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Mental Health in Diabetes Prevention and Intervention Programs in American Indian/Alaska Native Communities

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MENTAL HEALTH IN DIABETES PREVENTION AND INTERVENTION PROGRAMS

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Title: Mental Health in Diabetes Prevention and Intervention Programs in American Indian/Alaska Native Communities

Abstract: American Indian and Alaska Natives youth and adults experience higher rates of type 2 diabetes and mental health problems than the general United States population. Few studies have explored the relationship other than detail the two issues independently. The present review aims to identify programs that seek to prevent/treat type 2 diabetes and mental health disorders in the American Indian and Alaska Native population. Available programs were reviewed for AI/AN adults and youth who suffer with both. As part of the review process, databases were searched for peer reviewed published studies. It was found that very few programs effectively incorporate mental health into the existing diabetes program. Four recommendations for future research are offered based on this literature review.

Abstract word count: 119

Keywords: American Indian, Alaska Native, Native American, Type 2 Diabetes, Obesity, Mental Health, Stress

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Introduction

Type 2 diabetes mellitus is one of the leading causes of death in the United States affecting nearly 30 million Americans (Centers for Disease Control and Prevention, 2014). For American Indian and Alaska Natives (AI/AN), type 2 diabetes (hereafter referred to as diabetes) is not only a chronic disease that has emerged as a significant public health concern, but also a disease that threatens the future well-being of AI/AN communities (Moore, K. 2010). A leading causes of diabetes is obesity and one study shows that nearly 40% of the American Indian population is obese (Yracheta, J. M., Lanaspá, M. A., Le, M. T., Abdelmalak, M. F., Alfonso, J., Sánchez-Lozada, L. G., & Johnson, R. J., 2015).

Diabetes poses serious future implications for AI/AN communities considering that the risk for diabetes begins during childhood (Brown, B., Noonan, C., Harris, K.J., Parker, M., Gaskill, S., Ricci, C., Cobbs, G., & Gress, S., 2013). This risk has been rising as the prevalence of obesity and overweight in AI/AN children has been at a steady increase over the past two decades (Zephier, E., Himes, J. H., Story, M., & Zhou, X., 2006). As a result of this increase in obesity, a 30% climb in diabetes in AI/AN youth has also been observed (Lee, et al., 2004). American Indian and Alaska Native people who develop diabetes as children or adolescents will be more likely to develop serious complications as adults (Moore, K. 2010). Treating and preventing diabetes during childhood is, therefore, especially important to reduce the high rates of obesity and diabetes in AI/AN populations.

Individuals diagnosed with diabetes experience higher rates of disease-related complications: cardiovascular diseases, reduced or lost vision, kidney failure or disease, and amputations of the lower-extremities (Acton et al., 2002; Mendenhall, Seal, GreenCrown, LittleWalker, & BrownOwl, 2012). In addition to the physical disease related complications

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associated with diabetes, studies have consistently shown a direct correlation between mental health disorders and diabetes (Robinson, D. J., Luthra, M., & Vallis, M., 2013). Figure 1 (see appendix) illustrates that persons with mental health disorders and those with diabetes share common susceptibilities as well as comorbidities (Robinson, D. J., Luthra, M., & Vallis, M., 2013). Susceptibility in this model links diabetes to depression with high correspondence to other psychiatric diagnoses such as bipolar disorder, anxiety disorders, eating disorders, obesity and schizophrenia (Robinson, D. J., Luthra, M., & Vallis, M., 2013). Emerging research in AI/AN communities has documented mental health disorders, specifically stress and depression, as co-occurring conditions to the diabetes epidemic (Walls et al., 2014). Studies also show that AI/AN people that experience diabetes-related physical health symptoms have positive correlations with multiple psychological and/or emotional difficulties (Walls et al, 2014) that may prevent them from proper self-management of their diabetes (Turner DePalma, M., Trahan, L. H., Eliza, J. M., & Wagner, A. E., 2015). Although diabetes and mental health rates are high, little research that has been done on effective treatment programs for AI/AN people experiencing the comorbidity of these conditions.

Programs discussed in this review focus on those serving AI/AN adults and youth who suffer from both diabetes and mental health conditions with few that effectively integrate both mental health and diabetes prevention into one comprehensive program. Diabetes prevention and intervention programs can include any event or experience designed to impede the onset or risk of diabetes; the intervening, treating, or reduction of the progression of diabetes; and/or the prevention of obesity as a major contributing factor to diabetes. The objective of this literature review is to: 1) examine available diabetes prevention and intervention programs for AI/AN people

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and 2) understand how these AI/AN diabetes programs incorporate the prevention or treatment of mental health.

Review of the Literature

Type 2 Diabetes in American Indian and Alaska Natives

Diabetes is a chronic disease that affects individuals, families, and communities (Struthers, Hodge, Geishirt-Cantrell, & De Cora, 2003). The three leading factors that increase the likelihood of diagnosis include being overweight, lack of physical activity, and having a family history of diabetes (Amuta, A. O., Barry, A. E., McKyer, J., & Lisako, E., 2015).

American Indian and Alaska Native adults are 2.3 times more likely to have diagnosed diabetes compared to their non-Hispanic white counterparts (Indian Health Service, 2012). Early research among AI/AN populations with the Pima Indians in Arizona revealed that diabetes, which was commonly considered an adult disease, was prevalent in young Pima Indians as well (Acton, Burrows, Moore, Querec, Geiss, & Engelgau, 2002). American Indian and Alaska Native youth ages 10-19 are nine times more likely to have diagnosed diabetes compared to non-Hispanic whites (Indian Health Services, 2012).

The prevalence of diabetes among AI/AN youth and young adults has been associated with genetic factors and lifestyle choices, including poor diet and lack of physical activity (Acton et al., 2002; Islam-Zwart & Cawston, 2008). As a result of modernization, AI/AN children, teenagers, and young adults are adopting a less traditional lifestyle, which formerly incorporated healthier foods and greater energy expenditure in physical activity (Islam-Zwart & Cawston, 2008). Islam-Zwart and Cawston (2008) also found that children who have a parental history of diabetes had a significantly higher Body Mass Index (BMI) percentile rank compared to children who did not have a parent with diabetes. In 2009, the prevalence of diabetes in AI/AN youth, ages 10-19, was

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1.20 per 1000, the highest rate of any racial/ethnic group in the United States (Dabelea et al., 2014). It is clear that underlying lifestyle choices play a role in AI/AN risk for diabetes.

While diabetes cannot be cured, it can be managed and prevented. In addition to diabetes, AI/AN people are often diagnosed with other diseases or conditions, making prevention and management of both conditions challenging. Among these conditions, mental health disorders have become a frequent diagnosis among diabetes patients.

Mental Health Disorders and Diabetes in American Indian and Alaska Natives

Similar to diabetes rates, AI/AN communities disproportionately experience mental health and emotional problems at a rate greater than all other racial/ethnic groups (Walls, Aronson, Soper, Johnson-Jennings, 2014). Little research exists that examines the correlation between diabetes and mental health disorders in AI/AN communities (Tann et al., 2007; Walls et al., 2014). One study involving AI/AN individuals with diabetes found that 17.1% of the participants fit criteria for depression and 25% of participants self-reported moderate to severe anxiety (Walls et al., 2014). These statistics were similar to another study conducted by Sahota, Knowler, and Looker (2008) where the prevalence of depression in AI/AN people with diabetes (12.8%) was higher than AI/AN people without diabetes (9.4%). This available research shows that depression, stress and anxiety occur at a higher rate in AI/AN individuals diagnosed with diabetes than those who do not have diabetes (Calhoun et al., 2010; Sahota et al., 2008; Walls et al., 2014).

Children and youth who are obese, overweight, and/or are diagnosed with diabetes are more likely to have a mental health impairment (McGavock, Dart, & Wicklow, 2015). Obese children and youth, particularly girls, are more likely to suffer from depression and anxiety compared to peers of healthy weight (McGavock, Dart, & Wicklow, 2015).

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In this review, studies show that American Indian and Alaska Natives are twice as likely to be diagnosed with diabetes than their non-Hispanic white counterparts (Indian Health Service, 2012), and AI/AN communities disproportionately experience more mental and emotional problems than any other racial or ethnic group (Walls, Aronson, Soper, Johnson-Jennings, 2014). These studies further demonstrate that diabetes and mental health in AI/AN people need to be acknowledged together and addressed accordingly.

Methods

A literature review was conducted to identify relevant programs for AI/ANs suffering from diabetes and/or mental health distress. Searches were conducted for reviews, publications, and meta-analyses between February 3, 2015, and March 23, 2015. The terms (“type 2 diabetes”), (“diabetes mellitus”), (diabet*), (“obes*”), (“overweight”), (“mental health distress”), (“obesity”), (“diabetes”), (“mental health”), (“stress”), (“anxiety”), (“depression”), and (“American Indian”) OR (“Alaska Native”)) were used in the following search engines: Academic Search Complete, ERIC, PUBMED, PsycINFO and Google Scholar. Resource suggestions from co-workers, peers, and health resource websites were also used to compile references. Search restrictions included peer-reviewed and published items between 2004 and 2015.

Results

Nine AI/AN diabetes prevention and intervention programs were identified and are further substantiated in Table 1 (see appendix). Only two of the nine diabetes programs incorporated a mental health component into treatment (Cherokee Choices and Family Education Diabetes Series). Table 1 lists the programs that incorporated a mental health component, the sample from which findings were derived, methods employed by each study, population demographics, results found, and are categorized in ascending order by oldest to newest programs. Among the

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categorized adult and youth programs below, a model program was recognized. The model program, Family Education Diabetes Series (FEDS), not only effectively incorporated a mental health component into the design of the program, but it also utilized a community-based participatory research approach, which is ideal when working with tribal communities (Cochran, P. A., et al., 2008). The FEDS program is discussed last.

Adults

One of the first and most effective prevention efforts that focused on American Indian people was the Special Diabetes Program for Indians Diabetes Prevention (SDPI-DP; Jiang, Manson, Beals, Henderson, Huang, Acton, Roubideaux, & the Special Diabetes Program for Indians Diabetes Prevention Demonstration Project, 2013). SDPI-DP implemented lifestyle interventions, focusing on diet, exercise and behavior change in 36 health care settings serving 80 tribes. The goal of the program was to reduce prediabetes participants' body weight by 7%, thus greatly reducing their chance of a diabetes diagnosis (Jiang et al., 2013). Over the three years that the SDPI-DP was implemented, the cumulative incidence of diabetes among all 2,553 participants was 4.0% per year (Jiang et al., 2013). Participants lost 9.6 pounds on average (4.4% of baseline weight) and reported exercising more post-intervention (Jiang et al., 2013). Because of its success in delivering a lifestyle intervention, the SDPI-DP curriculum continues to be utilized throughout Indian Country (Jiang et al., 2013).

In addition to the SDPI-DP, Gilliland, Azen, Perez, and Carter (2002) created Strong in Body and Spirit, a culturally appropriate, community-based intervention to positively affect lifestyle changes in eight Rio Grande Pueblo communities in New Mexico. Participants were 18 years or older with diabetes and were assigned to one of two intervention groups or the control group. The intervention consisted of five educational lessons and was delivered in two different

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ways (individual vs. community) depending on group assignment. Based on the results of the study, participants receiving either intervention had significant benefits in glycemic control and weight loss compared to participants receiving usual Indian Health Service (IHS) medical care (Gilliland, S.S., Azen, S.P., Perez, G.E., & Carter, J.S., 2002). This study highlights the benefits of community-based lifestyle interventions in improving glycemic control in AI adults with diabetes (Gilliland, S.S., Azen, S.P., Perez, G.E., & Carter, J.S., 2002).

Another approach that seeks to reduce diabetes-related complications included health professionals adopting the traditional AI/AN use of talking circles and re-conceptualizing them into culturally appropriate educational tools for health and promotion of well-being (Struthers et al., 2003). Talking circles are a culturally competent form of facilitation used to “construct decisions and carry out a group process” (Struthers et al., 2003). Struthers et al. (2003) utilized a diabetes wellness Talking Circle intervention to improve participant knowledge and management of diabetes and its complications and create a space of dialogue for participants diagnosed with diabetes. In addition to increasing knowledge of the disease, the intervention proved to be helpful in providing an opportunity for participants to share their stories and experiences, an underestimated aspect of AI/AN specific adults and youth programs (Struthers et al., 2003).

Youth

The purpose of the Journey to Native Youth Health Program was to develop a culturally appropriate lifestyle intervention for American Indian youth, as well as assess implementation indicators and physiological and behavioral outcomes of the intervention (Brown et al., 2013). Researchers adapted the adult Diabetes Prevention Program (DPP) for its youth participants. Over 12 weeks, nine sessions were held with the goal of slowing or reducing BMI growth in AI youth, ages 10-14 years. Similar to the original DPP program, youth shared their knowledge of the

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session's topic, were provided with new resources about the topic, and given assignments to complete at home with family. Cultural components and traditional activities were integrated into the curriculum, such as storytelling in the traditional language, participation of elders, dancing, hunting, camping, horseback riding, traditional games, and berry picking (Brown et al., 2013). Compared to the group who did not receive the intervention, Journey DPP participants were consuming four times less fat and increased their nutritional knowledge, attitudes, and beliefs, which was measured by the KAB nutrition questionnaire (Brown et al., 2013).

Cherokee Choices is a community-based intervention developed to improve the health of the Eastern Band of Cherokee Indians of North Carolina, where men and women are twice as likely to be obese compared to all other racial/ethnic groups in the state (Bachar, Lefler, Reed, McCoy, Bailey, & Bell, 2006). Cherokee Choices aims to motivate the community to understand and challenge the environmental and biological factors that increase the risk of diabetes for Cherokee peoples (Bachar et al., 2006). There are three components to the program: elementary school mentoring, worksite wellness for adults, and church-based health promotion. The elementary school mentoring component was implemented at Cherokee Elementary School. Community mentors work with the children and staff to enhance self-esteem, cultural pride, conflict resolution, emotional well-being, and health knowledge (Bachar et al., 2006; Koplan, Liverman, Kraak, & Wisham, 2007). Changes in systematic approaches and the use of community mentors in the school increased physical activity, fresh fruit and vegetable options in lunch menus, and parental participation in student activities (Bachar et al., 2006; Koplan, Liverman, Kraak, & Wisham, 2007). In addition, students who spent time with mentors during school hours and/or after school hours reported increased interest in school, learning, and an ability to converse more easily with friends (Bachar et al., 2006; Koplan, Liverman, Kraak, & Wisham, 2007).

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Together Raising Awareness for Indian Life (T.R.A.I.L.) is a curriculum designed to prevent the onset of diabetes in AI youth within tribal communities. T.R.A.I.L. was developed in 2003 through a partnership between National Congress of American Indians, FirstPic, Inc., Indian Health Service, and Boys & Girls Club of America. The curriculum has been implemented in 54 Boys & Girls Club sites in Indian Country and has served more than 12,000 AI/AN youth ages 8-10 years old in 86 tribal communities (National Congress of American Indians, 2014). The curriculum is divided into four themes, consisting of 12 chapters that provide youth a comprehensive understanding of healthy lifestyle changes to prevent diabetes. The four themes are: About Me, My Health, & Being Part of a Team; Healthy Eating; Making Smart Food Choices; and My Healthy Community (National Services, 2015). The curriculum also provides youth with information about self-esteem, prevention activities, and teamwork to increase leadership skills (National Services, 2015). This program has not been scientifically reviewed and no results can be established; however, the T.R.A.I.L. program has been recognized by the National Congress of American Indians for 11 successful years (National Congress of American Indians, 2014).

The Washoe Tribal Health Center implemented the T.R.A.I.L. program curriculum in the Living Yesterday for Tomorrow (LYFT) program. To combat diabetes and cardiovascular disease by increasing physical activity and consumption of healthier foods, LYFT was offered to tribal communities in Nevada and California (Indian Health Service, 2014). The LYFT program was conducted for three years and targeted cohorts of youth between 12-18 years old (Indian Health Service, 2014). Culturally relevant physical and nutritional activities were incorporated, including hiking, camping, and hunting and gathering (Indian Health Service, 2014). Students engaged and learned healthy lifestyle changes in diet and exercise, building self-esteem and self-confidence, and developing interpersonal and leadership skills (Indian Health Service, 2014). Over a three-

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year time span, participants of the LYFT program showed a decrease in average BMI from 34.65 to 20.31, an increase in physical activity and consumption of fruits and vegetables, and a decrease in the consumption of sugary beverages (Indian Health Service, 2014). No statistical results were given regarding improvements in self-esteem and self-confidence aside from teacher comments.

The Pathways obesity prevention program is a culturally appropriate program developed by AI tribal nations, schools and families to promote physical activity and healthy eating behaviors among AI school aged children (Davis, et al., 1999). In two Pathways studies by Going, et al., (2003) and Cabellero et al., (2003) there were no statistically significant differences in weight loss or behavioral changes in the youth. Both studies, however, discussed the challenges of finding statistical evidence on the effectiveness of implementing a short-term prevention effort (Cabellero et al., 2003; Going et al., 2003).

Model Program

The Family Education Diabetes Series (FEDS) program was first initiated in 2003 and employed a wide range of techniques that were culturally appropriate, including talking circles with education incorporated, open-ended storytelling, smudging ceremonies, dancing, creative art, and community meals. The FEDS program was able to build trust with the tribal communities, allowing additional time to complete effective program implementation. In an effort to “increase ownership” in diabetes management by individual patients and the community, researchers from the University of Minnesota Medical School developed and piloted the FEDS as a diabetes intervention for AI communities (Mendenhall, Berge, Harper, GreenCrow, LittleWalker, WhiteEagle, & BrownOwl, 2010). First, researchers gathered patients, families, health care providers, mental health care providers, and other key stakeholders every other week for three hours to participate in educational sessions for six months. By using community-based

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participatory research principles, Mendenhall et al. (2010) determined necessary steps, strategies, partnerships, and topics needed to develop FEDS.

During meetings, community members, providers and tribal elders cooked and ate traditional meals together. A series of educational and instructional information was given to the participants based on their interests and knowledge. Educational information took place in talking circles and included traditional activities. Instructional information included “basic diabetes education, obesity and weight control, foot care, stress management, exercising, family relationships, dietary guidelines and portion sizes,” to name a few. (Mendenhall et al., 2010, p. 365). Results showed participants’ average weight loss improved from a baseline measure of 211.21 pounds to 196.86 pounds at the 6 month follow-up. Metabolic control improved between baseline and the 3-month follow-up, but no significant improvements were made overall between baseline and the 6-month follow-up. Blood pressure was significantly improved over the course of this study as well (Mendenhall et al., 2010). Managing stress, fighting depression and despair were not measured, however entire sessions were conducted on these topics individually. The FEDS program showed ownership, partnership, and the use of cultural knowledge and food preparation in improving diabetes management among AI communities.

Discussion

When addressing American Indian and Alaska Native health and well-being, more programs are needed that consider both diabetes and mental health distress. Lowering the risks and complications for both diseases can happen when AI/AN people increase their daily physical activity, decrease their dietary intake of fat, and treat any mental health problems they are experiencing or at risk for (Edwards, K. K., & Patchell, B., 2009). Tribal leaders, Indian health professionals, and American Indian communities prefer diabetes prevention and intervention

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materials to be relevant to their specific tribe and culture (Struthers, Hodge, Geishirt-Cantrell, & Cora, 2003). Programs, therefore, should also be individualized and tailored to specific tribes if/when possible.

AI/AN specific diabetes programs aim to increase knowledge and change lifestyles. It appears that emotional well-being components are often added as a small side discussion to existing diabetes programs. This, however, has not been extensively studied, partly because of the inconsistent and limited descriptive studies available linking the two diseases. Jiang, Beals, Whitesell, Roubideaux, Manson and the AI-SUPERPFP team (2007) argue that a better understanding of the association between diabetes and mental health disorders will contribute to the design of effective interventions for diabetes and mental health prevention and treatment within the AI/AN population.

Recommendations

Four recommendations for future research were derived based on the literature review. The first recommendation is to effectively create a program that addresses both diabetes and mental health distress. Walls et al. (2014) suggests that a mental health component should be incorporated into diabetes programs. For example, the Family Education Diabetes Series program discussed above focused on lifestyle changes, included a mental health piece, and was culturally appropriate to the community. The program was effective in reducing weight in a time frame that worked for the researchers as well as the participants. All of these components are important to include in a diabetes and mental health program. Additionally, this program integrated stress management strategies and techniques as well as fighting depression and despair into their session topics. A future step is to measure the effects these strategies have on diabetes, stress, and depression. By addressing mental health in diabetes programs through early detection screenings and culturally

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appropriate interventions, the health of AI/AN communities will greatly improve (Indian Health Service, 2011; Tann et al., 2007).

The second recommendation is to ensure that the program focuses on lifestyle change. Lifestyle changes and interventions are proven to be highly successful in preventing, delaying, and reducing diabetes (Diabetes Prevention Program Research Group, 1999; Jiang, L., et al., 2013). The Diabetes Prevention Program (DPP) Research Group (1999) found that managing individual cases of diabetes, educating on proper nutrition habits, exercising and weight control resulted in a 58% reduction of diabetes among American Indians and other ethnic groups. Additionally, programs that change lifestyles have the potential to reduce risk factors and prevent or impede the onset of diabetes (Brown, B. D., Harris, K. J., Harris, J. L., Parker, M., Ricci, C., & Noonan, C., 2010).

The third recommendation is to ensure that the program incorporates culture into the curriculum. It is also important to note that certain cultural beliefs may limit the effectiveness of these programs if they are simply adopted versus adapted in AI/AN communities. Few of the programs adapt, but one such program is the Journey to Native Youth Health Program mentioned above, which adapted the original DPP and focuses heavily on lifestyle change. Rather than simply adopting a non-culture specific diabetes program, programs need to be tailored to AI/AN populations because of cultural differences, beliefs, and barriers such as access to healthy foods. Another important aspect of this is community involvement in the planning and implementation of the program. Brown et al. (2010) states that there is an importance in engaging the community and its members to find strategies that will work within their specific cultures and traditions. For example, the Cherokee Choices development team listened and responded to the Cherokee community to ensure cultural values (importance of spirituality for balance, emphasis of extended

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family systems model, intergenerational support, etc.) were incorporated. Community input in identifying the problem and setting programmatic goals increases tribal ownership, community engagement, and program effectiveness (Mendenhall et al., 2010).

A fourth recommendation includes designing a curriculum that allows for the appropriate amount of time to see and measure the effectiveness of a program. Indian Health Service (2011) offers several recommendations for planning intervention programs including identifying program goal(s), defining program objectives using the SMART format (specific, measurable, action-oriented, realistic, and time-bound), and using key measures to monitor progress and the effectiveness of the best practices implemented. In 2011 IHS also published their best practices in preventing and treating diabetes in youth. A key recommendation IHS described is to implement an education and prevention/treatment plan for youth who are overweight or obese, and those with pre-diabetes or diabetes (Indian Health Service, 2011). An individualized plan developed in conjunction with youth, parents, and health care teams can encourage positive self-management and provide educational strategies for preventing diabetes (Indian Health Service, 2011). The plan should be age appropriate; focus on promoting healthy behavior; family-oriented; and include medical treatment, follow up, and evaluation (Indian Health Service, 2011). The treatment plan should include a patient medical history and a psychosocial assessment (Indian Health Service, 2011). The psychosocial assessment is critical in addressing comorbid conditions because it evaluates emotional health, substance abuse, family support, and obesity (Indian Health Service, 2011). Diabetes curriculum and treatment plans that are carefully devised allow for the potential to not only prevent and reduce diabetes, but treat any mental health difficulties clients are experiencing.

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In sum, recommendations include: 1) effectively creating a program that addresses both diabetes and mental health; 2) ensuring that the program focuses on lifestyle change; 3) ensuring the program incorporates culture into the curriculum; and 4) allowing appropriate time to see and measure the effectiveness of a program.

Conclusion

The literature suggests that American Indians and Alaska Natives suffer from both diabetes and mental health complications at significantly higher rates compared to the general U.S. population (Carter, J. S., Pugh, J. A., & Monterrosa, A., 1996; Indian Health Service, 2012; Walls, Aronson, Soper, Johnson-Jennings, 2014). While both rates are high in AI/AN populations, there are few programs that address the comorbidity of diabetes and mental health issues. This literature review examined available diabetes prevention and intervention programs for AI/AN people while also trying to understand how these programs included the prevention or treatment of mental health issues. Available programs for AI/AN adults and youth were highlighted in populations that suffer from both diabetes and mental health difficulties. This review indicates that there is a need for further research to treat these comorbid conditions.

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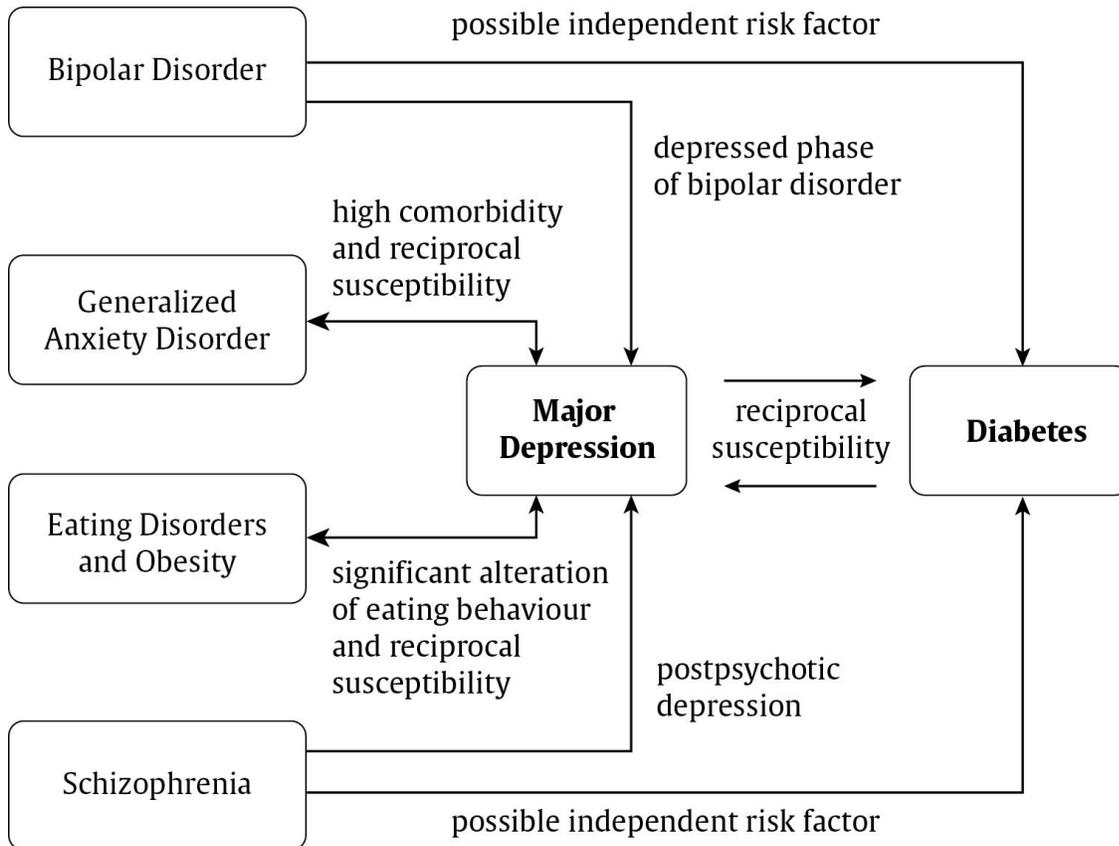
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Figure 1. The interplay between diabetes, major depressive disorder, and other psychiatric conditions



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Table 1. Diabetes prevention and intervention programs in American Indian/Alaska Native communities

Study	Program	Sample	Methods	Population	Results	Mental Health Component
Gilliland, Azen, Perez, and Carter, 2002	Strong in Body and Spirit	104 AIs with diabetes from 8 Rio Grande Pueblo communities	Community-based and culturally appropriate intervention model	Adults	Significant improvement in glycemic control and weight loss	No
Going, et al., 2003 and Caballero, et al., 2003	Pathways	1,704 AI students from 41 schools and 7 different communities	Culturally appropriated model of physical education intervention modeled after the SPARK program	Youth	The intervention significantly changed knowledge, attitudes, and behaviors positively	No
Struthers, Hodge, Geishirt-Cantrell, & Cora, 2003	Talking Circle	147 AIs community members from 4 different reservations	Culturally appropriated model and Talking Circle format; self-administered pretest and posttest questionnaires; descriptive phenomenology approach	Adults (ages 40-70)	An increase in knowledge about diabetes and participants found it positive to be involved in Talking Circles	No
Bachar, et al., 2006	Cherokee Choices	Elementary program: 140 Cherokee students	Elementary program: pretest and posttest on self-concept, perceived stress, cultural awareness, peer relations, and eating habits	Youth (ages 9–10)	Elementary program: children reported an increased interest in school, learning an easier ability to communicate with friends	Elementary program: Yes

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		Worksite Wellness program: 86 tribal workers	Worksite Wellness program: physical, educational, nutritional activities	Adults	Worksite Wellness program: physical activity, losing weight, and decreasing body fat increased	Worksite Wellness program: No
		Church wellness program: 150 community members from 5 churches	Church wellness program: physical, educational, nutritional activities	Youth & Adults	Church wellness program: participants achieved an 8,500 mile goal by walking a total of 31,600 miles	Church wellness program: No
Mendenhall, et al., 2010	Family Education Diabetes Series (FEDS)	36 Midwestern U.S. AI community members	Community-based participatory research strategies informed by the Citizen Health Care Model	Adults	Significant improvement in lower blood pressure, metabolic control, and weight loss	Yes
Brown, et al., 2013	Journey to Native Youth Health	64 AIs from 2 Montana reservations	Modified and culturally appropriate version of the Diabetes Prevention Program	Youth (ages 10-14)	Participants had a consumption of four times less fat and an increase in knowledge about nutrition, attitude and beliefs	No
Jiang, L., Manson, S.M., Beals, J., et al., 2013	Special Diabetes Program for Indians Diabetes Prevention (SDPI-DP)	2,553 AI/ANs with prediabetes	16-session Lifestyle Balance Curriculum; clinical pre-and-post assessment for diabetes evaluation	Adults	Significant improvement in lower blood pressure, weight loss, and lipid levels were observed	No

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<p>National Congress of American Indians, et al., 2014</p>	<p>Together Raising Awareness for Indian Life (TRAIL)</p>	<p>14,400 AI/AN youth in 86 tribal communities</p>	<p>Physical, educational, nutritional activities that promote healthy lifestyles</p>	<p>Youth (ages 7-11)</p>	<p>This program has not be scientifically reviewed, therefore no results can be established</p>	<p>No</p>
<p>Indian Health Services, 2014</p>	<p>Living Yesterday for Tomorrow (LYFT)</p>	<p>Unknown number of Washoe Tribal Health Center members</p>	<p>Modified curriculum of Together Raising Awareness for Indian Life program</p>	<p>Youth (ages 12-18)</p>	<p>Significantly lower BMI (34.65 to 20.31) over a three-year span, increased physical activity, consumption of fruits and vegetables and reduced sugary beverage intake</p>	<p>No</p>