Perceptions and Prevalence of Alcohol and Cigarette Use Among American Indian Adults With Type 2 Diabetes

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IN BRIEF This study examined community perceptions and prevalence of alcohol use and cigarette smoking among American Indian adults with type 2 diabetes. Results revealed normative rates and perceptions of smoking and negative views and low rates of alcohol use. Participants reported high levels of household indoor smoking and comorbid high-risk drinking and smoking. The high smoking rate among the adult American Indians in this study is especially problematic given the increased risk of cardiovascular problems related to both smoking and type 2 diabetes. The results underscore the importance of considering substance use behaviors and beliefs as a component of overall health and well-being for people with diabetes.

American Indians (AIs) experience striking health inequities relative to the general U.S. population (1,2). Policies of ethnocide, removal, and relocation undergird contemporary AI health problems (3). Chronic underfunding of AI health care (4), socioeconomic disadvantage, and systems of oppression (5) perpetuate these inequities. As an example, the prevalence of type 2 diabetes among AIs reached >15% between 2013 and 2015—more than double that observed for non-Hispanic whites and the highest rate of all U.S. racial/ethnic groups (6). Diabetes is consistently among the top five causes of death for AIs (2). Substance use provides another example; AIs experience heightened rates of past-year alcohol use disorder (19% compared to 14% for whites [7]) and amplified public health consequences such as alcohol-related violent offenses and deaths (1). Furthermore, rates of commercial cigarette smoking for AIs are double those for non-Native people (8).

There is widespread attention to type 2 diabetes and substance use among AIs as separate issues, yet there has been little empirical regard to the two considered together (9). This is a considerable gap in knowledge given heightened rates of both issues in many AI communities.

Diabetes research is also significant for health care providers in light of the high rates and cost of type 2 diabetes in clinical settings. Estimated costs for diagnosed diabetes in the United States were $327 billion in 2017 (10). Expenditures for AI patients with type 2 diabetes in the Indian Health Service (IHS) represented 37% of all adult treatment costs, and patients with type 2 diabetes accounted for nearly half of all hospital days excluding obstetrical care (11). In 2015, diabetes was present in roughly 15% of U.S. ambulatory care office visits and 20% of those involving patients ≥45 years of age (12).

The purpose of this study was to contribute to the literature about type 2 diabetes in AIs by investigating perspectives on alcohol use, cigarette smoking, and the prevalence and comorbid use of each among AI adults living with type 2 diabetes who were observed throughout 2 years.

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https://doi.org/10.2337/cd18-0078

Alcohol and AIs

Among the many stereotypes about AIs, the myth of the "drunken Indian" may be the most pervasive and damaging. In truth, AIs are more likely to report abstaining from alcohol than members of most other groups in the United States. In 2016, the drinking rate among AIs was 34% compared to 56% for whites (13). Still, the disproportionately high rates of alcohol abuse and consequences discussed previously affect many AI communities.

Alcohol played a role in the colonization of the Americas. Many tribes were introduced to European spirits through trade, and later, intoxication was used by federal officials as a means for enticing Native peoples' acceptance of unfair treaties (14). This historical use of alcohol for subjugation is clouded by firewater myths (15), the empirically unsubstantiated claims that AIs are genetically predisposed to alcoholism, have natural cravings for alcohol, and are unable to recover from alcohol problems (16–18). In reality, genetic risks for alcohol use disorders are the same for AIs as for individuals of European descent (19). Yet, historical legacy feeds both the perpetuation of such misconceptions (20) and their internalization among AIs (21,22).

Tobacco Use and AIs

The rate of cigarette smoking among AI adults is estimated to be 32%, compared to 15.5% for the U.S. population overall (8). Like most health behaviors, smoking varies considerably across tribes and in one report ranged from 4% in New Mexico to nearly 52% in Wyoming (23). Estimates from the states included in the current study reveal AI smoking disparities. In Minnesota, 59% of AIs compared to 16% of all adults reported current smoking (24). Smoking rates in Wisconsin in 2007 were 46% for AIs compared to 20% for the state overall (25). Secondhand smoke exposure is also amplified; <10% of nonsmoking adults nationally report living with someone who smokes in the home (26), yet this number reached roughly 30% for nonsmoking AIs (27). AIs were also least likely to report a household smoking ban compared to other groups in a multiethnic sample (27).

Many AI cultures use traditional forms of tobacco for spiritual purposes. Among the Anishinaabe (included in this study), traditional tobacco is called *asemaa* or *kinnikinnik* and differs substantially from commercial tobacco in composition, usage, and health impact; when used in its sacred way, traditional tobacco does not present health risks (28). Numerous AI-specific cessation programs (28–31) and tribal health campaigns to "keep tobacco sacred" (32) work to distinguish traditional tobacco use from misuse of commercial forms of tobacco. Yet, the two are often conflated (33,34). Before the Indian Religious Freedom Act of 1978, AI ceremonies were legally prohibited; thus, commercial tobacco was likely safer (from a legal standpoint) and easier to access than traditional tobacco (35). These historical and cultural contexts and access to commercial cigarettes are important backdrops to current smoking disparities and reports of permissive smoking norms in the AI community (36,37).

Guidelines for Substance Use in Type 2 Diabetes

American Diabetes Association (ADA) guidelines (38) suggest that adults living with type 2 diabetes limit alcohol intake to 1 drink/day for women and 2 drinks/day for men. This is consistent with possible benefits of moderate alcohol intake for cardiovascular disease (CVD) (39,40), including among individuals with type 2 diabetes (41). Alternatively, alcohol consumption has been linked to worse adherence to the type 2 diabetes care regimen, with effects observed starting with as little as 1 drink/day (42). Thus, the possible benefits of alcohol should be considered relative to its potential risks to self-care. Furthermore, ADA guidelines do not recommend that nondrinkers begin drinking.

The health risks associated with smoking and smoke exposure are clear, particularly for those living with type 2 diabetes. The ADA recommends against the use of cigarettes or other tobacco products for all people with type 2 diabetes (38). Smoking has been linked to the onset of type 2 diabetes (43), increased microvascular and macrovascular complications (38,44), and compromised glycemic control (45). Smoking is a significant contributor to CVD (26), the major cause of mortality among those with type 2 diabetes. In short, cigarette smoking with type 2 diabetes is a deadly combination. This is particularly worrisome for AIs given disparities in smoking and secondhand smoke exposure and findings from a multisite study in which AI adults with type 2 diabetes smoked more than those without diabetes (23).

Study Aims

We investigated substance use and type 2 diabetes on five AI reservations with a focus on alcohol consumption and commercial cigarette smoking. Our mixed-methods approach addressed two major research questions: *1*) In what ways do AI patients with type 2 diabetes view alcohol use and smoking? and *2*) What are the prevalence rates of alcohol use and commercial cigarette smoking and their comorbidity among AIs with type 2 diabetes throughout 2 years? We compared our findings to ADA's *Standards of Medical Care in Diabetes* (38) to identify areas for public health programming and type 2 diabetes education in AI communities.

Material and Methods

Procedure

Maawaji' idi-oog Mino-ayaawin (Gathering for Health) is a community-based participatory research collaboration between the University of Minnesota (UMN) and five AI communities in Minnesota and Wisconsin with an overarching goal of investigating stress and its impact on type 2 diabetes. Tribal resolutions supporting

the project were granted by each tribal government before submission of an application for funding. Community Research Councils worked in collaboration with the university research team to develop, refine, and implement study procedures. Methodology was approved by the UMN institutional review board (IRB) and the IHS national IRB. The study involved two major phases: a qualitative step using focus groups and a longitudinal, quantitative phase that included computer-assisted personal interviews (CAPIs).

Qualitative Inquiry

Sample and Procedure

Focus group participants were recruited by community research workers using purposive and convenience sampling techniques to select self-identified AI adults living with type 2 diabetes who lived within or near one of the five participating reservations. Consenting participants were provided a meal and $30. Focus group data included in this article used a questioning route that aimed to assess local perceptions of stress, coping, and the interplay of both in the context of type 2 diabetes. Thus, perspectives on substance use were not explicitly queried, and themes on this topic can be viewed as naturally emerging. Five groups (one per site) were completed in spring 2013, with a total of 42 participants (24 female/18 male).

Qualitative Analytic Approach

Author M.G. structurally coded focus group transcripts to locate any excerpts regarding perceived impacts of alcohol and smoking on health and especially diabetes-related outcomes. This process resulted in 17 distinct codes that were further developed using pattern-coding to group similar topics and establish major themes (46). Next, authors D.H. and M.G. assessed the data independently before reaching a consensus on codes (47) for the following questions related to perceptions of substance use: Did the participants directly or indirectly link alcohol and smoking with diabetes outcomes? What was the tone (negative, positive, neutral) underlying the impact of alcohol and smoking on health?

Quantitative Inquiry

Sample and Procedure

Clinic staff at each partnering tribal clinic generated probability samples from clinic records of individuals with a recent diagnosis of type 2 diabetes who were >18 years of age, living on or near the reservation, and were self-identified as AI. CAPIs were administered using laptop computers in 6-month intervals throughout 2 years between 2013 and 2017 for a total of four separate assessment points (i.e., waves). The baseline sample included 194 participants (response rate 67%) with CAPI data received for 192 participants. Retention rates were 86% at wave 2 and 84% at waves 3 and 4. Participants received $50 per interview.

Quantitative Measures

Alcohol Use

Respondents were asked on how many of the previous 30 days they had at least one alcoholic beverage and the average quantity consumed. We calculated the average number of drinks per drinking day (DPDD) per wave by dividing the past month's drinking by 30 and then multiplying by average quantities. We used ADA guidelines to create risk categories. Those reporting no alcohol use in the past month were considered non-drinkers; females consuming ≤1 DPDD and males consuming ≤2 DPDD were considered low-risk drinkers; and those exceeding recommendations were considered high-risk drinkers.

Cigarette Use

Respondents were asked at baseline if they had smoked at least 100 cigarettes in their lifetime. Those responding yes were asked how often they smoked in the past 30 days (0 = none, 1 = some days, 2 = every day). At subsequent waves, participants were asked how often they had smoked in the past 30 days. Respondents were considered current smokers if they smoked "some days" or "every day." Current smokers were also asked the average number of cigarettes smoked per day. To assess secondhand smoke exposure in the home, all participants were asked if, in a usual week, anyone who lives with them, including themselves, smoke cigarettes, cigars, or pipes, not including pipes for ceremonial reasons, anywhere inside the home.

Demographic Covariates

We examined several demographic characteristics as possible predictors of substance use patterns, including sex (0 = male, 1 = female), age at baseline, per-capita family income, and number of years since type 2 diabetes diagnosis.

Quantitative Analytic Approach

We stacked the data by wave and used the *xt* commands in Stata 15 (StataCorp, College Station, Tex.) to account for longitudinal design. We generated rates of use at each wave and a weighted average across waves and then used *xttrans* to examine stability and change in alcohol categories and smoking status. We used generalized estimating equations (GEEs) with robust standard errors to examine comorbidity between alcohol use and smoking. We compared drinking categories and predicted residence in a home with indoor smoking using a binomial distribution with a logit link and unstructured working correlation matrix. We used a Gaussian distribution with identity link to predict average DPDD. Smoking and drinking measures were allowed to vary across time.

Results

Qualitative Results: Community Perceptions of Alcohol and Cigarette Use

Table 1 displays major qualitative themes identified regarding substance use. Perceptions of alcohol use tended to emphasize its harms, including the negative impact of drinking for individuals and families. One woman

TABLE 1. Thematic Summary of Focus Group Participants' Perceptions of Alcohol and Cigarette Use

Theme	Participants' Views	Transcript Excerpts
Alcohol negatively affecting personal health	Alcohol contributes to comorbidities and interferes with spiritual health.	"I was almost 230 lb, and that's when I started having problems with my blood sugar and stuff. Plus, I was drinking a lot, a lot of beer. I used to drink a case of beer a day almost by myself." (Male)
Alcohol damages families/alcohol negatively affecting the family	Family alcohol use contributes to their health concerns by increasing stress and worry. Beyond their own health, the alcohol use of others contributes to concerns about individual safety, undermined family support, unhealthy coping, and the breakdown of family structures.	"I wrote a book for my family. I'm into my 1980s right now on it. But, I wrote a lot about the 1950s, what I observed during the times when they made us citizens. . . . I mean, we couldn't go into the bars and that, after that, they were able to go into the bars, after 1953 I think it was. And times changed at that time because a lot of our people took to drinking. A lot of families broke up. A lot of kids went to far-off foster homes. In fact, my family broke up. People that I know. We had a thriving community at one time." (Male)
Alcohol as a harmful coping technique	Alcohol is a harmful technique used to cope with stress and for pain management. Alcohol also contributes to denial of health concerns.	"That's what I told my doctor. Speaking of alcohol, I said, 'You know what?' I said, 'Since I quit drinking, that's when all of my health problems started.' [Because] I was drinking for probably 2 years straight." (Female) "Maybe that's why you have the health problems." (Male) "And then I quit drinking and, all of a sudden, everything after that . . . ." (Female) "[Because] you started noticing it . . . You probably had the problems. You just didn't recognize them because you were using the alcohol to cover it." (Male) "Mmhmmm." (Female)
Smoking as a helpful coping technique/ perceived benefits outweigh risks	Smoking is a coping technique, especially for diabetes management. Smoking decreases stress. Smoking curbs appetite.	"How do you cope or deal with stress? For example, do you breathe, do you meditate? How, if at all, do you deal with stress?" (Facilitator) "I'm a smoker." (Female) "I smoke and drink coffee. All day and all night, I will sit and drink pots of coffee and smoke packs of cigarettes." (Female) "I remember that, and I wanted to quit [smoking], but that smoking that cigarette curbs my appetite because of diabetes. I don't want to smoke, but I don't want to eat a lot more either." (Female)

Focus group data collected in 2013 in Minnesota and Wisconsin from 42 adult participants.

shared, "I worry more about my families, about their unhealthy coping, whether they're using pills or smoking weed or drinking." Furthermore, conversations around alcohol often referenced one's past behaviors (e.g., two males noted, "I was in the alcohol scene," and "I used to drink") or the behavior of others.

Alternatively, smoking was discussed as a current, personal habit. Concerns for health risks related to smoking were less obvious than those observed for alcohol use. One participant did allude to possible harms of smoking with regard to blood pressure (e.g., "I've got to quit smoking because that's really bad because I got such high blood pressure" [Male]), and two others made passing references to quitting smoking (e.g., "They told me to quit" [Female]). Still, most overt references to smoking focused on perceptions of its role in curbing appetite (e.g., "Well, I quit [smoking] before . . . but I also gained a lot of weight" [Female]) or as a coping technique (e.g., "Usually what relaxes me is if I smoke a cigarette or something and just try to clear my mind" [Male]). We did not find any references to comorbid alcohol/cigarette use in the qualitative transcripts. In all, participants seemed to perceive that smoking had greater benefits for their health (in particular, eating less) than quitting smoking altogether.

Quantitative Results

At baseline, there were slightly more females (55.7%) than males (44.3%) in the sample, and the average age of the participants was 46.3 years (SD 12 years). Average per-capita income was $9,767, and participants had been diagnosed with type 2 diabetes for an average of 1.6 years before baseline.

Alcohol Use

Table 2 presents ADA recommendations for drinking and smoking, the frequency of each, and related focus group themes. Averages across waves show that, overall, approximately two-thirds of participants reported no drinking (62%) and approximately one-fourth (27%) reported drinking

TABLE 2. Summary of ADA Recommendations, Prevalence Within Waves and Across Time, and Summary of Community Perceptions

ADA Recommendation for Alcohol Use: For women, no more than 1 drink per day; for men, nor more than 2 drinks per day. (One drink is equal to a 12-oz beer, a 5-oz glass of wine, or 1.5 oz of distilled spirits.)

	Wave 1	Wave 2	Wave 3	Wave 4	Overall[c]	Community Perceptions
Nondrinker[a]	59.6%	62.4%	65.4%	60.6%	61.9%	1. Alcohol negatively affecting health
Drinks within ADA guidelines (low risk)	29.8%	29.7%	23.3%	26.3%	27.4%	
Drinks above ADA guidelines (high risk)	10.6%	7.9%	11.3%	13.1%	10.7%	2. Alcohol damages families
Number of drinks consumed per day (female drinkers)[d]	1.0 (1.7)	0.9 (1.1)	1.5 (2.1)	1.2 (1.9)	1.1 (1.7)	3. Alcohol as a harmful coping technique
Number of drinks consumed per day (male drinkers)[d]	1.9 (2.3)	1.3 (1.2)	3.0 (5.5)	2.7 (3.9)	2.2 (3.5)	
Number of drinks consumed per day (combined)[d]	1.4 (2.0)	1.0 (1.1)	2.1 (3.8)	1.9 (3.0)	1.6 (2.6)	

ADA Recommendations for Cigarette Use and Secondhand Smoke Exposure: Discourage smoking for those who do not smoke; encourage smoking cessation for those who do smoke. Advise patients not to use cigarettes, other tobacco products, or e-cigarettes. Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care. Screen children for secondhand smoke exposure.

	Wave 1	Wave 2	Wave 3	Wave 4	Overall[c]	Community Perceptions
Nonsmoker[b]	38.5%	40.6%	39.6%	37.5%	38.8%	1. Smoking as helpful coping technique
Current smoker	61.5%	60.0%	61.6%	63.8%	61.2%	
Number of cigarettes smoked per day (for smoking participants)[d]	9.5 (7.1)	10.4 (7.3)	10.8 (7.9)	10.3 (7.0)	10.2 (7.3)	
Any smoking in house						
Overall	53.5%	48.5%	48.0%	44.1%	40.0%	
Smoking participants only	23.9%	25.4%	30.2%	23.3%	48.7%	
Non-smoking participants only	42.8%	39.2%	41.4%	36.4%	25.7%	

[a]Complete data on alcohol questions: W1–188, W2–165, W3–159, W4–160. [b]Complete data on cigarette questions: W1–187, W2–166, W3–161, W4–162. [c]Weighted proportion/mean across time. [d]Mean (SD).

within ADA guidelines. Few (11%) were considered to be at-risk drinkers (i.e., consuming alcohol in quantities above ADA limits). Among drinkers, DPDD was 1.6 (1.1 for females and 2.2 for males).

The top of Table 3 shows stability/change in alcohol use. A majority of nondrinking participants remained nondrinkers (86%), whereas 11.9% transitioned to low-risk drinking, and very few moved to high-risk drinking (1.8%). About 54% of low-risk drinkers remained so, whereas 29.5% transitioned to no drinking, and 16.3% transitioned to high-risk drinking. High-risk drinkers showed the greatest variability; 43.5% remained high-risk drinkers,

TABLE 3. Transition Probabilities Across Time for Alcohol Risk Categories (Top) and Cigarette Smoking (Bottom)

	Probability of Transitioning to:		
	Nondrinker	**Low-risk drinker**	**High-risk drinker**
Nondrinker	**86.36%[a]**	11.89%	1.75%
Low-risk drinker	29.46%	**54.26%[a]**	16.28%
High-risk drinker	17.39%	39.13%	**43.48%[a]**
	Nonsmoker	**Current smoker**	
Nonsmoker	**86.03%[a]**	13.97%	
Current smoker	9.09%	**90.91%[a]**	

Data collected between 2013 and 2017 in Minnesota and Wisconsin. [a]Bold type probabilities on the diagonal represent stability in each category across time.

whereas 39% transitioned to low-risk drinking, and 17.4% moved to nondrinking status.

Cigarette Smoking

The ADA recommends no smoking for people with type 2 diabetes. Few participants reported smoking <100 cigarettes in their lifetime and no smoking during the four waves of the study (11.7%, data not shown). Approximately one-fifth of the sample (22%, data not shown) were former smokers. As displayed in Table 2, most participants (61.2%) were current smokers and reported smoking an average of 10.2 cigarettes (i.e., half of a pack) per day, although there was substantial variability (SD 7.3).

ADA guidelines advise screening for secondhand smoke exposure. Approximately 40% of respondents said they or somebody else smokes inside their home. Specifically, 48.7% of current smokers live in homes where they or somebody else smokes indoors, and 25.7% of nonsmokers live in a home where somebody else smokes indoors.

Table 3 also shows stability and change in smoking status across time. A majority of nonsmokers remained so (86%), and 14% transitioned to current smoking. A majority of current smokers maintained their smoking status (90.9%).

Comorbid Use

Table 4 displays GEE models predicting alcohol use groups, DPDD, and smoking inside the home, controlling for demographics. The odds of low-risk drinking compared to no drinking increased by 140% for current smokers compared to nonsmokers; the odds of high-risk drinking compared to no drinking were 760% higher for current smokers compared to nonsmokers. Compared to nonsmokers, smokers had higher odds of high-risk relative to low-risk drinking (odds ratio [OR] 4.35). The odds of high-risk drinking compared to no drinking were 141% higher for those residing in a household permitting indoor smoking (OR 2.41). Those living in a house with indoor smoking had higher odds of high-risk compared to low-risk drinking (OR 2.92). Of the four demographics, increasing age lowered the odds of low-risk (OR 0.94, 95% CI 0.92–0.96) and high-risk (OR 0.95, 95% CI 0.91–0.99, data not shown) drinking compared to no drinking. Greater income increased the odds of low-risk drinking compared to no drinking (OR 1.06, 95% CI 1.02–1.09).

Current smokers drank on average 0.39 drinks per day more than nonsmokers. The only other factor associated with number of drinks per day was smoking indoors. Participants from indoor smoking households consumed 0.47 more DPDD than those in nonsmoking homes.

Current smokers had higher odds of living in an indoor smoking household compared to nonsmokers (OR 2.04). In addition, high-risk drinkers had higher odds of living in an indoor smoking household compared to nondrinkers (OR 3.42).

Discussion

Intervening on and preventing type 2 diabetes are paramount concerns for many AI communities. Documenting substance use behaviors that affect type 2 diabetes outcomes and the contexts from which these behaviors emerge illuminates targets for prevention and intervention. In this sample of AI adults living with type 2 diabetes, commercial cigarette smoking was highly prevalent and risky alcohol use was uncommon. Community members were quick to name alcohol as a health risk for individuals and families and less likely to cite harms of commercial cigarette smoking. These patterns are contrary to ADA recommen-

TABLE 4. Alcohol and Tobacco Use Comorbidity

	No Drinking Versus:		Low-Risk Drinking Versus High-Risk Drinking[c]	Drinks Per Day[d]	Smoking in House[d]
	Low-Risk Drinking[a]	High-Risk Drinking[b]			
Current smoker[e]	2.40** (1.34–4.31)	8.60** (2.09–35.42)	4.35* (1.08–17.48)	0.39** (0.16–0.63)	2.04* (1.15–3.62)
Smoking in house[e]	1.42 (0.99–2.04)	2.41*** (1.63–3.56)	2.92** (1.55–5.52)	0.47** (0.20–0.74)	
Low-risk drinker[e,f]					1.36 (0.95–1.96)
High-risk drinker[e,f]					3.42*** (2.06–5.69)

*Data reported as OR (95% CI) except for drinks per day, which are β (95% CI). All estimates adjusted for sex, baseline age, per-capita family income, and number of years since clinically diagnosed with type 2 diabetes. Data collected between 2013 and 2017 in Minnesota and Wisconsin. [a]Excludes high-risk drinkers (562 observations, 171 participants). [b]Excludes low-risk drinkers (451 observations, 160 participants). [c]Excludes nondrinkers (237 observations, 96 participants). [d]Panel data (625 observations, 175 participants). [e]Time-varying covariates. [f]No drinking is the reference group. *P <0.05. **P <0.01. ***P <0.001.*

dations that clearly articulate the risks of smoking for type 2 diabetes and allow for moderate alcohol use (35).

Among those in the current study who drink (roughly 40%), most drink within ADA guidelines (i.e., low-risk drinkers). On average, only one in ten participants reported drinking outside of clinical recommendations, comparable to about 8% in a previous sample, including AIs (9). Overall, 61% of the adults in this study were current smokers, which is double the rate reported for AIs nationally (32%) and more than four times higher than the general U.S. smoking rate (15.5%) (8). Compared to AIs in the two states from which our sample was drawn, the AI adults with type 2 diabetes in this study reported smoking levels somewhat on par with Minnesota and general AI rates (59%) and higher than those in Wisconsin (46%) (24,25).

Smoking status was relatively stable across this 2-year study, and drinking variability was observed mainly for the minority of high-risk drinkers who largely moved to either low-risk or nondrinking status. Substance use stability has also been reported among U.S. adults who are living with chronic conditions (48). Smoking inside the home was ~40% for smokers in this study and hovered at ~25% among nonsmokers, which is higher than national estimates (10%) (26). Increased awareness of the dangers of secondhand smoke for type 2 diabetes–related outcomes is needed given evidence that secondhand smoke may increase the risk of stroke—a particular concern for people with type 2 diabetes (26). About one-fourth of study participants who ever smoked had quit (24.7% quit ratio) and may be valuable sources of information and support for AIs working to stop smoking.

These trends are interpretable with our qualitative findings and historical contexts of substance use in AI communities. AI alcohol stereotypes and their internalization (21,22) may have fueled low reports of drinking in our sample. For instance, alcohol use was frequently described as a past behavior or an action of others, whereas smoking was described as a current personal habit. Removing oneself from drinking behavior in the case of the former may reflect the stigmatization of alcohol. The latter may illuminate community acceptability regarding smoking, a finding parallel to reports of lenient smoking attitudes among AIs (36). Thus, prevention efforts should include strategies for shifting norms and attitudes around smoking. The pervasive stereotypes surrounding AI substance use also may mean that providers who care for AI patients subconsciously prioritize abstinence from alcohol above abstinence from commercial tobacco. Targeted educational programming for physicians and other health professionals could reinforce the importance of tobacco cessation for AIs living with diabetes. Such programming could educate non-Native health professionals to discern between the spiritual and cultural role of traditional tobacco versus the current role and use of commercial tobacco products.

We also found that focus group participants saw smoking as tool to prevent weight gain, an issue of particular concern for people with type 2 diabetes. Although some individuals may gain weight shortly after smoking cessation, this does not offset the substantial cardiovascular benefits of quitting smoking (49). Participants also described smoking as a stress reduction/coping technique. Previous evidence suggests that the apparent relaxation effects of nicotine may actually be momentary relief from nicotine depletion rather than a stress reduction mechanism (50). Health literacy campaigns should aim to increase awareness of and dispel myths regarding smoking and health and promote healthy alternatives to coping with stress.

We found that current smokers are more likely to drink than nonsmokers; drinkers who smoke have higher odds of high-risk drinking. These findings are compelling in that comorbid alcohol and cigarette use among people with type 2 diabetes may exacerbate preexisting CVD symptoms, accelerate the development of new ones, and increase the risk of certain types of cancers (51). Moreover, drinking was associated with increased odds of living in a house that permits smoking indoors, a finding of notable consequence for risk of secondhand smoke exposure for all household members. As a result, diabetes care providers should consider clinical interventions to address co-occurring smoking, problem drinking, and household smoke exposure among patients.

Limitations

Our focus group questioning routes did not explicitly query substance use behaviors, which limited the amount of information shared in these domains. Thus, qualitative findings might be viewed as a more naturalistic appraisal of the salience of substance use for participants. Relatedly, we did not ask participants to discuss traditional versus commercial tobacco, which may have uncovered nuanced attitudes worthy of consideration. For example, a study with Lakota elders found strong positive messaging (e.g., natural, sacred, hope) around traditional tobacco but negative messages (e.g., unnatural, for pleasure, arrogant) connected to commercial tobacco (52). Our quantitative data do not assess secondhand smoke exposure outside the home (e.g., in the workplace). CAPIs were based on a clinical sample wherein all participants have sought formal health care. This may signal conservative estimates of substance use relative to a community sample. Given the stigma surrounding alcohol use, it could also be that participants underreported drinking behaviors.

Conclusion

The results of this study reveal high levels of commercial cigarette smoking, low alcohol consumption, and high comorbidity of risky alcohol use and smoking among AI adults with

type 2 diabetes. This underscores the crucial importance of ongoing, culturally relevant smoking cessation campaigns for AIs in both public health and clinical systems (28–31). Work is also needed to shift permissive norms around smoking and promote health literacy on substance use and type 2 diabetes. This work could include dismantling stereotypes about AI drinking patterns and norms with sensitivity to the historical context and impacts of alcohol in tribal communities and promoting understanding of the devastating role of commercial cigarettes and secondhand exposure in type 2 diabetes mortality (38) while honoring sacred tobacco traditions. These results offer specific clinical insights, as well. Providers are reminded to assess alcohol and tobacco use with patients with type 2 diabetes, provide education on the risks of smoking and secondhand smoke exposure for those with type 2 diabetes, and offer treatments and interventions to reduce the risk of CVD. Furthermore, workflows within primary care settings may offer structural supports for individual health professionals' efforts to discourage tobacco and inappropriate alcohol use. For example, electronic health record audits, quality measures reports, and quality improvement initiatives can describe the collective diabetes patient smoking and alcohol use within a practice or population and provide incentives for targeted interventions. In sum, clinical and public health approaches to type 2 diabetes intervention in AI communities should consider substance use behaviors and beliefs as a component of overall well-being for patients and families.

Acknowledgments

The authors gratefully acknowledge the clinical and community-based members of the Gathering for Health Team: Sidnee Kellar, Rose Barber, Robert Miller, Tweed Shuman, Lorraine Smith, Sandy Zeznanski, Patty Subera, Tracy Martin, Geraldine Whiteman, Lisa Perry, Trisha Prentice, Alexis Mason, Charity Prentice-Pemberton, Kathy Dudley, Romona Nelson, Eileen Miller, Geraldine Brun, Murphy Thomas, Mary Sikora-Petersen, Tina Handeland, GayeAnn Allen, Frances Whitfield, Phillip Chapman Sr., Sonya Psuik, Hope Williams, Betty Jo Graveen, Daniel Chapman Jr., Doris Isham, Stan Day, Jane Villebrun, Beverly Steel, Muriel Deegan, Peggy Connor, Michael Connor, Ray E. Villebrun Sr., Pam Hughes, Cindy McDougall, Melanie McMichael, Robert Thompson, and Sandra Kier.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.

Funding

This study was supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health (NIH) under award number DK091250 and by the National Institute on Drug Abuse under award number T32DA037183. The contents of this article are attributable to the authors and do not necessarily represent the views of the NIH.

Author Contributions

M.L.W. led project implementation, data collection, writing, and conceptualization for this article. D.H. led quantitative analyses and the writing of related results sections, including tables. M.G. led qualitative analyses and the writing of related results sections. B.G., B.D.A., and E.O. each contributed to the literature review and final editing. All authors edited the entire manuscript and read/approved the final version. M.L.W. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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