Published in final edited form as:

J Evid Based Soc Work (2019). 2021 ; 18(1): 32–48. doi:10.1080/26408066.2020.1799648.

American Indian Alcohol Use from a Sex-Specific Wellness Approach: Exploring Its Associated Physical, Behavioral, and Mental Risk and Protective Factors

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Abstract

Purpose: The top causes of death for American Indians (AIs), including heart and liver disease, are associated with alcohol use. Using the culturally based Framework of Historical Oppression, Resilience, and Transcendence (FHORT), the purpose of this article was to examine AI alcohol use from a sex-specific wellness approach, exploring its associated physical, behavioral, and mental risk and protective factors.

Method: Data were drawn from a cross-sectional survey with 479 AI adults in South Dakota. We employed a series of multiple hierarchical regression analyses to assess the associations of demographic (sex, age, marital status, income, and educational attainment), physical (Body Mass Index and cardiovascular risk), behavioral (smoking and health self-efficacy) and mental (depressive symptoms) factors with alcohol use.

Results: Results indicated that surveyed males tended to drink three times that of females, and depressive symptoms were associated with higher levels of alcohol use.

Discussion: This study highlights the need to examine AI alcohol use with sex in mind.

Keywords

American Indians; alcohol abuse; depressive symptoms; obesity; smoking; sex differences

American Indian and Alaska Natives (AI/ANs) experience among the highest mortality and morbidity rates of any population, and much of this is related to alcohol use (Indian Health Service, 2019). Yet, they also experience the historical oppression of invisibility of these urgent problems; they are among the most understudied when it comes to determinants of such health disparities (McKinley et al., 2020). AI/ANs come from 574 federally recognized

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Declaration of interest statement

The authors report no conflicts of interest.

tribes and more than 60 state recognized tribes, not to mention tribes outside either jurisdiction (Bureau of Indian Affairs, 2020). As part of the trust agreements to provide for their health and well-being, federally recognized sovereign tribes are eligible to receive healthcare through the Indian Health Service. This distinct trust relationship, based on treaty agreements with politically sovereign federally recognized tribes, warrants examining the disparities AI/ANs experience separately. These health disparities indicate a failure in the fulfillment of the trust agreement to provide for these populations' health and wellness.

The top causes of death for AI/ANs, rank-ordered, are heart disease, cancer, unintentional injuries (including motor vehicle accidents), diabetes, and alcohol-induced death (Indian Health Service, 2019). These causes tend to be interrelated and associated with alcohol use, yet extant research tends to examine one problem at a time, which limits practitioners' ability to address health holistically (Indian Health Service, 2018; U.S. Department of Health and Human Services, Office of Minority Health, 2017). In fact, risk for alcohol-induced death for AIs is almost seven-fold times higher than for all races, with accidents, many of which are alcohol related, at two and a half times higher than all other races (Indian Health Service, 2018). Suicide rates among AIs tends to be alcohol related (Ka'apu & McKinley, 2019) and is nearly 50% higher than for non-AIs (Centers for Disease Control and Prevention, 2014); it has been reported at 1.7 times the rate of all races (Indian Health Service, 2018). Alcohol abuse and smoking are known risk factors for cardiovascular disease (CVD), as well as diabetes, obesity, high blood pressure, and high cholesterol (CDC, 2019). Moreover, AI/ANs are the most likely of any race to be cigarette smokers (U.S. Department of Health and Human Services, Office of Minority Health, 2017). In fact, they are more likely to be obese, more likely to have high blood pressure, and more likely to be cigarette smokers than all adults – all risk factors for the top cause of death, CVD (U.S. Department of Health and Human Services, Office of Minority Health, 2017).

There exists much comorbidity across the top causes of death and disparities among AI/ANs, yet each of these factors tends to be examined separately, precluding the ability to understand how these factors may be related and addressed holistically. Despite alcohol abuse being a known risk factor for CVD, in a review of related research specific to AI/ANs, only two studies were found (McKinley et al., 2020; Costello et al. (2013); Tann et al., 2007). Moreover, although sex differences have been identified, they are seldom focal to inquiries on alcohol use (McKinley et al., 2020). In the general population, alcohol use disorder (AUD) has been found to be more prevalent in men, but is increasing among women, who have been found to be more vulnerable to its associated medical consequences, such as cardiovascular problems and cancer (Agabio et al., 2017).

Costello et al. (2013) found that the C-reactive protein, a marker for CVD, was higher for participants who abused alcohol, cannabis, and nicotine, along with participants who were female, obese, and older in age. Tann et al. (2007) reported poor mental health and heavy drinking as risk factors for diabetes, and that heavy drinking was higher for AI/ANs than Whites. In this article, we martial the culturally based Framework of Historical Oppression, Resilience, and Transcendence (FHORT) and its wellness approach to focus on risk and protective factors related to alcohol use, including CVD and diabetes, due to their comorbidity and their being among the top causes of death among AIs (American Heart

Association, 2019). Because alcohol abuse is a known risk factor for the top causes of death (e.g., CVD, diabetes, injuries, suicide, cancer), the purpose of this article is to examine AI alcohol use from a sex-specific wellness approach, exploring its associated physical, behavioral, and mental risk and protective factors.

Framework of historical oppression, resilience, and transcendence

The culturally based FHORT includes consideration of historical oppression, which extends the cumulative and massive historical trauma that has been imposed upon AI/ANs since colonization (McKinley & Figley, 2017). Figure 1 displays the FHORT with the focal dimensions of wellness we examine in this inquiry. A commonality of AI/ANs is the experience of historical oppression brought about through colonization (including drastic changes in lifestyle and health), as well as their distinct resilience and transcendence continually demonstrated across the centuries (McKinley & Figley, 2017). Resilience acknowledges the recovery from chronic oppression. Many AI/ANs transcend oppression and derive greater meaning, purpose, and strengths in spite of continual efforts to marginalize these groups (McKinley & Figley, 2017). The FHORT uses a holistic approach and examines the balance of risk factors (those that exacerbate or lead to negative outcomes – in this case alcohol use) and protective factors (those that buffer against or reduce alcohol use risk) that predicts whether a person experiences wellness (living in alignment across physical, mental, behavioral, and spiritual aspects of health) (McKinley & Figley, 2017).

Historical oppression differentially affected males and females, with alcohol use first being introduced as a tool of colonization to manipulate AI populations for the purposes of land acquisition and conquest (Szlemko et al., 2006). Historical oppression includes the localized context and the proximal factors that continue to perpetuate oppression (e.g., poor access to healthcare and healthy foods as a result of poverty and discrimination; the introduction and use of alcohol abuse throughout colonization) (McKinley & Figley, 2017). Alcohol was seldom if ever used among AIs prior to colonization, and was introduced with little time to establish social, moral, or behavioral guidelines to regulate use (Beauvais, 1998). Historical accounts trace heavy intoxication during trading agreements, and given the patriarchal norms of colonization, this would have primarily targeted male leaders (Beauvais, 1998). This pattern of heavy alcohol use has been passed down across generations (Beauvais, 1998). We approach the understanding of alcohol use with a wellness approach, focusing on the physical, behavioral, and mental factors that predict alcohol use. Using this wellness framing, we now explore the physical, behavioral, and mental factors related to alcohol use.

Physical factors

According the FHORT, physical factors are one dimension of wellness that can affect alcohol use. It is well documented that excessive alcohol use is associated with hypertension and high cholesterol, which are known risk factors for CVD both in the general population (Centers for Disease Control and Prevention (CDC), 2019) and among AI/ ANs (Denny et al., 2005; Harwell et al., 2001; Howard et al., 1998, 2000; Jernigan et al., 2010; Lee et al., 2006; Levin et al., 2002; Rhoades et al., 2007; Wang et al., 2006; Xu et al., 2006; Zhang et al., 2006). Obesity, as related to body mass index (BMI), is a known risk factor for CVD,

diabetes, and has a complex relationship with alcohol use among AI/ ANs (Howard et al., 1998; Jernigan et al., 2010; Lee et al., 1995; Wang et al., 2006; Welty et al., 1995; Zhang et al., 2006). Among the general population, the relationship of obesity with alcohol abuse is more complex. Multiple systematic reviews examining the relationship of alcohol consumption and weight gain reported mixed results, failing to show a consistent positive relationships between the two (Sansone & Sansone, 2013; Sayon-Orea et al., 2011). Counterintuitively, a high BMI has been found to have a consistent inverse relationships with alcohol abuse (Gearhardt & Corbin, 2009; Kleiner et al., 2004), along with marijuana and other illicit drug use (Blüml et al., 2012; Sansone & Sansone, 2013; Warren et al., 2005). Studies explain this inverse relationship in that overeating and obesity may act as protective factors, reducing alcohol and drug use reward and addiction in the brain; overeating may compete with alcohol in the brain reward sites, making alcohol use less reinforcing (Gearhardt & Corbin, 2009; Kleiner et al., 2004).

Behavioral factors

Behavioral factors are related to wellness and can include smoking and current tobacco use, which tends to be comorbid with alcohol abuse in the general populations (Evins & Kelly, 2018) and are documented risk factors for CVD among AI/ANs (Denny et al., 2005; Harwell et al., 2001; Jernigan et al., 2010; Lee et al., 2006; Levin et al., 2002; Rhoades et al., 2007; Wang et al., 2006; Welty et al., 1995). Moreover, health self-efficacy has been found to be associated with CVD (Saqib et al., 2013), and preliminary research indicates that self-efficacy may be helpful in preventing alcohol abuse (Gause et al., 2018). However, no studies were found examining self-efficacy among AI/ANs.

Mental factors

Depression, an aspect of the mental dimension of wellness, is not only a leading cause of suicide, which is disproportionately high for AI/ANs, it is associated with CVD and diabetes among AI/ANs (Cooper et al., 2014; Goins & Pilkerton, 2010; Grandinetti et al., 2000; Kaholokula et al., 1999; Sahota et al., 2008). Tann et al. (2007) studied the risk of alcoholism, diabetes, and depression in all 50 U.S. states and found that AI/ANs and Native Hawaiians had the highest risk for these problems compared with all other ethnicities. Alcohol and other drug abuse has been found to be a risk factor for all mental health problems among AI/ANs, including depression (Beals et al., 2005; Duran et al., 2005; Heart et al., 2016; Moghaddam et al., 2014; O'Connell et al., 2006; Rieckmann et al., 2012; Tann et al., 2007). Thus, BMI, cardiovascular risk, smoking, health self-efficacy, and depression are thought to be related to alcohol abuse.

Thus, from a wellness perspective, key physical, behavioral, and mental factors can affect AI alcohol use. Although alcohol use varies by sex, scarce research investigates such use with sex in mind (Agabio et al., 2017) with no known research investigating sex differences among AIs. This study explored sex and demographic (i.e., lower income, which can indicate a form of historical oppression manifested through economic marginalization) differences related to alcohol use. Our purpose was to examine sex differences in factors

related to alcohol use. Our study addressed the following hypotheses (Figure 2 depicts a conceptual framework for these hypothesized relationships):

1. Physical factors: Lower BMI and higher cardiovascular risk factors will be positively associated with alcohol use.
2. Behavioral factors: Smoking will be positively associated with alcohol use, whereas health self-efficacy will be negatively associated with alcohol use.
3. Mental factor: Depressive symptoms will be positively associated with alcohol use.

Method

Data collection

Data for this cross-sectional survey were collected in 2013 by the 2nd and 3rd authors. Data were drawn from a larger project, “General Well-being among Native Americans Survey,” that examined cancer screening literacy among AIs in South Dakota as well as associated physical, behavioral, and mental factors (Roh et al., 2018). Inclusion criteria consisted of participants being: (1) AI females (aged 18 years or older) or AI males (aged 40 years or older), and (2) residents of South Dakota at time of interview. The sex-specific age criteria reflected guidelines developed by national health organizations, based, in part, on different cancer screening tests for females (e.g., cervical cancer) and males (e.g., prostate cancer).

Willing participants completed a self-administered survey between September 2013 and March 2014. While questionnaires were designed to be self-administered, trained interviewers who were AI college students were available to assist anyone who needed assistance; five participants needed such assistance. Prior to each survey, eligible participants gave informed written consent. The questionnaire took approximately 30 minutes to complete. Upon completion of the survey, participants received cash remuneration in the amount of 10 USD for their time. After excluding the 10 cases from the total of 489 AI adults who initially participated but did not complete the study questionnaire, the final sample consisted of 479 AI adults.

Samples

We began this survey with a convenience sample of 489 AI adults from South Dakota. This study employed a combination of purposive and snowball sampling techniques to recruit participants. After approval from the Institutional Review Board at the University of South Dakota, the principal investigator (PI; the second author) contacted several different offreservation localities including two senior centers, five senior housing facilities in Sioux Falls, two AI churches, and three pow wows coordinators in Brookings, Sioux Falls and Vermilion, South Dakota. In the process of recruiting participants, flyers were posted in public areas of these 12 sites. A number of informational presentations were conducted describing the purpose of the study, eligibility criteria, the types of questions to be asked, confidentiality, anonymity of participation, the duration of the interview, and the voluntary nature of participation. To avoid bias from selecting only physically active people as the study participants, snowball sampling was also employed. Participants from the original

sampling (members of two senior centers, five senior housing facilities, two AI churches, and three pow wows) were asked to talk about the research project with others who might meet the eligibility requirements, even though they may be socially and geographically isolated. These individuals were given the phone number to contact the PI if they desired to participate in the study.

Measures

Demographics—Participant demographics included sex (“male/female”), age (in years), tribal enrollment (Dakota, Nakota, or Lakota tribe), monthly household income (“\$0–999; 1,000–1,999 USD; or 2,000 USD and above”), educational attainment (in years), and marital status (“single; married; divorced; widowed; separated; or other”).

Alcohol use—Participants were asked, “How often and how much do you drink?” with answer responses ranging from 0 to 20 with higher numbers indicating greater amounts and more frequent use and 0 indicating no use.

Physical health. CVD—Participants were asked whether they had the following health problems (“yes/no”): High blood pressure, high LDL cholesterol, and CVD. The inclusion of these three health problems was meant to create an overall indicator of cardiovascular risk, with higher scores indicative of higher risk for CVD.

Body Mass Index (BMI)—BMI was calculated on participants using their height and weight. BMI can be characterized by the following levels: (a) Underweight = <18.5; (b) Normal weight = 18.5–24.9; (c) Overweight = 25–29.9; (d) Obese = BMI of 30 or greater.

Behavioral health. Smoking—Participants were also asked whether they currently smoke (“not at all” = 0 to “everyday” = 3).

Self-efficacy—Participants completed the 28-item Self-Rated Abilities for Health Practices Scale (SRAHPS), which is a 5-point scale (“not at all” = 0 to “completely” = 4) to measure perceived ability to implement health-promoting behavior (Becker et al., 1993). Participants indicate the extent to which they perform health practices related to the four domains: exercise (“Do exercises that are good for me”), nutrition (“Eat a balanced diet”), responsible health practice (“Watch for negative changes in my body’s condition”), and psychological well-being (“Change things to reduce my stress”). Scores range from 0 to 112, with higher scores indicating greater health self-efficacy. Cronbach’s alpha for the study sample was .962

Mental health.

Depressive symptoms—Depressive symptoms were measured by the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001), a tool used and recommended for use with AIs (Urban Indian Health Institute, 2012). Participant’s indicated how often over the past 2 weeks they were bothered by: “Feeling down, depressed, or hopeless,” “Feeling tired or having little energy,” and “Trouble falling or staying asleep, or sleeping too much” on a 4-point response scale from 0 (“not at all”) to 3 (“nearly every day”). When summed, the nine

scale items had a possible range of 0 to 27 and the total score corresponded to an individual's level of depressive symptoms along a continuum that was scored as: minimal (score of 0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27) depression/depressive symptoms. PHQ-9 scores of 10 or higher indicate clinical depression, a cut point validated across numerous studies (Pratt & Brody, 2008). Cronbach's alpha for the study sample was .866.

Data analysis—Regression analysis with the inclusion of interaction terms was used to examine sex differences for factors related to alcohol use among AIs. This study first employed descriptive statistics and a correlation analysis to examine demographic characteristics and bivariate correlations among the main variables. Second, four separate regression analyses were conducted to examine sex differences, as well as physical and behavioral factors (BMI, CVD, smoking, and health self-efficacy), and mental factors (depressive symptoms) related to alcohol use (George & Mallery, 2013; Mertler & Vannatta, 2010). The first model examined males only, the second females only, the third included an interaction term between sex and depressive symptoms as related to alcohol use, and the fourth model, the complete model, contained the full sample of males and females with no interaction term. In the third interaction term model, demographic factors were entered in first, followed by behavioral factors, then finally, mental factors. No multicollinearity problems were observed among all independent variables, as indicated by variance inflation factor scores that were all greater than 1.002 (Mertler & Vannatta, 2010). Following Kang's (2013) guidance on handling missing data, listwise deletion was used for such data (Kang, 2013). However, the regression was also run using pairwise and mean imputation to examine any significant differences in outcomes with these different strategies. After no significant variation was viewed, listwise deletion was chosen as the most impartial and conservative strategy (Kang, 2013). IBM SPSS (version 25) was used for all of the data analysis in this study (Corp, 2016).

Results

Demographics factors and correlational analysis

Table 1 displays participant demographic descriptive statistics. The average age was just over 47 years, and the average person had just over 13 years of formal schooling. Around one-third of participants were single (34.1%) or married (32.0%), whereas the remaining were divorced (17.9%), widowed (6.8%), separated (5.5%), or "other" (3.6%). Although the overall age mean was just over 47, this did vary significantly for males and females (see Table 1). Over 40% of participants had a monthly household income of less than 1,000 USD per month, or 12,000 USD per year, indicating a relatively low-income sample. Moreover, not quite half of the sample were employed (47.5%). Most participants were enrolled tribal members in the Lakota, Nakota, and/or Dakota tribes (85.2%) as well as describing themselves as spiritual or religious (82.8%). Notably, on average, BMI for participants was 29.8 ($SD = 6.7$). This is at the obese/overweight range. Upon further investigation, this average was significantly different across sexes (female $M = 29.2$ and male $M = 30.6$). The average BMI for the total sample as well as the average for males and females separately approached the overweight to obese range.

Table 2 lists sex differences that were identified for key variables, such as CVD risk, diabetes, smoking, BMI, alcohol use, and depression. To examine preliminary sex differences, an independent-samples t-test was conducted to compare the frequency and quantity of alcohol use between males and females. There was a significant difference in the scores for alcohol use between males ($M = 5.03$, $SD = 7.02$) and females ($M = 1.6$, $SD = 3.62$) ($t = 6.95$, $p < .00$). This would indicate that on average, females in this sample drank the equivalent of 1–2 glasses or half a bottle of wine once or twice a month, whereas males tended to drink 1–2 glasses of wine once a week. Regarding other health outcomes, 35.7% reported having high blood pressure and 22.4% reported having diabetes (U.S. Department of Health and Human Services, Office of Minority Health, 2016), which are both higher than national statistics of AI/ANs and Whites (U.S. Department of Health and Human Services, Office of Minority Health, 2016, 2017).

In total, 42.1% reported having cardiovascular risk factors (high blood pressure or cholesterol and/or CVD). Over half (52.8%) of participants currently smoked sometimes to everyday, with 47.2% not smoking at all. On average, the score for alcohol use and frequency was 2.99 ($SD = 5.5$), which would indicate, on average, participants drank approximately half a bottle of wine to a full bottle of wine often (once or twice a month). The mean of depressive symptoms reported was 5.14 ($SD = 5.9$), which falls into the category of mild depression. Health self-efficacy scores were, on average, 72.78 ($SD = 23.24$), which indicated participants generally acted with self-efficacy “somewhat” or “mostly.” Correlational analysis (see Table 3) indicated that alcohol use was associated with lower income, lower educational attainment, lower health self-efficacy, and depressive symptoms.

Regression results

As depicted in Table 4, in the first model, we ran males only. In this model, variables explained 29% of the variance (R^2) in alcohol use. For model 2, which was the female only model, variables explained 7% of the variance (R^2). In the third model, we included an interaction term for females and depressive symptoms, and this model accounted for the largest, 48% of the variance (R^2). This would indicate that depressed females were more likely to have higher alcohol use. The final model, with both males and females included explained an additional 22% of the variance (R^2). Across models, depressive symptoms was significantly related to alcohol use, for both females and males.

Sex differences

In the regression analysis, sex remained a significant predictor of alcohol use across all models of the analyses, indicating sex differences for alcohol use, even when accounting for other factors. Across models, age, education, marriage, BMI, and CVD risk were not significantly associated with alcohol use. In the first model with males only (see Table 4), higher income, higher health self-efficacy, and depressive symptoms were associated with higher alcohol use. In the second model, with females only, only smoking and depressive symptoms were associated with higher alcohol use. In the third model, males reported higher alcohol use, whereas females reported more depressive symptoms, lower income, and

smoking. Male sex was significantly related to alcohol use in the final model, along with lower income, smoking, and depressive symptoms.

Physical risk factors

Hypothesis 1 was not supported, in that higher cardiovascular risk factors and BMI were not significantly associated with higher alcohol use across any model.

Behavioral risk and protective factors

Hypothesis 2 was partially supported, in that the behavioral risk factor of smoking was found to be strongly positively associated with alcohol use for females and in the full models, but not in the model with males only. Higher health self-efficacy was negatively associated with alcohol use for males only.

Mental risk factors

Hypothesis 3 was supported, and the mental risk factor of higher depressive symptoms was significantly positively associated with alcohol use across all models.

Discussion

Parallel to the FHORT and taking a sex-specific wellness approach to understand multidimensional factors, our findings identified several risk factors associated with alcohol use among an AI sample, providing a more nuanced perspective on the inter-related physical, behavioral, and mental risk factors associated with alcohol use in this population. One of the most important findings of the present study demonstrates that, with the exception of depressive symptoms, these factors and their relationship to alcohol use varied by sex. Males reported drinking three times that of females, and this difference was significant. Sex remained a significant factor with alcohol use being higher for males across all regression models. Overall, alcohol use was moderate to high across male and female AIs, which is commensurate with current research (Gone & Trimble, 2012; Ka'apu & McKinley, 2019).

Given the sex differences identified for males, in particular, alcohol use may drive health problems in this sample to a greater degree. Given historical oppression differentially affected males and females (Szlemko et al., 2006), likely targeting male leaders for treaty agreements, along with the social norms that make it more acceptable for males to overuse alcohol (Beauvais, 1998), the overuse by males may be related to historical norms being passed down intergenerationally. Although historical oppression was not measured in this inquiry, it is important to situate alcohol use within this broader context, where alcohol use has been considered a tool of colonization, when it was introduced and used for the benefit of settlers to gain land and resources from AI/ANs (McKinley, 2015). Understanding alcohol use within this background is particularly important, given that alcohol use drives mortality and morbidity and is a risk factor for CVD, along with diabetes, obesity, high blood pressure, and high cholesterol (Centers for Disease Control and Prevention (CDC), 2019).

Other important demographics related to historical oppression should be noted. Now, centuries later after it was first introduced, alcohol use may be perpetuated and exacerbated by the historical oppression of the social and economic marginalization that limits opportunity and access to prosocial forms of coping. In line with other reports of AI/AN populations (Gone & Trimble, 2012), the income of this sample was quite low, with 40% earning less than 1,000 USD per month, and less than half of participants were employed. The average BMI bordered around obese, which is concerning, and over one third reported high blood pressure, in comparison with just over 25% of Whites (U.S. Department of Health and Human Services, Office of Minority Health, 2017). Additionally, over 20% reported having diabetes in comparison with 6.6% of Whites (U.S. Department of Health and Human Services, Office of Minority Health, 2016). These elevated levels of BMI, high blood pressure, and diabetes indicate chronic health conditions that place AIs at high-risk for other health problems, such as the recent coronavirus pandemic (Van Dorn et al., 2020).

This research did not find significant differences related to alcohol use for BMI and cardiovascular risk, which contrasts nationally representative research (Blüml et al., 2012; Gearhardt & Corbin, 2009; Kleiner et al., 2004; Sansone & Sansone, 2013; Warren et al., 2005). Possible reasons for the lack of association of lower BMI and higher cardiovascular risk not being associated with higher alcohol use is potentially due to the female sample being, on average younger ($M = 45$) than the male sample ($M = 52$). Cardiovascular risk and associated BMI changes may occur as people enter later ages, and the age differences by sex may have canceled out significant effects. Indeed, only 36% of females reported cardiovascular risk, whereas 52% of males did.

Diabetes was also lower for females (20%) than males (27%). These sex differences in age may account for a lack of similar findings for health self-efficacy and smoking. More research with equivalent ages of the sexes is needed to replicate or explore these contrasting findings. Despite this finding, obesity is a risk factor for a host of other health problems, and this cannot be ignored. Eating patterns changed with colonization, when many AI/ANs were forced onto reservations, which were the equivalent of penal colonies; or they were relocated to undesirable land with limited resources (McKinley et al., 2018). Not only has this limited access to healthy and fresh foods, it has limited subsistence activities, which are connected to land, physical activity, and positive family time (McKinley & Figley, 2017).

Moreover, over half of this sample smoked, which is over 2.5 times the rate of 20.6% in the non-Hispanic White population (U.S. Department of Health and Human Services, Office of Minority Health, 2017). This finding is consistent with research reporting that AI/ANs are among the most likely of any race to be cigarette smokers (U.S. Department of Health and Human Services, Office of Minority Health, 2017), which is a risk factor for CVD (U.S. Department of Health and Human Services, Office of Minority Health, 2017). Regarding behavioral factors, as expected, smoking was positively associated with alcohol use for females, but not males, but was also significant in the models with both sexes. Health self-efficacy was only a significant factor for the male-only model. Finally, although females reported lower alcohol use across all models, females with more depressive symptoms were found to be more likely to use alcohol. Indeed, depressive symptoms were associated with alcohol use across all models and for both sexes.

Limitations and future research

This was a preliminary study and should be further explored in future research. This cross-sectional convenience sample study of the Upper Midwest is not representative and cannot be generalized beyond its context. The different age criteria for males and females should be noted as a pertinent limitation of this study, as results for both sexes and sex-specific results could reflect the potential interaction of age with other factors. Moreover, key cultural factors, such as enculturation, historical oppression, traditional spirituality, and social support may be relevant, but were outside the measurement scope of this study. The lack of measurement of structural, cultural, and community factors leaves a gap in understanding that future research would do well to investigate. A high rate of religion and spirituality was observed but not examined in the current study; this may be important to explore as a protective factor in future research. This article focused on individual-level factors, but factors at the family, cultural, and community levels will also be important to examine in future research.

Implications

This work demonstrates the interrelatedness of physical, behavioral, and mental factors related to alcohol use. Examining the connection of alcohol use with behavioral, physical, and mental factors provides a more complete picture of the multiple drivers and stressors that may exacerbate physical and behavioral health problems. Given the connection of alcohol use to the most prevalent causes of death for AI/ANs and persistent health disparities within this population, more work should take on this holistic approach, investigating multiple dimensions of wellness. Many of the concerning rates of poverty, smoking, high blood pressure, diabetes, and obesity represent effects of the current and continued historical oppression that continue to perpetuate health inequalities. The sex differences of this study indicate the need for a differential, sex-specific approach to understanding and addressing alcohol use. Most treatment modalities for alcohol abuse are not developed with sex in mind, and given the differences in factors, sex-specific interventions may more readily target sex specific use and treatment variables.

The high overall BMI is concerning, and some research has indicated that a Westernized diet, compared to a traditional diet high in fruits and vegetables, is generally associated with increased risk for CVD (Bersamin et al., 2008; Jernigan et al., 2010; Moy et al., 2010). Indeed, engagement with subsistence has been found to relate to greater physical activity, access to locally sourced and healthy foods, and greater wellness and family/community connectedness, all of which may be protective against CVD (McKinley & Figley, 2017). Culturally-based interventions that integrate subsistence traditions may be a promising pathway to healthier diet and exercise as a means of preventing health disparities. Promoting self-efficacy may be a way to facilitate health and prevent alcohol use. The association of depressive symptoms with alcohol use is an important treatment consideration to address potential co-morbidities. Thus, holistic prevention and intervention approaches that simultaneously address mental, physical, and behavioral health to promote wellness are recommended.

Acknowledgments

The data used in the study were collected with support from the University Of South Dakota School Of Health Sciences Seed Grants. The authors would like to acknowledge Dr. Robin Miskimins for her mentoring on School of Health Science Seed grant for Dr. Roh. This work was supported, in part, by Award K12HD043451 from the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health (Krousel-Wood-PI; Catherine McKinley-Building Interdisciplinary Research Careers in Women's Health (BIRCWH) Scholar). Supported in part by U54 GM104940 from the National Institute of General Medical Sciences of the National Institutes of Health, which funds the Louisiana Clinical and Translational Science Center. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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Framework of Historical Oppression, Resilience, and Transcendence (FHORT) and Alcohol Use

Figure 1.

The Framework of Historical Oppression, Resilience, and Transcendence (FHORT) as It Relates to Alcohol Use. *Note.* We examine physical (BMI and cardiovascular risk), mental (depressive symptoms), and behavioral (smoking and health self-efficacy) from a wellness perspective to examine how these factors are associated with alcohol use.

Figure 2. Physical, Behavioral, and Mental Factors Related to Alcohol Use. Note. Hypothesized relationships between physical, behavioral, and mental factors under investigation for this study are indicated by a $\pm$ for positive and negative relationships, respectively.

Table 1.

Participant Demographics (N = 479).

	<i>N</i>	%
Sex		
Male	191	39.9
Female	288	60.1
Age *	47.39 (<i>M</i>)	18–96 (Range)
Male	51.58 (<i>M</i>)	9.43 (<i>SD</i>)
Female	44.55 (<i>M</i>)	15.09 (<i>SD</i>)
Highest grade in school (years)	13.23 (<i>M</i>)	1–22 (Range)
Marital Status		
Single	160	34.1
Married	150	32.0
Divorced	84	17.9
Widowed	32	6.8
Separated	26	5.5
Other	17	3.6
Monthly Household Income		
\$0–999	188	40.6
\$1,000–1,999	115	24.8
\$2,000 and above	160	34.5
Employed (Yes)	223	47.5
Enrolled member Dakota/Lakota/Nakota tribe	408	85.2
Spiritual or Religious (Yes)	386	82.8
Health Self-efficacy	72.78 (<i>M</i>)	23.24 (<i>SD</i>)

Note. *M* = Mean; *SD* = Standard Deviation; % = Percentage

* indicates significant differences in mean scores by sex.

Table 2.

Sex Differences of Key Variables.

Variable	Females N (%)	Males N (%)	Total N (%)
Cardiovascular Disease (CVD) Risk ***	100 (35.5)	99 (51.8)	199 (42.1)
Diabetes	55 (19.5)	51 (26.7)	106 (22.4)
Smoking	109 (57.7)	138 (49.5)	247 (52.8)
BMI **, M (SD)	29.2 (6.6)	30.6 (6.8)	29.8 (6.7)
Alcohol Use *** M (SD)	1.60 (3.6)	5.03 (7.0)	2.99 (5.5)
Depressive Symptoms, M (SD)	5.06 (5.7)	5.26, (6.3)	5.14 (5.9)

Note.

*
 $p < .05$.**
 $p < .01$.***
 $p < .005$.

Prevalence among those who reported each of the variables (yes/no), including CVD risk, diabetes, and smoking. Actual numbers of BMI, alcohol use, and depressive symptoms are listed. T-tests along with their p -values indicate significant sex differences for CVD risk, BMI, and alcohol use. CVD Risk: Items that indicated whether participants reported (Yes/No) high blood pressure, high LDL cholesterol, and CVD were added. Alcohol use indicates frequency and amount used, ranging from 0 (no use) to 20 (daily heavy use).

Table 3.

Correlational Matrix of Key Variables.

Variables	1	2	3	4	5	6	7	8
(1) Age	–							
(2) Monthly Income	–.120**	–						
(3) Education	–.017	.188**	–					
(4) BMI	.143**	.037	–.055	–				
(5) Cardiovascular Risk	.334***	–.108**	–.076	.231***	–			
(6) Health Self-Efficacy	–.072	.180***	.086*	–.068	–.147**	–		
(7) Depressive Symptoms	–.075	0.019	–.077	.018	.108*	–.162***	–	
(8) Alcohol Use	–.021	–.237***	–.131**	–.064	.030	–.166***	.217***	–

Note.

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

Higher income, education, and health self-efficacy was correlated with lower alcohol use, whereas higher depressive symptoms were associated with higher alcohol use.

Table 4.

Regression Analysis for Predictors on Alcohol Use Frequency and Quantity.

Variables	Males (M) (N = 191)	Females (F) (N = 288)	Interaction Model (N = 479)	Complete (N = 479)
Demographic Factors	B (SE)	B (SE)	B (SE)	B (SE)
Sex (Female)	–	–	–2.2 *** (.67)	–3.17 *** (.53)
Female * Dep	–	–	.20 ** (.09)	–
Higher Income	–.84 *** (.24)	–.04 (.12)	–.37 *** (.13)	–.41 *** (.13)
Behavioral Factors				
Higher Self-Efficacy	–.04 * (.02)	–.01 (.01)	–.02 (.01)	–.02 (.01)
Smoking (Yes)	.71 (.39)	.35 * (.18)	.57 *** (.19)	.58 *** (.19)
Mental Factors				
Higher Depressive Symptoms	.24 ** (.09)	.10 ** (.04)	.29 *** (.09)	.18 *** (.05)
F	6.4 ***	1.9 ***	11.21 ***	10.57 ***
R ²	.29	.07	.48	.22

Note.

*
 $p < .05$.**
 $p < .01$.***
 $p < .005$.

The third model includes an interaction term with sex (females) and depression (Female*Dep). Variables not in the particular model were removed. Models were adjusted for age, education, marriage, BMI, and CVD risk, which were not significant.