

Contents lists available at [ScienceDirect](#)

Journal of Adolescence

journal homepage: www.elsevier.com/locate/jado

Factors associated with Indigenous youths' abstinence from drinking



Kelley J. Sittner

Department of Sociology, Oklahoma State University, 431 Murray Hall, Stillwater, OK, 74078, United States

ARTICLE INFO

Article history:

Received 16 May 2016

Received in revised form 9 May 2017

Accepted 12 May 2017

Available online 24 May 2017

Keywords:

American Indian

First nation

Alcohol

Adolescent alcohol use

Abstainers

ABSTRACT

The proportion of youth who abstain from alcohol use decreases during adolescence but little attention has focused on factors associated with abstinence. No research has examined this question for Indigenous youth, many of whom live in communities experiencing high rates of alcohol-related health problems. Using data from a longitudinal study of Indigenous youth ($n = 649$, ages 10–17 years) in the U.S. and Canada, the current study investigates factors associated promoting or decreasing abstaining from alcohol use. Results from generalized linear growth models demonstrate that abstinence declines significantly during adolescence. In concurrent models, caretaker monitoring and school adjustment increased the odds of abstaining, and frequency of smoking cigarettes and number of best friends who drink decreased the odds. In lagged analysis, only school adjustment, smoking, and peer drinking remained significant. Time-stable characteristics moderated several time-varying associations. This study has important implications for programs aimed at encouraging alcohol abstinence.

© 2017 The Foundation for Professionals in Services for Adolescents. Published by Elsevier Ltd. All rights reserved.

Over the course of adolescence, both the quantity and the frequency of alcohol consumption increase with age and, conversely, the proportion of adolescents who abstain from drinking decreases. According to recent Monitoring the Future data, 73.2% of 8th graders reported never trying alcohol, compared to 50.7% of 10th graders and 34% of 12th graders (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2015). The general pattern of decreasing abstinence held over time, for boys and girls, and across racial groups. Studies of American Indian adolescents differ somewhat in their estimates of abstinence from alcohol use, with some indicating lower rates of abstinence compared to their non-native counterparts. In a school-based study of American Indian youth on or near reservations across the U.S., 28% of 8th graders, 14% of 10th graders, and 7% of 12th graders had never tried alcohol (Beauvais, Jumper-Thurman, Helm, Plested, & Burnside, 2004). Conversely, Mitchell, Beals, & Whitesell (2008) found rates of abstinence among American Indian youth more similar to the nationally representative numbers in Monitoring the Future; approximately one third of their sample reported no alcohol use over a three year period (Wave 1 mean age = 16 years).

These patterns suggest that, at least on its face, experimenting with alcohol may be a normal part of adolescent development. But early drinking is not without its consequences, such as a higher risk of developing alcohol use disorder (DeWit, Adlaf, Offord, & Ogborne, 2000), and experiencing alcohol-related automobile accidents, fights, and unintentional injuries (Hingson, Edwards, Heeren, & Rosenbloom, 2009). Identifying factors that promote or reduce abstinence is a logical and necessary step in preventing those consequences. Little research has examined alcohol abstinence among Indigenous young

E-mail address: kelley.sittner@okstate.edu.

<http://dx.doi.org/10.1016/j.adolescence.2017.05.007>

0140-1971/© 2017 The Foundation for Professionals in Services for Adolescents. Published by Elsevier Ltd. All rights reserved.

people, despite the vast body of research on alcohol use in this population (May, 1994) and the higher rates of abstinence among Indigenous adults (Substance Abuse and Mental Health Services Administration (SAMHSA), 2010). To address this gap in research, the current study investigates factors associated with alcohol abstinence in a longitudinal sample of Indigenous adolescents spanning 10–17 years of age from the northern U.S. Midwest and Canada.

1. Alcohol and indigenous people

The context of abstaining from alcohol use for Indigenous youth, particularly those living on reservations or reserves, is likely very different than youth from other groups. Important variations in drinking exist across Indigenous cultural groups (Mitchell, Beals, Novins, & Spicer, 2003), suggesting different norms and availability for alcohol use (Kovas, McFarland, Landen, Lopez, & May 2008) as well as diverse patterns of consumption and abstinence over the life-course. As a group, American Indian adults abstain from drinking at higher rates than adults from other racial groups (SAMHSA, 2010), and American Indian adults over the age of 40 are also more likely than same-age adults from other groups to quit drinking (Kunitz & Levy, 1994). However, among those who consume alcohol, they are more likely to drink at problematic levels and develop substance use disorders (Beals et al., 2005; Whitbeck, Hoyt, Johnson, & Chen, 2006).

The health and social tolls that alcohol has taken on Indigenous communities cannot be overstated. Following European contact, alcohol was used as a tool of oppression and exploitation against Indigenous people (Abbott, 1996). In contemporary times, Indigenous people experience disproportionately high rates of substance use disorder, alcohol-related vehicle fatalities (West & Naumann, 2011), fetal alcohol spectrum disorder (Russo, Purohit, Foudin, & Salin, 2004), and alcohol-related violence (Perry, 2004, pp. 1–56). Importantly, Indigenous young people are not unaware of the effects of alcohol. In Whitbeck, Walls, Johnson, Morrisseau, & McDougall (2009) study of historical cultural losses with a sub-set of the sample included in the current study, almost one quarter of the youth (24.1%) and over one third of the female caretakers (36.3%) reported thinking daily or several times each day about the losses to their people from alcoholism. Only about one-third of the youth reported never thinking about those losses, suggesting widespread awareness of alcohol's consequences.

The high rates of abstinence noted above may be a result of the widespread consequences of alcohol use that many Indigenous communities experience. Yet despite the robust body of literature on alcohol use for both Indigenous youth and adults (May, 1994), very little research has examined abstinence from drinking among this population. Identifying the factors that foster abstinence for Indigenous youth can provide extremely useful information for tribal communities, educators, health practitioners, and researchers.

2. Factors promoting alcohol abstinence

In keeping with recent calls for strengths-focused research and research on positive outcomes for Indigenous people (Kirmayer, Marshall, & Phillips, 2011; Mohatt et al., 2004), emphasis is placed on factors that promote healthy behaviors, particularly alcohol abstinence. Different factors from the social domains of family and school are important for positive and prosocial development. Family is a key protective factor against substance use for youth (Dusenbury, 2000; Johnson et al., 1998). Rather than including parenting at one time point to predict substance use, recent work has begun examining the more dynamic effects of parenting by incorporating multiple observations. In their analysis of positive parenting trajectories in a diverse sample of 6th to 8th grade youth, Tobler and Komro (2010) found that level and consistency of positive parenting were important, with decreasing levels of positive parenting during early adolescence increasing the risk of adolescent alcohol use. Using growth models with time-varying parenting, Gutman, Eccles, Peck, and Malanchuk (2011) found that increases in positive family identification were associated both concurrently and predictively with less alcohol use, and increases in negative family interactions were associated with more concurrent alcohol use for both European American and African American youth (mean baseline age approximately 13 years). Regarding Indigenous-specific parenting, Mmari, Blum, and Teufel-Stone (2010) found the family to be the most important source affecting risk and protective factors for antisocial behaviors among young people using qualitative data from Indigenous youth and adults from three different tribal communities.

School is an important influence on both prosocial and antisocial behaviors. Catalano, Oesterle, Fleming, and Hawkins (2004) found school bonding to be associated with delayed initiation and lower levels of alcohol use in fifth thru twelfth grades among an intervention study sample (46% European American; 24% African American; 21% Asian American; 9% American Indian). School bonding was associated with lower levels of alcohol use in a cross-sectional study of Indigenous youth in 7th through 12th grades (Dickens, Dieterich, Henry, & Beauvais, 2012). Positive school experiences often serve as a source of resilience for youth in Indigenous communities (LaFromboise, Hoyt, Oliver, & Whitbeck, 2006; Mmari et al., 2010). For example, even among Indigenous youth who reported an earlier onset of substance use, those who remained in school instead of dropping out were more likely to desist in their substance use (Stanley, Harness, Swaim, & Beauvais, 2014).

3. Factors reducing alcohol abstinence

In addition to the positive influences, it is also important to explore key risk factors for alcohol use to determine how they impact abstinence during adolescence. Tobacco, primarily in the form of cigarettes, is one of the most common substances used by Indigenous youth, at rates exceeding the national average (Substance Abuse and Mental Health Services

Administration (SAMHSA), 2011). According to recent estimates from the National Survey on Drug Use and Health (SAMHSA, 2011), 16.8% of Indigenous 12- to 17-year-olds were current smokers compared to 10.2% nationally. Research with the Indigenous youth included in the current study identified cigarette smoking to be a common antecedent to alcohol use (Whitbeck & Armenta, 2015).

Peers play an important role in shaping adolescent views on alcohol (Donovan, 2004), and drinking commonly occurs while in the presence of one's peers (Mayer, Forster, Murray, & Wagenaar, 1998). Recent work has examined the relationship between peers and alcohol use to determine how peers matter. In a social network study of Swedish youth, selecting friends who drink better predicted alcohol use in early adolescence (mean age = 10.1 years), but both selection and socialization were important in middle adolescence (mean age = 13.1 years) (Burk, Vorst, Kerr, & Stattin, 2012). Elkington, Bauermeister, and Zimmerman (2011) examined the time-varying impact of positive and negative peer factors on substance use among a high school sample of European American and African American youth (mean age at baseline = 14.86 years). The authors found that increases in the number of deviant peers increased substance use over time, but changes in positive peer factors were unrelated to substance use. Using the same Indigenous data as the current study, Armenta, Sittner, and Whitbeck (2016) found that peer drinking and having positive views of substance using peers was associated with subsequent onset of alcohol use and meeting criteria for alcohol use disorder.

4. The current study

The current study extends prior literature in three ways. First, it addresses the gap in research on abstinence from alcohol among youth generally and among Indigenous youth specifically. This is important given the grave alcohol-related health disparities that affect Indigenous communities and the different cultural contexts of drinking for Indigenous youth compared to youth from other cultures. Second, the current study answers the call for a focus on positive development and strengths-focused research (Kirmayer et al., 2011; Mohatt et al., 2004) by exploring factors that promote or reduce abstinence. Third, it utilizes a longitudinal sample of Indigenous youth to test both concurrent and predictive associations between those factors and abstinence from early to late adolescence (i.e., ages 10–17 years). This approach assesses the contemporaneous covariation between time-varying factors and the outcome, and whether these relationships hold over time. Latent growth curve modeling is used to test the following four hypotheses: 1) Caretaker monitoring and caretaker warmth and support will be positively associated with abstinence; 2) Better school adjustment will be positively associated with abstinence; 3) Adolescent cigarette smoking will be negatively associated with abstinence; and 4) Peer drinking will be negatively associated with abstinence. To provide a more nuanced analysis of abstinence, I also examine whether the hypothesized relationships are conditioned by time-stable characteristics.

5. Method

5.1. Participants and data

These data come from an eight-year panel study of 745 Indigenous youth and their caretakers, and designed in partnership with four U.S. reservations, four Canadian reserves, and a university-based research team. The study focused on risk and protective factors for adolescent mental health and substance abuse problems from early adolescence to young adulthood. The reservations/reserves are representative of one of the largest Indigenous cultures in North America, and share a common language and cultural tradition. The names of the cultural group and participating reservations and reserves will not be identified to maintain confidentiality. Interviewers for this project received regular training on methodological guidelines of personal interviewing and all were certified for work with human subjects.

Each reservation/reserve provided a list of families of tribally enrolled children aged 10–12 years living on or proximate to (within 50 miles) the reservation or reserve. To obtain a population sample, attempts were made to contact all tribally enrolled families with a target child within the specified age range. Interviewers recruited participants through a personal visit. The overall baseline response rate for the study was 79.4%, or 746 adolescents. Both the study adolescent and at least one adult caretaker were interviewed annually and each given \$40 upon completion of the interviews. Subsequent annual retention rates remained quite high (wave 2 = 94.6%; wave 3 = 93%; wave 4 = 87.7%; wave 5 = 89.8%; wave 6 = 88%). Additionally, many participants who missed a wave returned in later in the study; 96.3% of adolescents completed at least three of eight waves, 94.1% completed at least four, and 91.9% completed at least five. For full study details, see Whitbeck, Sittner, Hartshorn, and Walls (2014).

This article included youth self-report data from the first six years of the project and seven of eight reservations/reserves (the eighth community did not have an active advisory board and out of respect for their right to review papers prior to publication, their data were not used). There were 674 adolescents interviewed at Wave 1, when they were between 10 and 13 years of age (13-year-olds are those youth who experienced birthdays between recruitment and interview dates). Following the conservative recommendation of Curran, Obeidat, and Losardo (2010), only those adolescents who had at least three observations were included in the analysis, which constituted 649 of the 674 (96.3%) adolescents. Adolescents excluded from the analysis were compared to those included on the current study's Wave 1 variables, but no significant differences were found. At Wave 1, the analytic sample was on average 11.07 years ($sd = 0.77$), and 50.1% female, and the average per capita family income was \$5491 ($sd = \4065).

5.2. Measures

5.2.1. Dependent variable

Abstaining from alcohol use was assessed with three questions. Respondents were asked if they had ever had a drink of beer, wine, or liquor. Negative responses to each of the three questions indicated that the adolescent had not consumed alcohol. A single dichotomous variable was created and coded 1 = abstained from drinking, 0 = did not abstain.

5.2.2. Time-invariant covariates (Level 2)

Three time-invariant characteristics were included from Wave 1 as control variables. *Adolescent sex* was coded as 1 = female, 0 = male. All of the reservations/reserves are located in rural areas, but some are more isolated than others. An indicator of *remote location*, defined as being 50 miles from even small towns and accessible only by dirt roads or over water, was included and coded 1 = remote, 0 = rural. Adolescents residing with two biological or adoptive parents at Wave 1 were considered to have an *intact family* structure (coded as 1); all other household arrangements were coded as 0.

5.2.3. Time-varying covariates (Level 1)

Six time-varying variables were included in the analyses and all were drawn from Waves 1, 2, 3, and 5 (they were not assessed in Waves 4 or 6, and not all adolescents were asked all of the questions in Waves 7 or 8). *Caretaker monitoring* and *caretaker warmth and support* were adapted from the Iowa Youth and Families Project (Conger & Elder, 1994). The first was assessed as a mean scale of 6 questions asking youth to report how often their behavior was monitored (e.g., how often they have to tell someone where they are going, how often they have a set time to be home). The latter was a mean scale of 6 questions and measured how often families were warm and supportive (e.g., how often family members praised them, how often they can talk to someone when they have a problem). Response options for both measures ranged from 0 = never to 2 = always. A measure of *school adjustment*, adapted from the Iowa Youth and Families Project (Melby, Conger, Fang, Wickrama, & Conger, 2008), was created by summing yes responses to seven items (e.g., you like school a lot, you do well in school) related to adolescents' attitudes toward school. This measure has been previously used with this sample of Indigenous adolescents (Crawford, Cheadle, & Whitbeck, 2010). Self-reported *smoking frequency* measured how often respondents smoked in the past year (0 = never, 1 = one or two times, 2 = less than monthly, 3 = monthly, 4 = weekly, 5 = nearly every day, 6 = every day). Those respondents who reported never smoking were also coded as 0. *Peer drinking* was measured as the number of respondents' three best friends who drink alcohol, ranging from zero to all three. *Per capita income* is included as control variable. Caretakers provided their total family income in ranges of \$10,000. Midpoints of these ranges were divided by one thousand to set the metric in thousands of dollars, which was then divided by the number of people living in the household.

5.2.4. Analysis plan

Hypotheses were tested using two latent growth curve models within a multilevel framework. Both modeled change in abstinence over time, but the first assessed the concurrent relationships between the covariates and abstinence using data from the same waves, and the second analysis included a lagged outcome (i.e., the time-varying covariates were drawn from Waves 1, 2, 3, and 5, and the abstinence outcomes were drawn from Waves 2, 3, 4, and 6). The data were restructured from wave to age for the growth model analyses.

To accommodate the binary outcome and the clustering of observations within individuals over time, generalized latent growth curve models with penalized-quasi likelihood estimation (PQL; also known as Generalized Estimating Equations (see Raudenbush & Bryk, 2001), was used. The dependent variable was transformed with a logit link function for the estimation, making the outcome the linearized log odds of abstaining from drinking (Lee & Nelder, 1996). In the generalized model, the level 1 variance ($R_{ij} = P(1 - P_j)$) was a function of the mean rather than a free parameter for estimation. Population average coefficients with robust standard errors are presented (Diaz, 2007). All latent growth curve modeling was done in HLM 7.

The within person (Level 1) model provided estimates of how the odds of abstaining changed over time (the trajectory) and how changes in the Level 1 covariates were associated with changes in the odds of abstaining. The time-varying covariates are not linked explicitly to time but reflect within-individual change; however each did change significantly over time (results available upon request). The between person (Level 2) model included stable individual characteristics measured in the first wave of the study (e.g., adolescent sex). The HGLM model estimated how individual characteristics were associated with the initial odds of abstaining (the intercept model), the change in the odds of abstaining over time and change in the time-varying covariates (as cross-level interactions with the abstaining growth trajectory and time-varying covariate slopes) (Snijders & Bosker, 1999).

All continuous variables were grand mean centered at Level 1 to facilitate interpretation of direct and interaction effects, and to reduce multicollinearity (Bickel, 2007; Nezlek, 2001). Age was included as the growth term, centered at age 10 (the age of the youngest adolescents in the sample) for individual j in the concurrent models, and at age 11 in the lagged models. There was one random Level 2 effect (the intercept, r_0), which gives an estimate of the variance in the odds of abstaining between adolescents (Luke, 2004; Raudenbush & Bryk, 2001). Random effects were tested for the age trajectory and time-varying covariates, but were not significant. Model 2 included all of the time-varying covariates at Level 1. The time-invariant covariates were added in Model 3 as cross-level interactions with the age trajectory and each of the time-varying covariates.

6. Results

Descriptive statistics for all of the study variables are shown in Table 1. The percentage of youth who reported no alcohol use started quite high (94.42% at Wave 1) but decreased steadily during the study, to 42.96% at Wave 6. The factors hypothesized to promote abstinence also declined over time, and the factors decreasing abstinence increased. For example, school adjustment decreased from a high of 5.97 at Wave 1 to 5.45 at Wave 5, while smoking frequency increased from 0.31 at the first wave to 2.27 by Wave 5.

6.1. Concurrent growth models of abstaining from alcohol use

The first model shown in Table 2 is the unconditional growth model with just an intercept and the trajectory slope (time centered on age 10). At age 10, the odds of an adolescent abstaining from alcohol use were quite high (O.R. = 20.7). There was a steep decrease in the abstaining trajectory; for each year past age 10, the odds of abstaining decreased by 45% (O.R. = 0.55). Fig. 1 displays the change in the predicted probability of abstaining between ages 10 and 17 years. At age 10, predicted probability that an adolescent would abstain was 95%, but by age 17, it was only 24%. The significant random effect for the intercept indicated there was still a significant amount of variance in the initial status that was not explained by age.

Time-varying covariates were included in Model 2 and the intercept random effect became non-significant. As hypothesized, caretaker monitoring and school adjustment were positively associated with abstinence. For each unit increase above the mean in caretaker monitoring and school adjustment, the odds of abstaining increased by 127% (O.R. = 2.27) and 20% (O.R. = 1.20), respectively. Also as hypothesized, smoking frequency and peer drinking were associated with lower odds of abstaining. A one-unit increase in the frequency of smoking cigarettes above the mean was associated with a 28% (O.R. = 0.72) decrease in the odds of abstaining from drinking. For each additional best friend above the mean who drank alcohol, the odds of abstaining decreased by 49% (O.R. = 0.51). Contrary to expectations, caretaker warmth and support was unrelated to changes in the odds of abstaining. Income was also not significant.

Time-invariant control variables were added in Model 3 to the intercept and as cross-level interactions with each of the time-varying covariates (the slope becomes the estimated log odds of abstinence when all time-invariant covariates equal zero; in this case, male, rural location, and non-intact family structure). At age 10, living in a remote location was associated with significantly higher odds of abstaining, relative to living in a rural area. There were no differences in the initial odds of abstinence based on adolescent sex or family structure. Several notable results emerged once cross-level interactions were added. First, caretaker monitoring was no longer associated with concurrent change in abstinence once the cross-level interactions were added. Simple slopes tests suggested that the slope for caretaker monitoring was significant only for females and was significantly larger for females compared to males, indicating that increases in parental monitoring had a positive effect on females' abstinence but no effect for males. Second, the smoking frequency slope was moderated by both adolescent sex and location. An increase in smoking frequency was associated with 24% lower odds of concurrent abstinence for girls (O.R. = 0.76) but 36% lower odds for boys (O.R. = 0.64). For each unit increase in smoking frequency, the concurrent odds of abstaining were nearly twice as high for youth in a rural location (O.R. = 0.64) than in a remote location (O.R. = 0.36). Third, the peer drinking slope was moderated by family structure. Each unit increase above the mean in the number of peers who drink was associated with 46% lower odds of abstinence for youth in a non-intact family (O.R. = 0.54), compared to 58% lower odds for youth living with both biological parents (O.R. = 0.42).

Table 1
Descriptive statistics for study variables.

	Wave 1 (n = 649)			Wave 2 (n = 628)			Wave 3 (n = 625)			Wave 4 (n = 585)			Wave 5 (n = 603)			Wave 6 (n = 590)		
	M	sd	α	M	sd	α	M	sd	α	M	sd	α	M	sd	α	M	sd	α
Abstaining from alcohol (%)	94.42	–	–	82.72	–	–	72.83	–	–	56.87	–	–	49.25	–	–	42.96	–	–
Female sex (%)	50.08	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Remote location (%)	10.48	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Intact family structure (%)	43.91	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Age	11.07	0.77	–	12.06	0.77	–	13.04	0.78	–	14.30	0.96	–	15.29	0.94	–	16.26	0.87	–
Caretaker monitoring	1.51	0.32	0.48	1.5	0.33	0.57	1.40	0.36	0.61	–	–	–	1.42	0.34	0.64	–	–	–
Caretaker warmth	1.42	0.34	0.60	1.34	0.37	0.67	1.31	0.35	0.69	–	–	–	1.26	0.37	0.77	–	–	–
Per capita income ^a	5.49	4.07	–	5.64	4.09	–	6.01	4.41	–	–	–	–	6.64	4.91	–	–	–	–
School adjustment ^b	5.97	1.46	0.72	5.63	1.73	0.76	5.37	1.80	0.75	–	–	–	5.45	1.76	0.75	–	–	–
Smoking frequency	0.31	1.04	–	0.61	1.47	–	1.14	1.99	–	–	–	–	2.27	2.58	–	–	–	–
Peer drinking	0.36	0.79	–	0.62	0.99	–	0.95	1.10	–	–	–	–	1.71	1.12	–	–	–	–

^a Income is in thousands of U.S. dollars.

^b Kuder-Richardson Formula 20 calculated for internal reliability; Cronbach's alpha calculated for all other scales.

Table 2
Concurrent growth model of abstaining from drinking (n = 649).

	Model 1			Model 2			Model 3		
	B	SE	OR	B	SE	OR	B	SE	OR
Fixed Effects									
Initial status	3.03***	0.11	20.70	2.60***	0.13	13.46	2.54***	0.28	12.68
x Female sex							−0.03	0.29	0.97
x Remote location							2.09*	0.88	8.08
x Intact family							−0.01	0.28	0.99
Abstaining trajectory	−0.60***	0.03	0.55	−0.32***	0.04	0.72	−0.33***	0.07	0.72
x Female sex							−0.04	0.08	0.69
x Remote location							−0.48*	0.22	0.44
x Intact family							0.05	0.08	0.76
Caretaker monitoring				0.82***	0.20	2.27	0.41	0.36	1.51
x Female sex							1.20**	0.42	5.00
x Remote location							−0.88	0.86	0.63
x Intact family							−0.22	0.43	1.21
Caretaker warmth				−0.15	0.19	0.86	−0.12	0.34	0.89
x Female sex							0.06	0.39	0.94
x Remote location							−0.73	0.90	0.43
x Intact family							0.03	0.40	0.91
School adjustment				0.18***	0.04	1.20	0.13*	0.07	1.14
x Female sex							0.07	0.07	1.22
x Remote location							−0.30	0.20	0.84
x Intact family							0.06	0.07	1.21
Smoking frequency				−0.33***	0.03	0.72	−0.44***	0.06	0.64
x Female sex							0.17*	0.07	0.76
x Remote location							−0.58***	0.14	0.36
x Intact family							0.12	0.07	0.73
Peer drinking				−0.68***	0.06	0.51	−0.62***	0.10	0.54
x Female sex							0.11	0.12	0.60
x Remote location							−0.07	0.28	0.50
x Intact family							−0.24*	0.12	0.42
Per capita income				−0.03	0.02	0.97	−0.07	0.03	0.93
x Female sex							0.02	0.03	0.90
x Remote location							0.04	0.04	0.92
x Intact family							0.05	0.03	0.93
Random Effects									
Initial Status	1.07***			0.55			0.60		

***p < 0.001, **p < 0.01, *p < 0.05.

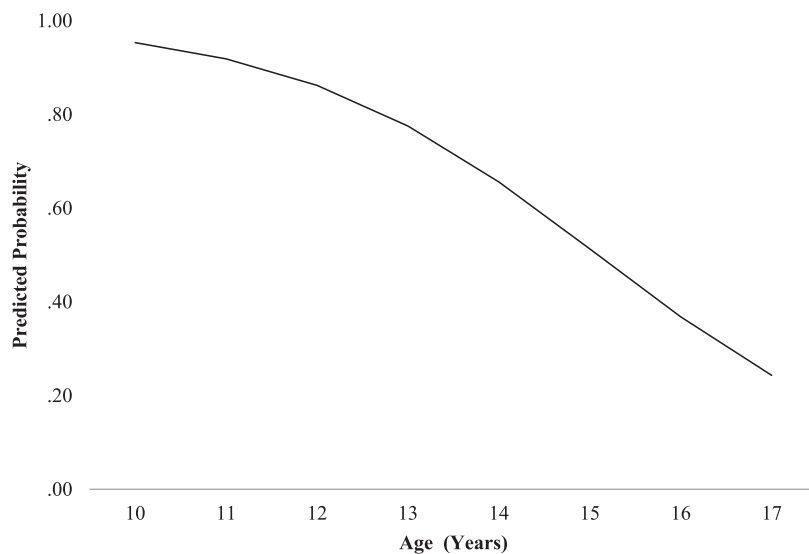


Fig. 1. Unconditional growth model of abstaining from drinking.

6.2. Lagged growth models of abstinence from alcohol use

For the second analysis, the outcome was lagged by one year to test whether the hypothesized relationships between the time-varying covariates and abstinence held over time (Table 3). In Model 1, the initial odds of abstinence were lower and the rate of change was smaller in the lagged models compared to the concurrent models. In the second and third models, the lagged associations were also generally much weaker than the concurrent associations. For instance, the slope for caretaker monitoring was smaller and only approached significance ($p = 0.077$) in Model 2. Caretaker warmth and support remained nonsignificant. Secondary analyses were conducted with only parental monitoring included; the results were not changed in either concurrent and lagged models. Although smoking frequency and peer drinking continued to be associated with abstinence, their log odds were reduced in magnitude. However, the hypothesis regarding the effect of school adjustment on abstinence was still supported and the effect was essentially unchanged. As shown in Model 3, remote location continued to moderate the relationship between several time-varying covariates and alcohol abstinence. Living in a remote (versus rural) location was associated 274% higher initial odds of abstaining (O.R. = 3.74), but a faster decrease over time. For each year after age 11, living in a remote location was associated with 49% lower odds of abstaining compared to 28% lower odds for living in a rural location. Location also moderated the caretaker monitoring slope such that living in remote location was associated with 189% higher subsequent odds of abstaining for each unit increase in monitoring (O.R. = 2.89). Additionally, a simple slopes comparison indicated that the slope of caretaker monitoring was marginally significant and positive only for remote location (O.R. = 1.20, $p = 0.096$). Remote location also moderated the smoking frequency slope; for each increase in smoking frequency above the mean, the odds of subsequent abstaining were 19% lower for youth in a remote location versus a rural location. Overall, the significant random effect for the intercept in all lagged models indicated that the covariates did a poorer job explaining the variance in the initial status of abstaining at age 11 than they did concurrently at age 10.

Table 3
Lagged growth model of abstaining from drinking ($n = 645$).

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Fixed Effects									
Initial status	1.96***	0.10	7.10	1.56***	0.10	4.76	1.67***	0.19	5.31
x Female sex							-0.49*	0.21	0.61
x Remote location							1.32**	0.39	3.74
x Intact family							0.14	0.22	1.15
Abstaining trajectory	-0.47***	0.03	0.63	-0.30***	0.03	0.74	-0.33***	0.06	0.72
x Female sex							0.09	0.06	0.79
x Remote location							-0.35**	0.13	0.51
x Intact family							-0.03	0.06	0.70
Caretaker monitoring				0.32	0.18	1.38	-0.25	0.31	0.78
x Female sex							0.53	0.37	1.32
x Remote location							1.31*	0.60	2.89
x Intact family							0.59	0.38	1.40
Caretaker warmth				0.20	0.16	1.22	-0.03	0.29	0.97
x Female sex							0.27	0.32	1.27
x Remote location							-0.30	0.56	0.72
x Intact family							0.24	0.33	1.23
School adjustment				0.17***	0.03	1.19	0.20***	0.05	1.22
x Female sex							-0.03	0.07	1.19
x Remote location							-0.18	0.13	1.02
x Intact family							0.00	0.07	1.22
Smoking frequency				-0.18***	0.03	0.84	-0.24***	0.05	0.79
x Female sex							0.05	0.06	0.83
x Remote location							-0.30*	0.14	0.58
x Intact family							0.14*	0.06	0.90
Peer drinking				-0.30***	0.06	0.74	-0.22*	0.10	0.80
x Female sex							-0.03	0.12	0.78
x Remote location							0.19	0.21	0.97
x Intact family							-0.15	0.12	0.69
Per capita income				0.00	0.01	1.00	-0.01	0.03	0.99
x Female sex							0.00	0.03	0.97
x Remote location							0.01	0.04	0.98
x Intact family							0.02	0.03	0.99
Random Effects									
Initial Status	1.17***			0.57***			0.60***		

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

7. Discussion

Despite a large literature on alcohol use among Indigenous people (May, 1994), studies of abstinence from drinking in this same group are few in number. The context of drinking for Indigenous youth, particularly those residing on reservations/reserves, likely impacts perceptions of and attitudes toward drinking, which impacts their drinking behavior. The current study advances our understanding of those factors associated with alcohol abstinence and utilizes data from a longitudinal study of Indigenous youth from seven reservations/reserves from the U.S. northern Midwest and Canada. Latent growth curve modeling was used to examine the relationships between abstinence and various factors hypothesized to either promote or decrease abstinence, both concurrently and over time. As hypothesized, caretaker monitoring and better school adjustment were positively associated with concurrent abstaining, although only school adjustment continued to be associated with abstaining in lagged analysis. Also as hypothesized, smoking and peer drinking were negatively associated with abstaining both concurrently and over time. Additionally, several of these associations were moderated by time-stable adolescent characteristics, briefly discussed below.

Parenting is widely regarded as important to preventing adolescent substance use and parents are frequently included in substance abuse prevention programs (Dusenbury, 2000). It was hypothesized that positive parenting behaviors would promote abstinence from drinking, with partial support found. In the current study, caretaker monitoring, but not caretaker warmth and support, predicted changes in abstinence from drinking, particularly for girls. However, this relationship did not hold over time, which may perhaps be due to the decrease in monitoring over the course of the study. Yet Tobler and Komro (2010) found a decreasing trajectory of positive parenting to be associated with higher odds of drinking. These differences could be due to the measurement of parenting behaviors, including the specific behaviors assessed (e.g., monitoring, communication, rule-setting, warmth, approval) as well as different cultural norms regarding parenting. Parenting styles and meanings vary across racial and ethnic groups (Crockett, Veed, & Russell, 2010) and most measures of parenting may not capture the dynamics of family and caregiving in the extended kinship networks of Indigenous adolescents (Whitbeck, Sittner Hartshorn, & Walls, 2014). Although the adaptations to the measures used in the current study were made with input from tribal advisory boards, they still may not accurately reflect what “good” parenting looks like in Indigenous families. Additionally, the internal reliability for these two measures were weak at the earliest waves (e.g., 0.48 for caretaker monitoring at Wave 1). It is critical that more attention is paid to developing accurate and reliable parenting measures because family is regarded as an important source of resilience and well-being for Indigenous youth (LaFromboise et al., 2006; Mmari et al., 2010).

School adjustment declines with age but those who experience more positive school adjustment earlier still exhibit fewer antisocial behaviors, including substance use (Catalano et al., 2004). School adjustment also promoted abstinence among youth in this study, and has consistently been associated with fewer adverse behaviors in other studies with these data (e.g., Melander, Sittner Hartshorn, & Whitbeck, 2013; Sittner & Hautala, 2016). For Indigenous youth, the stability of positive school experiences may be dependent on the type of school attended. According to Crawford et al. (2010) analysis with these same youth, positive school adjustment was stable only among those youth attending schools operated by tribes rather than public schools. The discrimination experienced in public schools accounted for at least part of the decline in adjustment. Fostering an inclusive environment in all school types would benefit the adjustment of Indigenous students and contribute to alcohol abstinence.

Importantly, strong parent and school bonds can impact the presence of risk factors that inhibit abstinence. Prior research has found positive parenting behaviors to be negatively related to both cigarette use and affiliation with delinquent peers (Simons-Morton, Haynie, Crump, Eitel, & Saylor, 2001), including substance using peers. Because cigarette smoking is a commonly used substance in early adolescence in this sample and has been linked to subsequent use of alcohol (Whitbeck & Armenta, 2015), reducing smoking behaviors may have a positive effect on abstinence. Similarly, reducing exposure to and the influence of drinking peers would also be beneficial. Burk and associates (2012) found that the nature of the relationship between peer drinking and adolescent alcohol use changed over the course of adolescence, but both selection and socialization processes explained drinking behavior throughout adolescence. School-based prevention efforts may be especially beneficial in this regard, as youth who attend schools with lower prevalence of substance using students themselves engage in less substance use (Alexander, Piazza, Mekos, & Valente, 2001), and stronger school bonds may buffer the effects of substance using peers on Indigenous alcohol use (Dickens et al., 2012).

In addition to the time-varying relationships already discussed, some results regarding time-invariant adolescent characteristics warrant brief attention. First, the males in this study had higher odds of abstaining at both ages 10 and 11, but there was no evidence of sex differences in the trajectory of abstaining over time. This matches earlier studies with these data, in which females had an earlier onset of alcohol use (Walls & Whitbeck, 2011) but were not different from males in substance use over time (Walls, Sittner Hartshorn, & Whitbeck, 2013). Second, location was an important covariate, particularly living in more remote areas. Abstinence was more common at ages 10 and 11, but declines over time were much sharper for youth in the remote locations. Additionally, increases in the number of peers who drink was unrelated to abstinence but the effect of smoking frequency was amplified for youth in a remote location. Communities that are considered to be remote in this study are smaller and much more isolated than the other locations, which results in important contextual differences that impact alcohol use.

7.1. Limitations

The findings from the current study must be tempered with some limitations. First, these data come from a single Indigenous culture that, although one of the largest cultures in the U.S. and Canada, make it necessary to be cautious in generalizing the results to Indigenous youth from other cultures or to urban Indigenous youth of the same culture. Second, the study utilizes self-reports of alcohol use. Some under-reporting of what may be considered an undesirable behavior may have occurred, leading to possible overestimates of alcohol abstinence. Third, the measure of peer drinking relied on adolescents reporting on how many of their three best friends drink alcohol, which captures only descriptive norms of alcohol use. Future research that includes measures of personal and injunctive alcohol norms would be useful (Elek, Miller-Day, & Hecht, 2006). Fourth, the variables used in the current study were selected based on prior studies of alcohol use, not necessarily alcohol abstinence. Risk factors for illness may not predict health because the absence of illness does not equal health (Keyes & Michalec, 2010, pp. 125–134). Unlike alcohol use, comparatively little research has examined abstinence from alcohol use. Consequently, there may be additional important risk and protective factors not examined in this study. Because the outcome variable was a binary indicator of drinking or no drinking each year, the analyses in the current study were not able to differentiate between experimenters, who may have consumed little alcohol in a given year, and heavier drinking adolescents. A descriptive follow-up examination of the data revealed that the majority of abstainers at every age reported no use in the following year and even among drinkers, not all reported frequent alcohol use. More work is needed to untangle these patterns over time.

8. Conclusions

Although the number of youth who abstain from drinking declines with age, the results of the current study are encouraging. Parental monitoring of children's behavior and positive school adjustment are positively associated with abstinence from drinking, and can potentially reduce cigarette smoking and exposure to peer drinking, which may further promote abstinence. The literature on adolescent alcohol abstinence, particularly for Indigenous youth, is sparse but the topic warrants greater attention given the seriousness of alcohol-related consequences for young people. Improving the measurement of abstinence to capture diverse patterns of drinking over time, including experimental, heavy, declining, and relapse, is important. Also important is examining these patterns over a longer period of time, given that abstinence rates are high among Indigenous adults but, compared to other groups, so too are rates of binge drinking and alcohol use disorders. Relatedly, more attention should be paid to identifying the factors that promote or inhibit abstinence, which may change in their importance at different stages of the life-course. Identifying ways to prevent or delay alcohol use is important and necessary for the healthy development of Indigenous youth.

Acknowledgements

Funding: This research was supported by the National Institute on Drug Abuse (DA13580) the National Institute of Mental Health (MH67281), and the National Institute on Alcohol Abuse and Alcoholism (AA020299), Les B. Whitbeck, Principal Investigator.

References

- Abbott, P. J. (1996). American Indian and Alaska Native aboriginal use of alcohol in the United States. *American Indian and Alaska Native Mental Health Research*, 7(2), 1–13.
- Alexander, C., Piazza, M., Mekos, D., & Valente, T. (2001). Peers, schools, and adolescent cigarette smoking. *Journal of Adolescent Health*, 29(1), 22–30. [http://dx.doi.org/10.1016/S1054-139X\(01\)00210-5](http://dx.doi.org/10.1016/S1054-139X(01)00210-5).
- Armenta, B. E., Sittner, K. J., & Whitbeck, L. B. (2016). Predicting the onset of alcohol use and the development of alcohol use disorder among Indigenous Adolescents. *Child Development*, 87(3), 870–882. <http://dx.doi.org/10.1111/cdev.12506>.
- Beals, J., Manson, S. M., Whitesell, N. R., Spicer, P., Novins, D. K., & Mitchell, C. M., for the AI-SUPERPPF Team. (2005). Prevalence of DSM-IV disorders and attendant help-seeking in 2 American Indian reservation populations. *Archives of General Psychiatry*, 62(1), 99–108.
- Beauvais, F., Jumper-Thurman, P., Helm, H., Pletsted, B., & Burnside, M. (2004). Surveillance of drug use among American Indian adolescents: Patterns over 25 years. *Journal of Adolescent Health*, 34(6), 493–500. <http://dx.doi.org/10.1016/j.jadohealth.2003.07.019>.
- Bickel, R. (2007). *Multilevel analysis for applied research: It's just regression!* New York: The Guilford Press.
- Burk, W. J., Vorst, H. van der, Kerr, M., & Stattin, H. (2012). Alcohol use and friendship dynamics: Selection and socialization in early-, middle-, and late-adolescent peer networks. *Journal of Studies on Alcohol and Drugs*, 73(1), 89–98. <http://dx.doi.org/10.15288/jsad.2012.73.89>.
- Catalano, R. F., Oesterle, S., Fleming, C. B., & Hawkins, J. D. (2004). The importance of bonding to school for healthy development: Findings from the social development research group. *Journal of School Health*, 74(7), 252–261. <http://dx.doi.org/10.1111/j.1746-1561.2004.tb08281.x>.
- Conger, R., & Elder, G. H. (1994). *Families in troubled times: Adapting to change in rural America*. New York: A. de Gruyter.
- Crawford, D. M., Cheadle, J. E., & Whitbeck, L. B. (2010). Tribal vs. public schools: Perceived discrimination and school adjustment among Indigenous children from early to mid-adolescence. *Journal of American Indian Education*, 49(1&2), 80–100.
- Crockett, L. J., Veed, G. J., & Russell, S. T. (2010). Do measures of parenting have the same meaning for European, Chinese, and Filipino American adolescents? Tests of measurement equivalence. In S. T. Russell, L. J. Crockett, & R. K. Chao (Eds.), *Asian American parenting and parent-adolescent relationships* (pp. 17–35). New York: Springer. http://dx.doi.org/10.1007/978-1-4419-5728-3_2.
- Curran, P. J., Obeidat, K., & Losardo, D. (2010). Twelve frequently asked questions about growth curve modeling. *Journal of Cognition and Development*, 11(2), 121–136.
- DeWit, D. J., Adlaf, E. M., Offord, D. R., & Ogborne, A. C. (2000). Age at first alcohol use: A risk factor for the development of alcohol disorders. *American Journal of Psychiatry*, 157(5), 745–750. <http://dx.doi.org/10.1176/appi.ajp.157.5.745>.

- Diaz, R. E. (2007). Comparison of PQL and Laplace 6 estimates of hierarchical linear models when comparing groups of small incident rates in cluster randomised trials. *Computational Statistics & Data Analysis*, 51(6), 2871–2888. <http://dx.doi.org/10.1016/j.csda.2006.10.005>.
- Dickens, D. D., Dieterich, S. E., Henry, K. L., & Beauvais, F. (2012). School bonding as a moderator of the effect of peer influences on alcohol use among American Indian adolescents. *Journal of Studies on Alcohol and Drugs*, 73(4), 597–603.
- Donovan, J. E. (2004). Adolescent alcohol initiation: A review of psychosocial risk factors. *Journal of Adolescent Health*, 35(6). <http://dx.doi.org/10.1016/j.jadohealth.2004.02.003>, 529.e7-529.e18.
- Dusenbury, L. (2000). Family-based drug abuse prevention programs: A review. *Journal of Primary Prevention*, 20(4), 337–352. <http://dx.doi.org/10.1023/A:1021366721649>.
- Elek, E., Miller-Day, M., & Hecht, M. L. (2006). Influences of personal, injunctive, and descriptive norms on early adolescent substance use. *Journal of Drug Issues*, 36(1), 147–172. <http://dx.doi.org/10.1177/002204260603600107>.
- Elkington, K. S., Bauermeister, J. A., & Zimmerman, M. A. (2011). Do parents and peers matter? A prospective socio-ecological examination of substance use and sexual risk among African American youth. *Journal of Adolescence*, 34(5), 1035–1047. <http://dx.doi.org/10.1016/j.adolescence.2010.11.004>.
- Gutman, L. M., Eccles, J. S., Peck, S., & Malanchuk, O. (2011). The influence of family relations on trajectories of cigarette and alcohol use from early to late adolescence. *Journal of Adolescence*, 34(1), 119–128. <http://dx.doi.org/10.1016/j.adolescence.2010.01.005>.
- Hingson, R. W., Edwards, E. M., Heeren, T., & Rosenbloom, D. (2009). Age of drinking onset and injuries, motor vehicle crashes, and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research*, 33(5), 783–790. <http://dx.doi.org/10.1111/j.1530-0277.2009.00896.x>.
- Johnson, K., Bryant, D. D., Collins, D. A., Noe, T. D., Strader, T. N., & Berbaum, M. (1998). Preventing and reducing alcohol and other drug use among high-risk youths by increasing family resilience. *Social Work*, 43(4), 297–308.
- Keyes, C. L., & Michalec, B. (2010). *Viewing mental health from the complete state paradigm. A handbook for the study of mental Health: Social contexts, theories, and system*.
- Kirmayer, L. J., Marshall, E., & Phillips, M. K. (2011). Rethinking resilience from Indigenous perspectives. *Canadian Journal of Psychiatry*, 56(2), 84.
- Kovas, A. E., McFarland, B. H., Landen, M. G., Lopez, A. L., & May, P. A. (2008). Survey of American Indian Alcohol statutes, 1975–2006: Evolving needs and future opportunities for tribal health. *Journal of Studies on Alcohol and Drugs*, 69(2), 183–191. <http://dx.doi.org/10.15288/jasad.2008.69.183>.
- Kunitz, S. J., & Levy, J. E. (1994). *Drinking careers: A twenty-five-year study of three navajo populations*. New Haven, CT: Yale University Press.
- LaFromboise, T. D., Hoyt, D. R., Oliver, L., & Whitbeck, L. B. (2006). Family, community, and school influences on resilience among American Indian adolescents in the upper Midwest. *Journal of Community Psychology*, 34(2), 193–209. <http://dx.doi.org/10.1002/jcop.20090>.
- Lee, Y., & Nelder, J. A. (1996). Hierarchical generalized linear models. *Journal of the Royal Statistical Society. Series B (Methodological)*, 58(4), 619–678. <http://dx.doi.org/10.2307/2346105>.
- Luke, D. A. (2004). *Multilevel modeling*. Thousand Oaks, CA: Sage Publications.
- May, P. A. (1994). The epidemiology of alcohol abuse among American Indians: The Mythical and Real Properties. *American Indian Culture and Research Journal*, 18(2), 121–143.
- Mayer, R. R., Forster, J. L., Murray, D. M., & Wagenaar, A. C. (1998). Social settings and situations of underage drinking. *Journal of Studies on Alcohol*, 59(2), 207–215. <http://dx.doi.org/10.15288/jasa.1998.59.207>.
- Melander, L. A., Sittner Hartshorn, K. J., & Whitbeck, L. B. (2013). Correlates of bullying behaviors among a sample of North American Indigenous adolescents. *Journal of Adolescence*, 36(4), 675–684. <http://dx.doi.org/10.1016/j.adolescence.2013.05.003>.
- Melby, J. N., Conger, R. D., Fang, S.-A., Wickrama, K. A. S., & Conger, K. J. (2008). Adolescent family experiences and educational attainment during early adulthood. *Developmental Psychology*, 44(6), 1519–1536. <http://dx.doi.org/10.1037/a0013352>.
- Miech, R. A., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2015). *Monitoring the future national survey results on drug use, 1975–2014: Volume 1, Secondary School Students*. Ann Arbor, MI: Institute for Social Research. Retrieved from http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2014.pdf.
- Mitchell, C. M., Beals, J., Novins, D. K., & Spicer, P. (2003). Drug use among two American Indian populations: Prevalence of lifetime use and DSM-IV substance use disorders. *Drug and Alcohol Dependence*, 69(1), 29–41.
- Mitchell, C. M., Beals, J., & Whitesell, N. R. (2008). Alcohol use among American Indian high school youths from adolescence and young adulthood: A latent Markov model. *Journal of Studies on Alcohol and Drugs*, 69(5), 666–675. <http://dx.doi.org/10.15288/jasad.2008.69.666>.
- Mmari, K. N., Blum, R. W., & Teufel-Stone, N. (2010). What increases risk and protection for delinquent behaviors among American Indian youth?: Findings from three tribal communities. *Youth & Society*, 41(3), 382–413.
- Mohatt, G. V., Hazel, K. L., Allen, J., Stachelrodt, M., Hensel, C., & Fath, R. (2004). Unheard Alaska: Culturally anchored participatory action research on sobriety with Alaska Natives. *American Journal of Community Psychology*, 33(3–4), 263–273.
- Nezlek, J. B. (2001). Multilevel random coefficient analyses of event- and interval-contingent data in social and personality psychology research. *Personality and Social Psychology Bulletin*, 27(7), 771–785. <http://dx.doi.org/10.1177/0146167201277001>.
- Perry, S. W. (2004). *American Indians and crime - a BJS statistical profile, 1992–2002 (No. NCJ 203097)*. U.S. Department of Justice, Bureau of Justice Statistics.
- Raudenbush, D. S. W., & Bryk, A. S. (2001). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Russo, D., Purohit, V., Foudin, L., & Salin, M. (2004). Workshop on alcohol use and health disparities 2002: A call to arms. *Alcohol*, 32(1), 37–43. <http://dx.doi.org/10.1016/j.alcohol.2004.01.003>.
- Simons-Morton, B., Haynie, D. L., Crump, A. D., Eitel, P., & Saylor, K. E. (2001). Peer and parent influences on smoking and drinking among early adolescents. *Health Education & Behavior*, 28(1), 95–107. <http://dx.doi.org/10.1177/109019810102800109>.
- Sittner, K. J., & Hautala, D. (2016). Aggressive delinquency among North American indigenous adolescents: Trajectories and predictors. *Aggressive Behavior*, 42, 274–286. <http://dx.doi.org/10.1002/ab.21622>.
- Snijders, T., & Bosker, R. (1999). *Multilevel modeling: An introduction to basic and advanced multilevel modeling* (1st ed.). Thousand Oaks, CA: Sage.
- Stanley, L. R., Harness, S. D., Swaim, R. C., & Beauvais, F. (2014). Rates of substance use of American Indian students in 8th, 10th, and 12th grades living on or near reservations: Update, 2009–2012. *Public Health Reports*, 129(2), 156–163.
- Substance Abuse and Mental Health Services Administration (SAMHSA). (2010). *Results from the 2009 national survey on drug use and health* (Vol. 1). Summary of national findings (The NSDUH Report). Retrieved from <http://www.samhsa.gov/data/2k9/2k9Resultsweb/web/2k9results.htm>.
- Substance Abuse and Mental Health Services Administration (SAMHSA). (2011). *NSDUH report: Substance use among American Indian or Alaska Native adolescents*. Rockville, MD: Center for Behavioral Health Statistics and Quality. Retrieved from http://oas.samhsa.gov/2k11/005/WEB_SR_005_HTML.pdf.
- Tobler, A. L., & Komro, K. A. (2010). Trajectories of parental monitoring and communication and effects on drug use among urban young adolescents. *Journal of Adolescent Health*, 46(6), 560–568. <http://dx.doi.org/10.1016/j.jadohealth.2009.12.008>.
- Walls, M., Sittner Hartshorn, K. J., & Whitbeck, L. B. (2013). North American Indigenous adolescent substance use. *Addictive Behaviors*, 38(5), 2103–2109. <http://dx.doi.org/10.1016/j.addbeh.2013.01.004>.
- Walls, M. L., & Whitbeck, L. B. (2011). Maturation, peer context, and Indigenous girls' early-onset substance use. *The Journal of Early Adolescence*, 31(3), 415–442. <http://dx.doi.org/10.1177/0272431610366245>.
- West, B. A., & Naumann, R. B. (2011). Motor vehicle–related deaths — United States, 2003–2007. *Morbidity and Mortality Weekly Report Supplement*, 60(2), 52–55.
- Whitbeck, L. B., & Armenta, B. E. (2015). Patterns of substance use initiation among Indigenous adolescents. *Addictive Behaviors*, 45, 172–179. <http://dx.doi.org/10.1016/j.addbeh.2015.01.006>.
- Whitbeck, L. B., Sittner Hartshorn, K. J., & Walls, M. L. (2014). *Indigenous adolescent development: Psychological, social and historical contexts*. New York: Routledge.

- Whitbeck, L. B., Hoyt, D., Johnson, K., & Chen, X. (2006). Mental disorders among parents/caretakers of American Indian early adolescents in the Northern Midwest. *Social Psychiatry and Psychiatric Epidemiology*, *41*(8), 632–640. <http://dx.doi.org/10.1007/s00127-006-0070-2>.
- Whitbeck, L. B., Walls, M. L., Johnson, K. D., Morriseau, A. D., & McDougall, C. M. (2009). Depressed affect and historical loss among North American Indigenous adolescents. *American Indian and Alaska Native Mental Health Research*, *16*(3), 16–41.