DIABETES EDUCATION AMONG AMERICAN INDIANS ON THE FORT BERTHOLD INDIAN RESERVATION: IMPROVING EDUCATIONAL INTERVENTIONS IN THE SCHOOL SETTING

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Diabetes Education Among American Indians On the Fort Berthold Indian Reservation: Improving Educational Interventions in The School Setting

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF NURSING PRACTICE

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ABSTRACT

Minority populations such as American Indians (AIs) in the United States experience large-scale healthcare related disparities when compared with non-minority citizens. Diabetes can affect all races and ethnicities across the globe, regardless of age, sex, or location on the map, and affects AIs at disproportionately high rates. While type 1 diabetes mellitus (T1DM) is not preventable, type 2 diabetes mellitus (T2DM) can be prevented and avoided in some instances. The implementation of an evidence-based diabetes program in a school-based setting has the potential to positively improve the health of school-aged children.

Based on the need for high-quality diabetes prevention education, an evidence-based educational curriculum was piloted in order to ascertain the feasibility of using such a program to increase diabetes and obesity prevention knowledge in the school setting. The implementation of the Diabetes Education in Tribal Schools (DETS) curriculum in community and school-based settings has been reported in literature. The program is intended to lower the prevalence of T2DM by incorporating lifestyle management options that specifically targets American Indian/Alaska Native (AI/AN) minority communities.

Three lessons from the DETS curriculum were presented to the Boys and Girls Club of Three Affiliated Tribes (TAT) in Mandaree, North Dakota. Throughout the curriculum, students were educated regarding T2DM and obesity prevention by engaging in interactive learning activities. The results of the project revealed that community-based interventions for preventing T2DM and obesity can be a helpful way to reach children in the community setting. Overall, this curriculum was effective and successfully taught to voluntary participants. The measures used included qualitative interviewing and learning activities with answers/responses from the

participants. Active community involvement by healthcare providers can promote primary prevention through educational activities.

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DEDICATION

I would like to dedicate this disquisition to God. Through my faith in him and his guidance, I was led down the nursing pathway which has blessed my life in countless ways. This dissertation is also dedicated to my significant other, Rory Sanford, who has been my biggest supporter in school and life. He made going back to school possible with his love and support. Also, I dedicate this project to our two boys, Kooper James Sanford and Tucker Ray Sanford. I would also like to dedicate this dissertation to my parents. Their unconditional love and support have taught me to always work hard and to keep pushing forward. They have stood by my side through life and are my best friends. Thank you for your love and support.

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LIST OF ABBREVIATIONS

T2DM.....Type 2 Diabetes Mellitus

T1DM.....Type 1 Diabetes Mellitus

DM.....Diabetes Mellitus

DETS.....The Diabetes Education in Tribal Schools

AI .....American Indian

AN.....Alaskan Native

AN.....American Native

DNP.....Doctors of Nursing Practice

IRB.....Institutional Review Board

TAT.....Three Affiliated Tribes

BGC .....The Boys & Girls Club

BGCA .....The Boys & Girls Club of America

NDSU.....North Dakota State University

IRB.....Institutional Review Board

CHAPTER ONE. INTRODUCTION

Background and Significance

Diabetes affects over 34.2 million Americans, or 10.5% of the entire population in the United States (US) (American Diabetes Association [ADA], 2020; Beitz & Geria, 2017; Centers for Disease Control and Prevention, 2017a). Of those affected by diabetes mellitus, 1.6 million Americans have type 1 diabetes mellitus (T1DM), and over 28 million have type 2 diabetes mellitus (T2DM), making type 2 the most prevalent type of diabetes (ADA 2020, ADA, 2018).

American Indians (AI) and Alaska Natives (AN) have well-documented health disparities, most notably concerning diabetes related morbidity and mortality (O'Connell, Wilson, Manson, & Acton, 2012). This ethnic group has the highest prevalence of diabetes among all racial/ethnic groups in the United States, with 15.1% of AI/ANs affected, compared to 7.4% of non-Hispanic whites (ADA, 2018). This more than doubles AI/AN individual's chances of being diagnosed with diabetes. AI/ANs have the highest risk of developing T2DM as children and youth compared to any ethnic group in the US (Nsiah-Kumi et al., 2013). One goal of Healthy People 2020 is to reduce the disease burden of diabetes mellitus (DM) and to improve the quality of life for all people who have or are at risk for diabetes (Office of Disease Prevention and Health Promotion, 2019). The goals are currently being set for Healthy People 2030 in order to continue to improve the health and well-being of all Americans.

AIs benefit from strong family and community involvement and support. Despite the strong sense of community and family that exists, AIs continue to experience unfavorable health outcomes and face serious health disparities (Kruse, Bouffard, Dougherty & Parro, 2016; Sequist, Cullen, & Acton, 2011). The AI population is at an increased risk of chronic diseases, such as cardiovascular disease, diabetes mellitus, being overweight or obese, high blood

pressure, and stroke (Adakai et al., 2018). These health disparities are related to centuries of forced assimilation resulting in adaptation to Westernized culture with accompanying high unemployment rates, low graduation rates, lack of access to healthy food, and little access to quality healthcare (Notah Begay III Foundation, 2015).

Yracheta et al. (2015) explains that obesity and diabetes were rare in most AI tribes before there was an influence from Western civilization, which suggests that the increased risk of obesity and diabetes in this population is mainly driven from environmental factors. With Westernization came diets higher in fats and sugars and low in fruits, vegetables, and whole grains consumption, which has caused a reduction in consumption of native foods (Yracheta et al., 2015). It is proposed that diabetes was almost confined to rich people whom consumed oil, flour, and sugar in excessive amounts in the pre-First and Second World War (Sami, Ansari, Butt, & Hamid, 2017). The manufacturing of soft drinks, which contains large amounts of high fructose corn syrup, has also been linked to obesity and diabetes due to the raise in blood glucose levels and BMI (Sami et al., 2017).

AI communities are aware of the challenges facing the community as a whole, but members often have little input and limited resources into the research and public health sectors in their communities. Many believe at the root of ending health disparities for indigenous people is having strong relationships with their land, language, culture, and religious beliefs (Satterfield, DeBruyn, Santos, Alonso, & Frank, 2016).

Social determinants of health can be defined as the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illnesses (Satterfield et al., 2016; World Health Organization [WHO], 2018). There are both social and biological/behavioral determinants of health that are identified. Social determinants of health

related to T2DM and obesity among AIs include poverty, family socioeconomic status, educational attainment, and access to education. Other factors include poor access to medical care, a lack of exercise, the lack of safe spaces to exercise, the inability to purchase high quality food/poor diet, increased stress, and unstable living conditions. Biological or behavioral risk factors for T2DM among AI include childhood obesity, and having a family history of T2DM (Bonilla, Rodriguez-Gutierrez, & Montori, 2016; Sequist, et al., 2011). Having a strong tie to the culture and participation in ceremonies and other cultural activities can impact health in some positive and negative ways. Due to some tribes having some contemporary food substitutions, such as incorporating fry bread at events and Powwows and having an increased consumption of high sugar soft drinks and high carb meals, this can negatively affect health (Adakai et al., 2018). Other social determinants of health related to the development of T2DM and/or obesity include historical trauma, racism and social exclusion, and self-determination, and autonomy (Dill et al., 2016; Notah Begay III Foundation, 2015). These are specific indigenous determinants of health that impacts AIs children and youth. Research has shown that having greater personal self-determination and autonomy of an individual is strongly correlated with having better health outcomes (Notah Begay III Foundation, 2015). Self-determination can also be applied to the community setting, such as having a group of people losing their autonomy when they experience oppression, assimilation, colonization, or other forms of control (Notah Begay III Foundation, 2015).

AIs living in the rural setting have limited access to healthcare for multiple reasons, that are discussed below. Living in rural areas puts AIs at risk for health disparities because they often lack regular access to healthcare services when compared to other Americans (Kruse et al.,

2016; Sequist et al., 2011). In the United States, AIs "rank as the most poverty-stricken group" (North Dakota Department of Human Services, 2001, p. 12).

Pediatric obesity has emerged as a leading health epidemic, with 36% of all children and adolescents in the US ages 6 to 17 years old being overweight and 13% of the 36% being obese (Candela, Gutierrez, Dufek, Putney, & Mercer, 2012). Primary prevention involves forming habits early on in life to prevent a disease or illness. By forming healthy habits early on in life, risk factors for T2DM can be minimized, decreasing the incidence of developing T2DM (CDC, 2017a). The prevalence of diabetes is on the rise, therefore reinforces the importance of education and preventing T2DM in the community setting.

Problem Statement

According to the CDC (2018), one out of every three adults living in the United States has prediabetes. With 88 million Americans age 18 and older living with prediabetes, more than 90% of people do not know they have prediabetes because there is a lack of symptoms early on in the start of the disease process (ADA, 2020). Because of the lack of symptoms, many people can go years without having symptoms or formally being diagnosed with T2DM. Prediabetes is defined as having blood glucose levels that are higher than normal, but they are not high enough to be diagnosed with T2DM (CDC, 2019). T2DM is considered a progressive condition that is preceded by years of deteriorating beta cell function before the blood glucose is high enough to be at levels consistent with T2DM. Having prediabetes puts a person at an increased risk for developing T2DM, heart disease, and stroke (CDC, 2018b; CDC, 2019).

Lowering the risk for developing T2DM often includes several behavioral changes, such as losing weight if obese and getting regular physical activity that can be incorporated into everyday activities (CDC, 2019). Getting regular physical activity means completing at least 150

minutes a week of moderate intensity activity (CDC, 2019). For children and adolescents ages 6 to 17, the CDC recommends one hour or more of physical exercise per day (CDC, 2017a). By setting small goals of weight loss, such as 5 pounds in 2-3 months, this makes obtaining the goal more realistic for better health outcomes (CDC, 2018d). This can make a positive difference in blood pressure, blood glucose, cholesterol levels, and overall weight, as well as reducing the risk of diabetes, insulin resistance, and obstructive sleep apnea (CDC, 2018d).

Adolescence is considered a transition period as youth learn to develop behavior patterns that are carried into adulthood, therefore affecting long-term health outcomes, such as acute and chronic disease development and life expectancy (Candela et al., 2012; National Research Council, 2009; Satterfield et al., 2016). Youth need support from their peers, parents, and community in order develop healthy habits and have positive health outcomes.

AIs/ANs have the highest rate of diabetes among all racial/ethnic groups at 14.7% in the United States today, as well as an alarming rate of prediabetes (ADA, 2020; CDC 2018; Jacobs-Wingo et al., 2016; National Institute of Diabetes and Digestive and Kidney Diseases, 2018). Along with rising T2DM rates, the risk for other co-morbidities are increased in this population. By having restrictions to access their fertile lands through policy changes and reservation life, AI's traditions have changed. Satterfield et al. (2016) report that prior to reservation life, indigenous people had greater access to their land in the past, and they traditionally gathered and cultivated plants and did more hunting and fishing. Because of the development of reservations, further limitations of the tribes' ability to harvest their traditional foods has also decreased physical exercise, which has contributed to an increase incidence of obesity and T2DM (Satterfield et al., 2016).

Community health measures are falling short for providing educational resources for rural communities related to diabetes prevention and overall health promotion (Candela et al., 2012; Jacobs-Wingo et al., 2016). Interventions that are aimed at increasing community health involvement with more education and increasing awareness in this population to improve patient, individual, and community outcomes was noted (Candela et al., 2012). By following recommendations to prevent T2DM and obesity, youth have the potential to improve their health outcomes and also decrease the country's high health care costs associated with T2DM. Education in the school setting can be utilized by health influencers, such as family practice providers to positively influence youth that may not come in frequently to the clinics to be seen (Bonilla et al., 2016; Sequist et al., 2011). By instilling healthy behavioral changes in the youth, participants may lower their chances of developing T2DM and other obesity-related co-morbidities and mortalities in their lifetime (CDC, 2017a).

Objectives and Project Description

The purpose of this community health project was to increase the awareness of T2DM among AI 1st through 3rd grade students in Mandaree, North Dakota by implementing and presenting education in the after-school program setting. It is anticipated that enhancing awareness of T2DM and obesity in youth may be contribute to the T2DM prevention in the AI population. The purpose of the project was met through achievement of the following objectives: 1) Present educational lessons to students of the afterschool program, 2) Improve students' overall knowledge/awareness of diabetes and obesity prevention, and 3) Promote healthy behaviors for students through a chart.

Three lessons from the DETS curriculum was presented to an after-school program on a rural reservation in Mandaree, North Dakota, which is a program created by the National

Institute of Health in order to offer culturally relevant and scientific based teachings. The target population included voluntary AI participants between first and third grade whom attended the after-school program during the days the interventions were implemented.

CHAPTER TWO. LITERATURE REVIEW

A comprehensive literature review search was conducted in order to locate scholarly, peer-reviewed articles and documents containing information pertaining to diabetes, diabetes education, obesity, community interventions, and diabetes prevention that is geared toward AIs and other minority populations. A number of databases were searched in order to find high quality research that was used in this dissertation. A search in CINAHL, Medline, Cochrane, and PubMed were conducted using key words. The following key words were used: T2DM mellitus, T2DM mellitus and dietary practices, T2DM mellitus prevention, AI/AN, Native Americans, T2DM, education, obesity, community projects, school projects, diabetes prevention, diabetes programs, and rural communities. Federal and state documents about North Dakota American Indians history were used in order to explain the history of the Three Affiliated Tribe (TAT). The Center for Disease Control (CDC) website was also utilized in the search for current research and key facts.

Introduction

In the United States, AIs rank as the most poverty-stricken racial group in the United States (NDDHS, 2001). The backdrop of poverty is significant when examining certain disparities that the group faces. Difficulties that AIs face can be better understood when considering the population has faced hundreds of years of historical trauma, detrimental government policies, and unsuccessful attempts to access AI's land and natural resources (McLaughlin, 2010). A reservation can be defined as a tract of land that is set aside/reserved for AIs to live on (Reservation, n.d). Reservations tend to be geographically isolated and can lack basic infrastructure that may improve health and well-being (Sequist et al., 2011). As a result, tribal members often need to go off of the reservations to purchase food, clothing, furniture,

appliances, cars, and other services (McLaughlin, 2010). Money rarely stays on the reservation; therefore, the money does not remain in circulation locally to positively affect their economy and communities (NDDHS, 2001).

AIs face poverty at a high level, which can create many disparities. AIs experience poorer health outcomes and have a life expectancy that is more than five years shorter than the overall US population (Sequist et al., 2011). The AI community faces many challenges to health that can be divided into three types, behavioral factors, social determinants of health, and infrastructure issues. Social determinants of health include having a poor diet, lack of exercise, lack of transportation, and cultural and language barriers (Notah Begay III Foundation, 2015). Lacking basic infrastructures can also take a toll on AI's health, such as inadequate access to preventative or regular health care, poor access to quality medical care and updated medical facilities, mistrust of fear of the medical profession, lack of culturally competent care, and misconceptions about Indian Health Service (NDDHS, 2001; Satterfield et al., 2016).

AIs have the greatest likelihood of developing diabetes compared to any racial group in the United States in their lifetime (ADA, 2020; Adakai et al., 2018; CDC, 2017a; McLaughlin, 2010). Compared to whites, AIs are twice as likely to develop diabetes in their lifetime (CDC, 2017a). Many studies have found that the modern diet consumption of processed foods can lead to adverse health effects and returning to a more traditional diet can prevent diabetes (Sami et al., 2017). This includes improvements in metabolic abnormalities such as high cholesterol, triglycerides, insulin levels, and glucose intolerance (McLaughlin, 2010).

North Dakota

North Dakota has an estimate of over 200,000 individuals living with prediabetes ages 20 years and older and 49,000 adults living with diabetes (North Dakota Diabetes Prevention and

Control Program, 2016). This number implies that T2DM will become more prevalent with the increase of prediabetes in the state. AI youths aged 10-19 years are over 9 times more likely to be diagnosed with T2DM compared with non-Hispanic whites (NDDPCP, 2016). Due to the high level of risk for T2DM among AIs, the TAT in Mandaree, North Dakota was chosen as the selected site to implement this project. Because most of T2DM diagnoses are related to behavioral changes such as being less physically active and unhealthy eating habits that can start early on in life, the prevalence of T2DM can be decreased with an increase in community-targeted interventions (Geria & Beitz, 2017; Sequist, Cullen, & Kelly, 2011).

Mandan, Hidatsa, and Sahnish (Arikara) Nation

The location of the tribe, how AIs lived historically, and the differences in their clan systems are characteristics that make each tribe unique. The Mandan, Hidatsa, and Sahnish (Arikara) Nation, also known as the Three Affiliated Tribes (TAT), resided along the Missouri River spanning from North Dakota, South Dakota, and down into Texas. The tribes were divided between many camps and villages. Each nation had their own distinct differences regarding ceremonies, clan systems, and practices. The villages of the different tribes were constructed mostly with earth lodges. The tribe members were farmers, gatherers, and hunters, with a heavy reliance on buffalo for food, clothing, and shelter (McLaughlin, 2010). All parts of the buffalo were used, including the bones to craft various utensils and tools. They would trade their goods with each other, constructing a large trading system utilized between the tribal members and white settlers (North Dakota Department of Public Instruction, 2002). This way of life for AIs is important to understand how they strongly believe in valuing and respecting the earth and land for food and all of their other resources. Research has found that the relationship between the traditional lands and AI individuals has a profound effect on the health of an indigenous

individual (Notah Begay III Foundation, 2015). This is due to the wide belief of maintaining holistic health and wellness that is connected to their lands by eating traditional foods that is taken from their traditional lands (Notah Begay III Foundation, 2015). When there is a disruption in traditional lands, the health and wellbeing of indigenous people is evident by having more diseases and poorer health, which includes both physical and mental/emotional health (Notah Begay III Foundation, 2015).

The establishment of boundaries for the Mandan, Hidatsa, and Arikara territory were set-aside by the 1851 Fort Laramie Treaty. This treaty set up boundaries and agreements regarding all tribes and the United States government. The 1851 Fort Laramie Treaty was established in order to set the boundaries along with agreements for the US to construct roads and military posts through the land set aside for the tribes. The reservations set aside for the tribes were also supplied with $50,000 a year for fifty years. "The Fort Berthold Reservation was established under what is known as the Executive Order of 1870" (North Dakota Department of Public Instruction, 2002, p. 18).

On July 13, 1880, the Mandan, Hidatsa, and Sahnish (Arikara) Nation were deprived of a large amount of their land due to an executive order that was written without tribal involvement. The government reduced their land of over 12 million acres to one-tenth of its original size within 25 years. With buffalo, wood supplies, and the fur trade dwindling with white settlers moving in, Indian societies radically transformed over the next century (North Dakota Department of Public Instruction, 2002).

"The Executive Order of 1891 provided for the allotment of the Fort Berthold Reservation" (North Dakota Department of Public Instruction, 2002, p. 25). This order restricted the sale of unallotted lands, thus reserving the land plots for future tribal members. This order

also created individual landowners within the tribe. Therefore, this act went against everything that the tribe believed in. They never thought of land as individually owned, more as a communal use for the entire tribe. This act in turn made it possible for white individuals to purchase Indian lands. Because of this, millions of acres were lost, pushing the tribal members to lower social and economic levels by forcing members to assume a philosophy of individualism instead of working together as a group (North Dakota Department of Public Instruction, 2002, p. 26).

Schools were introduced in the mid 1870's, with the goal of bringing AI children into a "civilized" society. Without sending their children to school on the reservations, families would have their rations withheld by the government. Children were often forced to wear school uniforms. They were also given Christian names and sometimes, lost their original names. Many of the children would run away from the schools because of the environment, food, clothing, language, and the white schoolteachers' attitudes. They were not allowed to speak their own languages and were denied the ability to live out the culture they were born into (North Dakota Department of Public Instruction, 2002). It is important to understand the history and cultural values of the TAT in order to understand their social determinants of health and to be aware of cultural practices that may influence lifestyle behaviors on the Fort Berthold Indian Reservation.

Fort Berthold Indian Reservation

The Fort Berthold Indian Reservation is located in the northwestern part of North Dakota. The land spans over one-half of a million acres, reduced from twelve million acres with which they started (North Dakota Department of Public Instruction, 2002). The Fort Berthold Indian Reservation is one of five reservations in North Dakota. Fort Berthold has six districts known as Four Bears, Mandaree, Shell Creek, Lucky Mound, Twin Buttes, and White Shield (North

Dakota Department of Human Services, 2001; North Dakota Department of Public Instruction, 2002).

The Mandaree district was included in the practice improvement project. Mandaree, North Dakota is located in a rural setting. The lack of quick access to hospitals and healthcare services mean that community members must travel long distances to seek healthcare. They have a small clinic in town with no hospital, but the clinic is only open certain days of the week and often has a long wait time to be seen. Over 30 miles away is New Town, ND with Elbowoods Memorial Health Canter. This creates a disparity that will be discussed in detail for the community members. Indian Health Services (IHS) currently has an outreach clinic in Mandaree, ND which members utilize to manage their chronic diseases, such as diabetes. IHS is also at Elbowoods in New Town. The clinic in Mandaree has limited hours and days of operation. Mandaree has a population of around 600 according to the 2010 census. The distance to the nearest hospital is 32 miles to Watford City, ND for emergency services and specialty care. The next nearest hospital is located in Dickinson, ND at 69 miles.

Diabetes Pathophysiology

According to the WHO (2016), diabetes occurs when "the pancreas does not produce enough insulin (a hormone that regulates blood glucose), or when the body cannot effectively use the insulin it produces" (p. 11). This project will focus on T2DM because this type of diabetes is affected by behavioral modification. The risk factors associated with developing T1DM are unknown because the exact causes cannot be pinpointed. With T1DM being an autoimmune disease with no behavioral component involved, T1DM will not be an emphasis of this project.

Insulin is the hormone produced by the pancreas that allows the body to metabolize glucose. Glucose is used for energy, and it is stored in the body as fat in the form of triglycerides. Insulin is the main hormone that controls the blood sugars in the body by not letting the sugars become too high or too low, which can cause a number of problems in the body. When blood glucose is greater than 125mg/dL while fasting and greater than 180 mg/dL 2 hours after a meal, this is known as hyperglycemia (Mouri & Badireddy, 2019). In contrast, when blood glucose is too low, hypoglycemia occurs. Fasting plasma glucose levels of 100 mg/dL to 125 mg/dL are said to be glucose intolerant, or pre-diabetic (Mouri & Badireddy, 2019).

Every living cell on earth uses some form of energy. The body uses sugar/glucose as energy; however, glucose cannot freely pass into the cells by themselves. With the help of cells in the pancreas, known as beta-cells, insulin is released into the bloodstream. Glucose is then absorbed from cells that are signaled by insulin to pull the glucose from the bloodstream (Hess-Fischl, 2018). Without insulin, a human cannot survive.

T2DM accounts for 90% of all types of diabetes that are diagnosed. Insulin resistance and impaired insulin secretion are the two physiological abnormalities associated with T2DM (Hall, Lattie, & McCalla, 2016). Initially, insulin resistance increases, and insulin levels slowly rise, but the glucose level remains normal. Over time, this creates what is known as hyper-insulinemia, which then leads to hypo-insulinemia and produces elevated plasma glucose levels with the endocrine function being unable to keep up (Dunphy, Winland-Brown, Porter, & Thomas, 2015).

Prediabetes involves insulin resistance, which can be described as the decreased sensitivity of tissue to absorb the glucose with normal blood concentrations of insulin. When the blood becomes more saturated with glucose, the pancreatic beta cells are stimulated to release

more insulin, creating primary insulin resistance (Buttaro et al., 2013). Over time, the beta cells in the pancreas are unable to keep up with the demands for insulin production and are unable to make enough insulin to keep the blood glucose in the normal range. Because there is a shortage of insulin in the body, extra glucose stays in the bloodstream instead of entering the cells. Over many years, the chronic inability for the beta cells to produce enough insulin to properly process the glucose results in higher blood sugars. Over many years, that inability to keep up with demand results in dysfunctional beta cells wearing out in an effort to produce enough insulin, and ultimately producing negligible amounts of insulin (CDC, 2018b; NIH, 2018).

Diabetes Prevalence

Along with diabetes already being an important public health problem globally, more than 422 million adults were living with some form of diabetes in 2014, compared to 108 million people living with diabetes in 1980. With diabetes prevalence more than doubling in this thirty-year period, diabetes has quickly become one of the largest healthcare associated burdens globally (Bonilla et al., 2016; WHO, 2016). More recently, the National Diabetes Statistics Report (2017) stated that T2DM accounts for 90 to 95% of all diabetes types. In the United States, 10.5%% of the population has some form of diabetes, which correlates to 34.2 million people of all age groups (ADA, 2020). Of people that have diabetes, 26.8 million are diagnosed, compared to 7.3 million people being undiagnosed. Of this total population with diabetes, 210,000 children and adolescents younger than twenty years of age have diabetes in the United States. This is an alarming number of children and adolescents with diabetes, which can be prevented in some instances, considering only 5% of the population had T1DM, a nonpreventable, autoimmune disease (NDSR, 2017; WHO, 2016).

The prevalence of diabetes may be higher than reported because it is considered a silent disease. Over one-third of individuals go without knowing they have the disease. This is due to the disease often being asymptomatic in the early stages. Hyperglycemia can be defined as having high blood glucose (blood sugar) which occurs due to the body having too little insulin or when the body can't use insulin properly (ADA, 2020b). Hyperglycemia can occur over many years without being diagnosed properly, which can lead to long-term damage of organs and systems, such as the kidneys, eyes, nerves, heart, and blood vessels (Dunphy, Winland-Brown, Porter, & Thomas, 2015).

According to the National Diabetes Statistics Report (2017), "American Indians and Alaskan Natives had the highest prevalence of diagnosed diabetes for both men (14.9%) and women (15.3%)" (p. 3). These percentages consist of U.S. adults ages 18 years or older for the years 2013-2015. Looking at children and adolescents ages 10 to 19, "U.S. minority populations had higher rates of new cases of T2DM compared to non-Hispanic whites" (NDSR, 2017. p. 6). In line with the WHO Global Report on Diabetes (2016), the economic impact of diabetes and the complications associated with diabetes present a substantial concern for economic loss. This includes "people with diabetes and their families, and to health systems and national economies thorough direct medical costs and loss of work and wages" (WHO, 2016, p.6). According to ADA (2020), diabetes was the seventh leading cause of death is the U.S. in 2017 and cost more than $327 billion by March of 2018.

Diabetes Risk Factors

Life expectancy of a person living with T2DM can decrease due to a number of co-factors, such as hypertension, smoking, drinking alcohol, consistently high blood glucose levels, and by the duration of diabetes itself (Dunphy et al., 2015). There are known risk factors for

developing diabetes. Risk factors can be both preventable and non-preventable, classifying the risk factors as modifiable or nonmodifiable, respectively. Because the exact cause of T1DM is not known, it is under the assumption that it is caused from an interaction between genes and environmental factors, though there are no specific environmental factors noted (Hall et al., 2016).

Risk factors associated with T2DM are considered genetic, environmental, and metabolic (Hall, Lattie, & McCalla, 2016). "Ethnicity, family history of diabetes, and previous gestational diabetes combined with older age, overweight and obesity, unhealthy diet, physical inactivity and smoking" can increase the risk of the disease (WHO, 2016, p. 12). The strongest risk factor associated with developing T2DM is excess body fat, which can correlate to aspects of a person's diet and the lack of physical exercise that they obtain. A first-degree relative with diabetes is a strong indicator for developing T2DM.

Many studies have found the link between children and adolescents who are obese early on in life with a higher range of body mass index (BMI) percentiles are more likely to be obese as adults (Golden, Schneider, & Wood, 2016; Hall et al., 2016). When a child is obese, they are at a greater risk for developing T2DM and cardiovascular disease sometimes even by the time they become adults (Golden et al., 2016; Hall et al., 2016; Springer et al., 2013). A higher waist circumference and BMI are associated with an increased risk of developing T2DM (Springer et al., 2013; Vivian, 2010).

The dietary practices linked with an unhealthy body weight and/or risk factors for T2DM development include a high intake of saturated fatty acids, inadequate intake of fiber, high total fat intake, and consumption of sugar-sweetened beverages (McLaughlin, 2010; Sami et al., 2017; Steinbrecher, 2011; WHO, 2016). Sugar-sweetened beverages can include soda, juices from

concentrate, and sports drinks, which are made from large amounts of high fructose corn syrup. Consuming these types of beverages increases the likelihood of being overweight or obese, starting in early childhood, as well as the development of T2DM (Sami et al., 2017). Risk factors for developing T2DM include many different kinds of factors that can contribute to the increased risk of insulin resistance in T2DM. These risk factors include being overweight, physical inactivity, high red meat intake, high intake of sweets and fried foods, high alcohol consumption, and smoking, which may affect all ethnic groups (Sami et al., 2017; Steinbrecher, 2011). Other risk factors for developing T2DM include poor fetal growth and poor early childhood nutrition, which can result from low or high birth weight (CDC, 2017a). Actively smoking, being a former smoker (risks remain elevated for 10 years after smoking cessation) and having a sedentary lifestyle all contribute to the development of T2DM (WHO, 2016).

Risk Factors for AIs

The research between AI/AN communities and genetic variables that relate to diabetes is still ongoing. Genetic researchers have found it difficult to relate T2DM to specific genes. Studies examining genome-wide associations have found that 40 genes have been associated with T2DM. However, the identified 40 genes have only been associated with 10% of the overall genetic component of T2DM. This finding offers further support that the disease has a multifactorial etiology which includes both environmental and genetic factors (Dunphy et al., 2015; McLaughlin, 2010; Sahota, 2012).

More factors that contribute specifically to AI rates of T2DM include their genetics, environmental, and behavioral issues. This includes a "genetic predisposition toward insulin resistance, exposure as fetuses to hyperglycemia during pregnancy, sedentary lifestyles, obesity,

and the effects of living in environments that are stress-producing, from both a social and physical standpoint" (McLaughlin, 2010, p. 273; WHO, 2016).

There are numerous risk factors that are associated with the development of T2DM. Being a member of a high-risk ethnic population, which includes African American, Latino, American Indian, Asian American, and Pacific Islander is a risk factor (ADA, 2020; McLaughlin, 2010). "Socioeconomic factors, differential health-care practices, unequal access to health-care resources, and ethnocultural influences in diet and activity and the impact of institutionalized racism" have all been found to influence the disease prevalence (Dunphy et al., 2015, p. 889). This supports the statement that race is not truly a genetic predisposition to develop T2DM, but rather it is a proxy for social determinants of health (ADA, 2020). Because the AI/AN population is twice as likely to develop diabetes compared to other populations, the Mandan, Hidatsa, and Sahnish Nation's risk factors and barriers they experience will be reviewed when looking at healthcare disparities among the population.

Barriers to Healthcare

There are many identified barriers in accessing healthcare that the AI/AN population faces, which contribute to health disparities. One major barrier that has been identified is limited access to care due to restricted and inadequate funding with Indian Health Services (IHS) and geographical location/isolation the population faces (McLaughlin, 2010; Vivian, 2010). IHS is mostly located in rural areas, creating difficult circumstances for limited resources that are available (Satterfield et al., 2016; Kruse, Bouffard, Dougherty, & Parro, 2016). Even with student scholarship opportunities and loan repayment programs offered by IHS to attract physicians, recruitment is difficult in this area due to the isolation of the reservation (Sequist et al., 2011). There is also the topic that AIs face health challenges and disparities more than any

other racial/ethnic group in the US, such as having an increased rate of T2DM, obesity, CVD, and other health issues. The health challenges can defer providers from serving this population with fears that they will have more complex cases being in the IHS facility. The cost of healthcare, childcare, transportation and traveling will also be looked at when considering different barriers.

Indian Health Services

Indian Health Services (IHS) was established in 1955 in order to serve members of federally recognized tribes for both AIs and ANs. IHS provides health care services through small hospitals and outpatient health centers. There are 565 tribes with over two million members that utilize IHS for healthcare services. IHS facilitates primary care services, prescription drug coverage, and some specialty services, although limited specialties are available (Jacobs-Wingo et al., 2016; Sequist et al., 2011).

The services provided at IHS usually do not include specialty care. These facilities are primary care clinics, and patients are often referred to other facilities when they have a larger health care need that the clinic is not equipped to handle (Jacobs-Wingo et al., 2016). A study conducted by Dennis and Momper (2016) concluded that there are many more needs than IHS can handle at this time. An increasing demand for services at IHS exists, and patients are placed on waiting lists, leaving patients with unmet health needs (Sequist, et al., 2011). The delay to care often leads to an increase in referrals, thus waiting 25 to 30 days for an appointment (Sequist, et al., 2011). The IHS is chronically underfunded with a chronically underserved patient population; therefore, the federal government must fulfill their responsibility to the AI communities as mandated by federal treaties. This can be accomplished by updating facilities and equipment, creating more facilities to minimize the geographic distance between sites, and

increasing the number of qualified providers available to care for these patients (Dennis & Momper, 2016; Hoyer, 2017; Jacobs-Wingo et al., 2016).

Transportation and Travel

Multiple transportation barriers exist when it comes to accessing healthcare services for AI/ANs living on a reservation, such as not having a car, license, or financial resources for gas. Because of the isolation of the reservations and IHS, obtaining healthcare can be difficult for tribal members. Many people are required to travel long distances to seek health care (Jacobs-Wingo et al., 2016; Sequist et al., 2011; Vivian, 2010). Also, when a public transport bus does not leave city limits, people cannot travel out of town if they do not have a car or money for fuel. Additionally, AI individuals have a higher need for transportation for mobility-dependent residents (Sequist, et al., 2011). Most public bus transportation services operate around city limits and do not travel to other cities or towns for a variety of reasons, including the driver's scope of practice and the cost of fuel for the transit (Mielke, 2011).

Due to the high cost of transportation, tribal members often carpool with each other to events or to appointments (Vivian, 2010). Shinstine, Denzer, and Ksaibati (2015) found that it is typical for tribal members to have a hard time getting around their town or community. Additionally, for younger tribal members, immobility tends to create social problems. Reservations typically have a higher rate of unemployment, higher poverty levels, and lower educational achievement (Sequist, et al., 2011). On reservations, many members of the community do not drive or own a vehicle (Vivian, 2010). The lack of transportation is especially concerning for the elderly or disabled (Shinstine et al., 2015).

Telehealth

In rural reservations across the United States, telecommunication technology has been explored since the early 1970's as a way of addressing the costs, quality, and access to healthcare. Telehealth offers rural American Indian communities affordable healthcare despite poor access in rural areas (Kruse et al., 2016). Increasing access to healthcare for the rural population could be obtained by providing educational services and culturally competent care with the convenience of not leaving the reservation, especially for specialty care (Kruse et al., 2016).

Telehealth offers many benefits for use within the IHS on the reservation, of which reducing travel costs and time are the biggest factors. Travel costs and time could be reduced with the use of telemedicine, regardless of geographical location. This can also eliminate traveling time for providers and educators. Time spent away from home and work to travel for healthcare could result in wages lost. Many patients must also seek childcare in order to travel. AI women often fill the role as caretakers, which can impact the health of the women because they may not be able to seek healthcare due to childcare restraints (Kruse et al., 2016).

Cultural Beliefs

The AIs' perceptions about diabetes and practices start with understanding the importance of spirituality and adherence to ceremonies, rituals, and native beliefs. Medicine men and the IHS are valued greatly in tribes. They believe in a holistic approach to healing. The Dakota indigenous tribes believe that diabetes is a result of a loss of traditional ways and a change in diet (McLaughlin, 2010; Sahota, 2012). This idea correlates with the land that was taken from them many years ago, as they were repressed to reservation life, therefore, being forced to conform to white civilization.

AIs culture is connected with the importance of their spirituality and adherence to ceremonies, rituals, and native beliefs (McLaughlin, 2010). Some cultural beliefs include the use of medicine men, sweat lodges, the Sun Dance ceremony, and the use of the Medicine Wheel for a visual tool. Storytelling is highly valued as a way for elders to teach the younger generations about tribal ways and traditions. Talking circles are also still used today to teach traditions and culture. Talking Circles were used in a study as a method for providing education and emotional support to individuals and their family members when coping when diabetes and offered users a community action (McLaughlin, 2010).

Diet and Exercise

Before the start of reservation life, AIs were thought to have expended over 4,000 calories per day (McLaughlin, 2010). Activities of daily living included farming, husking corn, hunting, fishing, canoeing, picking berries, and tanning hides. There were also frequent powwows that involved strenuous physical activity (McLaughlin, 2010; Satterfield et al., 2016). The move to reservation life brought tremendous loss for caloric expenditure for tribal members, with most AIs in the United States starting reservation life by the mid 1870's. Physical activities would continue to decrease over the next 150 years to present day for tribal members (Sahota, 2012).

Moving to reservation life also brought changes to the dietary intake of most tribal members. The AIs thrived on a hunting/gathering lifestyle and eating wild game, such as buffalo, elk, rabbit, snake, and fish, berries, and root vegetables, as well as teas made from wild herbs (McLaughlin, 2010). This diet contrasts significantly from modern day food consumption, in which the diet of a person living in the United States consists of highly processed foods high in sugar and simple carbohydrates (Sahota, 2012). The typical diet today is also higher in fat,

sodium, sugar, and cholesterol concentrations. Dietary fiber, vitamin, and mineral contents have dramatically decreased (McLaughlin, 2010; Sahota, 2012).

Food market placement can also be a barrier identified when looking at ways that AIs can access affordable produce and other healthy food groups. A lack of grocery stores located on the reservation leads to less access to a wider selection of nutrient-rich foods. Convenience stores are more prevalently located on reservations than grocery stores (McLaughlin, 2010). Convenience stores often carry more processed foods and high sugar-content drinks such as sodas and energy drinks compared with the fresh produce and whole foods that grocery stores carry (McLaughlin, 2010). A member of the Fort Berthold tribe often must travel over 30 miles to the nearest town to obtain groceries, creating a notable disparity.

Education

Educational barriers exist within the IHS. One major barrier is education material that is provided to the patients. The educational material may not be effective because they are not specifically developed to target the AI and AN population. This includes having suitable reading material with an appropriate health literacy level (Sequist et al., 2011). IHS also employs many traveling providers and nurses, thus culturally relevant material may not be given to patient at their visits. Without indigenous peoples' culture leading the way in their plan of care for medical conditions and health promotion and disease prevention, learning about health may not be fully achieved.

Mistrust

There is a large gap of cultural differences between both providers and patients within the IHS. Ten percent of physicians reported cultural barriers are present during clinical encounters (Sequist et al., 2011). The cultural dissonance can create a challenge when trying to deliver

effective care within the IHS. Mistrust can also stem from other issues, such as having limited access to quality medical care and updated medical facilities, and adequate health coverages (NDDHS, 2001, p. 17). There is also the fears of judgement or discrimination that the population faces.

Diabetes Prevention

Prevention of T2DM should be culturally appropriate for any ethnic group that is being targeted. Being overweight, physical inactivity, high meat intake, alcohol consumption, and smoking were positively correlated to the development of T2DM for all ethnic groups (Bonilla et al., 2016; Steinbrecher et al., 2011). Of new diabetes cases, it is extrapolated that 78% of men and 83% of women could have prevented the development of T2DM if the individuals were in the low risk category for all modifiable risk factors noted (Steinbrecher et al., 2011). Modifiable risk factors can include obesity from a sedentary lifestyle, alcohol consumption, diet, and physical activity (NIH, 2016). These factors account for one-third to one-half of the association between diabetes and socioeconomic status (Bonilla et al., 2016).

T2DM can be preventable in high risk adults through behavior change. T2DM prevention, such as reducing childhood obesity and other risk factors at the individual or population level in youth could lower the incidence of T2DM over time (NIH, 2016). The healthcare system and communities need to plan and prepare for high quality healthcare for the growing numbers of youth with diabetes (Imperatore et al., 2012; Steinbrecher et al., 2011). Preventing diabetes is a top priority, considering the morbidities that individuals face once they are diagnosed with the disease, which include chronic kidney disease, cardiovascular disease, and amputation of the lower extremities (AHA, 2018; Sequist et al., 2011).

The first step of preventing T2DM in children is identifying the children that are at the highest risk (Vivian, 2010). Children and adolescents who are obese are more likely to be obese as adults (Golden, Schneider, & Wood, 2016). The criteria for being at high risk for developing T2DM includes but is not limited to being overweight (BMI at or above the 85th percentile for age and sex) with two or more of the following risk factors: family history of type 2 DM in a first- or second-degree relative; Native-American ethnicity; and signs of insulin resistance (acanthosis nigricans, hypertension, polycystic ovarian syndrome, or other conditions associated with insulin resistance) (Golden et al., 2016; Vivian, 2010). Because families living in communities that are underserved or uninsured are harder to target for early diagnosis, there is a greater need for health services and resources for the prevention of diabetes in areas that experience significant disparities (Jacobs-Wingo et al., 2016; Vivian, 2010).

Physical Activity

It is recommended across many guidelines and reports that children and youth ages 5-17 years should obtain at least 60 minutes of moderate to vigorous-intensity physical activity daily (American Heart Association, 2018; CDC, 2017a). Physical inactivity and T2DM are linked because obtaining enough physical activity/exercise has protective mechanisms related to synergistic effects with insulin (Sami et al., 2017). It is suggested that skeletal muscle contractions enhance glucose uptake into the cells, therefore increasing blood flow and moving glucose into the muscle cell. Lastly, a reduction in intra-abdominal fat from physical activity can be reduced, which is important for diabetes risk reduction because having this increase in intra-abdominal fat increases insulin resistance.

For adults ages 18-64 years, 150 minutes of moderate-intensity aerobic physical activity should be obtained throughout the week, or at least 75 minutes of vigorous-intensity aerobic

physical activity throughout the week is recommended. Aerobic physical activity can include jogging, brisk walking, biking, swimming, Pilates, yoga, or gardening (American Heart Association, 2018; CDC, 2017a; WHO, 2016).

Diet

The current recommendations for food choices to prevent T2DM varies across studies. The 2015-2020 Dietary Guidelines for Americans uses MyPlate to offer healthy eating patterns to maintain health and to reduce the risk of disease (Dietary Guidelines for Americans 2015-2020, 2015). The main topics for MyPlate include making half of the plate fruits and vegetables and having the other one-fourth of the plate be grains and one-fourth being protein. Also, moving to a low-fat and fat-free milk or yogurt, varying protein routine, drinking and eating less sodium, saturated fats, and added sugars is recommended (Dietary Guidelines, 2015). The key recommendations outlined in the guideline show that healthy eating patterns are associated with a reduced chance of developing T2DM along with reducing the risk of being overweight or having obesity. Healthy eating patterns have been associated with having a consistently higher intake of vegetables and fruit. Other characteristics of eating healthy include eating more fat-free or low-fat dairy and having a lower intake of meats and sugar-sweetened foods, particularly beverages (CDC, 2017a). The WHO and the Food and Agriculture Organizations (FAO), recommend for the prevention of T2DM to limit saturated fatty acid intake to less than 10% of the total energy intake and to achieve an adequate intake of fiber (20g) by consuming cereals, legumes, fruits and vegetables regularly (CDC, 2017a).

Challenges for Youth

The stages of school-age children (6-11 years) and adolescents (12-18 years) are considered a timeframe for growth and development, with illness not being expected in this age

group. Psychological and physical changes occur during this time period (American Academy of Pediatrics, 2013). With the annual rate of T2DM among children and adolescents increasing from 4.8% from 2002 to 2012 and the projected rate to have a 49% increase of diagnoses of T2DM from 2010 to 2050, it is imperative to prevent more disease burden by targeting school populations (Geria & Beitz, 2017). Because children and adolescents are in a transitioning stage in their life, they are at an increased risk of developing T2DM and obesity based on behavioral changes (Satterfield et al., 2016). "Research has identified links between physiological stress responses in childhood and neurologic changes to the brain that can affect the complex web of causation for chronic disease and other threats (Satterfield et al., 2016, p. 4). There is a great need for early interventions for AI/AN populations, particularly youth early on in life (Francis & Chino, 2012). This will help to facilitate lifestyle changes that can reduce risk factors for developing T2DM by eating healthier and getting regular exercise (Jacobs-Wingo et al., 2016).

Educational Programs

Because the prevalence of T2DM is higher in racial/ethnic minorities, it is important to reduce disparities related to the disease by developing successful prevention strategies that can be implemented smoothly into a target population. Education could potentially have a strong impact on populations by providing guidance and recommendations for future generations. Different educational resources for preventing T2DM will be examined. The educational programs examined were the Centers for Disease Control and Prevention (CDC) Diabetes Prevention Program (DPP), the Special Diabetes Program for Indians Diabetes Prevention (SDPI-DP), Diabetes Education in Tribal Schools (DETS), and the Native Diabetes Wellness Program. These curricula have all been implemented in long-term studies and are evidence-based.

Previous studies have found that exercise, diet, and behavioral modifications have been shown to prevent T2DM (AHA, 2018). Some studies, however, have found that lifestyle interventions, such as diet and exercise, are less successful among populations with lower socioeconomic status (CDC, 2017; Jiang, Chang, Beals, Bullock, & Manson, 2018; Jiang et al., 2015). The effectiveness of lifestyle interventions is likely affected by neighborhood factors. An example of this would be a community attempting to increase their physical activity. Increased physical activity usually calls for a safe space and/or accessible exercise facilities. Individuals living in more disadvantaged neighborhoods have fewer resources in order to meet these goals; therefore, they would be less likely to reach their fitness and lifestyle intervention goals (Jiang et al., 2018).

Centers for Disease Control and Prevention National Diabetes Prevention Program

The CDC Diabetes Prevention Program (DPP), provides a framework for diabetes prevention efforts by bringing together partners from the public to prevent or delay the development of T2DM in the United States (Candela et al., 2012). Partners include federal agencies, state and local health departments, national and community organizations, employers, public and private insurers, healthcare professionals, university community education programs, and businesses that focus on wellness. This program works by making it easier for people with prediabetes to engage in affordable, high-quality lifestyle change programs to reduce their risk of developing T2DM and to improve their overall health. These programs teach participants to make lifestyle changes such as eating healthier, adding physical activity to their daily routine, and improving coping skills (CDC, 2017).

The DPP is a 16-module course that is completed over one year. Courses can be taught online or in-person. In a study conducted by Geria and Beitz (2017), they found that using a

modified version of the DPP yielded positive results for adolescents. The results suggest that the modified DPP increased knowledge and self-efficacy in order to achieve health promotion behaviors that can be associated with preventing or delaying the onset of T2DM. Programs for diabetes prevention that consists of healthy eating, physical activity, counseling, and group or individual sessions have prevented or delayed the onset of T2DM (Geria & Beitz, 2017). Research demonstrated by Geiria and Beitz (2017) has shown that in adolescent populations, T2DM prevention programs that focus on diet and exercise effectively decreases T2DM risk factors.

When considering implementing a condensed version of the original 16 module CDC DPP, language should be adjusted to be appropriate for adolescents and children. Age and culture must always be considered, therefore, adjusting food examples and activity suggestions should be implemented. To facilitate dissemination of the DPP in a community setting, it is advised that the dose of the intervention is considered to achieve the maximum benefit (Geria & Beitz, 2017). A group-based approach has many positive factors such as being cost effective and providing social support to increase the likelihood of adherence to physical activity recommendations (Candela et al., 2012; CDC, 2017a; Hall, Lattie, & McCalla, 2016).

Special Diabetes Program for Indians Diabetes Prevention (SDPI-DP)

Congress established what is known as the Special Diabetes Program for Indians Diabetes Prevention (SDPI-DP) in 1997 in response to the diabetes epidemic among AI and AN people (Knowler & Achermann, 2013). The funds covered diabetes prevention and treatment services, granting $150 million annually to IHS, Tribal, and Urban Indian health programs in the United States (Jacobs-Wingo et al., 2016). The SDPI-DP Program was designed to reduce diabetes incidence through the DPP lifestyle interventions that were previously created for the

DPP. The outcomes of the project were measured by calculating BMI, physical activity by using the Rapid Assessment of Physical Activity (RAPA) tool, diet information, participants demographics and socioeconomic characteristics, and staff demographics (Jiang et al., 2015).

The IHS SDPI-DP study reported that community activities to prevent diabetes are important and include activities such as promotion of traditional foods and community gardening, campaigns to increase diabetes awareness and knowledge, and the use of storytelling and talking circles (Jacobs-Wingo et al., 2016; Knowler & Achermann, 2013).

Diabetes Education in Tribal Schools (DETS)

The Diabetes Education in Tribal Schools (DETS) curriculum is an evidence-based program that was established in 2001 in order to address T2DM in the community setting of AI/AN populations (NIH, 2019). This program was part of a national effort to decrease the incidence of T2DM among AI/AN and was based off of the DPP. The program is designed for grades K-12 that incorporates AI/AN cultural and community knowledge (NIH, 2019). The goals of the curriculum were to increase the understanding of health, diabetes, and maintaining life in balance among AI/AN students, to increase AI/AN students' understanding and application of scientific and community knowledge, and to increase interest in science and health professions among AI/AN youth (NIH, 2019).

Because AI youth are at a high risk for developing T2DM, effective prevention programs targeting this group of youth is a public health priority for this population (Francis & Chino, 2012). In the 2007-2008 school semester, the DETS curriculum was evaluated in 14 states in the school setting to see how students responded to the program and also had teachers' ratings of the program. The findings indicated that this curriculum had an effective impact relative to its three goals. Overall, students consistently showed significant knowledge gains across all content and

grade levels including elementary, middle, and high school, with teachers rating the program "strong" or "very strong" (Francis & Chino, 2012). The DETS curriculum targets an audience from pre-K to the 12th grade of high school.

Native Wellness Diabetes Program

The Native Wellness Diabetes Program, offered through the CDC offers a balance between cultural practices and western medicine. The program is incorporated into reservations to prevent T2DM by increasing health promotion practices among AIs and ANs who are at risk. This program has gathered stories about tribal efforts to reclaim traditional foods. This includes promoting healthy eating and physical activities (CDC, 2018a). There are many educational materials that can be utilized, such as the Eagle books, art projects, and play scripts.

The Eagle books are included in the Eagle Adventure program that can be a useful tool to use for many educational outlets (CDC, 2018c). The books are short stories that can be read during school, after-school programs, story time, and read at local library readings. All of these programs had successful outcomes and were beneficial in the community setting for preventing T2DM and decreasing risk factors.

Theoretical Framework

The Social Ecological Model was used as the framework for this project by providing education on preventing T2DM and obesity in AI children. The main focus for the model is on the individual, family, organizations (school), and policy. By impacting individuals and providing education in the community setting, the hope that prevention of these diseases can be achieved in the future by addressing multiple aspects of the Social Ecological Model. Cultural aspects were taken into consideration and fit well with this model. Children are not able to change behaviors or prevent diabetes and/or obesity without having changes in the family,

school, and the community setting (CDC, 2018). The Social Ecological Model is a useful framework for understanding the many factors that influence health and wellbeing, specifically health behaviors, including the social determinants of health for populations. Because of this, the Social Ecological Model can be used to integrate components of other theories and models, thus ensuring the design of a comprehensive health promotion or disease prevention program or policy approach. The Healthy People 2020 framework addresses the importance of ecological models in health promotion and disease prevention. Programs are most likely to be effective when they are designed to address the multiple levels of influence on health behaviors (Rural Health Information Hub, 2019).

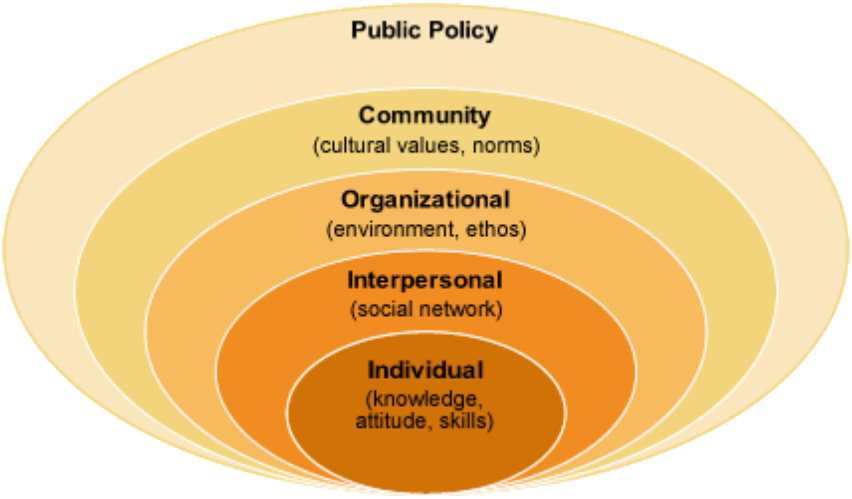

Figure 1. Social Ecological Model.

There are many factors that play into a person's health, starting with the individual. Factors within the individual person can include their physical health, personal preferences, knowledge and skills, age, sex, socioeconomic status, and race/ethnicity (Dietary Guidelines, n.d.). An individual will make food and beverage choices based on their individual eating patterns, food and cooking knowledge, age, and their ability to shop and cook for themselves. A child will make choices based on what they learn and what is cooked for them. The goal when

educating is to "develop programs that can help the individual to enhance their knowledge, attitudes, and motivation to make healthy choices" (Dietary Guidelines, n.d., para. 6).

A social environment can have a profound effect on an individual's thoughts, beliefs, and behaviors. These environments can include home, school, childcare services, worksites, and community centers. Because AI/ANs have long experienced health disparities, such as a lower life expectancy, poverty, and lower educational attainment, which affect the health of AI/ANs (IHS, 2019). Environmental settings have the power to determine what foods are being provided and what physical exercise activities are readily available. Without a supportive nutrition and physical education program, individuals' choices are limited.

Sectors that are involved in a community can include healthcare facilities, transportation, public health centers, governments, media, marketing, and retail. Owning a car, longer distances to grocery stores, and supply of healthy foods, such as fruits and vegetables can be difficult for tribal members to obtain. These community sectors have control over helping an individual make healthy choices because they can influence the degree to which people have access to healthy food and/or an opportunity to be physically active (Dietary Guidelines, n.d.). Without the proper infrastructures to provide a safe space to perform physical exercise and to make healthy food choices, children's options are limited.

Plan-Do-Study-Act

The Plan-Do-Study-Act (PDSA) framework was used as a quality improvement model for this project. The PDSA framework uses a four-stage problem-solving model that can help carry out change including plan, do, study, and act as the four stages (Institute for Healthcare Improvement [IHI], 2019).

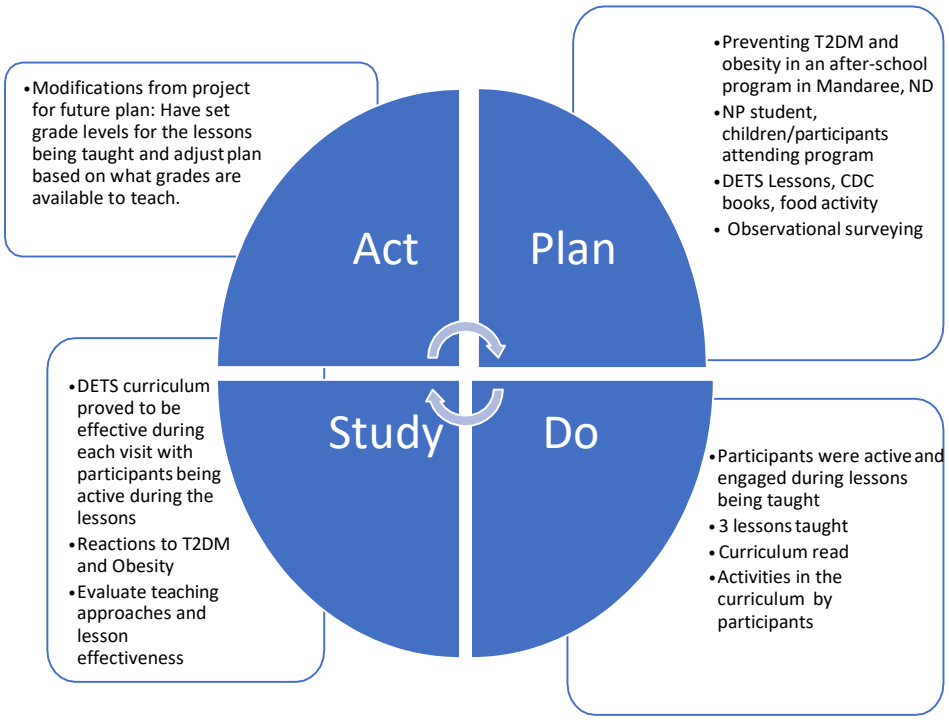

Figure 2. PDSA.

Using the Social Ecological Model and PDSA to help guide diabetes prevention education within the school system was used to improve outcomes for students. It is crucial to provide AI children with preventative education in the school and home setting so they can develop healthy eating habits and increase their physical exercise as children and adolescents. By providing culturally appropriate education in the community setting, children can better retain and apply information and behavior changes (Satterfield et al., 2016). Early education has the potential to promote behavioral change and increase knowledge that will happen in the short term with longer term impact on reducing the risk of T2DM in this AI population. Children may not have as much choice with what foods they are consuming, which may be related to their parents buying and preparing groceries, cost, or other constraints placed on the family. However, children can still make a conscious effort to stay active, choose healthier options in the lunch line or salad bar, and avoid eating refined sugars and sugary beverages for snacks.

AI/ANs experience significant health-related disparities compared to other minority populations in the United States. With AI/ANs at an increased risk for developing T2DM and/or obesity, health-related disparities are high for this population. Knowledge of AI/AN culture and their history can help individuals understand the historical trauma that AI/AN populations have experienced in the past to provide better education to the population. By incorporating culturally appropriate education in the school settings, community health projects have the potential to diminish health-related disparities and promote health and wellness among AI youth.

CHAPTER THREE. METHODS

Project Design

The steadily climbing rate of T2DM is affecting individuals, families, communities, healthcare services, and overall populations at a fast rate especially the AI/AN population. The literature review displayed the effectiveness of diabetes prevention programs and the need to implement evidence-based diabetes prevention programs into the community setting for prevention of T2DM. The amount of money needed and long periods of time to complete diabetes preventative programs can be a barrier to implementation.

This pilot project aimed to determine the feasibility of a school-based intervention designed to increase school-aged children's knowledge regarding healthy lifestyles and T2DM prevention. The community health promotion program was implemented and evaluated in a vulnerable community. The sample was a convenience sample including grades 1st through 3rd graders and included 15 participants. The education included information regarding healthy food choices and increased physical exercise from the DETS curriculum (National Institute of Diabetes and Digestive and Kidney Diseases, 2019). The project was guided by current research and diabetes prevention outcomes. The Eagle books were also utilized as they are incorporated into the DETS curriculum and are an evidence-based learning tool. The Eagle books were first designed for the Native Wellness Diabetes Program but were also added into the DETS curriculum for added content (NIDDKD, 2019). Lessons from the DETS curriculum was implemented into the club on set days that were planned by the club manager, Oliva Spotted Bear. All grade levels were taught the same lesson, so no after-school participants were left out or excluded from the lessons.

Storytelling is regarded as highly valuable when teaching younger generations about tribal ways and beliefs. Talking circles are also used to teach members about health education and promotion (McLaughlin, 2010). A talking stick can be used during talking circles, ensuring the person holding the talking stick is the only one that is speaking at that time. Because of the cultural impact of storytelling and talking circles were utilized when providing the lessons to the participants present to help facilitate learning.

Plan-Do-Study-Act

The Plan-Do-Study-Act (PDSA) framework was used as a quality improvement model for this project. The PDSA framework uses a four-stage problem-solving model that can help carry out change (Institute for Healthcare Improvement [IHI], 2019). The first step was to plan, which involved recruiting a team at the after-school club in Mandaree. The problem statement was stated clearly, and the causes were outlined. A literature review was conducted in order to identify gaps in diabetes education and identify ways to prevent the development of T2DM and obesity. Stage two involved implementing the action plan. The teaching sessions were carried out at the after-school program in Mandaree with the children that attended on those days. The third step was to study and determine what the results after each session as well as after the project was implemented.

Project Implementation of DETS Curriculum

The first step was to organize the curriculum to present to the students. Multiple sources were used to gather information regarding healthy food choices and physical exercise recommendations to prevent T2DM and obesity, such as the CDC and the DETS curriculum (NIDDKD, 2019). The National Institute of Health (2019) recommends initiation of diabetes

education and prevention programs in tribal schools should be initiated to prevent T2DM in American Indian and Alaska Native communities.

The Eagle books are a pre-developed program to be used in community settings. Lessons from the DETS program were used as teaching material to facilitate education that was culturally appropriate. To facilitate an intervention in the community setting, it is advised that interventions are appropriate for the target population (Hall et al., 2016). Because the books are easily accessible and can be incorporated into indigenous culture, such as talking circles and storytelling, the Eagle books that were incorporated into the DETS curriculum were read to the club.

In response to the rising incidence of T2DM, the CDC, IHS, Tribal Colleges and Universities (TCU), NIH, and the Tribal Leaders Diabetes Committee collaborated to create the DETS curriculum. The National Institute of Health describe the DETS curriculum as:

> "The lessons are designed to enhance the understanding and appreciation of the problems of diabetes in American Indian and Alaska Native communities, to empower students to make healthy lifestyle choices, and to stimulate general student interest in diabetes-based science careers" (NIH, 2019, p. 6).

AI culture and national education standards for the subjects is the basis for this curriculum. The DETS curriculum includes grades K-12 with culturally relevant activities incorporated into the programs to increase diabetes prevention efforts and to enhance students' cultural awareness (NIH, 2019).

It was anticipated that students would be positively impacted from this project. The education was presented to educate school-aged children about diabetes among the AI population and offer healthy strategies to enhance health and well-being, while also reducing their risk for

developing T2DM and obesity. Using age appropriate reading material for each grade level was crucial for comprehension of the material being learned in order to achieve the objectives. With the grade levels being mixed for the project, the club manager was the leader for deciding which age-appropriate lessons from DETS curriculum would be most beneficial and easiest to understand for the group. Health literacy can be defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions" (ODPHP, 2019, para. 1). With this in mind, visual and auditory teaching material were used instead of written questionnaires, which can be difficult to understand for children with varying literacy skills.

Information was used from multiple sources, including the DETS curriculum and the Native Diabetes Wellness Program (CDC, 2018a; NIDDKD, 2019). Information was gathered from each source and was then condensed down in order to increase awareness and enhance knowledge and learning about behavioral modifications that school-aged children can incorporate into their everyday lives, such as increasing daily activity and eating healthy foods. The target population included children in the Mandaree, ND after-school program who attended the club on the set days that the curriculum was presented. Enhancing learning, having an open dialogue with students that have questions and concerns, and promoting positively impacting health behaviors could potentially reduce the risk of children and adolescents from developing T2DM.

Setting

The Boys and Girls Club of America (BGCA) of the TAT-Mandaree Unit is an after-school program located in Mandaree, ND. The mission statement for the club is explained as: a non-profit youth organization which promotes positive attitudes and healthy lifestyles for kids

(Mandan, Hidatsa and Arikara Nation [MHA], 2018). The BGCA is open Monday through Friday, from 10am-6:30 pm, and receives 25-50 youth daily, depending on practice and other after school activities. The BGCA has a club located in Mandaree next to the school and also utilize the school gym when available.

Sample Recruitment

Participants were recruited for this pilot project by being present at the club on the set dates that the curriculum was being presented to the group. Participation was voluntary, but all members were encouraged to participate by the club manager. All members participated that were present at the club (N=15), and none declined participation. The data and samples were obtained for this project by convenience. All students were offered participation in the project. No consent was needed, because no part of the student's personal information was being utilized, therefore, minimizing the risk to the actual subjects/students. The inclusion of children and minorities in this capstone pilot project were important and the main focus of the project. AIs being a minority is the population being looked at. Children and adolescents are the population group.

This community health project followed the regulations of the North Dakota State University (NDSU) Institutional Review Board (IRB). According to the NDSU IRB, the project does not require IRB approval or certification of exempt status because it does not fit the regulatory definition of "research involving human subjects." The risk was minimized because no confidential information was obtained in order to complete this project; therefore, the IRB determined that the project did not meet the criteria for research. Refer to APPENDIX A for NDSU IRB approval letter.

Potential risks for the students were minimal. School-aged children were provided educational information on making healthy food choices and what exercise activities they can incorporate into their lives. Behavioral modification was assessed by having the individual children completing a chart on the days they are at the after-school program with stickers. By performing educational sessions in a school setting, classifying this as a common educational environment according to NDSU IRB, no consent was needed from a parent or guardian. Children are considered a population that is vulnerable due to their limited intellectual and emotional capacities.

Evidence-Based Project Interventions

The PDSA model was used when evaluating the curriculum after each session to ensure that the group was comprehending the material that was chosen by the co-investigator and the club manager. The feasibility of this community-based pilot project will be evaluated according to each objective, through observational surveying and a descriptive qualitative study that focused on participants' responses to the implemented lessons. Potential benefits of the proposed project to the students and others included gaining valuable information that they can incorporate into their everyday life at home and at school. The benefits of this project can be useful to both children and their parents in the home setting. Healthy eating habits can be improved in the home and school setting and children will also learn the benefit of increased physical exercise into their daily lives. By teaching this important information at a young age and instilling it in the school setting, children can hopefully gain behavioral modification strategies that improves their health, and over the long-term, may prevent obesity and/or T2DM.

Lifestyle changes are effective to prevent or delay the onset of T2DM. Other studies which use the DPP have shown that delivering lifestyle interventions in group settings at the

community level are also effective when reducing the risk of developing T2DM (Office of Disease Prevention and Health Promotion, 2019). A single setting in the Mandaree, ND school system was looked at for this project. Elementary school-aged children (grades 1st-3rd) attending the Mandaree after-school program are included in this project. There was also a mixture of grades 1-6 that attend the club, but the majority of students attending are grades 1-3. Lessons from the DETS program created by the CDC were used for the project and the grade level 3-4 were chosen with the help of the club manager who determined the middle age range of students that were attending.

The lesson plans chosen for the group included: Unit 1 Lesson 4: What is Diabetes? How to Find Out more, Unit 2 Lesson 1: Recognizing "Tricky Treats", and Unit 4 Lesson 2: Then and Now-Traditional and Modern Foods and Activities. Unit 1 Lesson 4 included information regarding beginning to understand what diabetes and disease is, reading and discussion the Eagle Book, *Through the Eyes of the Eagle,* and learning what glucose is and how the body uses glucose. Unit 2 Lesson 1 included information about examining ads, commercials, and packaging for "tricks" used to persuade consumers to buy a product. The second part of this lesson included reading the Eagle Book, *Tricky Treats.* Unit 4 lesson 2 included students comparing foods and activities of the past with those of the present. They then explored the importance of healthful diet and exercise and compared and contrasted the diet and activities of the past.

The curriculum was presented to the after-school program on three separate visits that lasted 30-45 minutes per session. The varied literacy levels of elementary-aged children were taken into consideration for this project. Outcomes were considered met if students' answers

were correct, student's food choices were healthier, and student's incentive charts were completed when they attend the after-school program.

Evaluation/Data Collection

Data was collected for this project by transcribing audio recordings of the participant's responses to the questions that were in the lessons provided from DETS, which will be disseminated in the form of descriptive themes. Their responses were then transcribed on a Word document after each visit. This information was obtained and saved on a personal computer with passwords in place for protection of answers. No personally identifying information was gathered on the participants that were at the club. Participant's first names were written on the sticker charts for the clubs use to track if they had chosen to eat a fruit or vegetable that day, and if they chose to do a physical activity/exercise for that day. The children and staff were instructed how to place stickers next to their name for each day they made a healthy decision. At each session, the number of participants was recorded.

Evaluation Methods

Evaluation of the diabetes education provided to the kids in the after-school program in Mandaree, ND was measured through qualitative interviewing questions that were conducted during each lesson. Participation was voluntary in this project. Multiple questions were asked during each lesson to help evaluate if learning was achieved by having the group answer the pre-populated questions that are in the DETS lesson plans.

Data for the project was collected by recording answers and later transcribing the children’s answers to the questions that were asked in the lesson plans. The initial data report was collected on March 6, 2020 and concluded on March 12, 2020. There were 15 participants

with grades ranging from first grade through third grade who participated in the project, with the majority of participants in the first through third grade.

Objective One

Present educational lessons to students of the after-school program.

The first objective was to present educational lessons to students of the after-school program to increase knowledge and an understanding of health, diabetes, and diabetes prevention among American Indian students. The evaluation for this objective was measured through collecting data on the days the lessons were implemented at the club, such as what days the lessons were taught and how many participants were present. The data was then put into a table.

Objective Two

Improve students' overall knowledge/awareness of diabetes and obesity prevention among youth attending BGC after-school program in Mandaree, ND.

The second objective was that the students will improve their overall understanding of diabetes and obesity prevention among youth attending BCG after-school program in Mandaree, ND by translating information from the curriculum that was taught to them by verbally responding back with answers to questions about the curriculum. This objective was measured through qualitative data that was collected and transcribed from the participants during the lessons.

Objective Three

Promote healthy behaviors for students throughout implementation phase.

The third objective was promoting healthy behaviors for students through a chart to establish and track lifestyle behaviors over the three lessons and evaluate their sticker chart at the

end of the lessons to track behavioral changes that occurred between the first learning session and the last session. The curriculum was taught in a one-week span with three lessons taught.

The final objective was measured by having participants fill out their sticker chart on the days they were present at the club. Students were recommended to have goals/stickers in both categories for each day. One column was eating a fruit or vegetable during the day at school lunch time. The other column included doing one physical activity during the day, such as running, jumping, playing basketball, or other sports. The participants would place a sticker behind their name in each column if they completed the goal for the day when they were at the after-school club.

Qualitative Data

The verbal qualitative responses from the participants provided key information for the presenter to understand if the participants were understanding the material being taught to them. Examples of some of trends and findings from the project will be discussed in the results section. By having open communication with participants, learning was achieved by having the participants respond back to the questions that were listed in the lesson plans. A Talking Circle was utilized for the group participants to ensure that everyone involved could see and hear.

CHAPTER FOUR. RESULTS

Presentation of Findings

Objective One

The first learning objective was to present educational lessons to students of the after-school program to increase knowledge and an understanding of health, diabetes, and diabetes prevention among AIs. The sessions were held three times for approximately 30 minutes each session. Table 1 includes data gathered from the participants.

Table 1

Participant Data

Date of Intervention	Grade of Participants	Number of Participants
March 6, 2020	1st graders: 4 2nd Graders: 6 3rd graders: 5	N=15
March 9, 2020	1st graders: 4 2nd Graders: 6 3rd graders: 5	N=15
March 10, 2020	1st graders: 4 2nd Graders: 6 3rd graders: 5	N=15

For the sessions, the same 15 participants attended and participated in all three lessons. All three lessons were held at the after-school program club located in Mandaree, ND. The method of instruction for the first objective included the presentation of the learning sessions, recorded conversations held with the participants that were transcribed, and the detailed learning instructions for the presenter. The objective was measured by the sessions occurring for the planned time frame with participants interacting during the sessions.

Unit 1, Lesson 4: What is Diabetes? How to Find Out more was selected for the first session, and 15 participants completed the lesson and activities. The second data report included

15 participants who completed the Unit 2, Lesson 1: Understanding Tricky Treats. The third data report included 15 participants who completed the Unit 4 lesson 2: Then and Now: Traditional and Modern Foods and Activities.

The completion rate for the lesson plans was 100%, as there were a total of 15 students (N=15) who attended the after-school program the days the lessons were taught, and they were the same participants at each visit. Participants were at the Mandaree, ND area club. Objective one was considered met due to the lesson plans being taught to the club on the set days, with all of the curriculum information presented and having participants answer back with their answers about T2DM and obesity.

Objective Two

The second learning objective was to improve the students' overall knowledge/awareness of diabetes and obesity prevention, which was evaluated by translating information from the curriculum that was taught through verbal responses to questions about the curriculum. With each learning session from the DETS curriculum, interactive questions were incorporated into the sessions to have the participants interact with the co-investigator. The questions ensured group participation but also ensured a safe space for children to answer without feeling singled out or called upon. The method of instruction for the second objective included interactive activities that are in the DETS lesson plans.

For the project, all 15 participants engaged in the interactive lessons and participated in the incentive chart, with 100% participation achieved with responses from questions asked of them recorded. The second outcome was considered met and is demonstrated by the following responses and inter-group communication: "I want to run and play more with my friends, so I do not become big and get diabetes," "We now know that we get sugar from our food we eat and

need to burn off sugar to stay healthy," "We can eat fruits and vegetables to help us not get diabetes," " I should not drink pop/soda every day because that is a bad form of sugar," " We do not want to get diabetes or be overweight because it is not healthy." Table 2 demonstrates themes of answers/responses from the participants in the group.

Table 2

Themes of Diabetes and Obesity Prevention

Questions	Answers
What is diabetes?	Basic understanding of the body processes associated with diabetes and metabolism
What can we do to prevent T2DM and obesity?	Willingness to stay active to prevent getting diabetes and/or obesity
Do we want to be healthy in the future?	Desire to prevent diabetes and obesity in the future
Can you explain what diabetes and obesity is?	Basic knowledge regarding diabetes and obesity
Do any of your friends or family have disease?	Recognizing the chronic health conditions (diabetes and obesity) of relatives and friends
What are ways to prevent obesity and T2DM?	Ways to stay active: running, biking, playing basketball, swimming, recess, football

Objective Three

The third learning objective for the project was promoting healthy behaviors for students through a chart to establish lifestyle behavior goals over the three lessons and evaluate their sticker chart at the end of the three sessions to ensure that behavioral changes have occurred between the first learning session and at the last lesson. The third objective incorporated behavioral modification practices to ensure learning was achieved and the children would have reliability on themselves for exercising and eating a healthy fruit or vegetable every day during the project. Participants filled out their sticker chart on the days they were present at the club. Examples of goals were to have a sticker in the two categories for each day. One column was

eating a fruit or vegetable during the day at school lunch time. The other column included doing one physical activity during the day, such as running, jumping, and playing basketball or other sports. The participants would place a sticker behind their name in each column if they completed the goal for the day when they were at the after-school club. With 100% of participants participating with the incentive chart during the project period, the categories of eating a healthy fruit/vegetable in a day and exercise/physical activity at least once a day was achieved. For a healthy fruit/vegetable, 15 participants marked down 100% of the time. Fifteen participants marked exercise/physical activity 100% of the time.

With the help of the club manager to help remind the participants to use the chart, the completion rate for the chart was 100%, with each child using the chart and staying aware that they were using the chart for one week. The chart was intended to encourage the participants to complete more physical activities and eat a fruit of vegetable during lunch time at school, with a chart to fill out at the end of the school day a form of accountability.

CHAPTER FIVE. DISCUSSION AND RECOMMENDATIONS

The sessions were held at the club in Mandaree, ND, which is located next to the school. The sessions were held inside, having participants gathered in a talking circle in an open-space room with no distractions. The participants reported a level of understanding during the lesson plans with varied answers and interactive activities they performed. Research has shown that enhancing education about diabetes may help facilitate providers and educators to improve communication, create cultural awareness and understanding, and to increase access to basic health care services and instruction in AI homes and communities (Policicchio & Dontje, 2017). The findings from the community health project are similar to the findings from the DETS curriculum implementation in the school setting, in which students demonstrated significant knowledge gains among students (Francis & Chino, 2012). A positive impact on the participants was noted from their responses to the curriculum.

The club director contributed to the development of what content would be delivered for this project based on her knowledge of the students' educational levels and learning styles. Having multiple age groups together was a disadvantage for this project. Without being able to split the groups up into each grade, the group was mixed with first graders up to third graders. Most of the older participants were confident answering questions and had a better understanding of the material being read to them, unlike the younger participants who were less aware and may have been afraid to answer more questions because there were older participants in the group. This could be seen as intimidating to some participants. Overall, the participants were excited to sit in the talking circle on the days that the curriculum was presented, and they listened well and paid attention with minimal interruption, which was consistent with the literature findings stating that talking circles enhance learning and engage learners (McLaughlin, 2010).

The Social Ecological Model guided the development of the project by focusing on the individual (participants), family (behaviors), and organizations (BCGA). Many factors influence health and well-being, including an individual's choice, their environment and peers, and family life. The multi-factorial and variable nature of health and well-being of individuals makes it amenable to change. Because a child may not have control over what foods they are provided at home, healthy behaviors can be instilled early on in life to promote making healthy individual choices while at school (Jacobs-Wingo et al., 2016).

The PDSA model was also used for this project. The interventions positively impacted the participants and the manager plans to utilize the DETS curriculum in the future for preventing T2DM and obesity. The Boys & Girls Club (BGC) stated a desire to continue with the diabetes prevention curriculum for future use as the participants were willing to partake in the activities and they stayed focused during the group activities. Some adjustments to be made in future years include splitting the group up into smaller groups and have the participants closer in age range that matches the curriculum, such as grades pre-K-K, 1-2, 3-4, and 5-8th grade. Stage four was to reflect on the plan and outcomes (IHI, 2019).

This framework worked well with the project implementation because of the steps involved, such as planning an activity and evaluating the outcomes at the end of the project. This model was implemented at the end of each session, with behavioral changes measured at the end of the three lessons taught. The coinvestigator evaluated after each teaching session to determine if there needed to be changes made from day-to-day. The manager of the club also discussed a desire to continue using this curriculum in the future, as she stated she did not think the curriculum was taught in the classroom setting and she could easily utilize the materials used in the curriculum.

Discussion of Objectives

Objective One

Objective one was to present educational lessons to students of the after-school program to increase knowledge and an understanding of health, diabetes, and diabetes prevention among AI students. This objective was considered met, having met on three set days with the curriculum successfully presented to the participants with the group interacting and answering correct questions that are listed in the curriculum. More educational sessions were planned in the beginning of the project, but the number of sessions/lessons were reduced from the amount that was previously planned. Knowledge about T2DM and obesity was increased in the group with positive answers back from the group.

With a group approach in mind, participants could answer back with their answers about the curriculum and hear what other participants had to say. This could have given them ideas about ways to stay active and exercise that they may have not known was a form of exercise. They could also hear from their peers about healthy and unhealthy food options that were discussed in the curriculum. This may have had a positive impact on participants by hearing ways they can stay active, along with discussing foods that are healthy/unhealthy and ways to prevent developing T2DM and/or obesity.

Objective Two

Objective two was to improve students' overall knowledge/awareness of diabetes and obesity prevention and was evaluated by compiling and categorizing verbal responses to questions about the implemented curriculum. With the set questions in the curriculum, participant answers were transcribed in a Word document. This outcome was considered met, with all 15 participants giving answers to the questions while sitting in the talking circle.

Because this was a group project, no single person was called on for an answer, so a group approach was used by sitting in a talking circle. The same 15 students participated in each session, which ensured that all 15 received the same information. Each session took thirty minutes to complete, with all 15 participants sitting in the sitting in the talking circle.

Encouraging group participation and open communication by using a talking circle worked well for this project. This allowed all participants to all contribute to the group and answer questions without feeling singled out. The students seemed to develop a good understanding of what diabetes and obesity, and ways to prevent the development of these diseases.

Objective Three

Objective third objective was promoting healthy behaviors for students through a chart to establish and track lifestyle behaviors over the three lessons and evaluate their sticker chart at the end of the lessons to ensure that behavioral changes have occurred between the first learning session and the last session. This outcome was considered met, with the help of the presenter and the club manager. The student participant received assistance when putting stickers on their chart in the two categories: eating a healthy fruit/vegetable and performing some form of physical exercise/activity for the day. By having an incentive chart, the goal was to have participants be aware of the choices they make during the school hours in order to get a sticker behind their name for that given day. This worked well when the staff were present to help participants place the stickers on the chart when they got to the club from after school. Without adult supervision and reminders, the participants may not have filled out their sticker chart correctly without being told or asked if they ate a healthy fruit or vegetable, and if they performed a physical exercise/activity that day.

The incentive chart was filled out each day with the help of the club manager when the participants were out of school for the day. Without adult help/supervision, participants may be less likely to fill out the chart by themselves. Developing healthy goals was an appropriate activity for kids in elementary school but needing prompting from adults was noted to be helpful for having them fill out their daily chart. By setting goals for themselves, participants will hopefully carry this on with them in everyday life and when they go home for the day after the club is done during the day. By using the Social Ecological Model in this pilot project focusing on the theories of the model that the individual, environmental and community influences all work together to positively drive behavior changes. Over time, behavior change can contribute to the formation of health habits and patterns.

Limitations

There were limitations associated with this community project. First, teaching at the TAT Boys and Girls Club in Mandaree and not being able to separate the group into grade-specific groups was a limitation. Education in this project was limited to the after-school club, which consisted of first through third grade students who attend the club. The mixed-age groups made it difficult to single out specific age groups for whom to target the intervention. Additionally, as with all community-based sampling interventions, the sample is limited by having minimal control over who was included. Participation was limited to those participants who happen to be present. The lesson plans in DETS are categorized into pre-K-K, K-2, 3-4, 5-6, 7-8, and 9-12 grades. The curriculum is themed around AI culture but can be used for students of all cultural backgrounds. The main age range for the students that attend the after-school program was determined by talking with the boys and girls club manager, Olivia Spotted Bear, and determining the median age range of kids who attend, which was the first through third graders.

In order to avoid excluding participants from an interactive learning activity, all participants who were attending the club for each day the lessons were taught in a group were invited, and no one was left out of project participation. The age range falling outside of the targeted age ranges provided by the DETS researchers may have limited the understanding and engagement of project activities.

A written survey for all age groups that would be age-appropriate for all levels of students participating was difficult to find. This drove the decision to use verbal evaluation and use qualitative data for the project. Knowledge questions were pulled from the lesson plans and participants were asked to verbally respond verses completing a written survey. Qualitative data collection can carry the risk of human error in transcribing, as well as also missing certain answers when more than one individual answer the same question. Answers can be missed or interpreted inaccurately. Additionally, some answers may not be said aloud, either due to too many people talking at once or embarrassment of answering in front of peers.

Obtaining a waiver of tribal approval for the project was another challenge. The club is a stand-alone entity, and as such the BGC Directed and MHA-Nation reported that no tribal approval was needed for this project. Written confirmation of waived tribal approval was requested on multiple occasions. Despite multiple attempts, the researcher was unable to obtain a formal letter from the MHA-Nation/tribe, as they stated it was not needed. AIs have a long history of valuing verbal communication, and that cultural norm may have hindered the process of obtaining formal confirmation, which delayed the implementation of the project and shortened the timeline for completion.

A deadline of one week to complete the project was another project limitation. The DETS curriculum is designed to be completed over multiple months in the classroom setting. With the

time constraint of only three meetings each lasting less than one hour, not all lessons could be taught in the DETS curriculum and therefore, certain lessons were individually chosen to be taught, and some lessons were excluded from the project. With the assistance of the club manager, the most interactive lessons at an age-level that every participant could understand were selected. Behavioral modifications take longer than days and weeks to become engrained in an individual's lifestyle, for which a timeline of months would have been more suitable to promote and expect lasting behavior change.

Another limitation of the project would be some of the participants stated they had read the Eagle books prior to the lessons being taught for this project. Previous exposure to curricular concepts potentially altered participants' answers to some questions because some had seen the curriculum before. Also, not knowing which club members would show up on the set days was a limitation. There were some inconsistencies with individuals attending the club during the week with sporting events happening in the state of North Dakota, some members were not present during the week the lessons were taught that would normally be at the club. This included some older participants such as 4th and 5th grade students who were not present at the club when they normally would be. The project was initially targeting all age groups at the club but was later narrowed down to 1st through 3rd graders who were present.

Lastly, the limitation and difficulty of measuring food intake, activity, and healthy behaviors by using the incentive chart was a limitation of the project. The time constraint of one week for the chart was a limitation and more time, such as more weeks and months would have been helpful to determine if behavioral modifications were achieved long-term with members. Because broad topics such as doing a physical form of activity and eating a fruit and/or vegetable was used, students could interpret this in different ways. They could consider eating a fruit from

a can with added fructose/corn syrup to be healthy, when a fresh fruit without added sugar would actually be a healthier choice. Also, there was no way to verify if the participants actually performed the behaviors or if they just wanted to place a sticker on their chart for the day. Additionally, goals work best when individualized. If time permitted, developing individual goals for student participants to strive towards and track may have promoted accountability and ownership.

Recommendations

For future research and projects, recommendations would be to have the curriculum completed in the classroom setting where individual grades could be taught according to the curriculum handouts. Because of the positive feedback from students who attended the curriculum and from the manager of the club, it is recommended for healthcare professionals to work with their community partners to facilitate the DETS curriculum in the community setting. This could include nursing students, nurse practitioners, nurse practitioner students, or any other healthcare-related professional who has a passion for education regarding T2DM and obesity prevention. Other sources to be utilized can include extension offices, public health offices, IHS, and dieticians. Another recommendation is for advertising to be done in the community where the DETS curriculum is being implemented to receive positive support from community members and to advertise the event happening to increase attendance, as well as familial involvement, which is an important component of the Social Ecological Model.

The DETS curriculum can be found online, therefore is little to no cost for a provider or educator to use the curriculum. The Eagle books can be ordered from the CDC website for free to be incorporated into the DETS lessons. The literature review conducted on the DETS lessons was useful for providing helpful information to ensure that the lessons were evidence-based.

There are many challenges related to implementation of a community health project and tribal projects. A structured timeline with knowing what topics need tribal approval and which topics do not need approval would be helpful for future projects.

Implications for Practice

This community health project impacted the students who attended the after-school program in a positive way with 15 total participants involved. With positive comments and feedback from the club members, prevention of T2DM and obesity can be possible in the community setting verses in the hospital/clinic setting. It is important to reach kids in the community setting because many do not come to a clinic or hospital unless they are already sick. By reaching these members of the community early on in life, the burden of T2DM and obesity can be decreased with the disparity of the disease hopefully also decreasing in this targeted population. This project is important because it adds to the already limited literature that there is a gap regarding youth, minority populations, and preventing T2DM and obesity in the community setting.

Healthcare providers and educators can reach individuals in the community setting by providing these teaching sessions to prevent disease before it develops. To meet the need for minority populations and youth, providers must think creatively about ways to teach and educate populations. Community outreach/education can be an important role for healthcare providers. Providers and educators must have enthusiasm, passion, and good communication skills to reach out to community members and partners to develop relationships with different organizations and clubs.

Implications for Future Research

There is a need for more education to occur in the community health sector across all AI communities. This pilot project determined that the feasibility of conducting a diabetes and obesity education curriculum in a school of community-based setting targeting AI youth is possible and shows promise. Future research could be aimed at completing the project in the school setting targeted for specific grades and ensuring time and access to complete all lessons. Research could also be aimed at measuring more behavior modification practices that can be instilled in youth to encourage lifestyle changes to carry on into adulthood that could be studied over a long period of time.

More research is needed to determine optimal strategies to prevent the development of T2DM and obesity in the home and school setting, particularly among high-risk groups. If projects are presented/implemented at the community level, parents can be involved/invested if they have knowledge about an event happening by being informed through advertisement in community places, such as at the school and flyers posted around town. These projects/programs depend on strong community involvement to ensure success of the participants by involving all family members and members of their community for support systems.

Ways that individuals can prevent developing obesity and T2DM could be further studied and explained. Also, finding ways to measure behavior changes could also be researched for different age groups.

Application to Other Nurse Practitioner Roles

AI/ANs are one of the most significantly underserved ethnic groups in US, and health disparities in this group are at an all-time high (Indian Health Service, 2019). Lower life expectancy among this population may be related to inadequate education, disproportionate

poverty, discrimination in healthcare services, and cultural differences. Doctors of Nursing Practice (DNP) working in the field should be well-informed and familiar with AI/AN culture in order to provide the best quality healthcare. Understanding AI/AN history and culture can further facilitate better learning and teaching opportunities for providers to reach out in their communities to make a difference with this population. Leadership played a large role during the implementation of the project. The coinvestigator performed the interventions by initiating and facilitating curriculum from the DETS program. Health promotion and disease prevention was the main focus of this project, which DNPs advocate in their practice. DNPs have strong leadership roles in the inpatient and outpatient setting. Community members look to DNPs for guidance regarding health promotion and disease prevention, so staying up-to-date on information regarding healthy choices and nutrition are key for DNPs and providers.

In conclusion, staying active in the community as healthcare providers proves to be important for many reasons, including educating youth and adolescents, staying well-informed in up-to-date health-related topics, and acting as a role model for youth. Being a strong leader in a community allows both professional and personal opportunities for DNPs to provide healthcare and education to community members.

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APPENDIX A. IRB LETTER

NDSU NORTH DAKOTA STATE UNIVERSITY

March 30, 2020

Dr. Mykell Barnacle and Ms. Lisa Swanson
School of Nursing

Re: Your submission to the IRB: "Preventing T2DM among American Indians on the Fort Berthold Indian Reservation: Improving Educational Interventions in the School Setting"

Co-Investigator(s) and Research Team: n/a

Thank you for your inquiry regarding your project. At this time, the IRB office has determined that the above-referenced protocol does not require Institutional Review Board approval or certification of exempt status because it does not fit the regulatory definition of 'research involving human subjects'.

Dept. of Health & Human Services regulations governing human subjects research (45CFR46, Protection of Human Subjects), defines 'research' as "…a systematic investigation, research development, testing and evaluation, designed to contribute to generalizable knowledge." These regulations also define a 'human subject' as "a living individual about whom an investigator (whether professional or student) conducting research:
(i) Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or
(ii) Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens."

It was determined that your project does not require IRB approval (or a determination of exemption) from NDSU. The practice improvement project does not seek to conduct a systematic investigation or contribute to generalizable knowledge, but will instead provide an account of program implementation at one site.

Please contact the Mandan, Hidatsa and Arikara Nation Tribal Council to obtain permission to write and publish materials related to program implementation.

We appreciate your intention to abide by NDSU IRB policies and procedures, and thank you for your patience as the IRB Office has reviewed your study. Best wishes for a successful project!

Sincerely,

Kristy Shirley

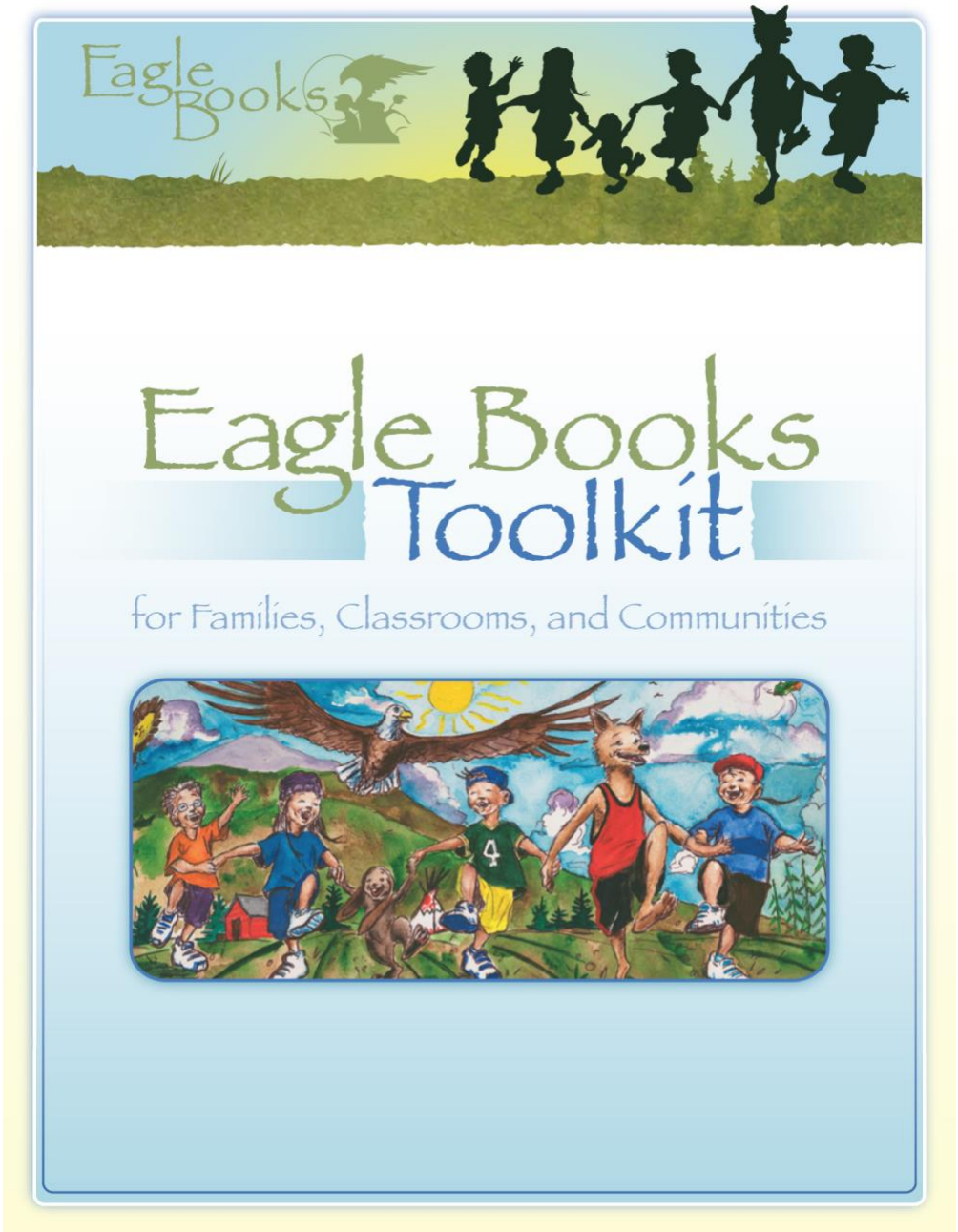
Kristy Shirley, CIP; Research Compliance Administrator

For more information regarding IRB Office submissions and guidelines, please consult https://www.ndsu.edu/research/for_researchers/research_integrity_and_compliance/institutional_review_board_irb/. This Institution has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

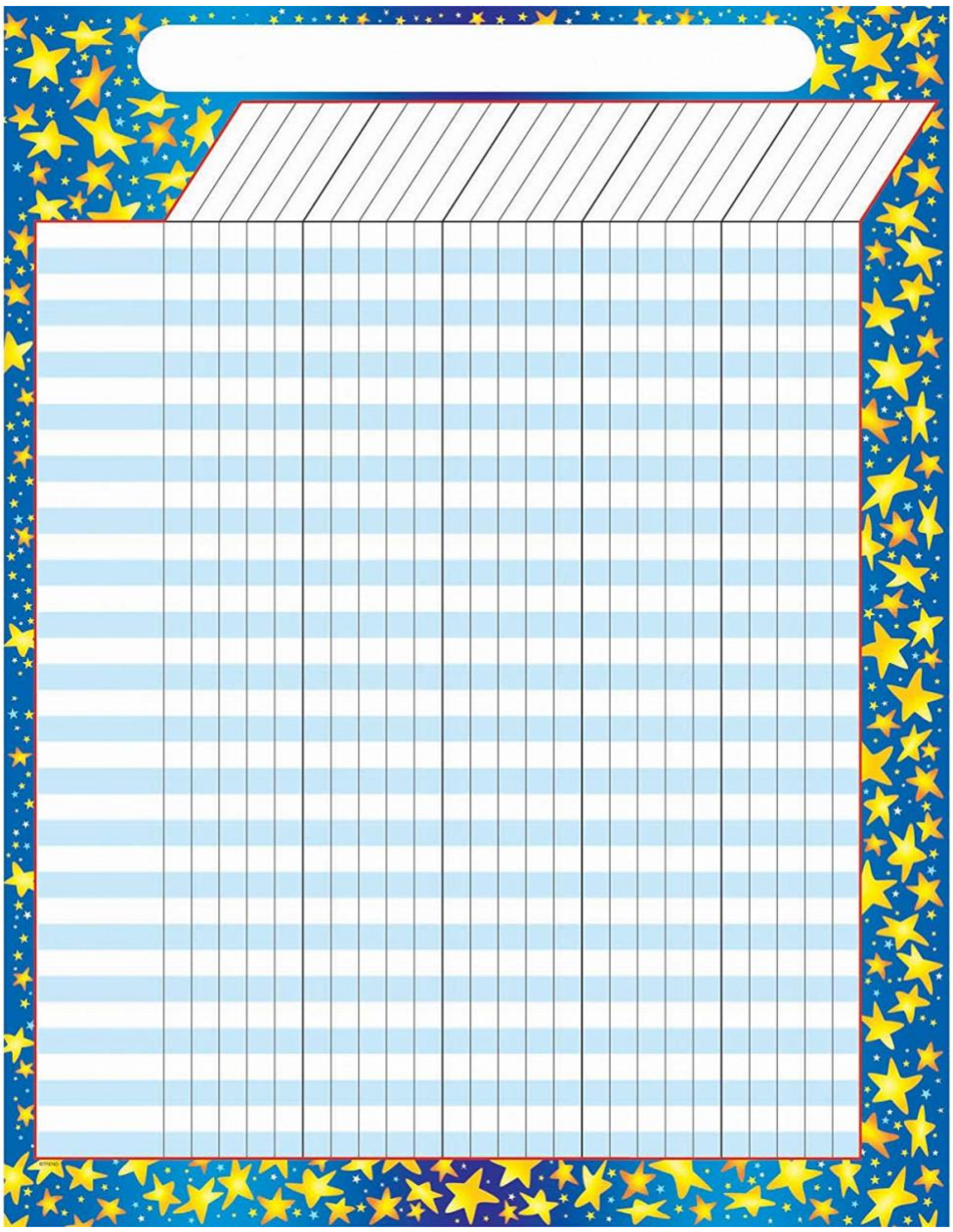
INSTITUTIONAL REVIEW BOARD
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.8995 | Fax 701.231.8098 | ndsu.edu/irb
Shipping address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

APPENDIX B. PDSA

APPENDIX C. EAGLE BOOKS TOOLKIT



APPENDIX D. INCENTIVE CHART



APPENDIX E. EXECUTIVE SUMMARY

Project Summary

The purpose of the community health project was to provide education to an underserved area/population targeting AI youth to prevent the development of type two diabetes mellitus and obesity. The Diabetes Education in Tribal Schools (DETS) curriculum was utilized for this community health project and was presented to the Boys and Girls Club of American (BGCA) of Mandaree, North Dakota.

Background

Diabetes affects over 34.2 million Americans, or 10.5% of the entire population in the United States (US) (American Diabetes Association [ADA], 2020; Beitz & Geria, 2017; CDC, 2017a). Of those affected by diabetes mellitus, 1.6 million Americans have type 1 diabetes mellitus (T1DM), and over 28 million have type 2 diabetes mellitus (T2DM), making this type the most prevalent type of diabetes (ADA 2020, ADA, 2018). AIs/ANs have the highest rate of diabetes among all racial/ethnic groups at 14.7% in the United States today, as well as an alarming rate of prediabetes (ADA, 2020; CDC 2018; Jacobs-Wingo et al., 2016; NIH 2018).

Lowering the risk for developing T2DM often includes several behavioral changes, such as losing weight if obese and getting regular physical activity that can be incorporated into everyday activities (CDC, 2019). Getting regular physical activity means completing at least 150 minutes a week of moderate intensity activity (CDC, 2019). For children and adolescents ages 6 to 17, the CDC recommends one hour or more of physical exercise per day (CDC, 2017a). By setting small goals of weight loss such as 5 pounds in 2-3 months, this makes obtaining the goal more realistic for better health outcomes (CDC, 2018d).

Process

A project using qualitative and observational methods was completed for this project at the Boys and Girls Club in Mandaree, ND. Curriculum from the DETS was collected and utilized as a tool for teaching methods to the participants. Lessons from the DETS curriculum was presented to the Boys and Girls Club of TAT in Mandaree, North Dakota. Throughout the curriculum, students were educated on ways to prevent T2DM and obesity by engaging in interactive learning activities. The results of the project revealed that community-based interventions involvement for preventing T2DM and obesity can be helpful and a way to provide education and prevention activities by reaching participant children in the community setting. Overall, this curriculum was effective and successfully taught to voluntary participants that were at the club on the set days that the curriculum was held. Through active community involvement by future Nurse Practitioners and other providers, primary prevention can be demonstrated, and information disseminated before individuals develop T2DM and obesity in their lifetime.

Finding and Conclusions

The sessions were held at the club in Mandaree, ND which is located next to the school. The sessions were held inside, having participants gathered in a talking circle in an open-spaced room with no distractions available. The participants reported a level of understanding during the lesson plans with varied answers and interactive activities they performed. The verbal qualitative responses from the participants provided key information for the presenter to understand if the participants were understanding the material being taught to them. Out of the 15 participants, 15 individuals responded with their answers from the questions asked of them. By having open communication with participants, learning was achieved by having the participants respond back

to the questions that were listed in the lesson plans. A Talking Circle was utilized for the group participants to ensure that everyone involved could see and hear.

Recommendations for Future Practice

Doctors of Nursing Practice (DNP) working in the field should be well-informed and familiar with AI/AN culture in order to provide the best quality healthcare. Understanding their history and culture can further facilitate better learning and teaching opportunities for providers to reach out in their communities to provide a difference with this population. DNPs have strong leadership roles in the inpatient and outpatient setting. Community members look to DNPs for guidance regarding health promotion and disease prevention, so staying up to date on information regarding healthy choices and nutrition are key for DNPs and providers.

APPENDIX F. BGCA LETTER

710 EAST AVENUE
PO BOX 189
NEW TOWN, ND
58763
701.627.4415
Fax 701.627.4416

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701 938-3293

Bismarck
701 751-7580

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Executive Director

Debra Malnourie
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Wendi Wells
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Member at Large

Patricia Poitra
Member at Large

Gary Dickens
Member at Large

BOYS & GIRLS CLUB
OF THE
THREE AFFILIATED TRIBES

3/6/20

Dear Lisa,

I wanted to thank you very much for volunteering your time at our Mandaree Boys & Girls Club. I am sure you are well aware that diabetes plagues the Ft. Berthold Reservation. What better way to combat diabetes but to educating our youth! I appreciate your efforts.

The Tribal Council supplements the budget for Boys & Girls Club of the Three Affiliated Tribes. But we are our own 501C3 nonprofit organization, with a governing Board. I am the Executive Director and I oversee all seven clubs, 6 on the reservation and one in Bismarck. Therefore, I am granting you permissions to "Publish" your work that was conducted at he Mandaree Boys & Girls Club.

I hope this clears up any questions, let me know if you need anything further, again Thank You!!

Sincerely,

Kirsten Morsette
Executive Director

GREAT FUTURES START HERE.