

Similarities in the Etiology of Alcohol Use Among Native American and Non-Native Young Women

KELLI A. KOMRO, PH.D.,^{a,*} MELVIN D. LIVINGSTON, PH.D.,^b BRADY A. GARRETT, PH.D.,^{a,c} & MISTY L. BOYD, PH.D.^c

^aDepartment of Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, Atlanta, Georgia

^bDepartment of Biostatistics and Epidemiology, School of Public Health, University of North Texas Health Science Center, Fort Worth, Texas

^cCherokee Nation Behavioral Health, Tahlequah, Oklahoma

ABSTRACT. Objective: This study examined social- and individual-level factors associated with alcohol use among young women and tested whether differences exist between Native American and non-Native young women. **Method:** School-based surveys were conducted among 952 young women (ages 14–19) attending four high schools within the tribal jurisdictional service area of the Cherokee Nation in northeastern Oklahoma. Structural equation modeling using Mplus was used to assess the direct and indirect effects of social- and individual-level factors on subsequent alcohol use among Native and non-Native young women. **Results:** We found no differences in the level of risk and protective factors among Native and non-Native young women. Among Native and non-Native young women, alcohol access, parental communication, and

best friends' alcohol use had statistically significant direct and/or indirect effects on alcohol use. Indirect effects were mediated through alcohol expectancies and norms. A history of alcohol problems by an adult in the household and depression were not retained as independent risk factors in either model. **Conclusions:** We found more similarities than differences in level of and relations to alcohol use among social and individual risk and protective factors between Native American and non-Native young women from northeastern Oklahoma. The results provide support for universal prevention strategies, suggesting the importance of increasing perceptions that it is difficult to obtain alcohol and increasing parent–child communication. (*J. Stud. Alcohol Drugs*, 77, 782–791, 2016)

THIS STUDY PROVIDES NEW INFORMATION to guide alcohol prevention efforts for Native American (NA) young women living in nonreservation communities. The focus on NA young women is important because national behavioral, morbidity, and mortality statistics indicate that NA young women are a vulnerable group for alcohol-related consequences (Centers for Disease Control and Prevention, 2009; Chartier & Caetano, 2010; Eaton et al., 2010; Keyes et al., 2012; Russo et al., 2004; Wallace et al., 2003). Yet there is limited understanding of whether and how the etiology of alcohol use during adolescence may differ among NA compared with non-Native young women, which is needed to inform universal prevention efforts in multicultural communities.

Given the long history of historical trauma, NA populations suffer from psychological and physical health dispari-

ties that may increase risk of early onset and heavy use of alcohol (Whitbeck et al., 2004). NA girls are at increased risk for trauma exposure during childhood (Ehlers & Gizer, 2013; Yuan et al., 2006), which increases later risk for substance use (Whitesell et al., 2012). Discrimination and historical loss are two important risk factors for alcohol abuse among NA women (Whitbeck et al., 2004).

There is a history of research examining risk and protective factors for NA adolescent alcohol use (Dickens et al., 2012); however, few studies have examined these factors at multiple levels (Chen et al., 2012). Economic deprivation, discrimination, and cultural conflicts are social stressors that have been shown to increase risk for NA youth's substance use (Chen et al., 2012). Social alienation and conflict may affect social bonding and connections, limiting a key protection against negative influences and amplifying the influence of negative peer influences (Chen et al., 2012). Threats to school bonding are important; a strong school bond has been found to be an important protective factor and moderator of the effect of negative peer influence on NA adolescent alcohol use (Dickens et al., 2012).

Consistent with etiological research among general populations of youth, a 6-year longitudinal study of a cohort of 14- to 20-year-olds from two Western tribes found risk and protective factors at multiple levels (Mitchell et al., 2008). Predictors of consistent alcohol use included alcohol expectancies, sensation seeking, other risky behaviors, and parental problems with alcohol. Friese and Grube (2009) examined direct community-level influences and reported

Received: October 30, 2015. Revision: March 18, 2016.

Research reported in this publication was supported by the National Institute on Alcohol Abuse and Alcoholism, with co-funding from the National Institute on Drug Abuse, and supplemental support from the Office of Research on Women's Health, of the National Institutes of Health (NIH) under Award Number 5R01AA02069. The Cherokee Nation Institutional Review Board reviewed and approved this manuscript for publication. The content is solely the responsibility of the authors and does not necessarily represent the views of the NIH or the Cherokee Nation.

*Correspondence may be sent to Kelli A. Komro at the Department of Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, 1518 Clifton Road NE, GCR 564, Atlanta, GA 30322, or via email at: kkomro@emory.edu.

that compared with Whites, NA youth drinkers were twice as likely to have gotten alcohol from an adult and from someone under age 21, and less likely to have obtained alcohol from their parents. Results by Friese and colleagues (2015) indicate that higher drinking among NA youth may be accounted for by lower school involvement, weaker neighborhood antidrug norms, greater neighborhood disorganization, and lower levels of police enforcement.

Our goal was to examine multilevel risk and protective factors for alcohol use among young women living in rural multicultural communities—including a high population of NAs and Whites—to help guide universal prevention efforts. The key question is whether universal prevention efforts are likely to be effective for all young women living within such communities. Figure 1 depicts the conceptual model that has guided our specific hypotheses and analyses. Correlations among each construct at each time point were expected. Given the reports of NA girls' greater exposure to social risks (Ehlers & Gizer, 2013; Friese et al., 2015; Whitesell et al., 2012; Yuan et al., 2006), we hypothesized that NA young women would have exposure to higher levels of social risks that would result in higher individual-level risks. However, we hypothesized similar effects of the risk and protective factors on alcohol use among NA and non-Native young women.

Method

Study design and sample

There are more than 500 diverse NA tribes within the United States, with significant variability in alcohol-specific death rates across the tribes and regions (Whitesell et al., 2012). The Cherokee Nation is one of the two largest federally recognized tribes in the United States, with more than 300,000 members. The study sample included all female high school students from four rural towns in northeastern Oklahoma located within the 14-county tribal jurisdictional service area of the Cherokee Nation. Nearly half of the Cherokee Nation citizens live within this 14-county region in Oklahoma. The Cherokee Nation is not reservation-based; therefore, the study sites are multicultural with predominantly White and NA populations.

Data for the current study were from the baseline period of an alcohol prevention trial, before any intervention activities began. The four towns with their embedded high schools (one high school per town) agreed to participate in the study and were purposively selected based on town and high school characteristics (Komro et al., 2015b). The town populations ranged from 2,452 to 9,539, with 14%–38% NA-alone households, and median income of \$30,040 to \$38,310. High school size ranged from 534 to 641, with 38%–56% NA students, and 40%–70% receiving free or reduced-price lunch. The current study included all the

young women from the study high schools (ages 14–19; $M_{\text{age}} = 16$), including those who self-reported as NA ($n = 422$), 83% Cherokee, and those who self-reported as non-Native ($n = 530$), 87% White.

Data collection

Brief self-report questionnaires were administered to students by a team of trained staff members (see, e.g., Komro et al., 2015a, for a description of survey administration) in November–December 2011, January–March 2012, and April–May 2012. Parents were sent a consent letter and were asked to call a toll-free number or to return a postage-paid postcard if they did not want their child to participate. Students were given an assent form and could refuse participation at each survey administration. Response rates over the three waves were 85%, 83%, and 82%. Survey procedures were approved by both the University of Florida and the Cherokee Nation Institutional Review Boards.

Measures

We designed our survey based on the literature that supports multilevel influences on NA youth drinking, as well as Wagenaar and Perry's (1994) comprehensive theoretical framework of drinking behavior. We conducted a psychometric study, which supported the reliability and validity of the scales among NA and White adolescents, including internal consistency, test–retest reliability, and criterion and predictive validity (Komro et al., 2015a).

Perceived access difficulty. Ten items measured perceptions of how easy it would be to get alcohol from various sources (Eaton et al., 2010; Komro et al., 2008).

Perceived police enforcement. Three items measured perceptions of how likely it would be “to get in trouble with police” if (a) “you tried to purchase alcohol at a store in your town,” (b) “you drank alcohol,” and (c) “you drove a car or other vehicle when you had been drinking alcohol” (Oklahoma Department of Mental Health and Substance Abuse Services, 2010).

Models of drinking. One item measured whether any household adults ever had problems (e.g., health, law, work, family) because of their drinking (Center on Alcoholism, Substance Abuse, and Addictions Research Division, 1995). One item measured the number of one's four best friends who drank alcohol (Oklahoma Department of Mental Health and Substance Abuse Services, 2010).

Social interactions. Parental communication was measured with three items, including parental general monitoring, and communication about the problems drinking alcohol can cause young people (Komro et al., 2008). Social support was assessed with six items measuring available support from adults and young people (Oklahoma Department of Mental Health and Substance Abuse Services, 2010).

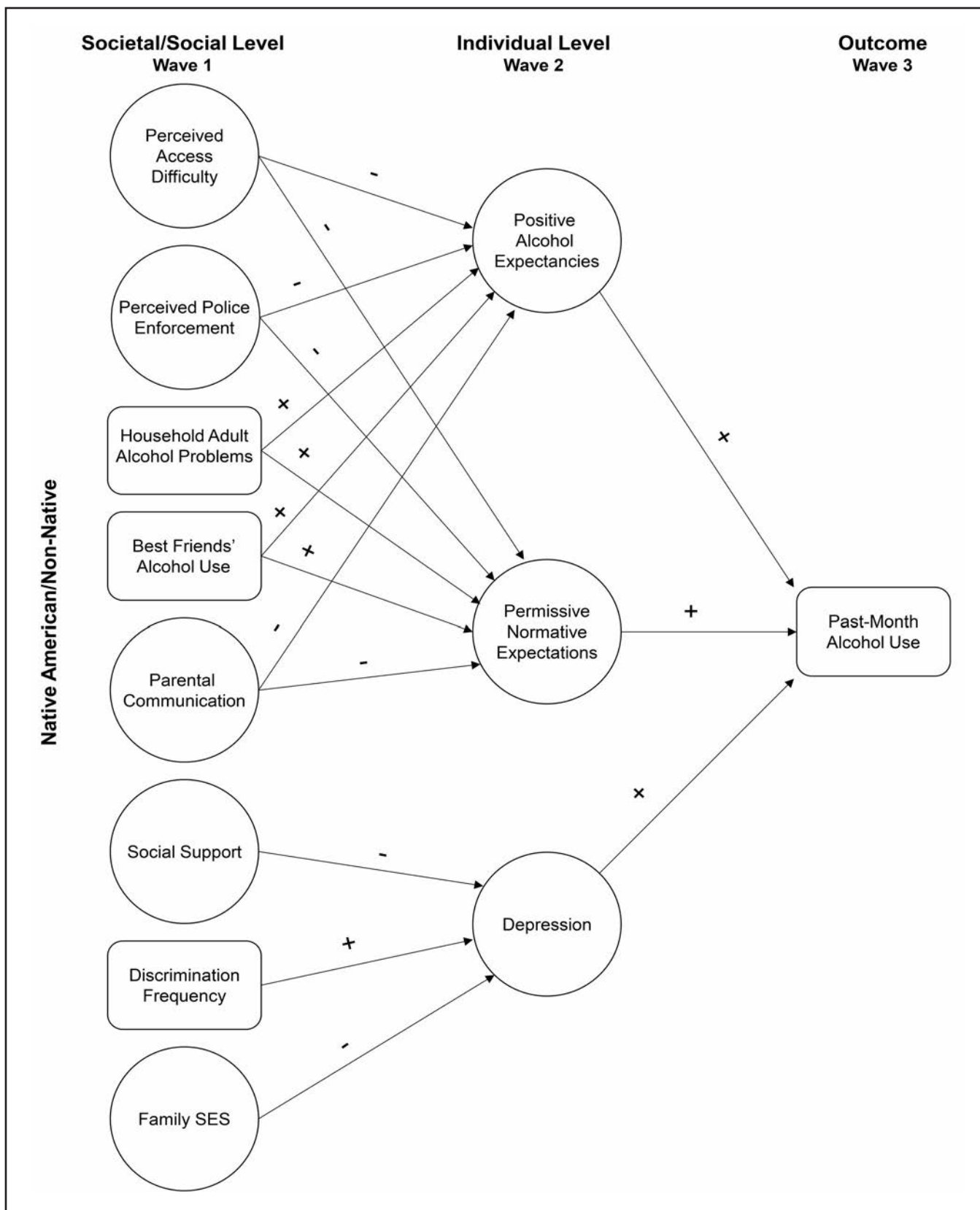


FIGURE 1. Conceptual model guiding study hypotheses. Note that within-wave correlations and direct effects from Wave 1 to Wave 3 are not displayed because of model complexity. Wave 1 variables are hypothesized to have direct effects on alcohol use at Wave 3. SES = socioeconomic status.

Discrimination. Racial discrimination was assessed with one item measuring frequency of experiencing discrimination because of race/ethnicity (Wolfe & Kimerling, 1997).

Family socioeconomic status. Socioeconomic status was measured by enrollment in a free or reduced-price lunch program, family composition, parental education, family computer ownership, and vacations (Boyce et al., 2006; Oklahoma Department of Mental Health and Substance Abuse Services, 2010).

Alcohol cognitions. Positive alcohol expectancies were assessed with 14 items from a scale (Christiansen et al., 1982) that measures beliefs about the expected effects of alcohol. Permissive normative expectations were measured with three items of perceptions of personal, adult, and parental norms around youth drinking (Komro et al., 2008).

Depression. Depression was measured with a standard brief adolescent depression scale, which included six items, developed by Kandel and Davies (1982).

Current alcohol use. The outcome of interest was current alcohol use, using a standard item from the Youth Risk Behavior Surveillance System measuring the frequency of alcohol use during the past 30 days (Eaton et al., 2010). Past-month alcohol use was dichotomized into *no use* and *any use during the past 30 days*.

Analytical strategy

Structural equation modeling using Mplus Version 6 (Muthén & Muthén, 1998–2010) was used to assess the direct and indirect effects of social- and individual-level factors on alcohol use among NA and non-Native young women. Analyses were conducted in two phases. First, measurement models estimated the relationships between observed variables and the hypothesized latent constructs and to test for measurement invariance across NA and non-Native young women. The second phase estimated structural models specifying the hypothesized causal relationships (Figure 1). To aid in causal inference, social-level measures, individual-level measures, and past-month alcohol use were derived from data from the first, second, and third survey waves, respectively.

Confirmatory factor analysis with categorical indicators in Mplus was used to estimate all measurement models. The initial factor structure was determined in the full sample of NA and non-Native young women. Poorly loading items were trimmed to achieve acceptable model fit. Model fit was assessed using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). CFI values greater than .90 indicate reasonably good model fit. RMSEA values less than or equal to .05 indicate close approximate fit, values between .05 and .08 suggest reasonable fit, and values greater than or equal to .10 suggest poor model fit. Once the latent factor structure was finalized, multigroup confirmatory factor analysis was used to assess measurement

invariance between NA and non-Native females. For each latent factor, free and restricted models were estimated. In the free model, the factor loadings and thresholds were freely estimated in NA and non-Native young women; factor means and variances were fixed to zero and one, respectively, for identification purposes. In the fixed model, factor loadings and thresholds were constrained to be equal across NA and non-Native young women; the factor means and variances remained fixed in the non-Native group and are freely estimated in the NA group. The freely estimated mean in the NA group can be interpreted as the difference in the latent means between the two groups. To establish measurement invariance, two conditions were met: there was adequate model fit in the fixed model, and the change in CFI between the fixed and free model was less than .01.

Subsequently, structural differences between NA and non-Native young women were tested using a likelihood ratio test comparing the two-group structural equation model with structural parameters free across race/ethnicity groups to the two-group structural equation model with parameters constrained to be equal across race/ethnicity groups (Byrne, 2001; Schumacker & Lomax, 2004). Separate structural models were built for NA and non-Native young women because of significant structural variance between the groups, $\chi^2(56) = 84.97, p < .01$. Structural models were built in stages following the temporal ordering of the hypothesized relationships: (a) relationships between social- and individual-level measures and (b) the relationships between social- and individual-level measures with past-month alcohol use. To account for potential confounding in estimates of the between-wave paths, variables were allowed to correlate within each time point. Pathways and correlations that were not significant ($p < .10$) were trimmed at each stage. All pathways and correlations found to be significant during the first stage were retained in the models regardless of any change in statistical significance in the final stage. Indirect effects were calculated as a product of coefficients describing the effect of the independent variable on the hypothesized mediator and the hypothesized mediator on the outcome. Sobel's method as implemented in Mplus Version 6 was used for calculation of standard errors of indirect effects.

Missing data

Young women who completed a Wave 1 survey were eligible for inclusion in the analyses. Of the 422 NA young women present at Wave 1, 85% ($n = 358$) were present at Wave 2, and 83% ($n = 350$) were present at Wave 3. Of the 530 non-Native young women present at Wave 1, 87% ($n = 461$) were present at Wave 2, and 85% ($n = 448$) were present at Wave 3. Students with missing survey waves were more likely to be NA, $\chi^2(1) = 6.78, p = .01$, be of low socioeconomic status, $\chi^2(1) = 23.09, p < .001$, have best

TABLE 1. Factor loadings, fit indices, and differences in latent means for multi-group measurement models

Variable	Factor loadings	CFI	RMSEA	Difference in mean (NA vs. non-Native females)	<i>p</i> value change in mean
Wave 1					
Parental communication		.995	.039	-0.014	.85
Parent/guardian ask where going/who with	0.528				
Parent/guardian talk alcohol problems	2.751				
Other adults talk alcohol problems	1.204				
Perceived access difficulty		.989	.033	-0.113	.13
Family member (not a parent) 21 or older	1.269				
Family member, younger than 21	1.218				
A waiter or bartender	0.592				
Parent or guardian with permission	0.585				
Perceived police enforcement		1	0	-0.015	.84
Purchase alcohol in your town	1.057				
Drank alcohol	1.602				
Drove when drinking alcohol	1.5				
Family socioeconomic status		.996	.019	-0.168	.08
Family computer ownership	0.699				
Parent education	0.769				
Free or reduced-price lunch	1.057				
Vacations	0.603				
Social support		.995	.047	-0.072	.29
Adult in my life who I can ask for help	0.808				
Young people in school I can ask for help	0.523				
People in town notice/acknowledge a good job	1.436				
Adults in town could talk to	1.125				
People in town proud of me	2.702				
People in town encourage me	1.956				
Wave 2					
Positive alcohol expectancies		.981	.049	0.035	.66
Feel good and happy	1.404				
Talk with people of opposite sex better	1.386				
Makes future seem brighter	0.969				
Makes people more friendly	0.819				
Helps people stand up to others	1.05				
Makes people more relaxed/less tense	1.223				
Makes parties more fun	0.97				
Keep mind off mistakes at school	0.839				
Depression		.984	.088	0.03	.7
Feeling too tired	1.242				
Trouble going to sleep or staying asleep	1.044				
Feeling unhappy, sad, or depressed	1.526				
Feeling hopeless about the future	1.265				
Feeling nervous or tense	1.83				
Worrying too much about things	1.991				
Permissive normative expectancies		1	0	0.084	.33
Someone your age to drink	1.237				
Adults (over 21) in town about kids your age	0.528				
Your parents/guardians for YOU to drink	1.45				

Notes: NA = Native American; CFI = comparative fit index; RMSEA = root mean square error of approximation.

friends who drink, $\chi^2(4) = 46.36$, $p < .001$, and report past-month drinking, $\chi^2(1) = 38.16$, $p < .001$. When categorical indicators are used, Mplus handles missing data by pairwise deletion assuming the data is missing completely at random. Because of the presence of missing data at each wave, multiple imputation using chained equations (MICE) with IVEWARE Version 0.1 tested the robustness of our findings (Raghunathan et al., 2007). MICE was preferred over Mplus's internal imputation procedure because MICE does not rely on an assumption of joint normality (Azur et al., 2011). The use of multiple imputation resulted in no substantive

changes to the measurement models or the test of structural variance. However, a small number of pathways were attenuated in the structural model for NA young women.

Results

Measurement models and student characteristics

Measurement models were fit for each of the latent constructs to verify the factor structure. All models adequately fit the data (all CFIs $> .98$ and all RMSEAs $< .1$) and were

TABLE 2. Distribution of manifest variables among Native American and non-Native young women

Variable	Non-Native young women, n (%)	Native American young women, n (%)	<i>p</i>
Past-month alcohol use	77 (22.00)	87 (19.46)	.38
Household adult alcohol problems			.57
No, none of them	166 (17.85)	118 (12.69)	
Yes, one of them	162 (17.42)	143 (15.38)	
Yes, two of them	115 (12.37)	87 (9.35)	
Yes, three or more of them	75 (8.06)	64 (6.88)	
Best friends' alcohol use			.01
0 friends	266 (28.39)	173 (18.46)	
1 friend	96 (10.25)	100 (10.67)	
2 friend	98 (10.46)	74 (7.90)	
3 friend	36 (3.84)	27 (2.88)	
4 friend	28 (2.99)	39 (4.16)	
Discrimination frequency			.77
Never	369 (42.53)	309 (33.19)	
Hardly ever	80 (8.59)	59 (6.34)	
A few times a year	32 (3.44)	31 (3.33)	
Monthly	4 (0.43)	5 (0.54)	
Daily	7 (0.75)	8 (0.86)	

invariant across groups ($\Delta\text{CFI} < .01$). There were no statistically significant differences in the latent means between NA and non-Native young women (Table 1). There were statistically significant differences in the distribution of respondent's best friend's alcohol use between NA and non-Native young women: NA young women reported more friends who had drunk alcohol in the last 30 days, $\chi^2(4) = 13.2$, $p = .01$ (Table 2). There were no significant differences in the distributions of the remaining manifest items.

Structural models

Final structural models are shown in Figures 2 and 3. The figures include all variables that were associated with a statistically significant structural pathway; however, all relevant variables are retained in the model to allow within-wave correlation between the factors. These within-wave correlations are removed from the figures to aid in readability (available from the first author on request). Structural pathways leading to the latent variables at Wave 2 should be interpreted as linear betas, whereas structural pathways leading to past-month alcohol use at Wave 3 should be interpreted as the change in log odds of drinking in the past 30 days. Fit indices indicated good fit to the data of both NA (CFI = .95; RMSEA = .03) and non-Native (CFI = .95; RMSEA = .04) young women.

Native American young women. The final structural model for NA young women is presented in Figure 2. Perceived access difficulty at Wave 1 was negatively associated with positive alcohol expectancies ($\beta = -.419$, $p < .001$) and permissive normative expectations ($\beta = .838$, $p < .001$) at Wave 2. Best friends' alcohol use at Wave 1 was positively associated with positive alcohol expectancies ($\beta = .141$, $p = .01$) and permissive normative expectations ($\beta = .359$, $p < .001$)

at Wave 2. Parental communication at Wave 1 was negatively associated with permissive normative expectations ($\beta = -.307$, $p = .02$) and depression ($\beta = -.255$, $p < .001$) at Wave 2. Frequency of discrimination at Wave 1 was positively associated with depression ($\beta = .324$, $p < .001$) at Wave 2.

Significant associations between Waves 1 and 2 variables with Wave 3 past-month alcohol use were observed. Best friends' alcohol use at Wave 1 was positively associated with Wave 3 past-month alcohol use ($\beta = .199$, $p = .04$). Positive alcohol expectancies and permissive normative expectations at Wave 2 were positively associated with Wave 3 past-month alcohol use ($\beta = .335$, $p = .006$, and $\beta = .374$, $p = .002$, respectively). Of all the pathways estimated, two were not robust to the use of multiple imputation to account for potential bias because of missing data and include the associations between (a) Wave 1 best friends' alcohol use and Wave 3 past-month alcohol use and (b) Wave 2 positive alcohol expectancies and Wave 3 past-month alcohol use. As a result, these pathways should be interpreted with a greater amount of caution.

Tests for indirect effects suggest that social-level influences at Wave 1 on Wave 3 past-month alcohol use were mediated by the individual-level factors at Wave 2. The effect of perceived access difficulty was mediated by positive alcohol expectancies and permissive normative expectations (indirect effect by positive alcohol expectancies: $\beta = -.140$, $p = .02$; indirect effect by permissive normative expectations: $\beta = -.314$, $p = .004$; total effect: $\beta = -.454$, $p < .001$). The effect of best friends' alcohol use was partially mediated by permissive normative expectations (indirect effect: $\beta = .134$, $p = .007$; total effect: $\beta = .333$, $p < .001$). The effect of parental communication on past-month alcohol use was mediated by permissive normative expectations ($\beta = -.115$, $p = .05$).

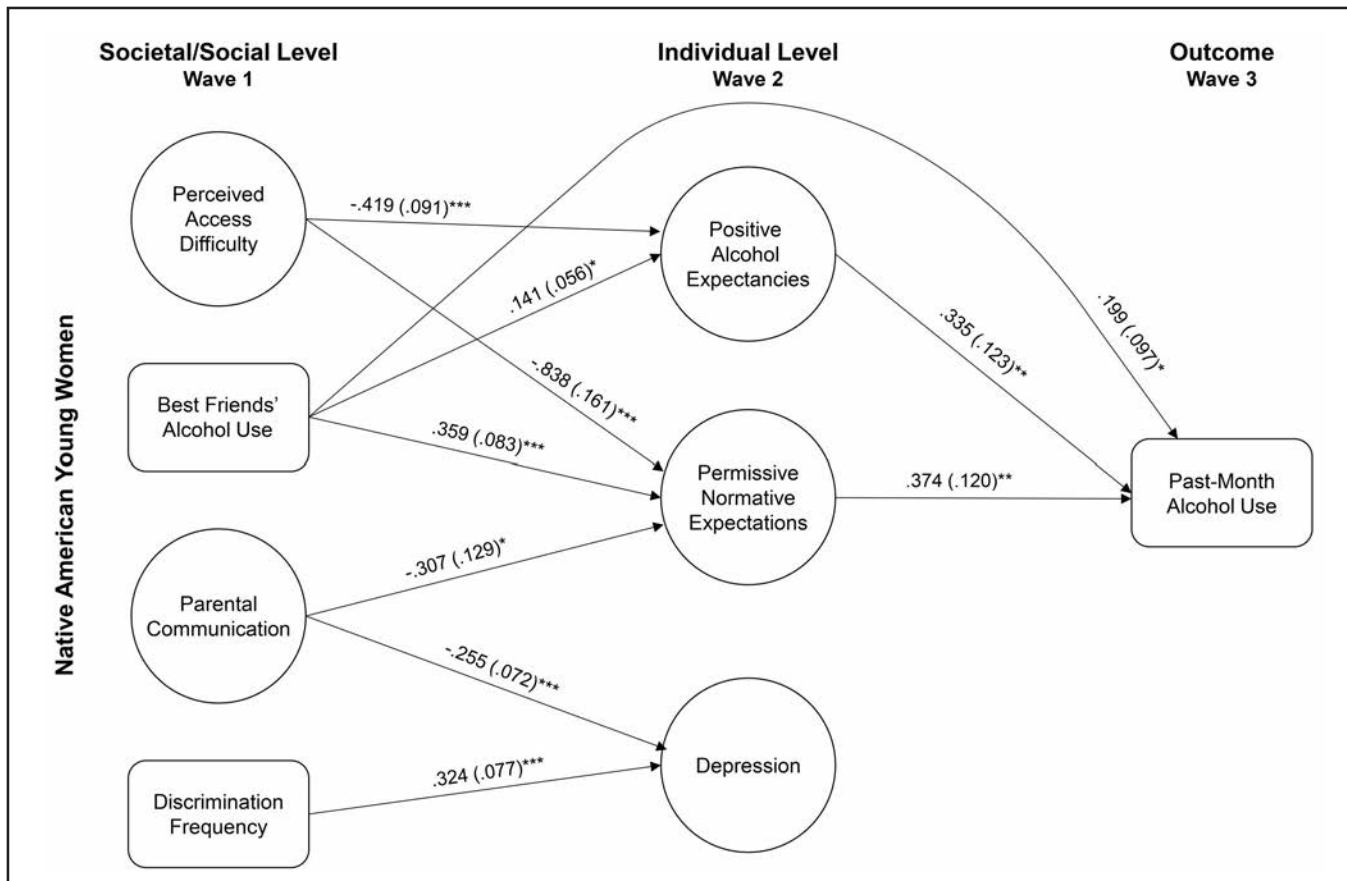


FIGURE 2. Structural model for Native American young women. Structural pathways leading to the latent variables at Wave 2 should be interpreted as linear betas, whereas structural pathways leading to past-month alcohol use at Wave 3 should be interpreted as the change in log odds of drinking in the last 30 days. Within-wave correlations are not displayed because of model complexity. Standard errors are in parentheses. Comparative fit index = .954; root mean square error of approximation = .031.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Non-Native young women. The structural model for non-Native young women is presented in Figure 3. Perceived access difficulty at Wave 1 was negatively associated with positive alcohol expectancies ($\beta = -.501, p < .001$) and permissive normative expectations ($\beta = -.455, p < .001$) at Wave 2. Best friends' alcohol use at Wave 1 was positively associated with permissive normative expectations ($\beta = .342, p < .001$) at Wave 2. Parental communication at Wave 1 was negatively associated with permissive normative expectations ($\beta = -.342, p < .001$) at Wave 2. Social support and socioeconomic status were negatively associated with depression ($\beta = -.235, p = .01$, and $\beta = -.359, p < .001$).

Significant associations between Waves 1 and 2 variables with Wave 3 past-month alcohol use were observed. Best friends' alcohol use at Wave 1 was positively associated with Wave 3 past-month alcohol use ($\beta = .256, p = .01$). Parental communication was positively associated with Wave 3 past-month alcohol use ($\beta = .281, p = .03$). Permissive normative expectations at Wave 2 were positively associated with Wave 3 past-month alcohol use ($\beta = .615, p < .001$).

Tests for indirect effects suggest social-level influences at Wave 1 on Wave 3 past-month alcohol use mediated by the individual-level factors at Wave 2. The effect of perceived access difficulty was mediated by permissive normative expectations ($\beta = -.280, p = .001$). In addition to its direct effects, the effect of parental communication was mediated by permissive normative expectations resulting in no net effect (indirect effect: $\beta = -.210, p = .001$; total effect: $\beta = .070, p = .530$). The effect of best friends' alcohol use was partially mediated by permissive normative expectations (indirect effect: $\beta = .210, p = .001$; total effect: $\beta = .466, p < .001$). Sensitivity analysis using multiple imputation for missing data showed no substantive differences in the estimated associations.

Discussion

The hypothesized model of risk and protective factors for alcohol use was supported for both NA and non-Native young women, with only a few exceptions. Risk and protec-

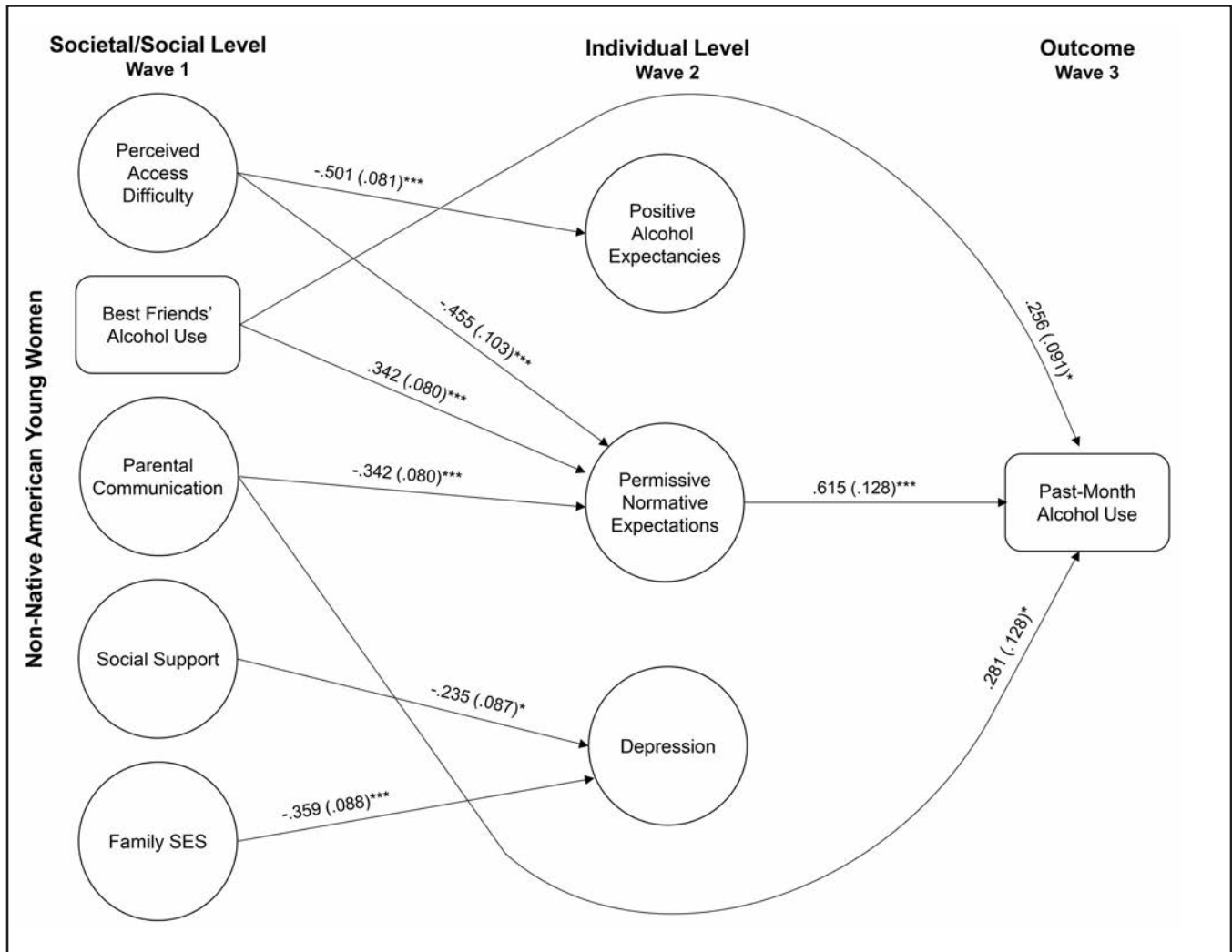


FIGURE 3. Structural model for non-Native young women. Structural pathways leading to the latent variables at Wave 2 should be interpreted as linear betas, whereas structural pathways leading to past-month alcohol use at Wave 3 should be interpreted as the change in log odds of drinking in the last 30 days. Within-wave correlations are not displayed because of model complexity. Standard errors are in parentheses. SES = socioeconomic status. Comparative fit index = .954; root mean square error of approximation = .035. * $p < .05$; *** $p < .001$.

tive factors were also similar across groups, with the exception of a greater number of friends who drank among NA young women. The similarity in risk exposures and etiology of alcohol use among NA and non-Native high school students may be influenced by the fact that the young women in our study were attending and living in the same multicultural rural high schools and communities. These communities are not located in a reservation; therefore, there is less physical isolation that may occur among reservation-based Native Americans.

Among NA and non-Native young women, alcohol access, parental communication, and best friends' alcohol use had significant direct and/or indirect effects on alcohol use. Young women who perceived that it was more difficult to get alcohol were less likely to have positive alcohol expectan-

cies and permissive norms, both of which were significant risk factors for alcohol use. Perceived police enforcement, although not significant in either model, was highly correlated with perceived access difficulty. The protective effect of increased police enforcement may work through teens' perceptions of how difficult it is to get alcohol. Easy access to alcohol has been found to be a risk factor for alcohol use among other youth samples (Tobler et al., 2011; Wagenaar & Perry, 1994), and this study provides evidence that access is relevant to NA young women as well.

Similar to Tobler et al. (2011), we found that parental communication had both direct and indirect protective effects on alcohol use. Among NA girls, parental communication was negatively associated with permissive norms and depression. Among non-Native girls, parental communica-

tion had a direct protective effect on alcohol use, as well as an indirect effect mediated through permissive norms.

Consistent with previous research (Chen et al., 2012), best friends' alcohol use was a risk factor for NA and non-Native young women, both directly and mediated through permissive norms. Among NA girls, best friends' use also influenced positive alcohol expectancies. NA young women may be particularly at risk for associations with deviant peers because of earlier age at menarche increasing associations with older and deviant peers (Deardorff et al., 2005; Mrug et al., 2014; Walls & Whitbeck, 2011).

Exposure to an adult's alcohol problems was not retained as an independent risk factor in either model, although it was negatively correlated with parental communication and social support. Jones and Houts (1992) proposed that heavier levels of problematic drinking by parents/adults can create environments that negatively affect crucial developmental processes and social skills. Parents who drank heavily and regularly were reported to be less supportive to their children, demonstrated less positive regard, and were less attentive to their children's feelings. Our finding seems consistent with these previous findings, suggesting that a history of adult alcohol problems may be linked to a household environment that supports young women's alcohol use.

Contrary to our hypotheses, depression was not a significant risk factor for alcohol use. Interestingly, we found different risk factors for depression by Native ancestry. Among NA young women, discrimination frequency was the only statistically significant risk factor for depression. Our findings are consistent with previous studies that suggest young women are more likely to cope with adverse experiences in less overt ways relative to boys (Hayward & Sanborn, 2002; Seiffge-Krenke & Stemmler, 2002; Whitbeck et al., 2001). For instance, Whitbeck and colleagues (2001) found a significant positive relationship between perceived discrimination and internalizing symptoms (e.g., depressive symptoms and low self-esteem) among NA girls.

The current findings are limited to a sample of young women attending high schools in northeastern Oklahoma within the jurisdictional service area of the Cherokee Nation and may not be generalizable to other NA tribes, especially those living on reservations. However, the study provided a large comparative sample of NA and non-Native rural young women to better understand the needs of these vulnerable youth populations. The study allowed for longitudinal investigation of risks at multiple levels, which is an advantage over cross-sectional studies. However, we were limited to an examination during the high school years; therefore, we were not able to investigate early risk factors. Also, we designed the survey to be a brief, 15-minute survey to reduce burden on classroom time; therefore, we acknowledge several limitations to our measures. First, our measure of discrimination, adult household problems, and best friend's alcohol use included one item each. Therefore, they may be less sensitive

measures of each of these important risk factors. Second, we did not include a measure of historical loss, although we included measures of depression, discrimination, and cultural identity. Given the longitudinal nature of the design, not all students completed all three waves of data collection, and those most at risk were more likely to be lost to follow-up. We conducted sensitivity analyses with multiple imputations for missing data and found only two substantive differences in results, suggesting that overall the results are stable.

We found more similarities than differences in level and relations to alcohol use among social and individual risk and protective factors between non-reservation NA and non-Native young women from northeastern Oklahoma. Important differences between NA and non-Native young women were noted for risk and protective factors for depression, with discrimination a risk factor and parental monitoring and communication protective factors among NA young women, compared with low socioeconomic status as a risk factor and general social support a protective factor among non-NA young women. To reduce underage drinking among young women, especially vulnerable NA young women, the results indicate that two powerful protective factors are increasing barriers to youth access to alcohol and increasing parent-child communication.

Acknowledgments

The authors thank the participating high schools and students for their time and effort. We also thank Dr. T. K. Kominsky, Bethany Livingston, and Jessica Douthitt for their outstanding contributions to survey implementation and the study overall, as well as the support of the Muskogee Nonprofit Resource Center and survey staff for their careful attention and thoughtful administration of the surveys.

References

- Azur, M. J., Stuart, E. A., Frangakis, C., & Leaf, P. J. (2011). Multiple imputation by chained equations: What is it and how does it work? *International Journal of Methods in Psychiatric Research, 20*, 40–49. doi:10.1002/mpr.329
- Boyce, W., Torsheim, T., Currie, C., & Zambon, A. (2006). The Family Affluence Scale as a measure of national wealth: Validation of an adolescent self-report measure. *Social Indicators Research, 78*, 473–487. doi:10.1007/s11205-005-1607-6
- Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Centers for Disease Control and Prevention. (2009). Sociodemographic differences in binge drinking among adults—14 states, 2004. *Morbidity and Mortality Weekly Report, 58*, 301–304. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5812a1.htm>
- Center on Alcoholism, Substance Abuse, and Addictions Research Division. (1995). *Family History Questionnaire*. Retrieved from <http://casaa.unm.edu/inst/Family%20History%20Questionnaire.pdf>
- Chartier, K., & Caetano, R. (2010). Ethnicity and health disparities in alcohol research. *Alcohol Research & Health, 33*(No. 1–2): 152–160.
- Chen, H.-J., Balan, S., & Price, R. K. (2012). Association of contextual factors with drug use and binge drinking among White, Native American,

- and mixed-race adolescents in the general population. *Journal of Youth and Adolescence*, 41, 1426–1441. doi:10.1007/s10964-012-9789-0
- Christiansen, B. A., Goldman, M. S., & Inn, A. (1982). Development of alcohol-related expectancies in adolescents: Separating pharmacological from social-learning influences. *Journal of Consulting and Clinical Psychology*, 50, 336–344. doi:10.1037/0022-006X.50.3.336
- Deardorff, J., Gonzales, N. A., Christopher, F. S., Roosa, M. W., & Millsap, R. E. (2005). Early puberty and adolescent pregnancy: The influence of alcohol use. *Pediatrics*, 116, 1451–1456. doi:10.1542/peds.2005-0542
- 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, 597–603. doi:10.15288/jsad.2012.73.597
- Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., . . . Wechsler, H. (2010, June 4). Youth risk behavior surveillance - United States, 2009. *MMWR Surveillance Summaries*, 59, No. SS-5, 1–142. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5905a1.htm>
- Ehlers, C. L., & Gizer, I. R. (2013). Evidence for a genetic component for substance dependence in Native Americans. *American Journal of Psychiatry*, 170, 154–164. doi:10.1176/appi.ajp.2012.12010113
- Friese, B., & Grube, J.W. (2009). Differences in drinking behavior and access to alcohol between Native American and White adolescents. *Journal of Drug Education*, 38, 273–284.
- Friese, B., Grube, J. W., & Seninger, S. (2015). Drinking among Native American and White youths: The role of perceived neighborhood and school environment. *Journal of Ethnicity in Substance Abuse*, 14, 287–307. doi:10.1080/15332640.2014.994723
- Hayward, C., & Sanborn, K. (2002). Puberty and the emergence of gender differences in psychopathology. *Journal of Adolescent Health*, 30, Supplement 1, 49–58. doi:10.1016/S1054-139X(02)00336-1
- Jones, D. C., & Houts, R. (1992). Parental drinking, parent-child communication, and social skills in young adults. *Journal of Studies on Alcohol*, 53, 48–56. doi:10.15288/jsa.1992.53.48
- Kandel, D. B., & Davies, M. (1982). Epidemiology of depressive mood in adolescents: An empirical study. *Archives of General Psychiatry*, 39, 1205–1212. doi:10.1001/archpsyc.1982.04290100065011
- Keyes, K. M., Liu, X. C., & Cerda, M. (2012). The role of race/ethnicity in alcohol-attributable injury in the United States. *Epidemiologic Reviews*, 34, 89–102. doi:10.1093/epirev/mxr018
- Komro, K. A., Livingston, M. D., Kominsky, T. K., Livingston, B. J., Garrett, B. A., Molina, M. M., & Boyd, M. L. (2015a). Fifteen-minute comprehensive alcohol risk survey: Reliability and validity across American Indian and White adolescents. *Journal of Studies on Alcohol and Drugs*, 76, 133–142. doi:10.15288/jsad.2015.76.133
- Komro, K. A., Perry, C. L., Veblen-Mortenson, S., Farbaksh, K., Toomey, T. L., Stigler, M. H., . . . Williams, C. L. (2008). Outcomes from a randomized controlled trial of a multi-component alcohol use preventive intervention for urban youth: Project Northland Chicago. *Addiction*, 103, 606–618. doi:10.1111/j.1360-0443.2007.02110.x
- Komro, K. A., Wagenaar, A. C., Boyd, M., Boyd, B. J., Kominsky, T., Pettigrew, D., . . . Molina, M. M. M. (2015b). Prevention trial in the Cherokee Nation: Design of a randomized community trial. *Prevention Science*, 16, 291–300. doi:10.1007/s11121-014-0478-y
- Mitchell, C. M., Beals, J., & Whitesell, N. R., & the Voices of Indian Teens team, & the Pathways of Choice team. (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, 666–675. doi:10.15288/jsad.2008.69.666
- Muthén, L. K., & Muthén, B. O. (1998–2010). *Mplus user's guide*. Sixth edition. Los Angeles, CA: Muthén & Muthén.
- Mrug, S., Elliott, M. N., Davies, S., Tortolero, S. R., Cuccaro, P., & Schuster, M. A. (2014). Early puberty, negative peer influence, and problem behaviors in adolescent girls. *Pediatrics*, 133, 7–14. doi:10.1542/peds.2013-0628
- Oklahoma Department of Mental Health and Substance Abuse Services. (2010). *Oklahoma Prevention Needs Assessment (OPNA)*. Retrieved from [http://ok.gov/odmhsas/Prevention_/Prevention_Initiatives/Oklahoma_Prevention_Needs_Assessment_\(OPNA\)](http://ok.gov/odmhsas/Prevention_/Prevention_Initiatives/Oklahoma_Prevention_Needs_Assessment_(OPNA))
- Raghunathan, T.E., Solenberger, P.W., & Hoewyk, J.V. (2007). IVEware: Imputation and variance estimation software (Version 0.1) [Software] Available from <http://www.isr.umich.edu/src/smp/ive>
- Russo, D., Purohit, V., Foudin, L., & Salin, M. (2004). Workshop on Alcohol Use and Health Disparities 2002: A call to arms. *Alcohol*, 32, 37–43. doi:10.1016/j.alcohol.2004.01.003
- Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- Seiffge-Krenke, I., & Stemmler, M. (2002). Factors contributing to gender differences in depressive symptoms: A test of three developmental models. *Journal of Youth and Adolescence*, 31, 405–417. doi:10.1023/A:1020269918957
- Tobler, A. L., Livingston, M. D., & Komro, K. A. (2011). Racial/ethnic differences in the etiology of alcohol use among urban adolescents. *Journal of Studies on Alcohol and Drugs*, 72, 799–810. doi:10.15288/jsad.2011.72.799
- Wagenaar, A., & Perry, C. (1994). Community strategies for the reduction of youth drinking: Theory and application. *Journal of Research on Adolescence*, 4, 319–345. doi:10.1207/s15327795jra0402_8
- Wallace, J. M., Jr., Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., Cooper, S. M., & Johnston, L. D. (2003). Gender and ethnic differences in smoking, drinking and illicit drug use among American 8th, 10th and 12th grade students, 1976–2000. *Addiction*, 98, 225–234. doi:10.1046/j.1360-0443.2003.00282.x
- Walls, M. L., & Whitbeck, L. B. (2011). Maturation, peer context, and indigenous girls' early-onset substance use. *Journal of Early Adolescence*, 31, 415–442. doi:10.1177/0272431610366245
- Whitbeck, L. B., Chen, X., Hoyt, D. R., & Adams, G. W. (2004). Discrimination, historical loss and enculturation: Culturally specific risk and resiliency factors for alcohol abuse among American Indians. *Journal of Studies on Alcohol*, 65, 409–418. doi:10.15288/jsa.2004.65.409
- Whitbeck, L. B., Hoyt, D. R., McMorris, B. J., Chen, X., & Stubben, J. D. (2001). Perceived discrimination and early substance abuse among American Indian children. *Journal of Health and Social Behavior*, 42, 405–424. doi:10.2307/3090187
- Whitesell, N. R., Beals, J., Crow, C. B., Mitchell, C. M., & Novins, D. K. (2012). Epidemiology and etiology of substance use among American Indians and Alaska Natives: Risk, protection, and implications for prevention. *American Journal of Drug and Alcohol Abuse*, 38, 376–382. doi:10.3109/00952990.2012.694527
- Wolfe, J., & Kimerling, R. (1997). Gender issues in the assessment of post-traumatic stress disorder. In J. Wilson & T. Keane (Eds.), *Assessing psychological trauma and PTSDA* (pp. 192–238). New York, NY: Guildford.
- Yuan, N. P., Koss, M. P., Polacca, M., & Goldman, D. (2006). Risk factors for physical assault and rape among six Native American tribes. *Journal of Interpersonal Violence*, 21, 1566–1590. doi:10.1177/0886260506294239