MARIJUANA AND ALCOHOL USE DURING EARLY ADOLESCENCE: GENDER DIFFERENCES AMONG AMERICAN INDIAN/FIRST NATIONS YOUTH

MELISSA L. WALLS

This study examines the growth of alcohol and marijuana use during early adolescence among a sample of 746 Indigenous youth (aged 10 – 12 years at wave 1; 50.3% female) of the upper Midwest and Canada, with a special focus on potential gender differences in these patterns. Research documenting the disproportionately high rates of Indigenous substance use, coupled by our lack of understanding of gender patterns among this group—especially in very early adolescence—highlight the need for this culturally specific work. Results of latent growth curve analyses from three waves of annual data collection indicate that the females in our sample engage in alcohol and marijuana use at rates similar to or greater than their male peers. This finding counters conventional ideas of gender and substance use that place young males at elevated rates of use compared to females, and also adds to our understanding of gendered substance use patterns among Indigenous youth.

INTRODUCTION

United States and Canadian national and multi-site estimates of substance use rates find that on average, American Indian/First Nations (hereafter Indigenous) youths show higher rates of alcohol and drug use than most other racial/ethnic groups (Beauvais, 1996; Gfellner, 1994; Wallace et al., 2003). This generalization is tempered by consideration of the vast degree of heterogeneity within and between the over 300 different tribal or language groups in the United States alone (Beauvais, 1998; May, 1995). Of specific interest to this paper are divergent findings with regards to gender and Indigenous substance use: Whereas some researchers report higher rates of use among males (Neumark-Sztainer et al., 1996; Substance Abuse and Mental Health Services Administration [SAMHSA], 2007), others conclude that Indigenous females use drugs and alcohol more often than or at similar rates as their
male peers (Spear, Longshore, McCaffrey, & Ellickson, 2005). This discrepancy illustrates the need for research within specific Indigenous cultures to identify patterns that may then be compared across groups. Such focus allows not only for a better understanding of ethnic group variation in substance use patterns on a national/international level, but also facilitates translational research toward targeted prevention and intervention efforts and partnerships at the community level.

The purpose of this study is to examine the growth of alcohol and marijuana use across early adolescence among a sample of Indigenous youth of the upper Midwest and Canada, with a special examination of the potential gender differences in these patterns. This study extends our knowledge of gender effects on substance use by exploring these possible differences among a sample of youths from a common Indigenous cultural group. In addition, despite a large body of research that highlights the exacerbation of drinking related problems among youth with earlier ages of substance use onset, little is known about the initiation of substance use before age twelve (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2005). This research contributes to the current literature by examining gendered patterns of substance use among Indigenous youth in pre and early adolescence.

**Prevalence and Consequences of Youth Substance Use**

Youth substance use represents a serious health hazard with consequences that can hinder an individual’s healthy development and future success. General population data suggests that youth tend to drink more heavily when compared to adult drinkers and that underage alcohol consumption is associated with risky sexual behaviors, academic failure, other drug use, and an increased risk for developing alcohol related disorders later in life (NIAAA, 2005). Like alcohol, adolescent marijuana use can be accompanied by risk for a variety of negative health and social consequences: Research suggests that marijuana use may increase respiratory problems, compromise the immune system, delay memory, and adversely impact learning (Budney, Moore & Vandrey, 2003; National Institute on Drug Abuse [NIDA], 2008). Increasing levels of marijuana use are associated with a variety of educational problems, including lower grades and school satisfaction, negative school attitudes, and school dropout (Lynsky & Hall, 2000).

Colonization of Indigenous communities has led to years of genocide and assimilation attempts including physical and psychological torment and forced removal and relocation that have resulted in a systematic attack on culture and community (Duran & Duran, 1995; EchoHawk, 1997). As a result, many Indigenous communities today face extreme poverty (Gregory, Abello, & Johnson, 1996; Roubideaux, 2005; Trosper, 1996) and elevated rates of violence (Bachman, 1992). As such, Indigenous youths and their families have endured a significant exposure to historical and contemporary stressors that largely contribute to their...
disproportionately high rates of substance use. These elevated rates place Indigenous youth at heightened risk for experiencing the deleterious consequences of substance use.

For example, early onset substance use is associated with a variety of problem outcomes (Kaplow, Curran, & Dodge, 2002), including lower achievement, academic problems, delinquent and antisocial behavior, later drug abuse and alcoholism, and adulthood problems with employment and criminal and violent behavior (Ellickson, Tucker, & Klein, 2003; McGue, Iacono, Legrand, Malone, & Elkins, 2001). Early substance use may play a role in three of the five leading causes of injury or death for adolescents aged 10 to 14 years: motor vehicle accidents, suicide, and homicide (Centers for Disease Control [CDC], 2001). Given the heightened risk for harm surrounding early onset substance use, reports that Indigenous youth are more likely to engage in early onset substance use (May, 1982, 1986) and disproportionately high rates of non-experimental substance use (see Herring, 1994) are especially worrisome and further highlight our need to better understand patterns and correlates of Indigenous substance use at earlier ages.

**Gender Differences in Youth Substance Use**

Although rates of adolescent substance use have typically been higher among boys than girls (Bachman et al., 1991; SAMHSA, 2007), empirical work points to a narrowing and/or closing of this gender gap where girls may actually be catching up or surpassing their male peers in terms of substance use rates (Donnermeyer, 1992; Johnston, O’Malley, Bachman, Schulenberg, 2006; Wallace et al., 2003). This pattern has been displayed among samples of youth from across a variety of racial and ethnic categories. Recent findings from the Monitoring the Future (MTF) project suggest that although male substance use tends to be greater than that of females at 12th grade, gender differences in earlier years (around 8th grade) are minimal, with some annual drug use rates higher for females than males (Johnston, O’Malley, Bachman, & Schulenberg, 2006). These MTF authors have noted that gender differences in which males use drugs and alcohol more so than females appear to emerge in mid-to-late adolescence. Thus, studies focusing on older youth may fail to capture important deviations from the conventional norm early on.

Studies of gender effects on substance use focused specifically on Indigenous youth have resulted in mixed findings. Research with Indigenous students in the state of Minnesota found that high-school-aged males were more likely than high-school-aged females to use marijuana. Additionally, at 12th grade these boys were more likely than girls to use alcohol, but girls were more likely to smoke cigarettes (Neumark-Sztainer et al., 1996). Beauvais (1992) reported only a slightly higher pattern of substance use for Indigenous 8th – 12th grade males compared to females. In a national sample that included Indigenous youth, Wallace and colleagues (2003)
found that during the 1990s, Indigenous youth alcohol use rates were similar by gender over time, but that Indigenous boys’ rates of marijuana use were higher than their female counterparts. These researchers also found that while Indigenous boys’ marijuana use remained essentially stable over time, girls’ rates increased between 1991 - 2000. Mitchell and colleagues (1999) reported that Indigenous males in their sample differed little from females in terms of their levels of marijuana use at age 14, but that males rates of use increased at a significantly higher rate across adolescence compared to females. In a follow-up study, Novins and Mitchell (1998) found that youth reported similar levels of low frequency marijuana use across genders, but that males were more likely to use marijuana at a high frequency. Novins and Baron (2004) found no gender differences in terms of the progression of substance use across time for Indigenous youth in their study. Among a sample of seventh-graders in the northern plains, Indigenous girls’ alcohol, marijuana, and cigarette use was greater than rates reported for Indigenous males and White youth of both genders (Spear et al., 2005). Finally, for youth aged 9-13 years, Costello and colleagues (1997) reported that Indigenous girls met criteria for substance use disorders more often than their male peers.

In sum, rates of Indigenous substance use vary depending on gender and the type of substance under study. With the exception of the work of Spear and colleagues (2005), whose sample included 12 and 13 year old Indigenous youths, and the gender comparisons provided by Beauvais (1992) for 8th – 12th graders, research explicitly examining the role of gender on early substance use patterns across tribal groups and cultures is lacking. As Spear et al., (2005) point out, “the available evidence on substance use among younger American Indian adolescents is both sparse and inconsistent,” and, “There is very little direct evidence on gender differences in American Indian adolescents younger than eighth-grade age” (p. 2). From the limited existing literature, these authors provide some evidence that Indigenous females in comparison to their male counterparts may be especially prone to engage in substance use in the pre- and early-adolescent years. With consideration of the amplified risk and consequences associated with early onset substance use, it is important that we examine patterns and correlates of substance use among youth as they enter and proceed through adolescence.

**Other Correlates of Youth Substance Use**

In an attempt to minimize the effects of potentially confounding demographic variables on youth substance use, a number of control variables are included in the analyses for this study. First, adolescents living in households that are experiencing higher rates of financial strain than others have been shown to be at greater risk for a variety of negative behavioral and psycho-social outcomes, including substance use (Ge et al., 1992; Hawkins, Catalano, and Miller, 1992; Whitbeck et al., 1991).
Family structure has also been linked to adolescent substance use. For example, youth living in single parent homes have been found to participate in more serious substance use behaviors than those in dual parent households; this association has been explained in terms of a differential exposure to stressors and deviant peers among those youth who live with only one adult (Barrett & Turner, 2006). Further, a recent study of urban-American Indian/Alaska Native youth revealed that compared to youths living in original two-parent homes, youths in single-mother households were more likely to engage in early onset alcohol and marijuana use as well as regular tobacco use (Lonczak, Fernandez, Austin, Marlatt, & Donovan, 2007).

Next, remote location status is also considered in these analyses. Although all of the reservation and reserve sites in this sample may be considered rural, several of the Canadian reserve locations are geographically isolated. On the one hand, such isolation might lead one to expect less accessibility to marijuana and alcohol (see, for example, Chiu, Perez, & Parker, 1997); however, qualitative information and anecdotal evidence from our project’s community partners suggest otherwise. Due to these contradictory explanations, the remote location measure is excluded from any formal hypotheses but is included here as a sample-specific contextual control variable.

In addition to the factors discussed above, previous research (Kandel & Logan, 1984; Menard & Huizinga, 1989; Mitchell et al., 1999) has suggested that adolescent substance users experience a ‘maturational process’ where drug use increases in early adolescence, peaks in mid-to-late adolescence, and then drops off as the adolescent matures into adulthood. Such research provides some evidence for an anticipated linear growth in substance use in this paper: At such early ages, the youth in this sample are likely increasing their drug use habits rather than reaching a dropping off point.

**Hypotheses**

Based on previous research, the following specific hypotheses are proposed for this study

$H_1$: Following early-adolescent findings reported by Spear and colleagues (2005), and based upon anecdotal concerns expressed by our tribal community partners, the females in this sample are expected to report significantly greater rates of substance use and experience greater growth in substance use rates over time compared to their male peers.

$H_2$: Because of the age range of the youth included in this study (early adolescence), rates of both alcohol and marijuana use should show positive linear growth during adolescence.
Financial strain is expected to be positively associated with youth substance use.

Youth living in single mother homes are expected to report higher rates of alcohol and marijuana use than those youth living in other family structure households.

Methods

Sample

These data were collected as part of a longitudinal lagged sequential study currently underway on four American Indian reservations in the Northern Midwest and five Canadian First Nation reserves. Several of the reserves are classified as “remote” in that they are considerable distances from even small towns and are accessed by non-paved roads, by boat, over ice in winter, or by airplane. The reserves and reservations included in this sample share a common cultural tradition and language with minor regional variations in dialects. The sample is representative of one of the most populous indigenous cultures in the United States and Canada. The long range purpose of the longitudinal study is to identify culturally specific resilience and risk factors that affect children’s well-being and to then use the information to guide the development of culturally-based interventions.

The project was designed in partnership with the participating reservations and reserves. Prior to the funding application, the research team was invited to work on these reservations and tribal resolutions were obtained. As part of our agreement to work together, the researchers promised that participating reservations would not be identified in published reports. On each participating reservation, an advisory board was appointed by the tribal council. The advisory boards were responsible for advising on handling difficult personnel problems, advising on questionnaire development, reading reports for respectful writing, and assuring that published reports protected the identity of the respondents and the culture. Upon advisory board approval of the questionnaires, the study procedures and instruments were submitted for review by the university Institutional Review Board for approval.

All participating staff on the reservations were approved by the advisory board and are either tribal members or, in a few cases, non-members who are spouses of tribal members. To ensure quality of data collection, all the interviewers underwent special training for conducting computer-assisted personal interviewing for the diagnostic measures1. The training included practice interviews and feedback sessions regarding interview quality. In addition, all of the interviewers completed a required human subject’s protection training that emphasized the importance of confidentiality and taught procedures to maintain the confidentiality of data.

Prior to this project, each tribe provided us with a list of families of enrolled
children aged 10 -12 years who lived on or proximate to (within 50 miles) the reservation or reserve. We attempted to contact all families with a target child within the specified age range. Families were recruited with a personal visit by an American Indian/First Nations interviewer explained the project to them. They were then presented with a gift and invited to participate. If they agreed to be interviewed, each family member received $40 for their time when the interviews were completed. Target adolescents and at least one of their adult caretakers are interviewed once annually for the longitudinal project design.

This study includes youth data from waves 1 - 3 of the project. At wave 1, the majority (97%) of the 746 youths interviewed were 10 - 12 years old; however, because of recruitment errors and birthdays between recruitment and interview dates, a small number of youth were aged 9 or 13 at wave 1. The sample is approximately evenly split by gender (50.3% female, see Table 2). The overall response rate for all sites at baseline was 79%. Subsequent retention rates were 95% for wave 2 and 93% for wave 3 of data collection.

Measures

Substance Use

Two measures each of alcohol and marijuana use are utilized in this study. To assess gender differences in lifetime prevalence rates of substance use, youth were asked to indicate whether they had ever had more than a sip of beer, wine, or other alcohol, and in a separate question, whether they had ever smoked marijuana. Responses to both questions are coded so that 1 = yes (ever used), and 0 = no. These dichotomous measures of substance use are included only in Table 1. Descriptive statistics for the central variables included in this study are included in Table 2.

The remainder of the analyses and descriptive information contain a second measure of substance use: In order to capture a wider range of variability in substance use over time, alcohol and marijuana use are each measured by a continuous variable. For both substances, respondents were asked a series of questions to assess their level of substance use. Youth who answered ‘yes’ to the lifetime prevalence questions described above were asked a subsequent and more detailed question regarding their substance use, and so on for the remainder of the items described below. Questionnaire skip patterns (i.e., systematic missings) were recoded as appropriate so that those who had not used substances were coded as ‘0’ in the continuous measures. In addition to the already detailed (1) lifetime prevalence item, youth were asked (2) if they had used the substance more than once, (3) if they had used the substance in the past year, and (4) if they still use the substance. Each of these 4 items are coded so that 1=yes and 0=no. The resulting summed scales ranged in possible values from 0 - 4, with higher values indicating a higher severity/frequency of substance use.
CONTROL VARIABLES

Each of the control variables were included as time invariant covariates measured at wave 1. Youth gender was a dummy variable indicator coded such that males = 0 and females = 1.

Single mother households were also indicated by a dummy variable where single mom (plus child[ren]) = 1 and 0 = all other household arrangements (e.g., live-in partners, grandparents, extended family members, etc.). Nearly 23% of the youth in the sample were living in single mother households at wave 1.

Remote geographic status controls for those reservation/reserve sites that are located in geographically isolated (i.e., no paved highways, not adjacent to neighboring cities or towns) locations. This variable was coded so that 1 = remote location and 0 = all other sample sites, with 9.2% of youth living in locations categorized as remote.

Financial strain is measured by adult caretaker responses to questions regarding their family’s financial situation (Conger et al., 1992). Respondents stated whether they strongly agreed, agreed, disagreed, or strongly disagreed to the following statements: My family has enough money to: (1) afford the kind of home we need, (2) afford the kind of clothing we need, (3) afford the kind of food we need, and (4) afford the kind of medical care we need. Two additional questions assessed financial strain during the past twelve months: (1) how much difficulty have you had paying your bills?, and (2) generally, at the end of each month [how much money] did you end up with? Responses were coded on a 0 - 3 scale, with a higher score indicating higher financial strain. The mean score for this measure at wave 1 was 1.3, and Cronbach’s alpha = .81.

ANALYTIC PROCEDURE

Bivariate associations and chi-square difference tests were used to explore the relationships between study variables and to assess gender differences in lifetime prevalence of alcohol use within each wave of data collection. Multivariate analyses were employed to test the remaining hypotheses via latent growth curve modeling (LGC).

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER DIFFERENCES IN LIFETIME PREVALENCE OF ALCOHOL AND MARIJUANA USE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wave 1</td>
</tr>
<tr>
<td>Wave 2</td>
</tr>
<tr>
<td>Wave 3</td>
</tr>
</tbody>
</table>

* p<.05
Latent growth curve models draw upon the strengths of structural equation modeling (SEM) by estimating latent factors that represent growth trajectories; these unobserved components of growth become the focus of the analysis. The latent growth curve model represents an advancement over previous methods such as autoregressive crosslagged (ARCL) models because 1) ARCL models are fixed-effects (where fixed refers to mean values) models only whereas LGC includes random effects (where random refers to individual variability in intercepts and slopes) as well, 2) ARCL models generally fail to adequately account for change over time, and 3) ARCL models do not consider the influence of earlier or later change on a single measurement construct (Curran & Hussong, 2002). In addition to addressing these issues, LGC is advantageous to regression-based multi-level modeling techniques in terms of the high degree of flexibility by which covariates can be added to a model, the ability to use SEM testing capabilities, and the ability to test any covariance structure, among other benefits (Rovine & Molenaar, 2000). As with all techniques that address nested data issues (here, three sets of interviews, or three separate time-points of assessment, are nested within each individual), LGC accounts for problems regarding aggregation bias, misestimated precision, and a “unit of analysis” problem inherent to nested designs (Raudenbush & Bryk, 2002; Singer & Willett, 2003).

As noted, retention rates for this study are quite high, therefore limiting the number of missing cases or individuals over time. Instead of excluding the limited number of cases with missing information (i.e., listwise deletion), modern data estimation techniques allow the use of complete data and provide more precise parameter estimates with less strict assumptions concerning causes of missing data (Enders & Bandalos, 2001). Those cases or variables missing any data were imputed within these analyses using maximum likelihood (ML). Maximum

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Descriptive Statistics for Major Study Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Time 1 alcohol use</td>
<td>.32</td>
</tr>
<tr>
<td>Time 2 alcohol use</td>
<td>.69</td>
</tr>
<tr>
<td>Time 3 alcohol use</td>
<td>1.11</td>
</tr>
<tr>
<td>Time 1 marijuana use</td>
<td>.24</td>
</tr>
<tr>
<td>Time 2 marijuana use</td>
<td>.54</td>
</tr>
<tr>
<td>Time 3 marijuana use</td>
<td>.84</td>
</tr>
<tr>
<td>Gender (Female=1)</td>
<td>-</td>
</tr>
<tr>
<td>Household Financial Strain</td>
<td>1.28</td>
</tr>
<tr>
<td>Single Mother Home</td>
<td>-</td>
</tr>
<tr>
<td>Remote Location</td>
<td>-</td>
</tr>
</tbody>
</table>
likelihood estimation attempts to select those values that maximize the likelihood that a particular parameter estimate would occur in a given population (Allison, 2002; Enders, 2005). Maximum likelihood parameter estimates are valuable in that they are considered both consistent and efficient when applied to larger sample sizes (Enders, 2005).

**RESULTS**

Comparisons between girls’ and boys’ lifetime prevalence rates of alcohol and marijuana use are shown in Table 1. With the exception of boys’ higher reports of alcohol use at wave 1, girls reported higher rates of alcohol and marijuana use than boys at all three time points. Chi-square tests of significance for differences in boys’ and girls’ substance use rates show that these gender differences are significant for alcohol and marijuana use at wave 2 only ($p < .05$). By wave 3 (when youth were mostly 12 - 14 years of age), nearly half of the girls and 43% of the boys had at least experimented with alcohol. By that same time, over one-third of girls and 30.6% of the boys said they had tried marijuana.

As can be seen in Table 2, the mean values of both alcohol and marijuana use (continuous measure) increase steadily across the 3 waves of data collection. This linear trend is in support of $H_1$ and is discussed in more detail and below.

Bivariate associations between the major study variables are provided in Table 3. Notice that each of the wave specific measures of substance use were moderately to highly correlated with the others. Rates of alcohol use and marijuana use within each wave were especially highly associated. At the bivariate level, being female was associated with higher levels of alcohol use at wave 3, and with higher levels of marijuana use at waves 2 and 3. Living in a household with higher financial strain was associated with youth drinking at wave 3 and youth marijuana use at waves 2 and 3 (lending partial support to H2), and was also correlated with single mother homes. In support of H3, living in single mother households was positively associated with youth substance use only in the case of marijuana use at wave 3. Finally, living in a remote location was negatively associated with alcohol use at waves 2 and 3.

Latent growth models were fitted using Mplus version 3.11 (Muthen & Muthen, 2004) to explore the potential growth of alcohol and marijuana use over time as well as to examine the impact of gender and the remaining covariates on these patterns.

Unconditional growth models refer to those models that include only time as a predictor variable in the analyses. An unconditional growth model was first estimated separately for each substance. The marijuana-specific unconditional model fit the data very well. The CFI was estimated at 1 (a value 1 indicates perfect fit), and the RMSEA was estimated at zero with a confidence interval ranging from .00 to .07
where values under .05 (some authors argue for a cutoff of .08, Browne & Cudeck, 1993) indicate acceptable fit (Hu & Bentler, 1999; Kenny, 2003; Schumaker & Lomax, 2004). The unconditional alcohol growth model fit the data just as well, with a CFI value of 1 and a RMSEA estimate of zero, with a confidence interval of .00 to .09.

Results of these unconditional models indicate that rates of alcohol ($M_α = .45$) and marijuana ($M_α = .37$) use at wave 1 were significantly different from zero ($p < .001$) and that the average linear growth across waves was both positive (alcohol $M_β = .79$; marijuana $M_β = .63$) and statistically significant ($p < .001$) for each substance.

Results for the final conditional growth models (where predictor variables are included in the model) are shown in Figure 1 (marijuana) and Figure 2 (alcohol). Note that although associations between each of the covariates (i.e., gender, financial strain, remote location, and single mother) and the substance use initial statuses and growth rates were tested, only the statistically significant paths are shown in the model. Paths are labeled by standardized coefficients.

Gender and the remaining time-invariant (time 1) covariates were added to the unconditional models (Figures 1 & 2). First, the findings were examined related to marijuana use and its association with the time invariant covariates. The conditional marijuana model fit the data well (CFI=1; RMSEA = .00, with a confidence interval ranging from .00-.03). None of the covariates were significantly associated with initial (wave 1) marijuana use. With regards to gender, this indicates that net of the control variables, males and females did not differ from one another in terms of their marijuana use during the first year of this study. With the inclusion of the covariates, the marijuana slope coefficient remained statistically significant, indicating positive linear growth ($M_β = .27; p < .01$). In addition, two of the covariates were significantly associated with changes in marijuana use over time. With the inclusion of the covariates, females experienced higher rates of growth in marijuana use compared to males ($β_1 = .11; p < .05$), as did those living in homes experiencing higher rates of financial strain ($β_1 = .10; p < .05$).

The conditional alcohol model also fit the data well (CFI = 1.0; RMSEA = .00 with a confidence interval ranging from .00 to .02). Similarly to the findings for marijuana, none of the covariates were significantly related to initial (wave 1) alcohol use. The conditional slope coefficient remained significant and positive for the alcohol model ($M_β = .53; p < .001$). Also similar to the findings related to marijuana use, none of the covariates were significantly associated with initial alcohol use but two were related to the growth of alcohol use over time. Holding each of the covariates constant, females experienced higher rates of growth in alcohol use over time than did their male peers ($β_1 = .15; p < .01$). Also net of the control variables,
youths living in remote geographic locations experienced slower rates of growth than those living in less isolated areas ($\beta_1 = -.15; \ p < .01$).

**DISCUSSION**

The purpose of this paper was to examine the growth of alcohol and marijuana use during early adolescence among a sample of Indigenous youth living in the upper Midwest and Canada, with special emphasis on the potential gender differences in these patterns. While most research focused on gender and substance use has reported higher frequency of use among males (e.g., SAMHSA, 2007), other studies point
to a narrowing and/or potential reversal of this gender gap (Johnston et al., 2006; Wallace et al., 2003); however, reports of gender differences in Indigenous youth substance use have been inconsistent. The results of these analyses show, in support of \( H_1 \), that Indigenous girls in our sample are reporting either similar or significantly higher rates of alcohol and marijuana use than their male peers. In addition, the growth of alcohol and marijuana use during early adolescence is significantly higher among girls than boys. In relation to previous literature, these results are similar to those reported for 12 and 13 year old Indigenous youth in which female substance use rates exceeded those of males (Spear et al., 2005) and complement Costello and colleagues’ 1997 report of greater substance use disorders among 9 – 13 year old Indigenous girls. In this regard, these prior studies and the findings presented in this paper (where youths began the study at ages 10 – 12 years and were 12 – 14 years of age by wave 3) can be considered in relation to Johnston and colleague’s (2006) assertion for the general population that young males’ heavier substance use does not actually emerge until middle to late adolescence. At the same time, the results of this paper contradict conventional ideas and previous reports of young Indigenous males engaging in marijuana and alcohol use at rates greater than similarly aged females (Neumark-Sztainer et al., 1996; Novins & Mitchell, 2001), even when younger (8th grade) adolescents are included in a sample (Beauvais, 1992). Others have reported similar rates of Indigenous youth substance use by gender (Novins & Baron, 2004), or gender differences dependent upon the drug under study (Wallace et al., 2003). In the context of Indigenous culture, such discrepancy is not altogether surprising given the heterogeneity of American Indian/First Nations reservation communities in terms of acculturation/enculturation, differences in traditional values and practices, and parenting norms, among other factors. More studies employing longitudinal data are needed to better describe the patterns of substance use from early-to-late adolescence within Indigenous communities.

In addition to these gender effects, bivariate analyses show that within each wave of the study, alcohol use is highly correlated with marijuana use. This finding suggests that the youth in this sample may be engaging in polysubstance use, even as pre-teens (ages 10 - 12 at wave 1).

Both the bivariate and latent growth analyses revealed that living in a remote geographic reserve is associated with lower rates of youth alcohol use as compared to less isolated locations. Nonetheless, this finding was not consistent for both substances: Remote location was not associated with marijuana use in any of these analyses. These substance-specific findings may be indicative of accessibility. It could be that youths living in isolated areas have less access to alcohol than they do to marijuana. Further, it is important to note that the effect sizes of the correlations
between alcohol use and remote status were somewhat weak (-.10 and -.12), thus accounting for only a small amount of the variance in alcohol use.

These analyses lend some support to each of the remaining proposed hypotheses. In support of H2, results of the latent growth analyses revealed that rates of substance use were occurring at a positive linear rate within this sample. As noted, this linear growth may be a result of the relative youthfulness of the sample: The youth in this study have likely not yet reached a maturation point of decreasing substance use described by other scholars (Kandel & Logan, 1984; Menard & Huizinga, 1989; Mitchell et al., 1999).

These analyses provide some support for H3. At the bivariate level, higher rates of household financial strain showed a positive but weak association with both alcohol use (at wave 3 only) and marijuana use (waves 2 and 3); in the multivariate (growth) analyses, financial strain was associated with growth rates of marijuana use only.

Hypothesis 4 (H4) was partially supported. Living in a single-mother home was weakly associated with higher levels of marijuana use in the bivariate analyses for wave 3. Additionally, there is a significant relationship between single-mother households and accelerated growth of marijuana use.

Limitations

Although this study provides new information on gender and substance use among Indigenous early adolescents, there are limitations that need mentioning. A limit of the current study is its focus on only two substances. The decision to focus on alcohol and marijuana use was based on trends revealed in our annual data reports to the tribal communities that participate in this longitudinal project. In addition, the intoxicating effects of alcohol and marijuana present unique risks in terms of how they affect decision making processes and risky behavior. Still, this study fails to address whether or not girls engage in higher rates of drug use for all substance types. In addition, a potential limitation of this research is our reliance on self-report data, which is subject to social desirability bias (i.e., underreporting; Fendrich, Johnson, Wislar, Hubbel, & Spiehler, 2004; Fendrich & Mackesy-Amiot, 2000). This research also pertains to people from a single Indigenous culture who live on or near reservations/reserves and may not be generalizable to other Indigenous cultures or to Indigenous people who live in urban areas. Last, as noted previously, the effect sizes of the bivariate relationships between substance use and the control variables in this study were weak to, at best, moderate. Clearly, other factors are related to Indigenous adolescent substance use and the results of these analyses should be interpreted with appropriate caution.
As noted, research findings on gender and Indigenous substance use have been mixed at best. This work brings us a step closer to understanding some basic gender patterns in substance use over time, but also warrants further examination of the mechanisms that drive these gender differences. Although not of central interest to this manuscript, the variance components of initial and growth rates of both substances were significant in these analyses, indicating the need for inclusion of a variety of potential explanatory risk factors for substance use in future models. Future research and theory should attend to these major issues, especially in terms of how such patterns emerge in Indigenous populations. For example, a large body of research has pointed to the effects of pubertal maturation and mixed-sex, older peer groups as major factors in young girls’ substance use (see, for example, Caspi, Lynam, Moffit, & Silva, 1993; Haynie, 2003; Patton, McMorris, Toumbourou, Hemphill, Donath, 2004). Such influence might begin to explain the elevated rates of alcohol and marijuana use among the Indigenous girls in a contemporary context.

Recent national findings on gender and substance use suggest that conventional findings in which males use substances more than females tend to emerge during later adolescence (Johnston et al., 2006). Future work is planned to extend these analyses when subsequent waves of data collection become available in order to examine whether or not similar gender patterns exist in this Indigenous sample.

The strong bivariate associations between marijuana and alcohol use, even at early ages (10-12 years, wave 1) warrants further work in terms of examinations of polysubstance use among Indigenous youth. For example, simultaneous or combined substance use result in possible additive intoxication effects that can increase health and safety problems (Hoffman, Barnes, Welte, & Dintcheff, 2000). The strong correlations presented here raise concern regarding such substance use among youth in this sample.

This work provides new information regarding the study of substance use among Indigenous adolescents and calls for research to answer questions about the mechanisms by which gender differences in Indigenous substance use patterns emerge. Such research will be instrumental in helping to delay of substance use onset. For example, it may be important for early adolescent Indigenous girls to learn culturally appropriate refusal skills in order to better protect them from substance use offers from older peer groups. In all, the finding that the young girls in our sample engage in substance use behaviors at rates similar to or significantly higher than their male peers raises issues in terms of the importance of integrating gender-specific tools and curriculum into substance use prevention efforts, especially in terms of delaying substance use onset.
ACKNOWLEDGEMENTS
This study is supported in part by grants from the National Institute on Drug Abuse (DA13580) and the National Institute of Mental Health (MH67281), Les B. Whitbeck, Principal Investigator. The author would like to thank the members of participating community advisory boards and Drs. Les Whitbeck, Dan Hoyt, and Rosalie Torres Stone for their helpful comments and suggestions on earlier drafts of this manuscript.

FOOTNOTES
1Diagnostic information was assessed in a separate interview at wave 1 of the project (Whitbeck, Johnson, Hoyt & Walls, 2006). Because latent growth curve analysis requires the use of 3 data points, diagnostic information is excluded from this paper.
2As noted previously, Beauvais’ 1992 study included 8th-12th graders as part of the total sample.

REFERENCES
Allison, P.
Bachman, R.
Barrett, A., & Turner, R. J.
Beauvais, F.
Beauvais, F.
Beauvais, F.

Beauvais, F., Oetting, E.R., & Edwards, R.

Budney, A. J., Moore, B. A., & Vandrey, R.

Caspi, A., Lynam, D., Moffitt, T., & Silva, P.

Centers for Disease Control and Prevention (CDC).

Chiu, A., Perez, P., & Parker, R.

Conger R., Conger K., Elder, G., Lorenz, F., Simons, R., & Whitbeck, L.

Costello, J., Farmer, E., Angold, A., Burns, B., & Erkanli, A.

Curran, P.J., & Hussong, A.M.

Donnermeyer, J.

Duran, E. & Duran, B.
EchoHawk, M.

Ellickson, P., Tucker, J., & Klein, D.

Enders, C.K.

Enders, C.K., & Bandalos, D.L.

Fendrich, M., Johnson, T., Wislar, J., Hubbell, A., Spiehler, V.

Fendrich, M., & Mackesy-Amiti, M.

Ge, X., Conger, R., Lorenz, F., Elder, G., Montague, R., & Simons, R.

Gfellner, B.

Gregory, R., Abello, A., & Johnson, J.

Hawkins, J. D., Catalano, P. & Miller, J. Y.
Gender and Indigenous Youth Substance Use

Haynie, D.L.

Herring, R.

Hoffman, J., Barnes, G., Welte, J., & Dintcheff, B.

Hu, L. & Bentler, P.M.

Johnston, L. D., O’Malley, P. M., Bachman, J. G., & Schulenberg, J. E.

Kandel, D., & Logan, J.

Kaplow, J., Curran, P., Dodge, K., & The Conduct Problems Prevention Research Group.

Kenny, D.

Lonczak, H., Fernandez, A., Austin, L., Marlatt, G.A., & Donovan, D.M.

Lynskey, M., & Hall, W.

May, P.A.
Walls

May, P.A.

May, P.A.

McGue, M., Iacono, W., Legrand, L., Malone, S. & Elkins, I.

Menard, S., & Huizinga, D.
1989 Age, period, and cohort size effects on self-reported alcohol, marijuana, and polydrug use: Results from the National Youth Survey. *Social Science Research, 18*, 174-194.

Mitchell, C., Novins, D., & Holmes, T.

Muthen, L.K. & Muthen, B.

National Institute on Alcohol Abuse and Alcoholism (NIAAA).

National Institute on Drug Abuse (NIDA).

Neumark-Sztainer, D., Story, M., French, S., Cassido, N., Jacobs, D., & Resnick, M.

Novins, D., & Mitchell, C.
Novins, D. & Baron, A.  

Novins, D., Beals, J., & Mitchell, C.  

Patton, G.C., McMorris, B., Toumbourou, J., Hemphill, S. & Donath, S.  

Roubideaux, Y.  

Rovine, M.J., & Molenaar, P.C.  

Schumaker, R. & Lomax, R.  

Spear, S., Longshore, D., McCaffrey, D., & Ellickson, P.  

Substance Abuse and Mental Health Services Administration (SAMHSA).  

Substance Abuse and Mental Health Services Administration (SAMHSA).  

Trosper, R.L.  

Whitbeck, L., Johnson, K., Hoyt, D., & Walls, M.

Whitbeck, L., Simons, R., Conger, R., Lorenz, F., Huck, S., & Elder, G.

Copyright of Journal of Drug Issues is the property of Florida State University / School of Criminology & Criminal Justice and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.