who are more likely to be marijuana users, especially frequent users. Finally, with regard to the sample, results for frequent use that differ from ever and last month use may, in part, be due to the smaller sample size for the frequent use model especially at grade 12, though cell sizes by grade are reasonable, varying between 80 frequent users for grade 12 to 111 frequent users for grade 9.

With respect to measures, several of the predictor variables were one-item measures because these items were part of other scales. However, single item measures have been found to be reliable for a variety of constructs, especially those where a holistic impression is informative (Youngblut & Casper, 1993; Zimmerman et al., 2006). Finally, Ludtke et al. (2008) found that when measuring contextual effects as the aggregated mean of the individual-level measures, underestimation of standard errors and bias in the estimates can occur.

Even with these limitations, this paper contributes substantially to our understanding of the role of norms in AI adolescents. The role of family is likely to be especially important for protecting against use in this population. When AI students perceive their parents as disapproving marijuana use, risk is substantially reduced. Furthermore, family injunctive norms serves to buffer the risk of use associated with descriptive norms. These findings underscore the need for future research to understand how Native parents are communicating disapproval to their children and to develop culturally-appropriate interventions targeted to this type of communication.

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Table 1

Percentages and Means for Outcome and Predictor Variables for 3 Grade Groups

	7 th – 8 th	9 th – 10 th	11 th – 12 th
<u>Outcome variables</u>			
<i>Percentage of students reporting ...</i>			
Ever used	53.5%	62.1%	69.0%
Past month use	33.7%	37.9%	33.3%
Frequent use	11.9%	19.4%	21.0%
<u>Normative variables</u>			
Descriptive norms:	2.66(1.50) ¹	3.28(1.48)	3.53(1.45)
Student injunctive norms:	3.37(1.41)	3.16(1.28)	2.99(1.22)
Family injunctive norms:	3.48(0.90)	3.51(0.82)	3.42(0.93)
Anticipatory socialization:	2.26(1.23)	2.29(1.12)	2.36(1.10)
School-level desc. norms:	2.42 (0.77) ²	3.31(0.51)	3.57(0.65)
<u>Control variable</u>			
Female:	47.6%	49.8%	52.6%
N ³	1423	1071	491

¹ Standard deviations in parentheses.² Standard deviation calculated using one observation per school.³ Due to missing values, some calculations are based on fewer observations.

Table 2
Unit Specific Odds Ratios (OR) and Confidence Intervals (CI) for Marijuana Use Outcome Variables

Variable	Ever Tried		Past Month Use		Frequent Use	
	Model 1 OR (CI)	Model 2 OR (CI)	Model 1 OR (CI)	Model 2 OR (CI)	Model 1 OR (CI)	Model 2 OR (CI)
Intercept	1.52** (1.21, 1.91)	1.63** (1.30, 2.03)	0.11** (0.43, 0.67)	0.41** (0.34, 0.51)	1.14 (0.75, 1.74)	0.84 (0.68, 1.05)
School Des. Norms		1.66* (1.21, 2.28)		1.51* (1.10, 2.06)		1.34 (0.92, 1.94)
Female	1.04 (0.84, 1.29)	1.07 (0.88, 1.31)	0.97 (0.80, 1.17)	1.10 (0.92, 1.33)	0.69* (0.51, 0.93)	0.80 (0.62, 1.04)
Grade	1.21** (1.15, 1.34)	1.09 <i>M</i> (0.99, 1.19)	1.10* (1.03, 1.18)	0.97 (0.90, 1.05)	1.15 (0.98, 1.34)	1.13** (1.03, 1.25)
Descriptive Norms		1.48** (1.32, 1.54)		1.35** (1.26, 1.45)		1.35** (1.21, 1.51)
Student Injunctive Norms		0.78** (0.72, 0.86)		0.78** (0.70, 0.86)		0.83** (0.74, 0.92)
Family Injunctive Norms		0.58** (0.49, 0.69)		0.49** (0.44, 0.55)		0.55** (0.48, 0.64)
Anticipatory Socialization		1.88** (1.72, 1.96)		1.74** (1.63, 1.87)		1.30** (1.15, 1.46)
Fam. Inj. Norms* Grade		0.92 <i>M</i> (0.83, 1.01)		0.84** (0.79, 0.91)		<i>NS</i>
Des. Norms* Fam. Inj. Norms		0.79** (0.72, 0.86)		0.82** (0.77, 0.89)		<i>NS</i>
N	3446		3446		1277	

*
 $p < 0.05$

**
 $p < 0.001$

M
= marginal significance $p < 0.06$;

NS
=non-significant.