

Community, Family, and Peer Influences on Alcohol, Marijuana, and Illicit Drug Use Among a Sample of Native American Youth: An Analysis of Predictive Factors

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Using a cross-sectional sample of 8th, 10th, and 12th grade Native American public school children, this study examines hypotheses pertaining to the ability and influence of measures drawn from social bonding, social learning, and social disorganization theories to account for variations in self-reported lifetime and 30 day use of alcohol, marijuana, and illicit drugs. Results derived from ordinary least squares regression equations show significant associations, most notably with variables from the social learning tradition. In addition, comparisons across equations show significant differences in the impact of the theoretical indicators on substance use between respondents in the sub-samples of those residing on and off reservations. The findings suggest that existing theories offer a promising framework for understanding the process of Native American substance use, and that the role of these in some cases differ for adolescents who reside on and off reservations. Contributions to the literature along with suggestions for future research are discussed.

KEYWORDS *adolescent substance use, Native American, social bonding theory, social disorganization theory, social learning theory*

The study of the correlates of youth substance abuse has held a historically salient place in the criminological literature. The nexus between social

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problems and substance use has been particularly influential in the development of criminological theories. This development has been most notable within three theoretical domains: social bonding theory (Billingham, Wilson, Gross, & William, 1999; Durkin, Wolfe, & Lewis, 2006), social learning theory (Earleywine, 1995; Grube, Chen, Madden, & Moran, 1995; Martino, Collins, Ellickson, Schell, & McCaffrey, 2006; Morrison, Simpson, Gillmore, Wells, & Hoppe, 1996; Smith & Goldman, 1994), and social disorganization theory (Chow, 1998; Crum, Lillie-Blanton, & Anthony, 1996; Ennett, Flewelling, Lindrooth, & Norton, 1997; Jang & Johnson, 2001; Kadushin, Reber, Saxe, & Livert, 1998; Leventhal & Brooks-Gunn, 2000; Raudenbush & Sampson, 1999; Yabiku et al., 2007).

Although the prior tests show strong support for the ability of these theories to account for variations in adolescent substance use, there is a lingering issue that continues to plague the current literature: almost all of these inquiries have centered on White adolescents. (See Lambert, Brown, Phillips, and Ialongo [2004], Ozbay and Ozcan [2008], and Yang and Hoffman [1998] for a more detailed account of this deficiency.) As such, there are concerns regarding to the degree to which existing theories can account for adolescent substance use patterns when ethnic minorities are the focus of investigation rather than a comparison group.

Few studies in the prior literature have focused exclusively on substance use among ethnic minorities. This deficiency is even more pronounced when considering the prior research that has examined this issue among Native American youth. Perhaps the most logical interpretation of the lack of attention given to Native American issues is their small proportional representation in the United States. According to recent estimates by the U.S. Census Bureau (2004), Native Americans comprise only 1% of the total U.S. population. However, the proportion of Native Americans is higher in some state than others, as is the case in Montana (the focus of this study), where 6% of the state's population is Native American. Even so, the consistent finding in self-report studies that use of alcohol, marijuana, and illicit drugs are substantially higher for Native American youth suggests that this is an issue meriting immediate attention. The importance is stated in a recent study by Kulis, Napoli, and Marsiglia (2002), who state that the "Use of alcohol and other drugs is a serious problem among American Indian youths. As an undifferentiated group, American Indian youths appear to begin drug use relatively early, have a high prevalence of lifetime use, and use certain substances, such as marijuana, more regularly than other youths" (p. 101).

Our study addresses the void in the prior literature by looking at a sample of Native American youth to investigate the degree to which variables derived from the social bonding, social learning, and social disorganization theories can account for variations in self-reported substance use. Our study builds on the prior literature by going beyond the simple rural

versus urban comparisons of Native American youth (Fisher, Storck, & Bacon, 1998). The analysis that follows is constrained to only Native American respondents. This initial sample is then divided into two sub-samples comprised of respondents living off and on reservation lands at the time of the data collection. The focus of this investigation is on how well theoretically derived predictors account for variations in adolescents self-reported use and the degree to which the influence of these vary between the sub-samples.

PRIOR LITERATURE

Although little more than a comparison group until then, studies examining issues pertaining to substance use among Native American youth began to emerge in the 1980s (Edwards & Edwards, 1988; May, 1982, 1986). Since this time, there have been a handful of studies that have focused on Native American's as the primary research interest (Beauvais, 1992; Novins & Baron, 2004; Pego, Hill, Solomon, Chisholm, & Ives, 1995; Spear, Longshore, Micarffrey, & Ellickson, 2005; Steinman & Hu, 2007; Wallace et al., 2002; Walls, 2008). Findings from this body of research suggest that Native American youths begin to use substances at an earlier age compared with White youths (May, 1986), were more likely to use substances and use more often than White youth (Steinman & Hu, 2007), and were found to have higher rates of alcohol, tobacco, and marijuana use than all other ethnic groups combined (Wallace et al., 2002).

A subset of the prior literature has focused on variations in substance use among different dimensions within samples of Native American youth. The most prevalent of these are examinations comparing gender difference. In contrast to the studies examining comparisons with other racial and ethnic groups mentioned above, the finding pertaining to differences in substance use among Native American men and women have been mixed. Some studies find levels of use to be higher for men (Beauvais, 1992), find differences only in the case of marijuana use (Wallace et al., 2002), or find similar levels of use among male and female Native Americans (Novins & Baron, 2004; Spear et al., 2005).

Of particular importance to the current study are the examinations that have looked at issues pertaining to difference among Native American youths residing on and off reservation lands (Beauvais, 1992; Edwards & Edwards, 1988; Pego et al., 1995). In each of these studies, the percentage of substance use was higher among those youths living on reservations. The most notable of these was the finding that Native American youth on reservations were almost twice as likely (47% versus 26%) to report using marijuana by the 8th grade than those living off reservations (Beauvais, 1992). Theorists have posited that these differences are attributable to isolation and chronic

unemployment on reservation lands, which leads to extended periods of unstructured time and boredom. This is posited as creating opportunities for risky behavior for reservation youth (Edwards & Edwards, 1988; Pego et al., 1995) when compared to Native American youth off of the reservation.

These studies suggest that there are key issues pertaining to Native American substance use that merit consideration well beyond that of a comparison group. Moreover, even though these show that progress is being made to more fully understand the process of substance use among Native American youth, there is a key limitation that plagues them—they have all been undertaken without a concentrated focus on theory. This deficiency has consequences for interpreting the research findings and any program and policy implications that can be derived from them. Because this study is grounded in the family, community, and peer theories within criminology, a brief overview of these traditions and their perceptions regarding youth substance use is in order.

THEORETICAL REVIEW

The theories of delinquency that have examined variations in youths' participation in substance use have largely originated in two criminological traditions—social bonding and social learning theories. Although these theories have traditionally been viewed as oppositional, both deal with the role that families and peers play either to keep youths committed to the laws and rules of society or as intimate groups where attitudes accepting or rewarding of law violation are learned and adopted (Simons, Simons, & Wallace, 2005). Specifically for substance use, both perspectives focus on the ways through which parents and peers act as buffers against or facilitators of youth's decisions to participate in substance use.

From a social bonding perspective, import is given to the family as the embodiment of traditional values in society (Hirschi, 1969). As attachment to parents and belief in the justness of laws increases, the likelihood of rules violating behaviors, such as substance use, decreases. Hirschi's (1969) social bonding theory is unique because it is an attempt to explain conformity to laws rather than violations of them (see also Nagasawa, Qian, & Wong, 2000). With regard to substance use, the theory suggests that youths will resist the temptation due to the close-knit bonds they develop with significant others (i.e., parents, teachers, and conformist peers) and the belief that substance use could jeopardize these relationships.

Since its inception, social bonding theory has been a useful tool for examining youth substance use. Prior studies have consistently shown that use is most likely to occur when a youth's level of attachment to parents becomes weak or absolved completely (Billingham et al., 1999; Durkin et al., 2006). As a youth's bond with parents, teachers, and conformist peers

weakens, so too does the informal control and psychological presence that typically acts as a buffer against delinquency, including substance use (Warr, 2005). The void that emerges is often filled with the development of bonds with peer level influences, which often provide attitudes and behaviors that are conducive to delinquency (Rebellon, 2002).

From a social learning perspective, focus is directed toward intimate groups and the acquisition of values and beliefs favoring deviance and crime (Akers, 1998; Patterson, 2002; Sutherland, 1947). This builds on the proposition taken from cognitive learning theory that learning can be both direct through lived experience and indirect through experiencing the behavior of others (Bandura, 1977, 1986). As associations with groups where attitudes favorable toward substance use become more frequent, more intense, and of a higher priority in the lives of youths, the likelihood of use and associations with substance using peers increases. Social learning theory suggests that the likelihood of substance use will be high in those situations where the perceived rewards associated with the practice are high and the costs associated with substance use are low. Thus, substance use is part of a learning process where youths learn the benefits and punishments both indirectly through observing the reactions to the use of others and directly through their interactions with others and others favorable or unfavorable reactions to their own use.

Many studies directly associate substance use with peer influence. (See Akers [1998], for a comprehensive review and Martino et al. [2006] for a more contemporary review.) Associating with peers who have pro-delinquent attitudes increases the likelihood of participation in delinquency, along with the probability of delinquent peer associations. Youth who believe that alcohol use has many positive and few negative consequences are more likely to have favorable attitudes toward alcohol use (Morrison et al., 1996), report that they intend to use alcohol (Earleywine, 1995), and actually use alcohol (Grube et al., 1995; Smith & Goldman, 1994).

As it pertains to Native American youth, Unger, Baezconde-Garbanati, & Soto (2004) found that they are significantly more likely than other youths to have tried smoking and to have smoked in the past month due to an excess of role models and opportunities for experimenting with smoking within their social networks (i.e., friends and parents). In a study by Kulis et al. (2002), Native American youth reported that they would experience less disapproval from friends if they tried drugs and cited drug use as fairly prevalent among their friends and school peers. These two studies are a rarity in the prior literature because they specifically use the application of theory to address social problems associated with Native American youth.

Recently, criminologists have suggested that there are cautions against attributing the effects of family and peer influences on delinquency without consideration for the ecological conditions in which adolescents live (Hay,

Fortson, Hollist, Altheimer, & Schaible, 2007; Wilson, 1987; Sampson & Wilson, 1995). This trend follows the revival of social disorganization theory originally proposed to the criminological world in the early 1940s. The theory assumes that humans are social by nature and law violation emerges in the pursuit of culturally prescribed values and beliefs that are in contrasts to the norms of the larger society (Shaw & McKay, 1942). Theorists in this tradition argue that elevated levels of delinquency, including substance use, are a result of the loss of informal social control owing in large measure to economic deprivation, ethnic heterogeneity, and high levels of residential mobility within socially disorganized communities. From its inception, social disorganization has been viewed as inhibiting a community's ability to supervise youth and maintain informal social control (Sampson & Groves, 1989). Thus, in places where adolescents experience social disorganization, the social bonds that normally inhibit them from delinquency become weak or broken, and they become more likely to associate with delinquent peers and participate in delinquency, including substance use (Bernburg, 2001).

Neighborhood level social disorganization has consistently been linked to substance use in the prior literature (Chow, 1998; Crum et al., 1996; Ennett et al., 1997; Kadushin et al., 1998; Leventhal & Brooks-Gunn, 2000; Raudenbush & Sampson, 1999). A recent development in this line of inquiry by Yabiku et al. (2007) suggested that substance abuse becomes a validated behavior and emerges as a viable option or coping mechanism for hunger, crime, violence, family issues, health issues, and substandard living conditions in socially disorganized neighborhoods where adolescents observe adults misusing drugs and alcohol. Neighborhood disorder also influences substance use by increasing the availability, as well as acceptability of drugs (Jang & Johnson, 2001), and prior research has found neighborhood context to be a key predictor of substance use for ethnic minority adolescents (Gruenewald, Millar, Ponicki, & Brinkley, 2000; Treno, Alaniz, & Gruenewald, 2000).

Although tests of criminological theories to account for variations in substance use are numerous, most theoretical tests have not focused on Native American youth. Thus, although we have a solid foundation on which to build theory and policy for White youths, there are questions regarding the degree to which these findings can be generalized to other ethnic groups. This issue has recently been brought to attention by Lambert et al. (2004), who state that:

Nearly all of the existing literature on adolescent substance use has been conducted with samples that are exclusively or primarily Caucasian, and when diverse samples have been used, the tendency has been to ignore ethnicity all together or to treat it as a nuisance variable and control for it in analyses.

This study seeks to address this void by focusing on the following theoretically derived research question: Are there differences in family, peer, and community influences on self-reported substance use by Native American adolescents residing on and off reservations in Montana? Drawing on prior theoretical tests in the criminological literature, the following two research hypotheses are evaluated:

1. Family, peer, and community level variables are significant predictors of lifetime and thirty day substance use by Native American adolescents.
2. There will be significant differences between Native American adolescents living on and off reservations lands in the degree to which family, peer, and community level variables account for variations in lifetime and thirty day substance use.

Based on the review of the literature, we expect levels of substance use to be highest for those respondents where levels of community social disorganization, association with delinquent peers, and pro-delinquent attitudes are high and attachments to parents and schools are low. As it pertains to the comparison of Native American youth residing on and off of the reservation, the limited research finds that substance use is typically higher for those on reservation lands. However, because our study is concerned with the utility of the theoretically derived predictors and not the levels of delinquency, all of the tests conducted in the analysis of the data were two-tailed tests.

DATA AND MEASURES

Data

Our analysis used data taken from the 2004 Montana Prevention Needs Assessment Survey (MPNAS) and was supplemented with community level data at the zip code level from the 2000 census. Since 1998, the MPNAS (originally obtained by federal contract 277-97-6001) has been administered every 2 years in the State of Montana. The survey was administered in the Montana public school system by trained teachers and staff from the Department of Health and Human Services. Data were collected from students in the 8th, 10th, and 12th grade levels. In an effort to protect the anonymity of students and the school districts that they reside in, the public use data file used in the analysis is available only in aggregate form. The smallest unit available for analysis and comparison is the zip code in which respondents reside.

The MPNAS survey instrument is composed of 238 questions and requires approximately 45 minutes of in-class time to complete. The questions are organized into five sections targeting student attitudes and perspectives regarding community, family, peers, school, and health behavior issues. The availability of measures pertaining to students' relationships with

family members, peers, community members, and self-reported substance use and the ability to merge this with census level social disorganization indicators make this an attractive set of data for the analysis that was conducted.

Method

The raw data set for the 2003–2004 academic year contained a total sample size of 20,274 cases. The vast majority of these respondents were White ($n = 17,409$; 81.5%). Native Americans represent the largest minority group in the data ($n = 1,611$; 7.5%). The number of Native American respondents is approximately three times that of Hispanic respondents, the second largest minority group ($n = 586$; 2.7%), and more than five times that of Asian Americans ($n = 269$; 1.3%) and African American ($n = 246$; 1.2%), respondents the third and fourth largest minority groups, respectively. As can be seen in these figures, unlike many other states Montana has a large segment of its population who are Native American. This is an advantage of the MPNAS data over those used in the studies outlined in the review of the literature and theoretical overview.

As mentioned above, the analysis was based on a merger of the MPNAS data with 2000 census data matched at the zip code level. The debate with regard to the appropriate unit of analysis to measure the effects of community factors on the link between parent and peer influences are ongoing. However, several recent analyses found important results with community aggregations that are larger than a census tract, including those pertaining to zip code areas and counties (Baumer & South, 2001; Bellair & Roscigno, 2000; Hay et al., 2007). The data offer the ability to evaluate findings based on a relatively large sample of Native American youth and to account for the influence of community level effects in the estimates for family and peer influences.

The test of hypothesis one was initially based on the full sample of respondents who self-identified as American Indian/Native American ($n = 1,611$) when the survey was administered in October of 2004. However, to evaluate the predictions in hypothesis two, it was necessary to fragment the full sample into sub-samples of those residing on and off reservation. Additional measures were taken to be certain that respondents were definitely living on or off of the reservation. In addition to verifying that the zip code was valid, we used a map of Montana that outlined the geographic boundaries of the states seven reservations (Flathead, Blackfeet, Rocky Boy, Fort Belknap, Fort Peck, Crow, and Northern Cheyenne). The change from the 1,611 Native American adolescents who originally took the survey to the 1,341 included in the analysis reflects the 270 cases that were lost due to incomplete or inaccurate zip code information on the survey or as a result of the valid zip code crossing both reservation and non-reservation lands. As such, in the analysis below all estimates are based on an initial sample of

1,341 Native American respondents that are then broken into sub-samples for those residing on ($n = 697$) and off ($n = 644$) reservation lands for the test of hypothesis two.¹

Measures²

SOCIAL BONDING VARIABLES

There are two social bonding variables included in the analysis. Parental Attachment ($\alpha = .91$) is a 12-item scale measuring how close respondents are with their parents, how often they share their thoughts with parents, and how much they enjoy spending time and consulting with parents for help with personal problems. School Attachment ($\alpha = .82$) is a 6-item scale that represents how well respondents enjoy school, find school interesting, and try to do their best. Responses are coded so that higher scores indicate those respondents who report close relationships with parents and who enjoy school, find it interesting, and try to do their best.

SOCIAL LEARNING VARIABLES

Two variables are available in the data to evaluate the influence of peers taken from the social learning perspective. Delinquent peers ($\alpha = .73$) is a 3-item scale based on respondents answers regarding their four best friends and how many of them have tried a series of substances, including alcohol and various drugs. Pro-delinquency attitudes ($\alpha = .80$) is a 5-item scale asking students about their attitudes toward delinquent activities (very wrong to not wrong at all). Higher scorers on the social learning variables are respondents who have four or more friends involved in delinquency and those who do not feel it is wrong at all to miss school, steal things that are worth less than five dollars, pick a fight, or attack someone with the intention of hurting them.

SOCIAL DISORGANIZATION VARIABLES

Three measures derived from zip code level data in the 2000 census are used to measure the influence of community factors on substance use. Racial/ethnic diversity was calculated by subtracting 1 from the sum of the squared proportions of each of the following racial/ethnic groups: Whites, Hispanics, Blacks, Asians, Native Americans, and others. This variable represents the diversity of racial and ethnic groups within a respondents' neighborhood. Residential mobility was obtained by taking the number of people in the census data who reported that they lived in a different house in 2000 than they did in 1995 divided by the total number of respondents. This ratio provides a proportion of the population who had moved in the prior 5 years. Neighborhood poverty was measured as the proportion of residents older than 16 who were unemployed plus the proportion whose incomes were below

the poverty level in 1999. These proportions were added together and divided by two to obtain the zip code level poverty indicator.

DEPENDENT VARIABLES

The data contain a large number of indicators pertaining to the respondent's short-term and long-term substance use. Respondents were asked to report how many times in the past 30 days and in their lifetime they had used these substances. Response categories range from never to more than 40 times.³ The measures for "Thirty Day and Lifetime Alcohol and Marijuana Use" were measured by a single question regarding the frequency of use in the given period. The indicators for "Thirty Day" ($\alpha = .92$) and "Lifetime Illicit Drug Use" ($\alpha = .96$) were based on the frequency respondents had used LSD, cocaine, crack, glue, stimulants (amphetamines, meth, crystal, or crank), sedatives (tranquilizers, such as valium or xanax, barbiturates, or sleeping pills), heroin, other opiates, or ecstasy in the past 30 days and in their lifetime. Those respondents with the highest scores were those with the greatest number of self reported occasions when they have these substances.

CONTROL VARIABLES

In trying to isolate the hypothesized effects there are concerns related to spuriousness that need to be addressed. First, findings could emerge due to the demographic characteristics of the respondents in the sample (e.g., age, sex, and levels of parental education) or due to individual level characteristics associated with the temperament of the child that influence variations in substance use. Several controls are included to address these concerns. Demographic characteristics that are controlled include age (an ordinal variable measured in years), gender (a categorical variable with males coded as the high category), and mother's and father's education level (a categorical variable measuring the combined level of education for a respondents mother and father). Characteristics pertaining to individual temperament are measured by a single variable. Impulsivity is a 3-item scale ($\alpha = .71$) measuring how frequently (never to once a week or more) the adolescents report doing what feels good without thinking about the consequences and are involved in dangerous and crazy activities. Including this control is critical to estimating the effects of family variables due to the finding in prior research that the link between parenting and delinquency is influenced by the effect of child's temperament on parental behavior (Hay et al., 2007).⁴

ANALYSIS

Table 1 contains relevant demographic information for respondents in the full sample and the sub-samples of those residing on and off the reservation.

TABLE 1 Demographics for the Full and Sub-Sample Groups of Native American Adolescents

Variables	Full sample (n = 1,341)	On reservation group (n = 697)	Off reservation group (n = 644)
Age	15.42	15.55	15.27
% Male	49.8	49.4	51.1
Mother/Father Education Level	4.48	4.37	4.59
Moves Since Kindergarten	3.37	3.41	3.32
Impulsivity	.17	.15	.18

These data show the average age of the respondents to be 15.42 years, a near equal distribution of men (49.8%) and women (50.1%), and combined education levels of the mother and father indicate that the average respondent in the Native American sample came from a household where parents had attended but typically had not completed a college degree. Comparisons of the sub-samples show slight differences between the Native American youths residing on and off the reservation with regard to these characteristics. The most notable difference between the samples pertains to levels of impulsivity. The data showed that respondent living off the reservation, on average, were more likely to make decisions without thinking about the consequences and being involved in dangerous and crazy activities than those living on the reservation.

Logic of the Analysis

Ordinary least squares (OLS) regression is used in the analytic models that follow. This is the appropriate technique as the research hypotheses stated earlier examined the impact of family, peer, and community influences on self-reported 30 day and lifetime substance use by Native American youth. All of the theoretical variables were continuous, had strong reliability scores when measured as scaled variables, and even though the data were cross-sectional in nature the regression models assumed that variations in substance use would be explained by the measures drawn from social bonding, social learning, and social disorganization theories outlined above.

The analysis began with an examination of the zero-order correlations of the variables. Next, OLS regression equations were used to examine the impact of the predictor variables on self-reported use among the 1,341 respondents in the full sample. The final section of the analysis examined differences in the impact of the predictor variables on substance use for those respondents who live on reservation lands (n = 687) compared with those who live off reservation lands (n = 644).

Bivariate Results⁵

Table 2 contains the zero-order correlations of the variables in the analysis. With regard to the statistical controls, Table 2 shows significant effects for

TABLE 2 Means, Standard Deviations, and Zero Order Correlations (n = 1341)

Variables	Mean (s.d.)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Age	15.42 (1.6)	-.044	-.074**	.022	.041	-.032	.056*	-.017	-.015	-.172**	.168**	.288**	.199**	.210**	.153**	.100**	.068*
Gender	1.50 (.50)	-	-.004	-.159**	.002	.159**	-.104**	-.142**	.070*	.012	.014	.013	-.016	-.031	-.113**	-.024	-.078**
Ed. Level	4.48 (1.69)	-	-	-.044	.017	-.006	-.002	-.010	.021	-.007	.006	-.097**	-.111**	-.074*	-.017	-.036	-.054
Impulsivity	.17 (1.028)	-	-	-	-.298**	-.421**	.374**	.525**	.008	-.007	-.030	.377**	.394**	.347**	.355**	.364**	.300**
Parental	.00 (1.00)	-	-	-	-	.292**	-.180**	-.308**	-.062*	.069*	-.023	-.136**	-.133**	-.209**	-.166**	-.147**	-.129**
Attachment	.00 (1.00)	-	-	-	-	-	-.289**	-.476**	.029	-.061*	.126**	-.243**	-.244**	-.225**	-.251**	-.293*	-.254
School	.00 (1.00)	-	-	-	-	-	-	.448**	.030	-.006	.065*	.275**	.407**	.386**	.442**	.496**	.455**
Attachment	.00 (1.00)	-	-	-	-	-	-	-	.071**	-.006	-.028	.327**	.377**	.371**	.385**	.452**	.407**
Delinquent	.00 (1.00)	-	-	-	-	-	-	-	-	-.178**	.168**	-.045	-.020	.045	.047	.025	-.007
Peers	.00 (1.00)	-	-	-	-	-	-	-	-	-	-.618**	.016	.018	-.047	-.028	.005**	.003
Pro-	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-.025	-.013	.134**	.088**	-.017	-.008
Delinquency	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-.634**	.617**	.433**	.349**	.219**
Racial	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	.493**	.544**	.510**	.458**
Diversity	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	.705**	.384**	.246**
Mobility	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.483**	.409**
Neighborhood	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.902**
Poverty	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lifetime	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alcohol Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thirty Day	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alcohol Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lifetime	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marijuana	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thirty Day	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marijuana	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lifetime Illicit	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Drug Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thirty Day	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Illicit Drug	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use	.00 (1.00)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Correlation is significant at the .05 level (two-tailed).

**Correlation is significant at the .01 level (two-tailed).

age, with older respondents reporting higher levels of substance use. In all cases, women were more likely to report substance use than men. As it pertains to 30 day use of marijuana and illicit drugs, the differences were significant ($p < .01$). Substance use tended to be lower in households where the mother's and father's education level was higher and higher for those respondents who reported often making decisions without thinking about the consequences and being involved in dangerous and crazy activities. The social bonding and social learning variables were all significantly correlated with substance use ($p < .01$). The effects sizes for delinquent peers and pro-delinquency attitudes were the strongest of all theoretical variables. As it pertains to the social disorganization variables, significant correlations were found only for the relationship between neighborhood poverty and 30 day and lifetime marijuana use. In sum, the results suggest that the predictors should be able to account for variations in self-reported use. Partial estimates were conducted next to evaluate how these initial relationships changed when the effects of the other variables in the model are accounted for.

Multivariate Results

HYPOTHESIS ONE

To assess the impact of family, peer, and community factors on lifetime and 30 day substance use by Native American adolescents, full model equations were estimated. The results are shown in Table 3. In some cases, the results were consistent with the zero-order estimates above. In other instances, initial findings were rendered spurious in the partial estimates. Impulsivity was the only control variable to remain statistically significant across all equations. Age was significant in all equations, with the exception of the examination of 30 day illicit drug use. Mother's and father's education was negatively associated with substance use in every case but 30 day marijuana use. It accounted for significant variation in the equations for 30 day and lifetime alcohol use. The effects of gender on substance use were markedly different in the partial estimates. Although women were more likely to report using all of the substances examined in the zero order estimates, the partial estimates showed the effects sizes to be significant for men in each instance with the exception of 30 day marijuana use. The data showed the differences between men and women to be significant when examining lifetime use of alcohol and illicit drugs ($p < .01$) and in the equation estimating variations in 30 day alcohol use ($p < .05$).

Another instance where the partial estimates vary markedly from zero order estimates was associated with the impact of social bonding variables on substance use. The effects for parental attachment and school attachment were negative and significantly associated with substance use at the bivariate level. However, in the multivariate model there were only two

instances: the effect of parental attachment on lifetime marijuana use ($p < .01$) and the effect of school attachment on lifetime illicit drug use ($p < .05$), where the variables remain as significant predictors. In addition, the effects sizes for parental attachment, albeit weak, were positive in four of the six models and in the model examining lifetime marijuana use for school attachment.

The social learning variables persisted as the most robust predictors of variations in substance use in the multivariate models. The partial estimates consistently showed delinquent peers and pro-delinquency beliefs to have significant effects ($p < .01$). In the equation examining lifetime alcohol use, the largest effect was found for pro-delinquency beliefs. However, in all other models the largest partial effects were found for delinquent peers. Despite accounting for the effects of the statistical controls and variables drawn from the prior literature on social bonding and social disorganization theories, the effects of the social learning variables on substance use were mediated very little in the partial estimates.

Consistent with the zero order relationships, the social disorganization variables did not prove to be significant predictors in the multivariate models. Racial diversity was significantly associated with lifetime alcohol use ($p < .05$) but did not significantly contribute to the explained variations in the remaining models. The prediction that levels of substance use increase as neighborhoods become more racially diverse was consistent with the results only in the equations examining marijuana use. In the remaining estimates, the observed effect was negative. Residential mobility was significantly associated only with lifetime marijuana use ($p < .05$). Although not significant, the finding that levels of illicit drug use decreased as the proportion of residents who have moved in the past 5 years is also inconsistent with what was expected. As it pertains to marijuana use, the effect for neighborhood poverty was significant ($p < .01$) and negative. However, in the remaining estimates for alcohol and illicit drug use, the data showed lower levels of self-reported use as the proportion of resident unemployed and living below the poverty line increased within the zip code level units of analysis.

Across all of the models, the combined effects of the controls, social bonding, social learning, and social disorganization variables accounted for a modest amount of the variations in self-reported substance use. The variables explained anywhere between 25% to 33% of the total variation. A careful examination of the full models suggests that age, impulsivity, delinquent peers, and pro-delinquency attitudes were the strongest and most consistent predictors across all equations. In contrast, the contributions of the social disorganization and remaining statistical controls were solid in some cases and weakly associated with explained variations in others. The social bonding variables, both in terms of the magnitude of the effects sizes and the number of significant effects, tended to be less likely to remain as significant predictors once the effects of the other variables were accounted for in the estimates.

HYPOTHESIS TWO

To test the second hypothesis, a comparison of the equality of the impact of the theoretical variables on substance use was required. To protect against problems associated with negative biases in the standard error of the difference between regression coefficients, we employed a z-statistic to evaluate statistical significance of the difference. This technique is described in detail by Paternoster, Brame, Mazerolle, and Piquero (1997). (See also Hay [2003] and Wilson and Donnermeyer [2006].) The formula for the z-statistic takes the difference between the two coefficients ($b_1 - b_2$) as the numerator and the estimated standard error of the difference (the square root of $SE\ b_1^2 + SE\ b_2^2$) as the denominator. If the value for z exceeds ± 1.96 (for a two-tailed test at the .05 alpha level, ± 2.58 at the .01 level), the null claim of no difference in the effect sizes can be rejected.

The results presented in Table 4 provided a test of the differences in the impact of the theoretical variables on substance use between the on and off the reservation sub-samples.⁶ The coefficients under the column labeled "On β " represent the effects sizes for the theoretical variables on substance use in the on reservation sub-sample. In contrast, the coefficients under the column labeled "Off β " represent the effects sizes for the theoretical variables on substance use in the off reservation sub-sample. In both instances, the reported effects sizes were partials as the influence of all other variables on the relationship of interest had been accounted for in the estimate. The column labeled "Diff" contains the observed difference in effect sizes for the two sub-samples (on minus off). The final piece of information under the column labeled "Z" is the test of significance pertaining to the observed difference.

The analysis of the data showed that of the 42 tests for statistical equality, the differences between the coefficients were significant in four instances. The differences pertaining to the impact of pro-delinquency attitudes ($Z = 2.669$) and those for neighborhood poverty ($Z = -2.634$) on lifetime alcohol use ($p < .01$) were large enough to rule out the null claim of no difference with 99% confidence. In addition, the differences in magnitude of the effects for pro-delinquency attitudes on 30 day alcohol use ($Z = 2.120$) and lifetime illicit drug use ($Z = 1.997$) were also unlikely due to random chance ($p < .05$). The difference in the impact of school attachment on 30 day marijuana use ($Z = -1.591$), pro-delinquency attitudes on 30 day illicit drug use ($Z = 1.511$), and those for racial diversity on lifetime marijuana use ($Z = 1.414$) were notable but did not breach the threshold for statistical significance ($p < .05$).

An examination of the trends with regard to the theoretical variables showed the most notable differences for pro-delinquency attitudes. Although important in both sub-samples, holding positive attitudes toward delinquency was more consequential for substance use for Native American youths on the reservation in all cases except 30 day marijuana use. The

TABLE 3 The Effects of Social Bonding, Social Learning, and Social Disorganization Variables on Lifetime and Thirty Day Substance Use (n = 1341)

Variables	Alcohol lifetime use	Alcohol thirty day use	Marijuana lifetime use	Marijuana thirty day use	Illicit drugs lifetime use	Illicit drugs thirty day use
Age	.287**	.183**	.188**	.131**	.087**	.056
	.169 (.02)	.121 (.02)	.127 (.02)	.104 (.02)	.068 (.02)	.045 (.02)
Gender	.117**	.091**	.049	-.030	.079**	.005
	.227 (.05)	.198 (.06)	.110 (.06)	-.080 (.07)	.201 (.06)	.012 (.07)
Mother/Father's Education	-.050*	-.083**	-.037	.012	-.013	-.034
	-.029 (.02)	-.054 (.02)	-.024 (.02)	.009 (.02)	-.010 (.02)	-.027 (.02)
Impulsivity	.240**	.213**	.142**	.137**	.118**	.065*
	.230 (.03)	.230 (.03)	.157 (.04)	.177 (.04)	.148 (.04)	.086 (.04)
Parental Attachment	.001	.024	-.074**	-.023	.031	.020
	.001 (.03)	.026 (.03)	-.081 (.03)	-.030 (.04)	.038 (.03)	.026 (.04)
School Attachment	-.037	-.013	.006	-.013	-.059*	-.045
	-.037 (.03)	-.014 (.03)	.007 (.04)	-.017 (.04)	-.075 (.04)	-.060 (.04)
Delinquent Peers	.096**	.256**	.236**	.295**	.367**	.353**
	.073 (.02)	.224 (.03)	.209 (.03)	.308 (.03)	.369 (.03)	.370 (.03)
Pro-Delinquency Attitudes	.166**	.161**	.168**	.154**	.192**	.155**
	.148 (.03)	.163 (.03)	.173 (.04)	.186 (.04)	.225 (.04)	.189 (.04)
Racial Diversity	-.065*	-.044	.006	.019	-.006	-.029
	-.039 (.02)	-.030 (.02)	.004 (.02)	.015 (.02)	-.004 (.02)	-.024 (.02)
Residential Mobility	.037	.020	.081*	.045	-.019	-.019
	.035 (.03)	.022 (.04)	.087 (.04)	.057 (.04)	-.023 (.04)	-.024 (.04)
Neighborhood Poverty	-.028	-.022	.139**	.087**	-.052	-.026
	-.015 (.02)	-.013 (.02)	.084 (.02)	.061 (.024)	-.036 (.02)	-.019 (.02)
Model R ²	.27	.29	.27	.27	.33	.25

Note: For each variable, the standardized coefficient is shown in the top row and the unstandardized coefficient and standard error (in parentheses) are shown in the bottom row.

*p < .05 (two-tailed).

**p < .01 (two-tailed).

TABLE 4 Between Groups Comparisons of the Impact of Social Learning, Social Bonding, and Social Disorganization Variables on Differences in Substance Use Between on (n = 697) and off (n = 644) Native American Subsamples

Variables	Lifetime alcohol			Thirty day alcohol		
	On β	Off β	Z	On β	Off β	Z
Parental Attachment	-.005	.006	-.194	-.006	.049	-.972
School Attachment	-.048	-.012	-.636	.029	-.042	1.004
Delinquent Peers	.074	.119**	-1.060	.306**	.200**	2.120*
Pro-Delinquency Attitudes	.243**	.092*	2.669**	.179**	.151	.396
Racial Diversity	-.055	-.073	.636	-.064	-.029	-.971
Residential Mobility	.061	.007	.843	-.005	.011	-.226
Neighborhood Poverty	.021	-.074	2.634**	-.003	-.058	1.230
	Lifetime marijuana					
	On β	Off β	Z	On β	Off β	Z
Parental Attachment	-.061	-.086	.442	.000	-.045	.636
School Attachment	-.031	.044	-1.061	-.079	.056	-1.591
Delinquent Peers	.221**	.253**	.566	.287**	.306**	-.297
Pro-Delinquency Attitudes	.213**	.126**	1.230	.141**	.160**	-.224
Racial Diversity	.040	-.020	1.414	.031	.013	.424
Residential Mobility	.130**	.054	.973	.085*	.027	.684
Neighborhood Poverty	.176**	.116*	1.20	.105*	.087	.360
	Lifetime illicit drugs					
	On β	Off β	Z	On β	Off β	Z
Parental Attachment	.042	.021	.328	.014	.025	-.141
School Attachment	-.054	-.049	-.064	-.057	-.022	-.407
Delinquent Peers	.382**	.366**	.274	.354**	.367**	-.203
Pro-Delinquency Attitudes	.275**	.119*	1.997*	.223**	.093	1.511
Racial Diversity	-.014	.000	-.329	-.044	-.020	-.566
Residential Mobility	-.029	-.016	-.153	-.045	.007	-.564
Neighborhood Poverty	-.046	-.043	-.060	-.031	.000	-.532

Note: All equations include controls for age, gender, mother/father's education level, and impulsivity.

* p < .05 (two-tailed).

** p < .01 (two-tailed).

effects of delinquent peers were consistently the strongest observed in the data except the one examining lifetime alcohol use among reservation Native Americans. The differences for neighborhood poverty and residential mobility were also interesting. The impact of turnover of residents and the proportion of the community unemployed and living below the poverty line was more consequential for explaining variations in lifetime and 30 day marijuana use in the on reservation sub-sample. However, beyond this the social disorganization variables did little to contribute in the equations examining alcohol and illicit drug use both on and off of the reservation. This too can be said for the social learning variables as strong bonds with parents and school did not add to the explained variation in the partial estimate models and did not differ substantially for Native American youths living on and off the reservation. However, there are several instances where the direction of the effect size of the social learning variables for respondents on the reservation differs from that found in the off the reservation sub-sample.

DISCUSSION AND CONCLUSION

The purpose of this investigation has been to assess the effectiveness of variables derived from social bonding, social learning, and social disorganization perspectives to explain variations in lifetime and 30 day substance use among a sample of Native American youth and to find out whether the effects varied between respondents living on and off the reservation. The prior research examining this relationship has been sparse, tending to focus more on demographical comparisons than incorporating and applying theory. The study employed a multi-domain approach that included community, family, and peer indicators and the analysis was conducted on a data set comprised exclusively of Native American youths.

Highlighting the importance of peer relationships for youth, findings showed variables derived from the social learning tradition to be the most consequential predictors of substance use. Delinquent peers and pro-delinquency attitudes were found to have consistent significant associations with each of the substance use measures examined in the analysis. The effects sizes for these variables were the strongest of the three theoretical orientations from which predictor variables were derived. Although there were few differences between the on and off reservation sub-samples, the majority of these pertained to the effects of social learning variables.

Variables derived from the social disorganization tradition failed to consistently account for variations in substance use in the multivariate models. The direct effects of these factors on substance use were found only in those models that examined marijuana use. The influence of community factors differed between the on and off reservation sub-samples only in the examination of the modest effects of neighborhood poverty on lifetime alcohol use

and were not found to be significantly associated with variations in illicit drug use. In contrast to expectations, parenting variables derived from the social bonding perspective were found to be the least consequential of all predictors. In one instance, the equation examining lifetime marijuana use was parental attachment shown to account for significant variation. Similarly, school attachment was found to be consequential only when examining lifetime use of illicit drugs. No significant differences related to the effects of parenting variables on substance use were found between the sub-samples.

As with any study, this one is not without important considerations that should be kept in mind when interpreting the results presented above. First, the data was secondary, cross-sectional, and limited to Native American adolescents in the State of Montana for whom we had a valid five-digit zip code. As such, temporal priority of the variables in the analysis is not achievable but inferred based on prior tests identified in the literature. Second, there are cautions that should be recognized with regard to the interpretation of the minimal direct effects that were found for the social disorganization measures. The census indicators used were based on objective, community-level data as opposed to perceptions of neighborhood problems based on respondent self reports in the places where they live. Although these are most consistent with Shaw and McKay's (1942) original statement of the theory and correspond with the prediction that the effects on delinquency, including substance use should be indirect through their connection with family and peer indicators; youth may not be as attuned to these as they are to things such as graffiti, trash, and drugs in their communities.

Although both of these considerations are important, perhaps greater concern pertains to the survey instrument and research design. The survey was designed and data were gathered with a general audience in mind rather than a sampling frame comprised of Native American youth. This issue is consequential when considering that the term "family" has a much broader cultural connotation for Native American's including mothers, fathers, brothers, sisters, aunts, uncles, cousins, grandparents, nieces, nephews, and adopted family members. The failure to account for difference such as this likely introduces measurement error into the estimates of effect size of community and family effects among Native Americans. This is particularly important in research such as that presented here where the analysis is constrained to only Native American youths and may be less reflective of the lack of importance to close ties with parents and school outlined as consequential in social bonding theory due to the use of generalized definition and lack of cultural context.

With these caveats in mind, findings reported here may be taken as evidence that existing theories are important frameworks for examining Native American substance use. They show that even though these theories did not originate with Native American adolescents as the primary focus, the estimates and predictions derived from them provide a basis for understanding

the process associated with variation in substances use. Although analysis of the data showed mixed support for theoretical derived predictors, this may be more indicative of methodological issues associated with measurement of key variables than deficiencies in the causal models themselves. Theoretical attention should continue to focus on testing and modifying these ideas to more fully account for differences pertaining to community, family, and peer influences on Native American substance use patterns.

This study addressed a serious void in the existing literature on Native American adolescent substance use. It identified the need for research directed at Native American youth issues as a primary research focus, rather than cross-ethnic comparisons, or statistical control indicators that have been the norm in the extant literature. Future research needs to address Native American issues and the methodological concerns pertaining to them in isolation from the stereotypes and misunderstandings of prior research. This new work needs to be grounded in theory and recognize the importance of cultural context when analyzing Native American issues. To better understand and use cultural sensitivity, research designs need to begin with a Native American worldview that is carried throughout the entire process. The questions, research design, data collection, measures, and methods need to be embedded and informed by cultural context. The analysis of on versus off reservation differences, much like the inconsistencies of findings pertaining to the effects of gender, suggest that a more careful examination of cultural and methodological considerations may be in order before intricacies based on gender and residential location can be adequately evaluated.

NOTES

1. Analysis of the 270 cases that were omitted from the Native American sample due to missing or incomplete five-digit zip codes did not show any significant differences ($p < .05$) when compared to the 1,341 respondents included in the analysis with regard to the demographic variables discussed in Table 1.

2. All of the variables included in the analysis are measured as standardized scores. Because there are differences in the scale construction of the theoretical variables in the analysis, it was preferable to retain the items as standardized scores. All of the measures are based upon indicators derived from the review of the literature and theoretical overview outlined in the earlier section of the paper. Additional assistance regarding the census level social disorganization indicators was drawn from Ainsworth's work (2002) examining the mediating effects of community context on educational attainment. Confirmatory factor analysis supports each of the items as unidimensional indicators; the reported alpha reliabilities are based on the 1,341 cases that comprise the data for the test of hypothesis one.

3. Response categories for lifetime reported use of marijuana were given as follows: 1 = 0 occasions, 2 = 1 to 2 occasions, 3 = 3 to 5 occasions, 4 = 6 to 9 occasions, 5 = 10 to 19 occasions, 6 = 20 to 39 occasions, and 7 = 40 or more occasions.

4. A statistical control for the number of moves the child reported since kindergarten is available in the MPNAS data and was included in the preliminary estimates of the models. Although this indicator was associated with the dependent variables and was included to control for varying lengths of time respondents had lived at their current address, estimates were confounded in the multivariate models due to high levels of collinearity with the residential mobility indicator drawn from the 2000 census. Because the community level indicators are key tenets of social disorganization theory, residential mobility

at the zip code level was retained and the number of moves since kindergarten was removed from the multivariate analysis presented in the following section.

5. Data were screened for missing data, outliers, and other potential data entry errors. Univariate and multivariate examinations of the data supported assumptions of normality, linearity, and homoscedasticity, and colinearity diagnostics, such as variance inflation factor and tolerance scores, showed no evidence of multicollinearity in the final models.

6. Although not a part of the test of hypothesis two, *t* tests of the differences in average levels of self-reported use between the on and off reservation respondents were conducted. The results showed that in only one instance (lifetime use of marijuana) were the average scores higher for the on reservation sub-sample than it was for the off reservation sub-sample. In all instances, the differences were very slight and did not come close to approaching statistical significance.

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