RELATIONSHIP BETWEEN SOCIAL SUPPORT AND SUBSTANCE USE AMONG AMERICAN INDIAN PEOPLE WITH SUBSTANCE USE DISORDER

by

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ABSTRACT

American Indians and Alaska Natives (AI/ANs) have endured trauma over generations and still experience systemic racism and oppression today. Historical trauma has contributed to health problems among AI/ANs, including high rates of substance use disorder. Social support is a protective factor for substance use in other populations; however, little is known about the role of social support and substance use in AI/AN communities. The current study employed secondary data analysis to understand the relationship between social support and substance use among AI/AN adults with substance use disorder. Using a Community-Based Participatory Research framework, a cross-sectional survey was conducted in partnership with an AI reservation community in Montana to examine risk and protective factors for substance use. Participants were 198 tribal members who self-identified as having a substance use problem. Social network characteristics were assessed using a modified version of the Important People Drug and Alcohol (IPDA) interview and substance use was assessed using the Timeline Followback. Consistent with previous research, the current study found that network substance use behavior was a better predictor of participant substance use outcomes than general support, substance specific support, or support for recovery/treatment. Variables associated with greater drug and alcohol abstinence among participants included living in larger household, having a greater percentage of the household that is sober, not having attended boarding school, having a larger percentage of the social network that does not accept one's substance use, having a smaller percentage of the social network rated as moderate or heavy substance users, and having a smaller percentage of the social network that uses substances frequently. An additional analysis was conducted to test whether the association between social support and participant substance use was moderated by the substance use behavior of the network, but the interaction was not significant. Contrary to prior research, the size, general supportiveness, and importance of the social network were not significantly associated with participant substance use. Results suggest that the IPDA may benefit from modifications to improve its usefulness in addiction research with AI/ANs. Implications for tribal members with substance use problems, their loved ones, and community leaders are discussed.

INTRODUCTION

Although many American Indians and Alaska Natives (AI/ANs) are lifelong abstainers from alcohol (Cunningham et al., 2016), there are serious health disparities related to alcohol use disorder (AUD) in AI/AN communities. Research has shown that AI/ANs consume alcohol less often than other racial groups, but when drinking, consume alcohol in larger quantities (Beals et al., 2003; Cunningham et al., 2016). Epidemiological data collected from 2015 to 2019 found that 53.2% of AI/ANs consumed alcohol in the past year relative to 70.3% of Whites (Center for Behavioral Health Statistics and Quality [CBHSQ], 2021). Despite lower rates of past-year alcohol use, AI/ANs had high rates of past-year AUD (19.2%) compared to the national average (13.9%; CBHSQ, 2021). Another national survey found that AI/ANs had the highest rate of lifetime AUD (43.4%) among all racial and ethnic groups in the U.S.—a rate markedly higher than the national average of 29.1% (Grant et al., 2015a).

There also is evidence of greater past-year illicit drug use and substance use disorders (SUDs) among AI/ANs relative to other racial groups in the U.S. (CBHSQ, 2021). For example, AI/ANs use methamphetamine at disproportionately high rates. Research shows that, among AI/ANs, 26.2 of every 1,000 people have used methamphetamine in the past year, compared to 6.8 of every 1,000 people in the general population (Coughlin et al., 2021). Opioid use is another prevalent concern in AI/AN communities, with recent increases in overdose deaths largely driven by illicitly manufactured fentanyl and fentanyl analogs (Kariisa et al., 2022). Relative to other racial groups, AI/ANs experience greater rates of both past-year and lifetime SUD (Rieckmann et al., 2022; CBHSQ, 2021). In addition, AI/ANs utilize SUD treatment services

more often than other racial groups (CBHSQ, 2021), reflecting health disparities related to SUD in this population.

Consequences of Substance Use

In addition to disproportionately high rates of substance use and SUD, alcohol and drug-related mortality also is a significant public health concern in AI/AN communities. American Indians and Alaska Natives have a 90% higher premature death rate than other races in the U.S. (U.S. Department of Health and Human Services, 2010), with alcohol and other substance use among the leading causes of preventable deaths (Indian Health Service [IHS], 2019; Naimi et al., 2008). A study by Landen et al. (2014) examining death records and Indian Health Service records from 1999 to 2009 found that, relative to White people, AI/ANs were more likely to die from alcohol-related causes. Natives residing in the Northern Plains had the highest rate of alcohol-attributable deaths compared to those in other regions (Landen et al., 2014). Moreover, deaths resulting from drug overdoses are climbing at alarming rates in the U.S., resulting in historically high mortality rates that disproportionately affect Native communities (Kariisa et al., 2022). From 1999 to 2017, overdose mortality rates were increasing steadily among AI/AN and White populations (Friedman & Hansen, 2021). However, mortality rates among AI/ANs surpassed those of Whites by a large margin beginning in 2019 and continued to do so throughout the COVID-19 pandemic (Friedman & Hansen, 2021). From 2019 to 2020, overdose deaths increased by 39% for AI/ANs compared to 22% for Whites (Kariisa et al., 2022).

American Indians and Alaska Natives also suffer disproportionately from other health problems caused or exacerbated by substance use. In 2016, AI/ANs had greater rates of HIV infection attributed to injection drug use compared to the general population (Centers for Disease

Control and Prevention [CDC], 2016), as well as higher rates of hepatitis C, a liver disease common among people who use drugs intravenously (CDC, 2016). In 2019, chronic liver disease, a serious health problem associated with alcohol and drug use, was the fourth leading cause of death for AI/ANs (CDC, 2020). Substance use also has been shown to contribute to alarmingly high rates of suicide in AI/AN communities (Gray & McCullagh, 2014). Compared to their White counterparts, AI/ANs have a 20% higher rate of suicide (CDC, 2021). In 2019, suicide was the second leading cause of death for AI/ANs between the ages of 10 and 34 (CDC, 2019). It is important to understand and intervene upon substance use to improve health equity for AI/AN people.

Risk and Protective Factors in AI/AN Communities

To understand substance use in AI/AN populations, it is important to consider the context of historical trauma and the lasting impact of historically traumatic events (Whitesell et al., 2012). Brave Heart (2003) defines historical trauma as the "cumulative and psychological wounding over the lifespan and across generations, emanating from massive group trauma experiences" (p. 7). Historical trauma resulted from brutal colonization practices and genocide after European contact. Furthermore, a history of racist laws aimed at stripping AI/ANs of land and cultural identity continue to affect Native people today. These laws were enacted to outlaw Native spirituality, the practices of medicine men, ceremonies such as the Sun Dance, and the ability to leave the reservation without permission. These Congress-instated "Civilization Regulations" were in place until 1936 (Enoch & Albaugh, 2017). Egregious acts of colonization including broken treaties, forced removal from tribal lands, and forced removal of children and placement in government-operated boarding schools have resulted in long lasting

intergenerational trauma that has been linked to substance use and SUD (Brave Heart, 2003; Evans-Campbell, 2008; James, 1992). The motto of Indian residential schools was to "Kill the Indian; Save the Man." Attempts at forced assimilation involved punishing children for speaking their Native language or practicing their cultural traditions (Enoch & Albaugh, 2017). Children attending boarding schools often endured abuse and neglect, and removal from their families disrupted both traditional parenting practices and the intergenerational transmission of cultural knowledge (Evans-Campbell, 2008). Boarding school attendance is associated with increased rates of suicide and substance use among those who survived the experience as well as their descendants (Evans-Campbell et al., 2012).

In addition to historical trauma, risk factors contributing to substance use-related health disparities among AI/ANs include racism, inadequate access to evidence-based treatments, and poverty—all of which have resulted from colonization. Psychological stress from racism is an important factor in the development and continuation of SUDs (Farahmand et al., 2020), and racism and discrimination have been linked with substance use among AI/ANs (Skewes & Blume, 2019). Although there are evidence-based treatments for SUD, AI/ANs have more difficulty accessing these services, reflecting systemic racism in access to healthcare (Zeledon et al., 2020). Barriers to treatment include scarcity of treatment services, few qualified prescribers for medical treatments, and lack of funding to meet current needs (Rosenblatt et al., 2015). Distrust in Western medicine, unequal access to care, lack of culturally informed treatment services, and historical trauma also act as barriers to effective SUD treatment for AI/ANs (James et al., 2017).

Poverty also is a consequence of colonization and a risk factor for substance use (Smyth & Kost, 1998). Many AI/ANs were forcibly removed from their lands and relocated to reservations—often remote locations with stagnant economies and few opportunities for socio-economic growth (Davis et al., 2016)—and many still live on reservations today. In 2016, AI/ANs residing in rural areas were more likely to live in poverty (28.8%) compared to their rural White counterparts (10.4%; Probst & Ajmal, 2019). Poverty is a barrier to receiving SUD treatment and other mental health services, and also contributes to increased use of maladaptive strategies to cope with stress, such as substance use (Jones, 2008).

Mental health problems constitute another health disparity affecting Native communities that may increase risk for alcohol use disorder (AUD) and other substance use disorders (SUDs). For example, the prevalence of post-traumatic stress disorder (PTSD) in AI/ANs (22.9%) is double the rate at which Whites experience PTSD (11.7%; Emerson et al., 2017). A study by Emerson et al. (2017) found that PTSD is directly related to AUD in AI/ANs, and also found that AI/ANs with PTSD are burdened with higher rates of AUD compared to Whites with PTSD. Individuals with mental disorders such as anxiety, depression, and PTSD may use substances to alleviate psychiatric symptoms. Substance use, in turn, may exacerbate mental disorders and increase the risk of developing addiction (Kelly & Daley, 2013; NIDA, 2022), resulting in a harmful cycle of mental health symptoms and substance use.

Despite facing numerous risk factors, AI/ANs have demonstrated powerful resilience. Protective factors such as cultural identity and supportive social networks play a role in preventing substance use and SUD. In a qualitative study by Skewes et al. (2019), tribal members emphasized the protective role of having a strong cultural identity, and also identified

lack of cultural identity as a risk factor for substance use. Elders teaching younger generations about their culture, language, traditions, and heritage helps develop cultural knowledge and foster cultural identity (Cwik et al., 2019), and strengthening cultural identity is protective for substance use (Baldwin et al., 2011). Many Native cultures are collectivist in nature, centering the family and community rather than the individual (Whitesell et al., 2012). Therefore, one's social network may be a particularly important influence on substance use among AI/ANs.

Social Support

Social support has been shown to predict substance use in non-Native samples (Owens & Zywiak, 2016) and there is reason to believe that social support may be important for AI/ANs as well. Social support is a critical resource for managing stressors (Taylor, 2011). Social support may include providing resources to someone, tangible or informational, or offering emotional support (Taylor, 2011). Additionally, social support can simply be the perception that social support is available if needed (Taylor, 2011). Research has found that greater perceived social support is linked to decreased substance use problems (Tan et al., 2021). Social support may be general or substance specific (Longabaugh and Beattie, 1985, 1986). General support is support of one's wellbeing, whereas substance-specific support is support of one's decreased substance use, abstinence, or treatment seeking.

Lack of social support has been associated with using alcohol as a coping mechanism, and drinking to cope is associated with worse substance use consequences (Holahan et al., 2004). Among people with SUD, lack of social support has been linked to dropping out of treatment (Dobkin et al., 2002) as well as increased risk of relapse after treatment (Hser et al., 1999). Family involvement in SUD treatment predicts positive treatment outcomes, including lower

rates of relapse (Kelly et al., 2010). Emotional support and functional social support strongly predict long-term abstinence from alcohol and other drugs among people with SUD (Beattie & Longabaugh, 1999; Havassy et al., 1991; Witkiewitz & Marlatt, 2004). Increasing social support is an important component of many SUD treatment programs.

A criticism of Western treatments for SUD is that they focus on the individual, despite evidence that the environment and social network are important influences on substance use behavior (Kelly et al., 2011). As many Native cultures are collectivistic rather than individualistic, it may be particularly important to consider the role of social networks in substance use among AI/ANs (Whitesell et al., 2012). Larger household sizes in AI/AN communities may result in higher levels of social support, and extended family members may facilitate access to treatment by providing transportation or appointment reminders, or by offering emotional support during treatment (Magarati et al., 2022). However, if household members are currently using substances, the social network may act as a risk factor instead. Little is known about whether and how social networks influence substance use among tribal members with substance use problems. In this study, I aim to examine social network characteristics in relation to substance use behaviors among AI/AN people with SUD.

Important People Drug and Alcohol Interview

While greater perceived social support is linked to decreased substance use, there are certain characteristics of a social network that may be protective and other characteristics that may increase the risk associated with substance use. The Important People Drug and Alcohol interview (IPDA; Zywiak et al., 2009) and its predecessor, the Important People and Activities instrument (IPA; Clifford & Longabaugh, 1991), have been utilized in research to examine the

relationship between social network characteristics and drug and alcohol use. These instruments assess general perceived social support as well as characteristics of social networks hypothesized to be important for understanding and predicting substance use behavior. For example, they assess the substance use behavior of the social network members, the respondent's perception that the social network is supportive of substance use, and the perception that the social network is or would be supportive of the respondent's treatment and recovery.

The IPA has been adapted into several variations of the instrument, including the IPDA and the Important People Inventory (IPI; Clifford et al., 1992). These variations are not entirely new measures, but resulted from small adjustments to fit the aims of a given study. For example, the IPA includes an "activities" portion, while the IPI and IPDA do not. Additionally, the IPA and IPI are alcohol specific, while the IPDA includes questions about other substances as well. The IPA and its variations are empirically validated and show good predictive validity and test-retest reliability (Owens & Zywiak, 2016; Zywiak et al., 2009; Groh et al., 2007). The family of Important People measures are the most commonly used assessments of social networks in SUD research (Arnaudova et al., 2020) and were used in the two largest longitudinal randomized clinical trials of alcohol treatments conducted in the U.S. to date (i.e., Project COMBINE [Anton et al., 2006] and Project MATCH [Project MATCH Research Group, 1997]). Although alcohol and drug use are often co-occurring, the original versions of the measure were specific to alcohol (Zywiak et al., 2009). Therefore, Zywiak et al. (2009) adapted the IPA to ask about other drug use as well, resulting in the Important People Drug and Alcohol Interview (IPDA).

Zywiak et al. (2009) calculated 23 indices from the IDPA data that reflected different characteristics of the social network, including the participant's investment in their social

network, network drinking/drug use, support for drinking/drug use, support in general, and support for treatment. *Investment in social network* consisted of the network size, daily contact with the network, and average importance rating of the most important people. *Network drinking* consisted of the drinking status of network members, frequency of network members' drinking, percentage of heavy drinkers, and percentage of abstainers. *Network drug use* consisted of the drug use status of network members, frequency of drug use, percentage of heavy drug users, and percentage of abstainers. *Support for drinking or drug use of the most important network members* consisted of the highest support rating for drinking or drug use, the lowest support rating for drinking or drug use, and the average support rating for drinking or drug use. *Support in general* and *support for treatment* consisted of the highest support rating, the lowest support rating, and the average support rating across all network members. This is just one example of how to score the measure; there is no standard scoring protocol. The scoring procedure tends to differ from one study to another, depending on the aim of the study.

Important Findings

Previous research using the Important People inventories has found that larger social networks and those with more supportive relationships are associated with better substance use outcomes (Zywiak et al., 2002). Substance-specific support has been shown to be a better predictor of substance use outcomes than general support (Beattie and Longabaugh, 1999; Havassy et al., 1991; Longabaugh et al., 1993). Interestingly, Zywiak et al.'s (2009) study using the IPDA found that network substance involvement was a more powerful predictor of substance use outcomes than perceived general support, support for treatment, or support for substance use. Additionally, individuals who had networks with a greater percentage of abstainers or people in

recovery had better substance use outcomes than those with a greater number of moderate or heavy drinkers/users (Zywiak et al., 2002). Therefore, it appears that the substance use behavior of the social network may be a stronger predictor of participant substance use than whether the participant perceives that the network supports their substance use or treatment/recovery.

CURRENT STUDY

To my knowledge, no studies have examined the relationship between social support and substance use among AI/AN adults with a substance use problem. The current study involves secondary analyses of data collected as part of a larger Community-Based Participatory Research (CBPR) project that aimed to understand risk and protective factors for substance use on a rural AI reservation. This study used a CBPR approach to study design, data collection, and dissemination of findings. The CBPR framework involves equitable partnerships between researchers and community members and helps prevent harmful research practices that have historically been detrimental to AI/AN communities (Parker, 2017). This framework also helps ensure that research benefits the community (Parker, 2017).

In this study, I examined associations between social support variables measured with a modified version of the IPDA and substance use among American Indian participants from a rural reservation community who self-identified as having a substance use problem. In particular, I aimed to explore associations between social support variables derived from the IPDA and participants' recent alcohol and drug use, and to understand which social network characteristics most strongly predict substance use in this population. The goal of this research is to provide direction for researchers using the IPDA with AI/ANs and to provide useful information about social support for tribal members who aim to change their substance use behavior.

Method

Participants

Participants in this study were 198 AI tribal members who self-identified as having a substance use problem. Of the participants, 95 (48%) were male and 103 (52%) were female; no other genders were represented in the sample. Ages ranged from 18-65 (M = 37.36, SD = 11.81). Median income was well below the poverty line, at $190.50 per month ($SD$ = $1,812.73, range: $0-$15,000). Although there were a few outliers, 45.9% of the sample had no monthly income, and 83.1% made less than $1,000 per month. Household sizes ranged from 1-15 people (M = 3.87, SD = 2.53). Of the 198 participants, 70 had attended boarding school (35.4%). Regarding educational attainment, 50.20% had no high school diploma, 34% had completed 12th grade or the GED, and 12.7% reported some college or a college degree. Regarding previous experiences with SUD treatment, 27.8% reported no past treatment, 45.5% reported receiving outpatient SUD treatment located on the reservation, and 26.8% had received inpatient SUD treatment located off the reservation. Participants mostly reported alcohol, marijuana, or methamphetamine as their primary drug or substance of choice.

Measures

Background and Demographics. Participants self-reported background and demographic data, including gender, age, monthly income, highest level of education, whether they attended boarding school, the primary substance(s) used, and substance use treatment history. This questionnaire also asked participants to report the number of people in their household and number of people in their household who are abstinent from alcohol and other drugs. These

questions were used to calculate a new variable, percent of the household that is sober, to be used in analyses.

Social Support and Network Characteristics. A modified version of the *Important People Drug and Alcohol interview* (IPDA; Zywiak et al., 2009) was used to measure social support and characteristics of the social network (see Appendix 1). While the original measure asked about alcohol and drug use separately, the version used in the present study was modified to refer to alcohol and/or drug use among the social network members. Participants are asked to list up to 12 people with whom they have had contact in the past four months and to indicate their relationship with each network member (e.g., parent, spouse, friend, etc.). Participants then rate the frequency of contact with each network member on a 7-point scale from *once in the past 4 months* (1) to *daily* (7) and how important each person is to them on a 6-point scale from *not at all important* (1) to *extremely important* (6). Participants then rate the extent to which each network member is generally supportive of them on a 6-point scale from *not at all supportive* (1) to *extremely supportive* (6).

To assess the substance use behavior of the social network, participants are asked to rate each network member's drinking or drug use status on a 5-point scale (*recovering from addiction, abstainer, light drinker or user, moderate drinker or user, heavy drinker or user*) and to estimate the frequency with which each network member uses alcohol or drugs (*not in past 4 months* to *daily*). Participants then rate how each network member has reacted (or would react) to the participant's drinking or drug use on a 5-point scale from *left or made you leave when you're drinking or using* (1) to *encouraged* the participant's substance use (5). Finally, participants rate how each network member has felt (or would feel) about the participant seeking treatment or

changing their substance use rated on a 6-point scale from *strongly opposes it* (1) to *strongly supports it* (6). Each item also includes a *don't know* response option. The IPDA is administered in a structured interview format by a trained researcher and takes about 20 minutes to complete.

Substance Use. The *Timeline Followback* (TLFB; Sobell & Sobell, 1992) interview was used to assess substance use over the past 90 days. The TLFB is the gold standard for self-report assessment of substance use. It has been shown to have strong validity and reliability for measuring both alcohol and drug use (Fals-Stewart et al., 2000) and has been used successfully in the present population (Gameon & Skewes, 2021; Gonzalez & Skewes, 2021; Skewes et al., 2020). Participants are presented with a calendar reflecting the assessment period, anchored with holidays and important personal events to assist with recollection of their substance use. Participants are led through a series of questions using these memory anchors and asked to report the quantity of alcohol (in standard drinks) and the type of drugs used on each day during the assessment period. The TLFB yields several substance use variables, including the number of drinking days, number of drug use days, number of drinks per drinking day, number of days abstinent from alcohol and drugs, and percent days abstinent. In the present study, the outcome variable was number of days abstinent from alcohol and drugs in the past 90 days.

Procedure

All measures and data collection procedures were approved by the project's Community Advisory Board, the Institutional Review Board (IRB) at Montana State University, and the tribal IRB. Participants provided informed consent prior to data collection. Data collection took place in a private study room at the tribal college library. Participants were offered refreshments, as is the custom in this community, and were engaged in an informal conversation to help them

feel at ease. Following this conversation, the TLFB and modified IPDA were administered by a trained research assistant in an interview format. After completing these interview-based measures, participants then completed a packet of self-report instruments designed to assess constructs related to substance use, including assessments not examined in the present study. Participants completed the paper-and-pencil measures independently or, in some cases, in interview format whenever literacy was a concern. Participants were compensated with a $50 gift card for approximately two hours of their time to complete the study. Upon completion, participants received information about mental health and substance use treatment resources available in the community.

Data Analytic Plan

This study examined associations between social network characteristics and substance use outcomes (i.e., number of abstinent days in the 90-day assessment period) among American Indian participants from a rural reservation community. In particular, I aimed to understand which IPDA variables were most strongly associated with number of abstinent days among tribal members who use substances. I also examined whether associations previously found in other populations (e.g., that larger social networks and those with more supportive relationships were protective; that network members' substance use behavior predicted participants' substance use) also held true in this sample. While this study is largely exploratory, we expected that network members' opposition to substance use and support for treatment/recovery would be associated with more days abstinent. We also hypothesized that network substance use behavior would be a more powerful predictor of abstinent days than these social support variables. Finally, we examined the association of a potentially important variable derived from the background and

demographics questionnaire—the percentage of the respondent's household that is abstinent from alcohol and drugs—with the number of days abstinent reported by the participant. It was expected that living in a household with a greater percentage of sober people would be associated with more abstinent days among participants.

Prior to data analysis, a number of variables from the IPDA were calculated. For example, when looking at the substance use status of the social network, participants are asked to rate each network member's drinking or drug use status on a 5-point scale (*recovering alcoholic or user*, *abstainer*, *light drinker or user*, *moderate drinker or user*, *heavy drinker or user*). I calculated the frequency of each category among each participant's network and created a new variable representing the percentage of the network that fell into each category (*percent of the network in recovery*, *percent of the network that are abstainers,* etc.). I also combined some responses to create new categories. For example, a new variable, *percent of the network that does not use substances,* was created by summing the number of network members rated as either in recovery or abstainers and dividing by the size of the participant's network. I took this approach to calculate the percentage of the network that opposes or strongly opposes the participant's substance use, supports or encourages the participant's substance use, and supports or strongly supports the participant's recovery. I also calculated the percentage of the network that were rated as heavy substance users, heavy or moderate substance users, daily substance users, frequent or daily substance users, and so on. In all, I calculated 33 percentage variables from the IPDA data. I calculated percentages rather than frequencies of responses to account for differing network sizes (e.g., three people who support one's recovery may have a different influence on

the participant's substance use if they have three people in their network vs. 10 people in their network).

Data were analyzed using IBM SPSS Statistics (Version 28). First, descriptive statistics and bivariate correlations were examined for all study variables. Then, variables with significant zero-order correlations with number of days abstinent were examined for inclusion in subsequent regression analyses. Variables were screened for assumptions of regression. The Shapiro-Wilk test for the substance use outcome analyzed in this study, number of abstinent days, had a significant p-value, indicating that the variable was not normally distributed (Shapiro and Wilk, 1965). Neither a square root transformation nor a log 10 transformation improved the distribution of the residuals. Despite this, the skewness and kurtosis estimates for number of abstinent days were within acceptable range (between -2 and +2; George & Mallery, 2010). I examined percent days abstinent to determine whether this variable more closely approximates the normal distribution than number of abstinent days; it did not. Therefore, the untransformed variable representing number of abstinent days was used in subsequent analyses. All other study variables were normally distributed.

Initially, based on findings from previous research, I had planned to run a regression analysis entering network social support variables in the first block (i.e., general social support, acceptance or rejection of the participant's substance use, support for or opposition to the participant's recovery), followed by network substance use variables (i.e., substance use status of the network members, frequency of drinking/drug use among the network) in the second block. Then, I planned to run a second regression, adding the percentage of the household that is sober in the third block. Finally, I planned to run an additional regression analysis in which percentage

of the household that is sober would be entered in the first block, followed by social support variables in the second block and network substance use variables in the third block. However, after examining the zero-order correlations with number of days abstinent, we found that some of these variables were not significantly related to the outcome of interest. Therefore, bivariate correlations were examined to see which variables significantly related to our outcome of interest for inclusion in the regression analyses.

After examining the zero-order correlations among IPDA variables, demographic variables, and number of days abstinent, I selected household size, percentage of the household that is sober, and boarding school attendance as variables to be included in the regression analyses due to their significant correlations with the number of abstinent days. Similarly, I selected one social support variable (percentage of the network that does not accept the participant's substance use) and two behavioral variables (percentage of the network rated as heavy substance users; percentage of the network that uses substances often) for the same reason. However, when screening these variables prior to analysis, I detected a strong correlation between the two behavioral variables ($r = .69$, $p < .001$), indicating that multicollinearity may be an issue. Therefore, I selected only one behavioral variable—the percentage of the network that uses substances often—for inclusion in the regression analysis. This variable had a stronger zero-order correlation with number of days abstinent. Total network size, importance of the network members, and general supportiveness of the network were not significantly associated with participant substance use in this sample and therefore were excluded from the regression analyses.

Additionally, two moderation analyses were performed using the Hayes SPSS Process Macro (Hayes, 2013). In particular, it was expected that the association between substance use-specific social support (i.e., the percent of the network that does not accept substance use) and number of abstinent days would be moderated by the substance use behavior of the network members (i.e., percent of the network that uses substances often). I also conducted a moderation analysis to determine whether the network's substance use behavior moderates the association between social support for recovery (i.e., percent of the network that supports recovery) and number of abstinent days. In both moderation analyses, I hypothesized that social support would be more strongly associated with greater abstinent days when the network's substance use was low. See hypothesized moderation models in Figures 1 and 2, below.

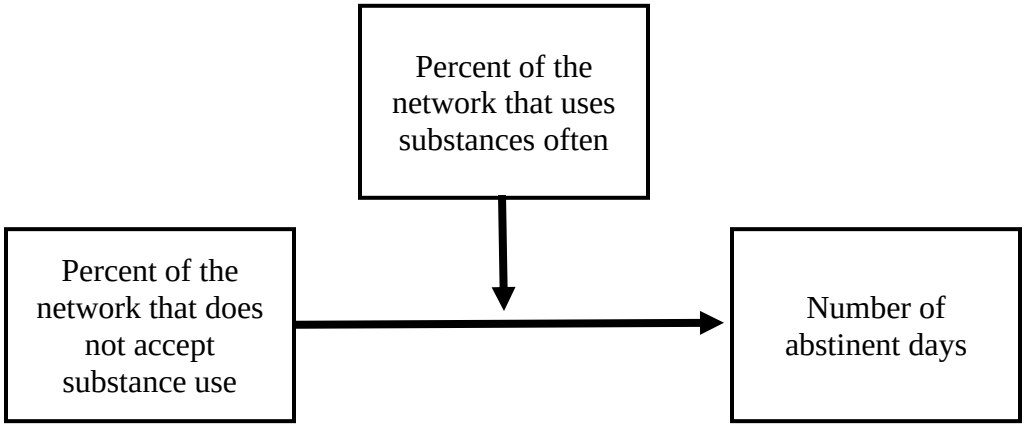

Figure 1. Hypothesized model examining whether percent of the network that uses substances often moderates the relationship between percent of the network that does not accept substance use and number of abstinent days.

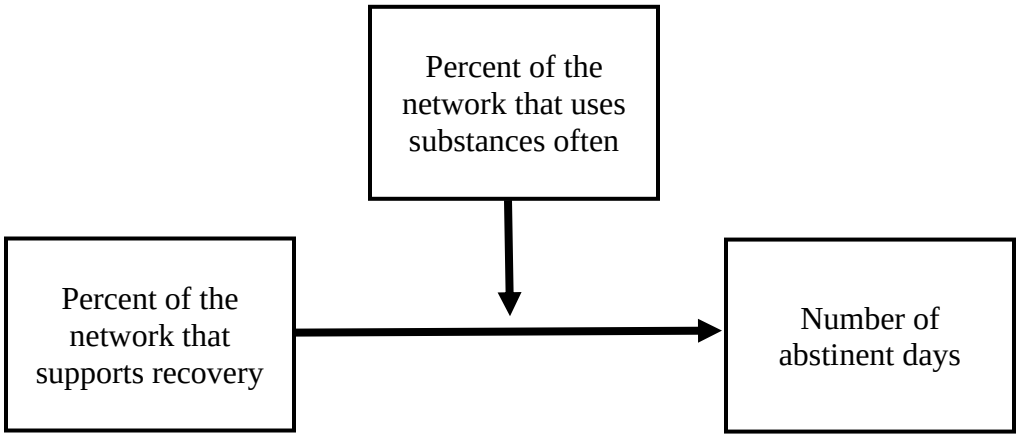

Figure 2. Hypothesized model examining whether percent of the network that uses substances often moderates the relationship between percent of the network that supports recovery and number of abstinent days.

RESULTS

Descriptive Statistics

Means, standard deviations, and ranges for the social support variables derived from the IPDA and number of days abstinent from the TLFB are shown in Table 1.

Substance Use

Alcohol was the most commonly used substance among participants (42.3%; *n* = 80), followed by marijuana (16.4%; *n* = 31), methamphetamine (12.2%; *n* = 23), opioids (3.2%; *n* = 6), and prescription pills (2.1%; *n* = 4). Additionally, 23.7% of participants reported polysubstance use (*n* = 45). Participants reported an average of 48.26 days abstinent over the 90-day period (*SD* = 35.06, range: 0-90). See Table 1. Additionally, participants reported an average of 19.56 drinking days (*SD* = 26.88, range: 0-90), an average of 19.09 drinks per drinking day (*SD* = 17.13, range: 1-116), and an average of 28 drug use days (*SD* = 35.54, range: 0-90).

Social Support

Participants reported an average total network size of 7.19 people (*SD* = 2.34) with an average daily network (i.e., number of people you have daily contact with) of 3.54 (*SD* = 2.17). Although the IPDA was capped at 12 network members, this was not an issue as no participant listed more than 11 (range: 1-11). Participants rated an average of 97% of network members as important to them and 99.50% of network members as supportive. Because there were so few network members who were rated as not important or supportive, neither variable was included as a predictor in the regression analyses.

On average, participants reported that 39.92% of their networks do not use substances (i.e., in recovery or abstainer; *SD* = 26.33) and an average of 27.47% of network members were rated as using substances often (i.e., 3-6 times a week or daily; *SD* = 26.90). An average of 32.52% (*SD* = 30.19) of the participants' networks did not accept their substance use (i.e., did not accept or left/made you leave when drinking or using drugs) and an average of 33.71% (*SD* = 30.59) accepted their substance use (i.e., accepted or encouraged). On average, 64.05% (*SD* = 34.07) of the network members were rated as supportive of the participant's recovery (i.e., supports or strongly supports you seeking treatment), with 4.69% (*SD* = 15.27) rated as opposing the participant's recovery (i.e., oppose or strongly oppose you seeking treatment). Overall, participants reported an average 52.09% of their household is sober (*SD* = 38.99). See Table 1.

Table 1. Descriptive Data for Study Variables

	M	*SD*	*Min*	*Max*
Number of abstinent days	48.26	35.06	.00	90.00
Total size of the network	7.19	2.34	1.00	11.00
Size of the daily network	3.54	2.17	.00	10.00
Household size	3.87	2.53	.00	15
% of the household that is sober	52.09%	38.99%	.00%	100%
% of the network rated as supportive	99.50%	3.19%	67%	100%
% of the network rated as important	87.64%	19.73%	17%	100%
% of the network that are heavy substance users	19.37%	23.39%	0%	100%
% of the network that do not use substances	39.92%	26.33%	0%	100%
% of the network that use substances often	27.47%	26.90%	0%	100%
% of the network that does not accept substance use	32.52%	30.19%	0%	100%
% of the network that accepts/encourages substance use	33.71%	30.59%	0%	100%
% of the network that supports recovery	64.05%	34.07%	0%	100%
% of the network that opposes recovery	4.69%	15.27%	0%	100%

Bivariate Correlations

Table 2 highlights bivariate correlations for several key study variables. First, bivariate correlations between background/demographic variables and number of abstinent days were examined. There was no significant relationship between gender (r = -.03, p = .68), age (r = -.06, p = .43), monthly income (r = .01, p = .95), or having received prior treatment (r = -.01, p = .85) with number of abstinent days in the past 90 days.

Boarding school attendance was significantly correlated with number of abstinent days (r = -.21, p = .003). Those who had attended boarding school were coded as 1, and those who had not attended boarding school were coded as 0. Thus, those who had attended boarding school had significantly fewer abstinent days than those who had not attended boarding school. Household size was significantly correlated with number of abstinent days (r = .21, p = .003), and the percent of the household that is sober was even more strongly correlated with number of abstinent days (r = .34, p < .001). This indicates that those living with more people and, more importantly, those with a greater percentage of sober people in their household had more abstinent days.

Next, bivariate correlations between IPDA variables and number of abstinent days were examined. Total network size was not significantly correlated with number of abstinent days (r = .01, p = .92), and neither was the number of people the participant has daily contact with (r = -.02, p = .78). Number of days abstinent was significantly negatively correlated with the percentage of the network that use substances often (i.e., 3-6 times a week or daily; r = -.26, p < .001), but was not significantly correlated with the percentage of the network that did not use substances (r = .11, p = .13). This indicates that participants had fewer abstinent days when their

network used substances often, but the percentage of non-users in the social network was not associated with participant abstinence. The percentage of the network that does not accept the participant's substance use (i.e., did not accept or left/made you leave when you are drinking or using drugs) was significantly correlated with number of abstinent days (r = .17, p = .02); however, the percentage of the network that encourages substance use was not significantly correlated with number of abstinent days (r = -.09, p = .20). That is, having a greater percentage of the social network perceived to be opposed to one's substance use was associated with more abstinent days, whereas the network's encouragement of substance use was not related to participant abstinence. Neither the percentage of the network that supports recovery (i.e., support or strongly support you seeking treatment or changing your substance use), nor the percentage that opposes recovery (i.e., oppose or strongly oppose you seeking treatment or changing your substance use) were significantly correlated with the participant's number of abstinent days (r = .13, p = .08; r = .09, p = .20, respectively).

Table 2. Correlations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Abstinent Days	1.0											
2. Network Size	.01	1.0										
3. Household Size	.21**	.06	1.0									
4. % Household Sober	.32**	-.03	.12	1.0								
5. Boarding School	-.21**	.06	.02	-.22**	1.0							
6. % Heavy Users	-.17*	-.03	-.02	-.22**	.15*	1.0						
7. % Non-Users	.11	-.09	.04	.20**	-.07	-.38**	1.0					
8. % Often Users	-.26**	.04	-.10	-.23**	.09	.69**	-.49**	1.0				
9. % Do Not Accept	.17*	-.10	.14*	.14	-.07	-.19**	.44**	-.34**	1.0			
10. % Accept/Encourage	-.09	-.03	-.07	-.18*	.06	.41**	-.29**	.53**	-.47**	1.0		
11. % Supports Recovery	.13	-.16*	.04	.25**	.00	-.11	.30**	-.19**	.39**	-.06	1.0	
12. % Opposes Recovery	.09	0.02	.17*	-.14	-.07	.02	-.08	.10	-.11	.13	-.36**	1.0

Note. *p<.05; **p < .01. Abstinent Days = total number of abstinent days over the past 90 days. Network Size = total number of network members. Household Size = total number of people you live with. % Household Sober = percentage of the household that does not drink alcohol or use other drugs. Boarding School = whether the participant had attended boarding school or not (0 = no, 1 = yes). % Heavy Users = percentage of the network rated as heavy drinkers or substance users. % Non-Users = percentage of the network that does not use alcohol or drugs. % Often Users = percentage of the network that uses substances 3-6 times/week or daily. % Do Not Accept = percentage of the network that did not accept or made you leave when drinking or using drugs. % Accept/Encourage = percentage of the network that accepted or encouraged your drinking or drug use. % Supports Recovery = percentage of the network that supports or strongly supports you seeking treatment. % Opposes Recovery = percentage of the network that oppose or strongly oppose you seeking treatment.

Hierarchical Regression Analyses

In the first regression analysis, we aimed to examine whether the percent of the network that does not accept substance use and the percent of the network that uses substances often were significantly associated with number of abstinent days. Household size and boarding school attendance were significantly correlated with number of abstinent days and therefore were included in the model as covariates. Household size and boarding school attendance were entered in block one, followed by the percentage of the network that does not accept the participant's substance use in block two, and the percent of the network that uses substances often in block three. The dependent variable was number of days abstinent.

Model 1 was significant. The household size and boarding school attendance variables together explained 8.9% of the variance in number of abstinent days (R^2 = .089, p < .001). Both household size (B[SE] = 2.87[0.96], β = .21, p = .003) and boarding school attendance (B[SE] = -15.66[5.09], β = -.22, p = .002) were statistically significant predictors of number of abstinent days. Participants living in larger households had more abstinent days and those who had attended boarding school reported fewer abstinent days in the assessment period.

Model 2 was approaching significance, with household size, boarding school attendance, and the social support variable together explaining 10.8% of the variance in abstinent days (R^2 = .108, p = .051). The change in R^2 was nonsignificant in step 2, indicating that the social support variable (percentage of the network that does not accept the participant's substance use) did not predict abstinent days after controlling for household size and boarding school attendance. In Model 2, household size (B[SE] = 2.59[0.96], β = .19, p = .008) and boarding school attendance (B[SE] = -14.93[5.06], β = -.21, p = .004) were still statistically significant. However, the

percentage of the network that does not accept substance use was not a significant predictor of abstinent days (*B*[*SE*] = 15.98[8.13], β = .14, *p* = .051), although it was approaching significance.

Model 3 was significant with household size, boarding school attendance, the social support variable, and the behavioral variable together explaining 14.2% of the variance in number of abstinent days (R^2 = .142, *p* = .007). In Model 3, household size (*B*[*SE*] = 2.48[0.95], β = .18, *p* = .01) and boarding school attendance (*B*[*SE*] = -13.87[4.99], β = -.19, *p* = .006) were still statistically significant. Percent of the network that did not accept substance use remained nonsignificant. The variable added in this step, percent of the network that used substances often, was significant (*B*[*SE*] = -25.48[9.42], β = -.20, *p* = .007). The change in R^2 was significant in step 3, indicating that the percentage of the network that used substances often predicted abstinent days above and beyond household size, boarding school attendance, and the percent of the network that did not accept the participant's substance use. Controlling for household size and boarding school attendance, having a greater percentage of the social network that did not accept the participant's substance use was not associated with abstinent days among participants. However, when controlling for household size, boarding school attendance, and substance-specific social support, networks with greater substance use behavior were associated with fewer abstinent days among participants.

Table 3. Multiple Regression Predicting Number of Abstinent Days from Household Size, Boarding School Attendance, Substance-Specific Social Support, and Frequency of Network

Variable	*B*	*SE(B)*	β	R^2	ΔR^2
Step 1					
Constant	42.78	4.75		.089	.089**
Household size	2.87	.96	.21**		
Boarding school attendance	-15.66	5.09	-.23**		
Step 2					
Constant	38.35	5.23		.108	.019
Household size	2.59	.96	.19**		
Boarding school attendance	-14.93	5.06	-.21**		
% did not accept substance use	15.98	8.13	.14		
Step 3					
Constant	47.99	6.25		.142	.034*
Household size	2.48	.95	.18*		
Boarding school attendance	-13.87	4.99	-.19**		
% did not accept substance use	8.22	8.49	.07		
% used substances often	-25.48	9.42	-.20**		

Substance Use

Note. *p<.05; **p < .01.

Due to the strong correlation between the variable derived from the demographics and background questionnaire, the percentage of the respondent's household that is sober, and number of days abstinent, we decided to repeat the regression analysis reported above and add this household variable in the fourth step. We were interested in understanding whether the substance use of the household members was a significant predictor of number of abstinent days while controlling for household size, boarding school attendance, and the social support and behavioral variables discussed previously. Again, household size and boarding school attendance were entered in the first step, the social support variable (percent of the network that does not accept substance use) was entered in the second step, and the behavioral variable (percent of the network that uses often) was entered in the third step. Finally, the percentage of the household that is sober was entered in the fourth step.

In the second regression analysis, all four of the models were significant; Model 1 explaining 8.1% of the variance in abstinent days (R^2 = .081, p < .001), Model 2 explaining 10.2% of the variance in abstinent days (R^2 = .102, p = .047), Model 3 explaining 14.6% of the variance in abstinent days (R^2 = .142, p = .004), and Model 4 explaining 18.6% of the variance in abstinent days (R^2 = .186, p = .005).

In Model 1, both household size (B[SE] = 2.77[1.06], β = .20, p = .009) and boarding school attendance (B[SE] = -14.57[5.36], β = -.20, p = .007) were statistically significant. These variables also were significant in Model 2; household size (B[SE] = 2.56[1.05], β = .20, p = .016) and boarding school attendance (B[SE] = -13.65[5.33], β = -.19, p = .011). In this analysis, the social support variable was significant in the second step (B[SE] = 16.91[8.44], β = .15, p = .047). In Model 3, household size (B[SE] = 2.42[1.03], β = .17, p = .02) and boarding school attendance (B[SE] = -12.37[5.23], β = -.17, p = .019) remained statistically significant. However, the social support variable was not significant in the second step (B[SE] = 7.68[8.85], β = .07, p = .386). The behavioral variable added in this step was significant (B[SE] = -29.30[10.12], β = -.23, p = .004).

In Model 4, with the addition of the percentage of the household that is sober, household size remained significant (B[SE] = 2.10[1.01], β = .15, p = .04). However, boarding school attendance was no longer statistically significant (B[SE] = -9.52[5.22], β = -.13, p = .07). The social support variable was also nonsignificant (B[SE] = 6.89[8.67], β = .06, p = .428). The network behavior variable was significant (B[SE] = -23.82[10.09], β = -.18, p = .019). Finally, the added variable, percent of the household that is sober, was also significant (B[SE] = -19.17[6.71], β = .21, p = .005). Controlling for household size, boarding school attendance,

social support and network substance use, a greater percentage of household members that are sober was associated with significantly greater abstinent days among participants.

Table 4. Multiple Regression Predicting Number of Abstinent Days from Household Size, Boarding School Attendance, Substance-Specific Social Support, Frequency of Network Substance Use, and Percentage of Household Members Rated as Sober

Variable	*B*	*SE(B)*	β	R^2	ΔR^2
Step 1					
Constant	42.69	5.49		.081	.081**
Household size	2.77	1.06	.20**		
Boarding school attendance	-14.57	5.36	-.20**		
Step 2					
Constant	37.34	6.06		.102	.022*
Household size	2.56	1.05	.18*		
Boarding school attendance	-13.65	5.33	-.19*		
% did not accept substance use	16.91	8.44	.15*		
Step 3					
Constant	48.62	7.10		.146	.043**
Household size	2.42	1.03	.17*		
Boarding school attendance	-12.38	5.23	-.17*		
% did not accept substance use	7.68	8.85	.07		
% used substances often	-29.30	10.12	-.23**		
Step 4					
Constant	37.51	7.96		.186	.041**
Household size	2.10	1.01	.15*		
Boarding school attendance	-9.52	5.22	-.13		
% did not accept substance use	6.89	8.67	.06		
% used substances often	-23.82	10.09	-.18*		
% of the household that is sober	19.17	6.71	.21**		

Note. *p<.05; **p < .01.

Considering how the addition of the household variable significantly increased the variance explained in number of days abstinent, a third exploratory regression analysis was conducted to determine whether household size, boarding school attendance, and the IPDA variables were significant after controlling for the percentage of the household rated as sober. In

this regression, percentage of the household that is sober was entered in step 1, followed by household size and boarding school attendance variables in step 2, the social support variable in step 3, and finally the network behavior variable in step 4. Number of abstinent days remained the outcome variable.

Three of the four models were significant, with Model 1 explaining 9.7% of the variance in abstinent days (R^2 = 0.097, p < .001), Model 2, explaining 14.4% of the variance in abstinent days (R^2 = .144, p = .012), Model 3, being nonsignificant, explaining 15.9% of the variance in abstinent days (R^2 = .159, p = .091), and Model 4 significantly explaining 18.6% of the variance in abstinent days (R^2 = 0.186, p = .019).

In Model 1, the percentage of the household that is sober was statistically significant (B[SE] = 28.12[6.60], β = .31, p < .001). This variable was also significant in Model 2 (B[SE] = 23.38[6.67], β = .26, p < .001). Both household size (B[SE] = 2.31[1.03], β = .16, p = .026) and boarding school attendance (B[SE] = -10.62[5.31], β = -.15, p = .047) were significant predictors of abstinent days, controlling for percent of the household that is sober. In Model 3, the percent of the household that is sober remained significant (B[SE] = 22.17[6.68], β = .25, p = .001), as well as household size (B[SE] = 2.16[1.03], β = .15, p = .037). In this step, boarding school attendance was no longer a significant predictor (B[SE] = -10.07[5.29], β = -.14, p = .059), and neither was the social support variable (B[SE] = 14.00[8.24], β = .12, p = .091). In Model 4, the percent of the household that is sober remained significant (B[SE] = 19.17[6.71], β = .21, p = .005), as well as household size (B[SE] = 2.10[1.01], β = .15, p = .04). Boarding school attendance and social support remained nonsignificant. However, the addition of the behavior variable was significant (B[SE] = -23.82[10.09], β = -.18, p = .019).

Controlling for percentage of the household that is sober, larger household sizes were associated with more abstinent days and boarding school attendance was associated with fewer abstinent days. Additionally, controlling for percent of the household that is sober, a greater percentage of the social network that uses substances often was still associated with significantly fewer abstinent days among participants, but a greater percentage of the network that does not accept substance use was not significantly associated with the number of abstinent days.

Table 5. Multiple Regression Predicting Number of Abstinent Days from Percentage of Household Rated as Sober, Household Size, Boarding School Attendance, Substance-Specific Social Support, and Frequency of Network Substance Use

Variable	*B*	*SE(B)*	β	R^2	ΔR^2
Step 1					
Constant	33.75	4.33		.097	.097**
% of the household that is sober	28.12	6.60	.31**		
Step 2					
Constant	30.73	6.32		.144	.046*
% of the household that is sober	23.38	6.67	.26**		
Household size	2.31	1.03	.16*		
Boarding school attendance	-10.62	5.31	-.15*		
Step 3					
Constant	26.92	6.67		.159	.015
% of the household that is sober	22.17	6.68	.25**		
Household size	2.16	1.03	.15*		
Boarding school attendance	-10.07	5.29	-.14		
% did not accept substance use	14.00	8.24	.12		
Step 4					
Constant	37.51	7.96		.186	.028*
% of the household that is sober	19.17	6.71	.21**		
Household size	2.10	1.01	.15*		
Boarding school attendance	-9.52	5.22	-.13		
% did not accept substance use	6.89	8.67	.06		
% used substances often	-23.82	10.09	-.18*		

Note. *p<.05; **p < .01.

Moderation Analyses

To test the hypothesis that the substance use behavior of the network moderates the association between social support and participant substance use, two moderation analyses were conducted using the Hayes PROCESS macro. In the first moderation analysis, I examined whether the association between the percentage of the network that does not accept the participant's substance use and the number of abstinent days depended on the percentage of the network that used substances often (see hypothesized model in Figure 1). I conducted a second moderation analysis to determine whether the association between social support for recovery and number of abstinent days depended on the percentage of the network that used substances often (see hypothesized model in Figure 2). In both cases, I hypothesized that the association between substance-specific social support and number of abstinent days would be stronger when the percentage of frequent users in the network was low. In both analyses, the interactions between the social support variable and the network substance use variable were nonsignificant (p = .71 and p = .90, respectively), indicating that the substance use behavior of the network did not moderate the associations between social support and abstinent days in this sample.

DISCUSSION

The goal of the present study was to examine the relationship between social support as measured by the IPDA and substance use behavior in a sample of adult American Indian tribal members with a self-identified substance use problem. While some findings were consistent with those of previous research, the current study presents several novel findings.

Network Size

Previous research has found that a larger total network size may be protective against substance use (Zywiak et al., 2002) and that larger daily networks (i.e., a measure of investment in one's network) are associated with more abstinent days (Zywiak et al., 2001). In the current study, however, total size of the network was not correlated with number of abstinent days, nor was the size of the daily network. However, we did find that one variable from our background and demographic questionnaire, the number of people residing in the participant's household, was significantly positively associated with number of abstinent days. This held true even when controlling for other variables correlated with abstinent days, such as the percentage of the household that is sober, the percentage of the network that opposes one's substance use, and the percentage of the network that uses substances frequently. Participants who reported living in larger households reported more abstinent days, independent of the percentage of the household that is sober. This suggests that a larger household rather than a larger network size in general was protective in this sample. It may be that living with more people results in more social support, or household size may be a proxy for social network investment. Previous research found that a person's investment in his or her social relationships was associated with better

drinking outcomes (Beattie & Longabaugh, 1997). Zywiak et al. (2009) discuss how social investment may aid in participants' recovery by increasing access to alternative (non-drug-related) sources of reinforcement and help with coping with stressors that may lead to relapse. In the present sample, the size of the household may be a better indicator of social investment than total size of the social network or the size of the daily social network. Previous research findings suggest that larger household sizes in AI/AN communities may result in higher levels of social support and family members may facilitate access to treatment or offer emotional support during treatment (Magarati et al., 2022). Further research is needed to examine the nature and quality of relationships with household members to understand why larger household sizes appear to be protective, whereas larger social networks and larger daily networks do not.

Social Support

Previous research has found greater general social support to be related to better substance use outcomes (Beattie and Longabaugh, 1999). Interestingly, the current study found that the percentage of the network that is perceived as generally supportive was not related to the number of abstinent days reported by the participant. There was a ceiling effect in the present study, as participants rated nearly every person in their network as generally supportive (97% of the sample rated 100% of their networks as supportive). This may be an indicator of resilience that reflects the supportive nature of social relationships in this community. The high levels of general social support among the network members in this study is encouraging, but not related better substance use outcomes among the participants.

The high importance of the network members may be another indicator of resilience in this sample. On average, participants rated 88% of their network members as important to them.

Zywiak et al. (2009) found that the average importance of the four most important people in the participant's network was associated with fewer drug use days 4 to 6 months post-treatment, but not correlated with drug use pre-treatment. The finding that the percentage of the participant's network rated as important was not related to substance use in the current study is consistent with this finding because the current study was conducted at one time point, independent of treatment engagement. We do not have post-treatment data to compare to previous research. However, the high overall importance ratings may reflect the closeness of social relationships in this community and the importance of the social network to AI/AN people.

Other studies have found substance-specific social support to be a better predictor of substance use outcomes than general support (Beattie and Longabaugh, 1999; Havassy et al., 1991; Longabaugh et al., 1993). Substance-specific social support refers to support for one's drinking or drug use and support for one's efforts to change one's substance use. People who have more network members who support their abstinence and more network members who support seeking treatment tend to do better in SUD treatment (Zywiak et al., 2009). In the present study, I found that the percentage of the network that does not accept the participant's substance use was significantly positively associated with the number of abstinent days. That is, participants with a greater percentage of network members who do not accept the person's substance use had better substance use outcomes. There also was a significant positive correlation between the percentage of the network that does not accept one's substance use and the percentage of the network that supports one seeking treatment or trying to change (i.e., supports recovery). This suggests that social networks that do not accept substance use also tend to support recovery. However, the percentage of the network that supports recovery was not

significantly associated with the number of days abstinent reported by the participant. It may be that having networks that support one's recovery is not enough to reduce substance use among participants, but having network members that will not tolerate one's substance use or be around the participant when they are using may help them reduce their alcohol and drug use.

Network Substance Use

Consistent with findings from previous research (Zywiak et al., 2009), network substance use was a stronger predictor of substance use outcomes than general support, substance-specific support, or support for recovery. However, previous research has found that individuals who had networks with a greater percentage of abstainers or people in recovery had better substance use outcomes than those with a greater percentage of moderate or heavy drinkers/users (Zywiak et al., 2002). I did find that a greater percentage of moderate/heavy users as well as a greater percentage of network members who used substances often were related to worse participant substance use outcomes, but there was no relationship between non-users (i.e., abstainers or people in recovery) and participant substance use in the present study. The presence of frequent substance users in one's network was associated with greater substance use among participants, whereas the presence of nonusers was not associated with participant substance use. It may be that participants with a greater percentage of substance users in their network experience greater exposure to triggers leading to cue-induced drug or alcohol cravings, and exposure to triggers may have a more powerful effect on behavior than having more abstainers in one's network. Relapse often happens well into SUD recovery due to exposure to drug cues, which may trigger cravings long after withdrawal symptoms have stopped (Bedi et al., 2011). Frequent substance

users in participants' social networks may increase their exposure to triggers that lead to greater substance use and fewer abstinent days.

Historical Trauma

Previous research has linked historical and intergenerational trauma to increased rates of substance use (Brave Heart, 2003; Evans-Campbell, 2008; James, 1992). For example, boarding school attendance has been shown to be associated with substance use among AI/ANs (Evans-Campbell et al., 2012). In the present study, 35.4% of the sample had attended boarding school at some point in their lives. Consistent with previous research, the current study found a significant relationship between boarding school attendance and number of abstinent days. Those who had attended boarding school reported significantly fewer abstinent days than those who had not. This relationship was discovered even when controlling for household size, the percent of the network that does not accept substance use, and the percent of the network that uses substances often. Boarding school attendance was not significantly associated with number of abstinent days when the percent of the household that is sober was added to the model, however. Findings suggest that boarding school attendance is an indicator of historical trauma and risk factor for substance use, and that historical trauma should be addressed in SUD interventions with AI/AN people. Also, because research has found an association between being the descendant of someone who attended boarding school and substance use (Evans-Campbell et al., 2012), future studies should ask participants not only if they attended boarding school, but also if they are a descendant of someone who attended boarding school, and perhaps how many generations between them.

Implications & Recommendations

In the present sample, participants had frequent or daily contacts with several people they considered important, the majority of whom were supportive of their recovery. In close, interconnected rural communities, advice to avoid others who are using substances is not realistic. Rather, SUD interventions with AI/ANs should teach skills for coping with substance use triggers and cravings brought about by interacting with people who use substances. Intervention participants may benefit from strategies to use the social support available to them in ways that support their recovery. For example, they could communicate the need to reduce substance use triggers to network members who drink or use drugs. Relatives of people trying to recover could benefit from advice to avoid drinking or using around the individual, or to communicate that they do not accept the person's substance use and will not be around them when they are using, but will reengage when the person is sober. This is consistent with the Community Reinforcement and Family Training (CRAFT) approach that teaches loved ones to reinforce periods of sobriety and disengage with loved ones when they are under the influence (Meyers et al., 1998). Similar community and family training approaches may be especially beneficial in AI/AN communities.

Results showed a strong association between the percentage of the household that is sober and participant substance use. This speaks to the need for sober living houses on the reservation. In rural areas where housing is scarce, it is not realistic to ask someone to move or change the composition of their household. For people motivated to recover from SUD, alternative housing options such as sober living houses could be a great benefit. Sober living houses are resident-operated drug and alcohol-free homes that support people in recovery as

opposed to formal treatment centers (Polcin et al., 2010). They provide a safe place to live and increase access to social support for recovery. Sober living houses could increase the total household size, which is protective, as well as increase the percentage of the household that is sober, and may also increase the percentage of the network that does not accept one's substance use, another protective factor. Previous research has found sober living houses to be associated with better substance use, employment, and criminal justice involvement outcomes over time (Polcin et al., 2010). Tribal communities could invest in sober living houses as a way to support community members trying to recover from addiction. Rural AI/AN communities should examine the plausibility of implementing these options to reduce substance use.

Other implications of this research include potential revisions that could be made to the IPDA for use in substance use research with AI/AN people. For example, if these results are replicated, it may be that questions regarding the importance and general supportiveness of the network members are not needed in future iterations of the measure. Also, it may be that asking participants to report the size of their household and the number of household members who are sober will be adequate for assessing risk related to the social network. Trimming irrelevant items would reduce the length of the assessment and its ease of use, thereby reducing participant response burden.

Strengths, Limitations, & Future Directions

This study was the first to examine the relationship between social support and substance use among AI/AN adults with a substance use problem. Strengths of this study include its focus on an understudied population that is often difficult to engage in research and our use of a CBPR framework to ensure the research was respectful and benefitted the community. The project's

Community Advisory Board was involved in developing the research questions, selecting the measures, determining the recruitment and data collection strategies, and will approve this thesis prior to dissemination. The earlier relationship building phase of the project resulted in community buy-in, which helped our team recruit 198 tribal members to participate in this sensitive and potentially stigmatizing research. Another strength of the current research is that it adds to the growing body of literature utilizing the IPDA in a population that is not represented in the extant literature and contributed new knowledge regarding the use of this measure with AI/AN communities. Understanding which social network characteristics are most strongly associated with substance use can inform future SUD intervention programs implemented on AI/AN reservations.

Despite these strengths, the current study is not without limitations. It is important to note that participants were from one tribal community and the results may not be generalizable to other communities or AI/AN cultural groups. This study should be replicated with other AI/AN communities. Also, all participants in the present study self-identified as having a SUD. We do not know whether these results will apply to people who drink or use other substances moderately. Future research should examine the relationship between social support variables and social/occasional substance use. Future research also is needed to understand whether changing characteristics of one's social network (for example, by increasing the number of people in recovery in one's network or household) predicts change in substance use behavior over time.

Another potential limitation is that a self-report assessment was used to measure substance use in the past 90 days. In some situations, participants may be motivated to

underreport their substance use and biochemical verification of self-reported alcohol and drug use is warranted. However, in the present study, self-report data using the TLFB instrument is likely valid, with any errors resulting from memory recall errors rather than deliberate underreporting. The interviewers used an open, empathic, nonjudgmental style when collecting data and there was no consequence for reporting high levels of use. The TLFB has demonstrated strong validity and reliability, and correlates highly with biological samples (Fals-Stewart et al., 2000). In fact, this measure is often used as an alternative to biological methods of drug screening due to its strong correlation with drug testing results (Hjorthøj et al., 2012).

Other possible limitations are related to the potential difficulty of answering the questions on the IPDA. Some participants may have had trouble gauging whether their network members were light, moderate, or heavy substance users or their frequency of use (once a month, 3-6 times a week, daily, etc.). Zywiak et al. (2009) argue that it may be easier for participants to accurately gauge drinking/drug use status for their network members than it is for them to gauge their general/treatment support or support for substance use. Researchers may consider asking participants to rate their confidence on each item to better understand how accurate their ratings may be, or gathering collateral information from social network members themselves. Additionally, the present research assessed social support and respondent substance use over the recent past. We do not know how social support variables may predict future substance use. Future research should examine whether characteristics of one's social network predict future substance use among AI/AN people. Daily diary or ecological momentary assessment studies also may be helpful for understanding the role of social support in substance use behavior.

Another possible limitation of the current study is that drug/alcohol items were combined in this modified version of the IPDA in order to reduce the length of the interview. Other versions of the IPDA have asked separate questions about drugs and alcohol, but in this study the items were combined. It is possible that network members may have been supportive of abstaining from drugs but not alcohol, or vice versa. It also is possible that different social support variables may be more or less important for participants who use alcohol only, drugs only, or both drugs and alcohol. Futhermore, we did not examine the relationships of the network members listed on the IPDA to the participant. It may be that the social support provided by relatives had a greater influence on the participant's substance use relative to that provided by friends or colleagues. Future research should also consider examining the importance of the network members in conjunction with substance specific support. Network members of higher importance may have a greater impact on the participant's substance use if the participant values their opinions more than network members of lower importance. Additionally, participants did not identify which network members lived with them. Since household size and percentage of the household that is sober were both significantly related to substance use in this sample, future research should ask participants to identify which network members listed are also household members to further explore this relationship. Further research is needed to examine the complexities of the social support variables assessed using the IPDA in relation to participants' substance use.

CONCLUSION

American Indians and Alaska Natives have endured generations of traumatic experiences that have led to present day health disparities, including substance use and addiction. Despite having many risk factors for substance use problems, AI/ANs also have many protective factors, such as supportive social networks. Against all odds, AI/ANs have displayed great resiliency across generations that persists today. Having high investment in their social networks and having highly supportive social relationships appear to be important factors of resiliency in this community.

The present study was an important first step toward understanding how social support and social network characteristics are related to substance use outcomes among AI/ANs struggling with addiction. We found that having a network that does not accept one's substance use, a network that does not use substances often or heavily, a larger household size, and a greater percentage of household members who are sober were significantly related to greater abstinence among participants. By better understanding which variables are associated with substance use in this population, we can begin to revise the IPDA and develop a modified version for AI/ANs. Not only could an adapted instrument reduce the burden on research participants and interviewers, but understanding which factors are important in this community allows us to make recommendations to those who would like to change their substance use, to network members who would like to help their loved ones, and to tribal leaders who would like to promote and support recovery in their communities.

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APPENDIX

IMPORTANT PEOPLE DRUG AND ALCOHOL INTERVIEW

Hi, my name is_____and during the course of our interview, I am going to ask you some questions about the people that have been important to you, and with whom you have had contact during the past 4 months. These people may be family members, friends, people from work, or anyone that you see as having had a significant impact on your life, regardless of whether or not you liked them. If you have any questions during the interview, please do not hesitate to ask.

A) Name	B) Relationship	C) During the past four months on average, how frequently have you been in contact with…?	D) How important has this person been to you?	E) Is … generally supportive of you?* (see below for explanation)
(First name and last initial)	Specify relationship and enter code # 1=parent 2=spouse 3=significant other 4=child 5=sibling 6=other relative 7=friend 8=co-worker 9=AA member 10=other	7=daily 6=three to six times a week 5=once or twice a week 4=every other week 3=about once a month 2=less then monthly 1=once in the past four months	6=Extremely important 5=Very important 4=Important 3=Somewhat important 2=Not very important 1=Not at all important	6=Extremely supportive 5=Very supportive 4=Supportive 3=Somewhat supportive 2=Not very supportive 1=Not at all supportive
1a)	1b)#:	1c)	1d)	1e)
2a)	2b)#:	2c)	2d)	2e)
3a)	3b)#:	3c)	3d)	3e)
4a)	4b)#:	4c)	4d)	4e)
5a)	5b)#:	5c)	5d)	5e)
6a)	6b)#:	6c)	6d)	6e)
7a)	7b)#:	7c)	7d)	7e)
8a)	8b)#:	8c)	8d)	8e)
9a)	9b)#:	9c)	9d)	9e)
10a)	10b)#:	10c)	10d)	10e)
#	#:			
#	#:			

Now, before we begin, do you have any questions?

*To what extent is this person generally supportive of you, by being sensitive to your personal needs, helping you to think about things, solve problems, and by giving you the moral support you need?

First name from page 1	F) Drinking/drug use status	G) How often does this person drink alcohol or use drugs?	H) How has this person reacted to your drinking or drug use? Or How would this person react to your drinking or drug use?	I) How has this person felt about your getting treatment or trying to change your substance use?
	5=heavy drinker or user 4=moderate drinker or user 3=light drinker or user 2=abstainer 1=recovering alcoholic or drug user 8=don't know	7=daily 6=three to six times a week 5=one or two times a week 4=about every other week 3=about once a month 2=less often than monthly 1=once in the past four months 0=not in the past four months 8=don't know	5=Encouraged 4=Accepted 3=Neutral 2=Did not accept 1=Left, or made you leave when you're drinking or using drugs 8=Don't know	6=Strongly supports it 5=Supports it 4=Neutral 3=Mixed 2=Opposes it 1=Strongly opposes it 8=Don't know how they would feel about it
1)	1f)	1g)	1h)	1i)
2)	2f)	2g)	2h)	2i)
3)	3f)	3g)	3h)	3i)
4)	4f)	4g)	4h)	4i)
5)	5f)	5g)	5h)	5i)
6)	6f)	6g)	6h)	7i)
7)	7f)	7g)	7h)	7i)
8)	8f)	8g)	8h)	8i)
9)	9f)	9g)	9h)	9i)
10)	10f)	10g)	10h)	10i)