Determinants of Type II Diabetes among Native Americans in the United States: An

Analysis of the 2015 Behavioral Risk Factor Surveillance

by

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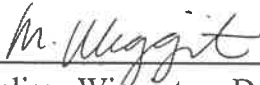The College of Health Science

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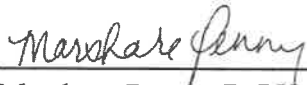This is to certify that the Master's Thesis of

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Abstract

The purpose of this study is to examine the relationship between type II diabetes and mental health status, alcohol/tobacco use, sleep disorders, and healthcare coverage within the Native American population. The aim of this study is to answer these questions: (1) Is mental health status, sleep disorders, tobacco use and alcohol abuse significantly associated with self-reported type II diabetes in the Native American Population? (2) Is health care coverage significantly associated with self-reported type II diabetes in the Native American Population? This study uses data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS). After reviewing the 2015 questionnaire, six-questions were classified as dependent variables and examined to determine if there was a significant relationship with self-reported type II diabetes in the Native American population (measured using BRFSS Question 7). The design was a cross-sectional design using secondary data. No significant relationship between the variables sleep or energy and having type II diabetes among Native American participants. There was a significant relationship between the variables alcohol, reported being a current/former smoker, and mental health concerns (including stress, depression, and problems with emotions) and having type II diabetes. The results also showed that having health care coverage was significantly associated with participants that reported having type II diabetes. Findings from this study are beneficial in understanding the Native American/Alaska Native population and type II diabetes relationships.

Key Words: Native Americans, type-II diabetes, alcohol, sleep, mental health.

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<center>**Review of Literature**</center>

Introduction

Diabetes is a growing epidemic in the United States, affecting more than 30 million Americans (Centers for Disease Control and Prevention [CDC], 2017). According to the CDC (2017), of those Americans with diabetes, 90-95% have type II diabetes (CDC, 2017). Type II diabetes is a preventable disease; however, there are several factors that can increase an individual's risk for developing the disease, including prediabetes, being overweight, obesity, being older than 45 years of age, a history of type II diabetes among immediate family members (siblings or parents), physical inactivity, and being of African American, Hispanic/Latino American, American Indian, Alaska Native, Pacific Islander, or Asian American descent (CDC, 2017).

Diabetes Rates among Native American and Alaska Natives

According to the American Diabetes Association (2018), adult Native Americans and Alaska Natives have the highest diabetes diagnosis rates in the United States at 15.1% of the population. Other ethnicity rates are whites 7.1%, Asian Americans 8%, Hispanics 12.1%, and non-Hispanic blacks 12.7%. Native Americans are two times more likely to develop diabetes compared to all other races and ethnicities (Scarton, & de Groot, 2017). From 1990 to 1998, Native Americans diagnosed with type II diabetes increased 58% (Walls, Aronson, Soper, & Johnson-Jennings, 2014); this disease is ranked among the top four causes of death of Native Americans (Patel, Davila, Patel, & Norman, 2014). Studies have also shown that there is an increased risk of cancer mortality associated with diabetes because of the

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increased prevalence of stomach and liver cancers among diabetics (Best, García-Esquinas, Yeh, Zhang, Lee, & Rhoades, 2015). Examining additional factors related to the development of type II diabetes, such as sleep disorders, alcohol/tobacco use, mental health status-anxiety and depression, and access to health care services will aid in preventing diabetes and provide evidence of ways to control or reduce the incidence rates of both diabetes and other related diseases (Best, García-Esquinas, Yeh, Zhang, Lee, & Rhoades, 2015).

Mental Health Status and Diabetes

The CDC (2018) defined mental illness as ailments that impact individuals' mental state, influencing their behaviors, mood, or way of thinking. Depression and anxiety are some of the disorders identified with mental illness that can impact an individual's mental health status. Although depression and anxiety are often coupled together, they are not the same. Both disorders can affect sleep, cause nervousness or irritability, and impact an individual's concentration (National Institute of Mental Health, 2017). Major depression is one of the most common forms of depression and results in severe depressive episodes (National Institute of Mental Health, 2017). In 2016, 8.7% of Native Americans/Alaska Native's experienced major depression within the past year, which is the highest prevalence when compared to other ethnicities (Hispanics 5.6%, Whites 7.4%, Blacks 5.0%, Asians 3.9%) (National Institute of Mental Health. 2017). Furthermore, in 2016, 40 million Americans were affected by anxiety, making it the most common mental illness in the United States (Anxiety and Depression Association of America, 2016). Within the U. S., 1.2% of the population identifies as Native American or Alaska Native, and 21% of that

community has been diagnosed with a mental illness (Mental Health America, 2014). Compared to the general population, they are 1.5 times more likely to experience psychological distress (Mental Health America, 2014).

The literature has shown a link between poor mental health status and Native Americans with type II diabetes (Walls et al., 2014). Native Americans who were diagnosed with diabetes were twice as likely to experience depression (Walls et al., 2014). Individuals displaying both depression and diabetes are at a greater risk of mortality compared to individuals with only one of these conditions (Walls et al., 2014).

Sleep and Diabetes

Prevalence of insufficient sleep among Native Americans is increasing (Nuyujukian, Beals, Huang, Johnson, Bullock, Manson, & Jiang 2016). Recent studies have revealed that sleeping too much or too little can be detrimental to one's health (Nuyujukian et al., 2016). If an individual sleeps less than seven hours (considered short sleep duration), they have a 12% greater risk of early death, while those who sleep more than nine hours (considered long sleep duration) have a 30% greater risk of early death (Nuyujukian et al. 2016). Type II diabetes has been linked to improper sleep duration, meaning those who suffer from sleep disorders have a greater risk of developing type II diabetes (Nuyujukian et al., 2016). Demographic disparities also play a role in who experiences sleep disorders. Individuals with a greater degree of American Indian Ancestry (AIA) have been associated with short sleep durations, reporting less than six hours of sleep a night and raising their risk for developing other diseases (Ehlers, Wills, Lau, & Gilder, 2017). The increase of type

II diabetes among Native Americans may also increase their risk of insufficient sleep (Nuyujukian, Beals, Huang, Johnson, Bullock, Manson, & Jiang 2016).

Alcohol, Tobacco, and Diabetes

Diabetes and substance use are a toxic combination for an individual's health. For example, alcohol use and nicotine dependency can affect sleep duration resulting in disrupted sleep from difficulties breathing to frequent bad dreams (Ehlers, Wills, Lau, & Gilder, 2017). Compared to the general population, Native Americans have higher rates of both alcohol and tobacco use (Moghaddam, Dickerson, Yoon, & Westermeyer, 2014). According to the CDC (2017), in 2013 approximately 43.8% of American Indians/Alaska Natives reported currently using tobacco. The co-occurrence of diabetes, alcohol use, and mental health issues are twelve times higher in Native Americans (Aronson, Johnson-Jennings, Kading, Smith, & Walls, 2016).

Reports indicated that 9.2% of Native Americans age 12 and older partook in heavy drinking, and in 2015, 346,000 Native Americans participated in binge drinking over a one-month period (Recovery, 2018). The National Institute on Alcohol Abuse and Alcoholism (2017) defined binge drinking as four or more drinks for women and five drinks for men within a two-hour period. An individual is considered a heavy drinker when he/she binge drinks five or more days within one month (National Institute on Alcohol Abuse and Alcoholism, 2017). Studies have shown an increased chance of developing type II diabetes if an individual drinks excessively (Moghaddam, Dickerson, Yoon, & Westermeyer, 2014). Therefore, raising awareness regarding the need to limit alcohol use in an effort to

prevent/reduce the incidence of developing type II diabetes is crucial (Wu et al., 2015).

Health Care Factors and Diabetes

Other factors that Native Americans face, which could increase their likelihood of developing type II diabetes, are disparities regarding health care services. According to Mental Health America (2014), there are 566 federally recognized Native American tribes that live primarily in the western states, and only one-third live on reservations. Most of the population resides in urban, suburban, and rural areas (Mental Health America 2014). Native Americans may not receive consistent available health care due to their living conditions whether they reside on or off a reservation. Not all reservations provide accessible health care on-site, and if individuals live off the reservation, they may face even greater obstacles to obtaining good mental health care (King et al., 2018). Some obstacles they face if they live off-reservation include distance to the clinic and access to specialty care, especially if they live in rural or remote areas (Nicklett, Omidpanah, Whitener, Howard, & Manson, 2017). A recent study reported that less than half of the Native Americans participating in a survey lived within 15 minutes of their healthcare source (Nicklett et al., 2017).

Although the Indian Health Service does provide family and internal medicine clinics for eligible Native Americans, they still fall short. According to King et al. (2018), roughly 47% of medical staff on reservations anticipate leaving their position within the first year due to short staffing and poor compensation. Native Americans struggle to find appropriate transportation to visit these clinics, and when they do,

they experience inconsistencies with the clinical staff, such as physicians being unavailable, scheduling too far in advance, and the hours of appointments being held during typical work hours (King et al., 2018). This creates great challenges for Native American communities across the Unities States. If clinics were improved and could ensure timely, consistent, and appropriate healthcare service, health outcomes for Native Americans may be improved (King et al., 2018).

Native Americans who visited their primary physician within a year of being admitted into the hospital due to complications related to diabetes had lower rates of mortality compared to those who did not follow up with a primary care provider (King et al., 2018). Native Americans with diabetes averaged 1.25 days in the hospital, which was found to be five-times greater than individuals without diabetes (O'Connell, Wilson, Mason, & Acton, 2012). In summary, the health care-related issues discussed may be preventing Native Americans from seeking the help they need, especially when addressing potential risk factors for type-II diabetes.

Purpose of Study

The purpose of this study was to examine the relationship between type II diabetes and mental health status, alcohol/tobacco use, sleep disorders, and healthcare coverage within the Native American population.

Research Questions

The study aimed to answer the following research questions:

1. Are mental health status, sleep disorders, tobacco use, and alcohol abuse significantly associated with self-reported type II diabetes in the Native American population?

2. Is health care coverage significantly associated with self-reported type II diabetes in the Native American population?

Hypothesis

It is hypothesized that there is a significant relationship between mental health status relating to anxiety and depression, sleep disorders, tobacco use, and/or alcohol consumption with self-reported type II diabetes in the Native American/Alaska Native population. It is also hypothesized that there is a significant relationship between access to healthcare coverage and self-reported type II diabetes in the Native American/Alaska Native population.

Method

Design

This research study employed data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS). After reviewing the 2015 questionnaire, approximately six questions were classified as dependent variables and examined to determine if there was a significant association between the responses and self-reported type II diabetes in the Native American population. The design was a cross-sectional design using secondary data.

Procedures

Data used in this study was from the Centers for Disease Control and Prevention's 2015 Behavioral Risk Factor Surveillance System (BRFSS), which is a publicly available, de-identified dataset. Landline and cell phones were used to administer the BRFSS questionnaire. All 50 states in addition to Puerto Rico, the District of Columbia, and Guam participated in the 2015 BRFSS. The questionnaire has three parts/components: (1) core component, (2) optional BRFSS modules, and (3) the state-added questions (BRFSS, 2015). The core component is a standard set of questions that all participating states use and include questions pertaining to demographics, perceptions about health-related topics, conditions, and behaviors (i.e., fruit and vegetable consumption, tobacco and alcohol use, and healthcare access HIV/AIDS risks, health status, etc.). A set of core component questions are rotated on even and odd years. Sections, such as hypertension awareness, cholesterol awareness, fruit and vegetable consumption, and arthritis, were added to the core component section in 2015.

Participants

The 2015 BRFSS dataset included 7,942 Native American respondents; however, after removal of those who did not respond to select BRFSS questions, the sample size resulted in 222 adult male and female study participants. A minimum sample size of 152 was required for this study based on estimates using G*Power software. The G*Power analysis facilitates the selection of an appropriate effect size to include in a study and is commonly used in social and behavioral sciences (Faul, Erdfelder, Buchner, & Lang, 2009).

Dependent Variable

In this study, self-reported diabetes was the dependent variable. The question used to measure this variable was, *"Has anyone ever told you that you have diabetes?"* (DIABETES3) (CDC, 2016). The variable was recoded as "DiabetesYN" to include only responses that indicated if the respondent stated whether or not they had diabetes. Responses were recoded as 1 = 1 (yes), 3 = 2 (no), and 2 (gestational diabetes), 4 (pre-diabetes), 7 (don't know), and 9 (refused) were coded as system missing. Gestational diabetes and prediabetes were not included in the analysis.

Independent Variables

In this study there were six independent variables. For the first research question, the independent variables included sleep difficulties, mental health status, energy level, alcohol consumption and smoker status. The variable that assessed sleep difficulties (ADSLEEP) was derived from the BRFSS question, *"Over the last 2-weeks, how many days have you had trouble falling asleep or staying asleep too much?"* This variable was recoded from ADSLEEP to "Sleep_R." Responses were

collapsed so that any reported sleep difficulties in the last 14 days were coded as 1 and 88 (none) was coded as 2. The mental health variable was derived from the BRFSS question, *"Now thinking about your mental health, which include stress, depression, and problems with emotions, for how many days in the past 30-days was your mental health not good?"* This variable was recoded from mental health to "MentalHealth_R." Response options were recoded so that any reported mental health problems in the last 30 days were coded as 1 and 88 (none) was coded as 2, while 77 (don't know) and 99 (refused) were coded as system missing and excluded.

The energy level variable, ADENERGY, was derived from the BRFSS question, *"Over the last 2-weeks, how many days have you felt tired or had little energy?"* This variable was recoded from ADENERY to "Energy_R," and the responses were collapsed so 1-7 days = 1, 8-14 days = 1, 88 (none) = 2, and 77 (don't know) and 99 (refused) were coded as system missing and excluded.

The alcohol consumption variable, DRNKANY5, was derived from the BRFSS question, *"Adults who have reported having at least 1 drink of alcohol in the past 30-days."* This variable was recoded from DRNKANY5 to "Alcohol_R," and the responses were coded as yes = 1, no = 2, and 9 (refused) and 7 (don't know) were coded as system missing. The variable asked participants to identify with one of the four levels of drinking status.

The smoking status variable, SMOKER3, was recoded as "Smoke_R." Responses options were 1 = current smoker/now smokes every day, 2 = current smoker, now smokes some days, 3 = former smoker, and 4 = never smoked. Responses were then collapsed so that current smoker/now smokes every day = 1,

current smoker, now smokes some days = 1, former smoker = 1, and never smoked = 2 to compare variables as "current/former smokers" to "non- smokers/ never smoked." Lastly, responses such as don't know/refused was recoded as system missing and excluded from the study.

To answer the second research question, the independent variable measured was health-plan coverage. The variable used to address this question was HLTHPLN1, which was derived from the BRFSS question, *"Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMO's, or government plans such as Medicare or Indian Healthcare Services?"* The variable HLTHPLN1 was recoded to "HealthPlan_R." Responses were coded as 1 = 1 (yes), 2 = 2 (no), and 7 (don't know) and 9 (refused) were coded as system missing and excluded.

Data Analysis

Statistical Package for Social Sciences (SPSS) version 24 was used to run chi-square tests of independence to determine if there was a significant relationship between self-reported diabetes and the independent variables. To answer the first research question, five chi-square tests were run, so a Bonferroni correction was applied, reducing the significance from .05 to .01. Additionally, frequencies and descriptive statistics for each variable were analyzed.

Results

Participants

The sample used in this study included respondents from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) who self-reported their ethnicity as Native American/Alaskan Native (n = 7,942). The participants consisted of 44.8% males (n = 3,559) and 55.2% females (n = 4,383) of whom 38% were married (n = 3,079). Additionally, 34.6% reported completing the 12th grade or obtaining a GED (n = 2,750), 29.5% reported completing one to three years of college (n = 2,344), and 17.7% reported completing four or more years/graduating college (n = 1,412). Among the respondents, 18.9% (n = 1,501) reported that they had been told that they had diabetes. As shown in Table 1, more than half of the participants were over the age of 45, 19.2% were between the ages of 45 to 54 (n = 1,523), 22% were between the ages of 55 to 64 (n = 1,746), and 21.5% were 65 years or older (n = 1,707). Descriptive statistics are further illustrated in Table 1.

Major Findings

The purpose of this study was to determine if the variables mental health, sleep, energy levels, alcohol and tobacco use, and health care coverage were associated with self-reported type II diabetes among the Native American/Alaskan Native population. Questions were used from the 2015 BRFSS to answer the research questions for this study. Chi-square tests of independence was calculated to explore the relationships between mental health status ("MentalHealth_R"), sleep disorders ("Sleep_R"), energy level ("Energy_R"), alcohol ("AlcoholR") and tobacco use ("SmokerR"), and self-reported type II diabetes ("DiabetesYN") among Native

Americans/Alaskan Native Americans in the United States. Multiple tests were run to address one research question, and therefore, a Bonferonni correction was conducted to determine if the results were still significant.

The results indicated there was no significant relationship between "Sleep_R" ($x^2(1) = 3.45$, $p > .063$) and having type-II diabetes. There was no significant relationship between "Energy_R" ($x^2(1) = .792$, $p > .373$) and having type II diabetes. There was a significant relationship between "AlcoholR" ($x^2(1) = 166.26$, $p < .000$) and having type II diabetes. Those who reported having type II diabetes were .41 times more likely to have consumed alcohol in the past 30 days (OR = .41, CI = .363, .476). Participants who reported having type II diabetes were 1.28 times more likely to be a current/former smoker ($x^2(1) = 17.47$, $p < .000$; OR = 1.28, CI = 1.14, 1.45). Additionally, participants who reported having type II diabetes were 1.24 times more likely to have mental health concerns (including stress, depression and problems with emotions) in the last 30 days ($x^2(1) = 13.11$, $p < .000$; OR = 1.24, CI = 1.10, 1.40).

The second research question the current study examined was, "Is healthcare coverage significantly associated with self-reported type II diabetes in the Native American population?" Results from a chi-square test of independence found that having health care coverage ("HealthPlan_R") was significantly associated with participants who reported having type II diabetes ($x^2(1) = 72.26$, $p < .000$). Specifically, those who reported having type II diabetes were 2.74 times more likely to have health care coverage as shown in Table 2.

Discussion

The purpose of this study was to explore relationship between sleep, mental health status (including depression and anxiety), energy levels, health plan coverage, alcohol consumption, and tobacco use with self-reported type II diabetes among the Native American population. Chi-square tests of independence were used to analyze these variables. Results from the chi-square test revealed that there was no significant relationship found between self-reported energy levels and sleep status and self-reported type II diabetes within the Native American population. However, a significant relationship was found between alcohol consumption, tobacco use, mental health status, and healthcare coverage and type II diabetes among the Native American population.

Sleep and Diabetes

The findings of this study partially coincide with previous studies. According to prior research, sleeping less than seven hours and more than nine hours places an individual at a greater risk of type II diabetes (Nuyujukian et al., 2016). Also, recent studies have provided evidence that certain predictors, such as reduced or disrupted sleep, have been found to be associated with type II diabetes (McNeil, Doucet, & Chaput, 2013). However, the results from this study revealed no significant relationship. Participants in the current study who reported having type II diabetes were 1.8 times more likely to have difficulties sleeping in the past two weeks, but this relationship was not significant. This result seemed drastically lower compared to previous studies which have shown an odds ratio of about 3.81 when analyzing the

association between short sleep duration as a risk factor for type II diabetes (McNeil et al., 2013).

Energy Levels, Mental Health Status and Type II Diabetes

Participants who reported having type II diabetes were 1.4 times more likely to have low-energy levels in the past two weeks; 71.2% reported low energy levels and having type II diabetes. Prior research has shown a significant correlation between fatigue/energy levels, depression, and type II diabetes. In a previous study, 68% of participants with type II diabetes reported experiencing fatigue (Jain, Sharma, Choudhary, Yadav, Jain, & Maanju, 2015). It has also been established that fatigue can result from depression or anxiety (mental health status); further, it can be a challenge to determine if the root cause of fatigue stems from mental health or type II diabetes (Jain, Sharma, Choudhary, Yadav, Jain, & Maanju, 2015). Also, prior research has shown that Native Americans are 1.5 times more likely to experience psychological distress, including depression and anxiety (Mental Health America, 2014). Moreover, participants who reported having type II diabetes were 1.24 times more likely to have mental health issues in the past 30 days. Fatigue and mental health status play a large role in the health of individuals with type II diabetes.

Alcohol, Tobacco Use, and Type II Diabetes

Previous studies revealed that Native Americans who engage in risky behaviors, such as smoking tobacco and consuming alcohol, have an increased likelihood of developing type II diabetes (Moghaddam, Dickerson, Yoon, & Westermeyer, 2014). Research has also revealed that Native Americans are more likely to smoke tobacco and drink alcohol (Moghaddam et al., 2014). However, this

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study showed that individuals who reported having type II diabetes were 58% less likely to have consumed alcohol in the past 30 days. This may be due to a change in behavior and/or lifestyle. Prior research has shown that individuals who develop a disease and become ill are likely to reduce or abstain from alcohol consumption altogether in the hopes of reversing the effects of the newfound disease (Shaper, 2011).

Additionally, participants who reported being a current or former smoker were 1.28 times more likely have type II diabetes compared to those who had never smoked. Previous research indicated that Native Americans are more likely to participate in smoking tobacco than other populations (Moghaddam et al., 2014). Tobacco use increases insulin resistance, which can significantly increase the risk of type II diabetes (Kim, Kim, Cho, Park, Jee, & Nam, 2014). All populations are at risk of developing diseases from tobacco use. Studies have found that 43.8% of American Indians/Alaska Natives reported currently using tobacco (CDC, 2017). Native American/Alaska Native populations are at risk for type II diabetes and other diseases, and reducing tobacco use and/or quitting can significantly help reduce the chances of individuals in this population developing this disease.

Health Care Coverage and Diabetes

Lastly, participants who reported having type II diabetes were 2.74 times more likely to have health care coverage. Nearly 95% of participants who reported having type II diabetes also reported having health care coverage compared to 87% of participants who did not have type II diabetes. This rate of health care coverage is extremely high compared to prior research. Typically, the rates of uninsured among

this population range from 18% to 35% as it differs across the nation (Frerichs, Bell, Hassmiller Lich, Reuland, & Warne, 2019). It is important to note that the 2015 BRFSS questionnaire asked whether or not the respondent had *any* kind of health care coverage, including Medicare, Medical, Indian Health Services (IHS), etc. However, it is unclear if the participants in the current study have IHS or some other form of insurance. While improvements have been made in the U.S. to provide accessible health care among Native Americans and Alaska Natives, these populations have typically reported not having a health care provider or health care coverage.

Public Health Implications

It is evident that type II diabetes is prevalent among Native Americans/Alaskan Natives in the United States. There is limited research available that studies the deeper causes behind these findings. Prior research has shown that Native Americans/Alaska Natives are pre-disposed and more likely to be diagnosed with type II diabetes (Scarton, & de Groot, 2017). Results from the current study have indicated a need for public health to address this population in regard to preventing type II diabetes. In the current study, psychological distress was found to be a risk factor for type II diabetes among Native Americans/Alaska Natives. Public health advocates can address this by promoting healthy lifestyle choices and educating this population of individuals about good mental health techniques. Prior studies have researched the role of self-efficacy and risk perception among Native Americans/Alaskan Natives in an effort to prevent type II diabetes (Scarton et al., 2019). This research has indicated a need for a theoretical framework to help both researchers and educators to better understand the association between perceptions of

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diabetes risk and how it affects their willingness to adopt a healthy lifestyle (Scarton et al., 2019).

It is important for health educators to be culturally competent when addressing this population. Within the Native American culture, smoking tobacco from a pipe is a long-standing tradition. There are also rituals associated with the use of tobacco among this population, and smoking is viewed as spiritual and sacred (Godlaski, 2013). Although tobacco use for ceremonial purposes is appropriate, recreational use of tobacco has increased at alarming rates. Previous studies have revealed that American Indians in the United States have the highest prevalence for commercial tobacco as 35.8% of the population ages 12 years and older smoke (Nadeau, Blake, Poupart, Rhodes, & Forster, 2012). Creating a culturally appropriate intervention that will be sensitive to the traditional use of tobacco and discourage commercial use of tobacco use is essential.

Local and governmental organizations can work together to make improvements by assessing communities, looking at poverty rates, and increasing accessibility to healthy food, housing, transportation, and jobs. Interventions and prevention programs are key to reducing rates of type II diabetes among this population (Scarton et al., 2019). Ongoing and continuous education in addition to assessing those clinical outcomes can impact this community immensely. Public health professionals can also continue to advocate for better and more accessible health care coverage. Funding has increased in an effort to open eligibility windows within this community, but it continues to fall short (Frerichs et al., 2019). Efforts to

advocate for funding, promote and educate community members, and provide

programs or interventions for these communities are essential.

Limitations

This study has certain limitations. The BRFSS is a self-reported survey, which leads

to response bias. For example, participants may not have been honest or truthful when

answering questions, and this could have skewed the results. Recall bias is also a

limitation; the responses may not be valid. The BRFSS questionnaire requires

participants to recall specific details about how they felt and what they did in the past

14 to 30 days when answering questions, which can be challenging to recall

accurately.

Additionally, the questionnaire is a limitation because the questions were

vague. Questions such as *"Over the last 2 weeks, how may days have you had trouble*

falling asleep or staying asleep or sleeping too much," "Over the last 2 weeks, how

many days have you felt tired or had little energy," and *"During the past 30 days,*

how many days per week or per month did you have at least one drink of any

alcoholic beverage such as beer, wine, a malt beverage, or liquor" asked participants

to recall information without taking into consideration any details about the question.

Some responses may vary from day to day, which would be difficult for the

participant to identify with only one answer (i.e. difficulty falling asleep vs. sleeping

too much). It would be beneficial to know the quality and quantity of the sleep cycle.

Also, a question asking participants whether they have increased or decreased alcohol

consumption in the past 30 days and why (i.e., doctor recommendation, personal

choice, etc.) would be helpful to identify additional areas of need for public health officials.

A cross-sectional study design has weaknesses (i.e. the inability to infer causation from the results), it requires a large sample size for adequate power, results could be affected by selection bias, and participants omitting potential third variables can impact the results (Salazar, DiClemente, & Crosby, 2015). The purpose of this study was to identify a relationship, and therefore, a weakness was that causation could not be established. Selection bias and participants omitting possible variables that could affect their responses are other weaknesses of the study design. The questionnaire asks a participant to take a snap shot of their habits over the course of the last 14 to 30 days. Other variables, such as events in an individual's life, can impact habits, and therefore skew the results. Therefore, there may not have been accurate representation of participants' lifestyles, due to potential third variables. This may result in participants omitting responses.

Another limitation was the possibility of a type I error due to a large sample size. Future research may want to consider looking at Native Americans separately from Alaskan Natives to reduce sample size. Mental health status, alcohol consumption, tobacco use, smoking status, and health care coverage were significant and were likely over-powered, whereas energy levels and difficulties sleeping were not significant and possibly underpowered. These two variables had fewer than 250 respondents; therefore, if a smaller subset of the population was used, it is likely that the minimum cell count of five may not have been met, which is an assumption of chi-square tests.

Recommendations for future research would be to use data provided from Indian Health Care Services to investigate Native Americans as an isolated population. Additionally, a longitudinal study could help determine causation rather than using a cross-sectional design. Lastly, it is recommended to run separate analyses for the variables that had a high number of respondents and the variables that had a smaller number of respondents so, that researchers can use a smaller subset of the population without impacting the variables that had fewer respondents. Also, a logistic regression could be run to better explain the relationships between these variables.

Conclusion

This study found some evidence that aligned with previous research in addition to findings that did not concur. Mental health status (including depression and anxiety), alcohol consumption, tobacco use, smoking status, and health care coverage aligned with previous findings. Reports of low energy levels and difficulties sleeping did not have a significant relationship among participants with type II diabetes. This did not coincide with previous findings that found supporting data that energy and sleep are related to type II diabetes. Finally, sleep and energy are affected by mental health status. It is recommended that further research be conducted using different procedures to establish relationships between variables. Additionally, it is suggested to investigate the Native American and Alaska Native populations separately. Findings from this study are beneficial in understanding the relationship between the Native American/Alaska Native population and type II diabetes relationships.

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Table 1
Demographic details for Native American/Alaskan Native Respondents to the 2015
Behavioral Risk Factor Surveillance System (N = 7,942)

Variable	*N*	%
Age		
18 - 24	662	8.3
25 - 34	1,104	13.9
35 - 44	1,200	15.1
45 - 54	1,523	19.2
55 - 65	1,746	22
65 and older	1,707	21.5
Marital Status		
Married	3,017	38.8
Divorced	1,378	17.4
Widowed	808	10.2
Separated	306	3.9
Never Married	1,899	23.9
Member of an unmarried couple	406	5.1
Refused to answer	66	0.8
Gender		
Male	3,559	44.8
Female	4,383	55.2
Education Level		
Elementary	30	0.4
Some high school (grades 9-11)	443	5.6
High school graduate or GED	926	11.7
Some college (1 - 3 yrs)	2,750	34.6
4- or more yrs of college	2,344	29.5
Refused to answer	1,412	17.8
Ever been told you have diabetes		
Yes	1,501	18.9
No	6,118	77

Table 2
Crosstabulation of determinants of Type II Diabetes

Diabetes

	Yes	No	OR	CI	X^2	df	p-va
Reported having difficulties sleeping			1.81	.963, 3.397	3.45	1	0.06
In the last 14 days (yes)	34 (64.2%)	93 (49.7%)					
None	19 (35.8%)	94 (50.3%)					
Smoker			1.28	1.14, 1.45	17.47	1	.000
Current/Former Smoker	846 (59.3%)	3,078 (53.1%)					
Non-smoker/Never smoked	581 (40.7%)	2,715 (46.9%)					
Consumption of Alcohol			.416	.363, .476	167.26	1	.000
In the last 30 days	317 (22.6%)	2,364 (41.2%)					
Not in the last 30 days	1,087 (77.4%)	3,370 (58.8%)					
Self-reported mental health			1.24	1.10, 1.40	13.11	1	.000
In the past 30 days (yes)	602 (41.4%)	2,175 (36.3%)					
Not in the last 30 days	851 (58.6%)	3,815 (73.7)					
Low energy levels reported			1.36	693, 2.45	.792	1	.373
In the last 14 days (yes)	37 (71.2%)	122 (64.6%)					
Not in the past 14 days	15(28.8%)	67(35.4%)					
Health Plan coverage			2.74	2.15, 3.49	72.26	1	.000
Has coverage (yes)	1415(94.8%)	5,277(87%)					
Does not have coverage	77(5.2%)	787(13%)					

Notes: Reported having difficulties sleeping (n=240), Smoker (n=7,220), Consumption of alcohol (n=7,1 Self-Reported Mental Health (n=7,443), Low energy levels reported (n=241), Health Plan Coverage (n=7,556).