**The Impact of Social Determinants on**

**Diabetes Mellitus Type II**

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**Abstract**

Social determinants of health (SDOH) can affect a wide range of health risks and contribute to significant health disparities and inequalities. Individuals with diabetes lacking access to a grocery store with healthy food options are less likely to be able to maintain a healthy A1C. Diabetes mellitus type II is one of the leading causes of death in the United States in recent years and contributes to a lower life expectancy. The inquiry for this evidence-based, quality improvement project is, in adult males and non-pregnant females with diabetes mellitus type II, does SDOH screening improve A1C within three-months at a rural health clinic in Kansas? The current SDOH screening process was time consuming and not done regularly by staff, and there was no formal education process to provide resources to patients who screened positive. This project aimed to implement a simplified SDOH screening tool and increase the distribution of the Resource Guide for community resources to patients at a rural health clinic and decrease patient A1C. The Health Leads screening tool was administered to 20 patients who met inclusion criteria to assess for unmet social needs. Patients who screened positive for one or more SDOH needs were provided a Resource Guide. Overall, the A1C increased for males and females. Social determinants of health are a complex issue. Those with positive indicators for SDOH are at increased risk of negative health outcomes.

*Keywords:* diabetes mellitus type II, food insecurity, A1C, rural health, social determinants of health

**The Impact of Social Determinants on**

**Diabetes Mellitus Type II**

Food policy councils are in a unique position to have a large impact on diabetes mellitus type II in the United States and globally by improving social determinants of health (SDOH). Diabetes mellitus type II is currently identified as a non-communicable disease (NCD). Non-communicable diseases are serious medical problems that have a significant impact on the overall health and the economy. This problem has been worsing despite primary care providers and dieticians educating patients about the need for improved lifestyles. Currently, NCDs have been noted to be the leading cause of global mortality and have resulted in 40.5 million deaths in 2016, or 71% of the total deaths (Wijnhoven et al., 014; WHO, 2016a; WHO, 2016b; WHO, 2016c). Obesity alone is a significant contributing factor to these statistics with 3.5 million deaths noted in 2010, as well as an estimated 10% of global disability adjusted life years as a result of dietary risk factors and physical inactivity (Lim et al., 2012). It is imperative that communities have supportive resources. Those with positive indicators for SDOH are at increased risk of negative health outcomes due to a lack of resources to promote healthy dietary habits as well as overall health for improved health outcomes in the entire population (Woods & Mutrie, 2012).

Accessing fresh, healthy food is an important aspect of controlling blood sugars effectively. The SDOH have a significant impact on the ability of a person to access healthy food. Food policy councils have seen varying degrees of success across the United States by removing some of these barriers to allow better access to fresh healthy food, although not every community has a well implemented food policy council. Removing barriers and improving SDOH are of particular concern for those in rural areas and at-risk populations. This project aimed to decrease the complications of type two diabetes mellitus for the selected population, apply to other populations by establishing a connection between desired results, and remove barriers to healthy fresh food.

According to Herman and Riddle (May, 2018), steady increases have been noted in the total direct cost of diabetes in the United States which was $116 billion in 2007, $176 billion in 2012, and $237 billion by 2017.  In 2018, diabetes cost accounted for about one out of every four dollars spent in healthcare in the United States, and the annual cost for care of a diabetic patient with diabetes averaged around $16,752 per year (Herman & Riddle, 2018).

**Diabetes Mellitus Type II Background and Significance**

Successful management of diabetes mellitus type II depends greatly on maintaining a healthy lifestyle. The American Diabetes Association suggests that an A1C <7% (53 mmol/mol) is a reasonable goal for most nonpregnant adults (American Diabetes Association, 2019b). Obesity and type two diabetes mellitus are on the rise in the United States, with diabetes being the seventh leading cause of death. Diabetes leads to many severe health risks and medical complications if not well managed. Despite many programs and initiatives aimed at decreasing the development or worsening of type two diabetes mellitus, the population continues to struggle with this chronic disease. Diabetes mellitus type two appears to be partly due to barriers to access to fresh healthy food. The health of those who have diabetes type II is affected by those who also experience food insecurity, which can decrease their ability to effectively manage their own health and other conditions such as diabetes (Del Monte et al., 2014). For those who live in communities in which there is less access to healthy foods and more access to unhealthy foods, there is also a correlation between increased food security and associated increased risk for developing diabetes (Breland et al., 2013).

***Impact to Health***

             For adults who have developed type two diabetes mellitus, there are several increased long-term health problems, according to the Cleveland Clinic (2017). These health problems may affect any part of the body (Centers for Disease Control and Prevention [CDC], 2019). They can specifically affect vital organs such as kidneys, heart, brain, as well as the eyes, feet, and nerves. It is further generally recommended that adults who have developed type two diabetes can decrease these problems through blood sugar control and lifestyle changes including diet, according to the American Diabetes Association (2019).

***Impact to Healthcare***

Citizens of the community who have type two diabetes can decrease their A1C by eating healthier food, which can be supported by the community through a Food Policy Council. A lower A1C would decrease the complications and mortality associated with type two diabetes mellitus. According to Herman and Riddle (May, 2018) there has been a steady increase in the total direct cost of diabetes in the United States, which was $116 billion in 2007, $176 billion in 2012, and $237 billion by 2017. Herman and Riddle (May, 2018) state that diabetes cost accounted for about one out of every four dollars spent in healthcare in the United States and that the annual cost for care of a diabetic patient averaged around $16,752 per year at the time of their report. There are additional indirect costs as well as complications. It is worth noting that in the information supplied by Herman and Riddle (May, 2018) that there were adjustments made for inflation and they noted an 11% increased prevalence of diabetes.

***Impact on Quality of life***

Diabetes has become a leading cause of death in the United States as of 2010 in the United States, along with heart disease, stroke, and cancer (Dwyer et al., 2014). In regards to morbidity for adults aged 20 years or greater, the percentage of people with physician-diagnosed or undiagnosed diabetes in the United States was 12.6% in 2011-2014, with 9.6% physician diagnosed and 3.0% undiagnosed by a physician (Centers for Disease Control and Prevention, 2017). In regard to mortality, for adults aged 20 years or greater who had a diagnosis of diabetes, the number of deaths per year was 80,058 in 2016, and the cause of death rank was listed as seven (Arias et al., 2018).

 Diabetes is a serious, chronic disease with a far reaching impact on every system of the body. It is associated with increased risk for morbidity (Centers for Disease Control and Prevention, 2017) and mortality (Arias et al., 2018). Those who do not have the disease can work to mitigate their chances of developing it by incorporating lifestyle changes and healthy eating habits into their daily lives. Those who have already developed type two diabetes can decrease the damage and complications and increase the length of their lives by incorporating healthy lifestyle changes and eating habits into their daily lives, according to Kenan and Popkin (2016). Eating healthy, fresh food can assist with lowering the A1C to acceptable levels.

**Local and Diversity**

In many of our communities, especially in rural communities, there are at-risk populations of older adults and those in poverty who may not have access to the means to acquire and prepare healthy fresh food. An active food policy council developing initiatives in a community can make a difference in the quality of life and the health of the citizens. Alkon et al. (2009) noted that the current national policy in the United States supports an oversupply of grains which translates to an excess of sugars, sweets, fats, and red meat while the fruits and vegetables become increasingly more expensive. Alkon et al. (2009) added that diabetes has been increasing over the last 20 years and that there is a correlation with processed foods becoming cheaper while whole foods increase in price, which they stated is due to farm policy stimulating the production of the wrong kinds of calories. Food policy councils develop food policies that make fresh healthy food accessible to at-risk populations, and this can directly impact and decrease the A1C and decrease the many health problems associated with high blood sugars.

**Diabetes Mellitus Type II Problem and Purpose**

**Problem**

Increased A1C, low-density lipoprotein (LDL), waist circumference, BMI, and blood pressure are associated with diabetes mellitus type II, which can lead to an increased risk for morbidity (Centers for Disease Control and Prevention, 2017) and mortality (Arias et al., 2018). Successful management of diabetes mellitus type II depends on maintaining a healthy lifestyle and also keeping the glycated hemoglobin (A1C) below the gold standard of 7% for non-pregnant adults (American Diabetes Association, 2019b). Improved health outcomes can be increased through access to quality food and community resources. Obesity and diabetes mellitus type II are on the rise in the United States, with diabetes being the seventh leading cause of death. Diabetes leads to many severe health risks and medical complications if not well managed. Despite many programs and initiatives aimed at decreasing the development or worsening of diabetes mellitus type II, the population continues to struggle with control of diabetes. This appears to be partly due to barriers that prevent those with the disease from accessing fresh, healthy food and other health resources in the community to improve their health outcomes.

Social determinants of health are defined as structural determinants and conditions in which people are born, live, work, play, age, and worship, according to Healthy People 2030, and these factors can affect quality-of-life measures as well as overall health, according to the US Department of Health and Human Services, (2019, July). The SDOH can be slightly different for each community, though they generally include housing, transportation, socioeconomic status, discrimination, education, job opportunities, income, access to healthy food, access to physical activity, language barriers, and pollution. Each of these components can have a significant impact on health outcomes. Those who have any positive indicators for SDOH are at increased risk for poor health outcomes, and those with multiple positive indicators for SDOH are at significant risk. These factors affect many of the patients who receive care at a rural health clinic as they are often uninsured and low income as well as located in a rural setting. At the site of this project, there is no formal process for provision of a Resource Guide (RG).

**Purpose Statement**

As noted by Del Monte et al. (2014), the health of those who have diabetes mellitus type II is affected by those who also experience food insecurity, and this can decrease their ability to effectively manage their own health and other conditions such as diabetes. Furthermore, Breland et al. (2013) noted that for those who live in communities in which there is less access to healthy foods and more access to unhealthy foods, there is also a correlation between decreased food security and an increased risk for developing diabetes. Diabetes is a serious disease that impacts every body system. It is associated with increased risk for morbidity (Centers for Disease Control and Prevention, 2017) and mortality (Arias et al., 2018). The aim of this quality improvement project was to implement an SDOH screening tool to increase provider referral rates to community resources and improve the A1C in patients with diabetes mellitus type II at a rural health clinic.

**Project Facilitators and Potential Barriers to Change**

Project facilitators included various local healthcare providers, healthcare systems, the community, local health departments, the active food policy councils in the area, and others who had a genuine interest in improved access to healthy food or health outcomes in the community. This included the members of the community such as those who are disadvantaged or unable to access the resources needed to effectively manage their health with the intervention of a healthy diet.

The cost of the proposed research project was not expected to be a barrier. This will likely result in increased facilitation and sustainability for this project in the community. Grants and other viable sources of funding were not needed for the project.

The factors that fostered potential promotion during the project occured through regular and expected channels such as the local health department and primary care provider staff in regards to access and knowledge of the resources in the community. The project interventions were expected to remain sustainable for the duration of the project and after completion as they are relatively low cost to implement. The interventions can also be defined and altered according to any changing needs of the community population.

**Review of the Evidence**

**Inquiry**

In adult males and non-pregnant females with diabetes mellitus type II, does SDOH screening improve A1C within a three-month time frame at a rural health clinic in Kansas?

**Literature Search Strategies**

A thorough integrated literature review was completed and utilized a comprehensive search of PubMED, CINAHL, Google-Scholar, and UMKC Health Sciences Library. Also, the Center for Disease Control endorses food policy councils. A review of studies from 2010-2020 revealed numerous studies on diabetes and food access. Various searches were conducted using a combination of keywords. Initially, the search included food policy council and diabetes which yielded 159 articles. This search was further refined by adding additional words to focus on specific aspects of the project. These additional keywords included connection, health promotion, social determinants of health, A1C, community resources, metabolic syndrome, health promotion, disease prevention, and health literacy. The final set of keywords included social determinants of health, food policy council, diabetes, connection, health promotion, A1C reduction, community resources, metabolic syndrome, health promotion, lifestyle change, blood pressure, disease prevention, health literacy, and food insecurity.

Thirty-three articles were found to evaluate the impact of food policy councils on diabetes mellitus type II in non-pregnant adults. Based on Melnyk’s Hierarchy of Evidence, 14 were Level I systematic reviews or meta-analysis, and 12 were Level II randomized controlled trials. The remaining studies represented pilot studies, expert opinions, and plans for future systematic reviews.

**Evidence Themes**

For the scope of this project, six themes were identified that pertained to the project intervention. The first states that diabetes mellitus type II is impacted by improved SDOH. This theme is centered on the concept that support is needed in communities in addition to education, and policy efforts are aimed at improving community supports. The second theme indicates that interprofessional collaboration is needed to achieve healthy outcomes. Evidence suggests that improving social determinants of health with an interdisciplinary approach, using a tailored approach, improves the unmet needs associated with that particular community. The third theme notes that food policy has made significant changes to access to healthy food for those with unmet needs as identified by SDOH screenings and provision of a Resource Guide. This is because various infrastructure is placed by food policy councils in the community to support improved food access, leading to improved health outcomes and management approaches for those with diabetes mellitus type II as well as SDOH. Food policy councils are an important driver for SDOH and can have a high degree of impact on the resilience and network of a community as well as access to resources for those in need. The fourth theme focuses on food inequality effects on those with diabetes. Significant food inequality is present in many communities, and each of these situations is different and unique. In the fifth theme, improved access to community resources is explored as it relates to SDOH. Food policy has a great potential to change how the food system is accessed by the public. Lastly, the sixth theme states that policies on agriculture can impact diabetes. This theme relates to policy that interfaces with agriculture. What is planted and how it is brought to market can have a significant impact on availability to those who face challenges as a result of their SDOH.

The SDOH and food policy councils are closely related, and food policy can have a great impact on SDOH. It is important for any community or organization that wants to improve health outcomes relating to SDOH to closely examine their local and regional food policy and food policy council involvement. Various research studies and evidence-based practice guidelines demonstrate support regarding the use of food policy councils as an intervention for diabetes mellitus type II. There are some gaps in the evidence in that research is limited, and while the research does exist, it is not as plentiful as some other interventions. The total number of food policy councils present in the United States, Canada, and in the Tribal Nations currently numbers at 278 (Allen et al., 2017b). Food policy councils involve complex food system changes in rural settings as well as in urban settings, and system changes require a certain degree of collaboration among stakeholders in the community to provide connection to various resources within the community (Allen at al., 2017a). There are also some limitations in the application of the evidence to the inquiry. A food policy council operates in a cross-sector fashion and involves collaborations from various aspects of the food system to work together on identifying issues, coordinate programs, and also to inform policy (Allen at al., 2017a). While there are tools designed to measure council members’ perceptions, no tools have been developed to measure the perception of the members in regard to the capacity and effectiveness of the food policy councils, according to Allen et al. (2017b).

However, there are various positive practice implications for improved quality of healthcare and patient outcomes using food policy councils according to the evidence available currently for review. Significant potential is present to decrease negative health effects for those with diabetes mellitus type II, resulting in a healthier community overall. It would also have a significant impact on the reduction of health care costs from both the private and commercial sectors. Productivity would also be expected to increase with improved health, and food inequality is expected to decrease.

***Diabetes Mellitus Type II is Impacted by SDOH***

Preventative medicine often focuses on the common framework of using an epidemiological approach (Clark & Leavell,1953). Ali and Katz (2015) further indicate that preventive medicine encompasses primary, secondary, and tertiary prevention. It is important to educate patients on what they should do, but it is an ineffective stand-alone concept. Health promotion centers on satisfying a perceived knowledge deficit. Often when a person is seen by their primary care provider, the provider will initiate a discussion or provide a handout designed to educate the patient on a health promotion topic, such as diet or exercise, to encourage the individual to then take action.

Those who have developed type two diabetes can decrease the damage the disease can do to their bodies and increase the length of their lives by also incorporating healthy lifestyle changes and good eating habits into their daily lives, according to Kenan and Popkin (2016). Eating healthy, fresh food is part of what can be done to lower the A1C to acceptable levels. In many communities, especially in rural communities, at risk populations of older adults and those in poverty may not have access to the means to acquire and prepare healthy fresh food. An active food policy council developing initiatives in a community can make a difference in the quality of life and the health of the citizens.

Alkon et al. (2009) note that the current national policy in the United States supports an oversupply of grain which translates to an excess of sugars, sweets, fats, and red meat while the fruits and vegetables become increasingly more expensive. Alkon et al. (2009) added that diabetes has been increasing over the last 20 years and that there is a correlation with processed foods becoming cheaper while whole foods increase in price, which they stated is due to farm policy stimulating the production of the wrong kinds of calories. Food policy councils develop food policies that make fresh healthy food accessible to at-risk populations, directly impacting and decreasing the A1C and health problems associated with high blood sugars.

***Interprofessional Collaboration Needed to Achieve Healthy Outcomes***

Local policy is a tool that community leaders often use to define a clear direction for the community they represent. This defines a path that others can then follow to reach stated goals. It also focuses work efforts and concentrates assets on needed resources. It is often implemented at the higher levels of community leadership, and in the case of food policy councils, some input is derived from various interested representatives in the community. Food policy council membership typically includes citizens and government officials with the goal of reviewing the local food system (Centers for Disease Control and Prevention, 2010). This local policy is part of a much larger food system. Connections are made to this food system by several methods. Traditionally, a family or individual may purchase food. But diverse avenues are available for connection into this food system, such as via food stamps, food banks, stores, agritourism, farmers markets, vending machines, concession stands, and others. Food poly councils are one tool of several that can be used to work towards common goals in a complex system.

***Food Policy Has Made Significant Changes to Food Access***

For adults who have developed type two diabetes mellitus, there are several increased long-term health problems, according to the Cleveland Clinic (2017).  These health problems may affect any part of the body, as noted by the Centers for Disease Control and Prevention (CDC) (2019).  It is generally recommended that adults who have developed type two diabetes can decrease these problems through blood sugar control and lifestyle changes including diet, according to the American Diabetes Association (2019). **C**itizens of the community who have type two diabetes can decrease their A1C by eating healthier food.  Having a Food Policy Council in place to direct change is one way that a community can support consuming healthy foods, thus decreasing the complications and mortality associated with type two diabetes mellitus.

***Food Inequality Affects Those with Diabetes***

Ahrens et al. (2020) indicate that noncommunicable diseases are the leading cause of mortality across the globe. Further, these authors indicate that there are significant costs that are social and economic in nature and that these costs only seem to be elevating diabetes. Low physical activity and unhealthy diet appear to be contributing factors. It is not enough to educate patients. They must also have access to the needed resources to comply with education and advice of health care professionals. These factors are driven primarily by elements located up the chain, such as policy. Complimentary policy integration that meets the needs of the patients in a given population can change the outcomes and encourage healthy lifestyle modifications with equality in resource availability and support for the entire community.

Inequality can be a concern for those who are poor, without transportation, who use food stamps (on a debit card system) in an area that accepts cash such as the Farmers Market, in towns where the nearest grocery store is either very limited in healthy options or very far away, and for those in the lower working class who may not have access to many healthy options while at work. Inequality can also be a concern for those who are uneducated on proper food preparation for available food items which are healthy options. Additionally, inequality can include those food items which involve complex preparation or are costly to prepare.

***Food Policy Council Used to Improve Access to Community Resources***

The connection to community resources concept is an integral component of a complex system of support to increase overall health and improve health outcomes in a community. This connection puts the knowledge into action using various tools, such as a local policy. Blanchard et al. (2001) noted that community is generally established by the individuals who are socially linked within it. The University of Kansas (2019) further indicated that a community is defined rather broadly in terms of resources used to improve the lives of those within a group. These definitions imply that a community resource can be a person, place, community service, business, and members of the community as well. There are many options for various community resources. Each community is unique in what they have available. Some communities will have a transportation system, community gardens for free or inexpensive use, farmers' markets, government assistance programs, or other options. Understanding the unmet needs and working closely in collaboration to develop what is needed to meet the most needs can be helpful.

***Food Policies on Agriculture Can Impact Diabetes***

As noted by Merrigan et al. (2015), agriculture has an effect on the health of society. Any successful policy regarding food should address at least the basic aspects of this impact. There are three main components that are typically addressed in the agricultural food policy: farm-to-school programming, sustainability recommendations in the Dietary Guidelines for Americans, and antibiotic use in animal agriculture. A particular focus which is relevant for this line of inquiry would follow along with the recommendations for the Dietary Guidelines for Americans component. Agriculture also drives the market in some locations. If it is easy or minimal cost to grow a given crop, then food that uses that crop will be more available.

**Limitations**

According to some (Clayton et al., 2015), the food policy council has limitations. One such limitation is that there is limited research available to support positive outcomes or effectiveness. Food policy councils also rely heavily on stakeholders and partnerships in the community (Clayton, Frattaroli, Palmer, & Pollack, 2015). These partnerships can be barriers when partners are not fully engaged or perhaps have little influence on the food sector (Clayton, Frattaroli, Palmer, & Pollack, 2015). Clayton et al. (2015) further add that while the goal of food policy councils is to identify priorities within food systems to improve those priorities through policy efforts that there is limited research describing the food policy council strategies for achievement.

**Gaps**

A large quantity of food policy councils are present in the United States. The total number present in the United States, Canada, and in the Tribal Nations is 278 (Allen et al., 2017b). A food policy council operates in a cross-sector fashion and involves collaborations from various aspects of the food system to work together on identifying issues, coordinate programs, and also to inform policy (Allen et al., 2017a). There is actually not much known about how they operate to achieve influence on the food system in their communities (Allen et al., 2017b). Food policy councils sometimes involve complex food system changes in a rural setting as well as in urban settings, and changes require a certain degree of collaboration among stakeholders in the community to provide connection to various resources within the community (Allen at al., 2017a). While there are tools designed to measure council members’ perceptions, there are no tools that have been developed to measure the perception of the members in regard to the capacity and effectiveness of the food policy councils, according to Allen et al. (2017b).

**Summary and Discussion of Evidence**

The review of evidence revealed that there is a substantial degree of evidence to support the use of SDOH screening and food policy councils to foster health, including management of diabetes. For adults who have developed type two diabetes mellitus, there are several increased long-term health problems, according to the Cleveland Clinic (2017). It is further generally recommended that adults who have developed type two diabetes can decrease these problems through good blood sugar control and lifestyle changes, according to the American Diabetes Association (2019). The A1C is a test used to measure the average levels of blood glucose over the last two to three months (National Institute of Diabetes and Digestive and Kidney Disease, 2018).

Campbell et al. (2018) reported published data of case studies that compared 10 different food policy councils based in California and how these councils interacted with the food systems. Clayton et al. (2015) conducted an investigation as part of a larger study. This investigation involved interviews with 12 food policy council representatives and six policy experts. Buckwalter et al. (2013) is a study that was conducted in Kenya. While it is not United States based, it does underscore the importance of the role that food insecurity plays in diabetic patients in rural settings who have food insecurity problems and poor food choices as a result.

As noted by Del Monte et al. (2014), food insecurity is also prevalent in North America and especially in households with a person diagnosed with diabetes. Also, diabetes is more common in homes that are noted to be more food-insecure. This study emphasizes that all providers should be aware of this fact and knowledgeable about how food security affects the choices diabetics might make between medications and food and other expenses due to food insecurity concerns and that food insecurity is not always easily apparent. Marshall et al. (2018) completed a study in which 5329 adults were screened for diabetes at 27 different food pantries in three cities (Oakland, CA; Detroit, MI; and Houston, TX) for one year (October 2015 – September 2016) and then randomized the 568 participants according to certain criteria. They found that food banks are well placed in the community and equipped to provide needed support to diabetics who are food-insecure. They also found that there is some benefit to providing chronic disease support in the community as more of the population is able to be reached through the food banks.

**Theory of Social Support as a Theoretical Model**

Social Support Theory encompasses several components such as knowledge, social support, and health literacy (Ansari et al., 2016). According to Araban et al. (2018), diabetes is known to be dependent on self-care behaviors. However, Araban et al. (2018) also note that there are several studies that indicate that diabetic patients do also have a lessened ability to care for themselves, which results in additional issues. Social Support Theory diverges potentially into two main avenues according to Collins and Feeney (2015). One avenue is a person being able to cope successfully with life’s adversities, and this may be due to having solid social supports in place or access to useful resources in their community. The other avenue is in relation to a person taking deliberate action to pursue various opportunities in life to improve their circumstance. In either case, the individual is successful and thrives due to effects of social support.

**Concepts**

There are four types of social support: emotional, instrumental, informational, and appraisal (Glanz et al., 2008). Each of these concepts can be used individually or together (Glanz et al., 2008). The main focus of this project was on the instrumental concept as this concept relates to services that are available to the member of the community.

***Emotional***

This is expressed in terms of love, trust, and caring, usually by friends or family but may be neighbors or church family. This is less tangible and is something that is more felt such as a sense of belonging and a sense that one would be missed. This can also be expressed in terms of having a social network.

***Instrumental***

Physically tangible aide and service is the piece where community resources and services are available for use by the individual members of the community. A person can make use of the policy in place by the local food policy council to gain easier access to their local farmer's market or have healthier choices made simpler at work or at the grocery store. Giving people the tools that they need to be successful is key as it often extends beyond simply having the motivation to be successful or being educated on what things to do correctly for self-care. Often, patients are at a loss as to how to connect the dots of access to resources in their lives.

***Informational***

Advice, suggestions, and information is where most clinics are presently in terms of this theory. Information is given to patients about how they can improve their health by eating better and exercising. The problem often lies in a disconnect between what the patient is being told is best and how they can find alternatives to make that a reality in their lives. Sometimes these things are more complex than they initially seem.

***Appraisal***

Information that is useful for self-evaluation may relate to things such as motivational interviewing or areas where patients receive information that they find useful to help them adjust their strategy to achieve the desired goal of blood sugar control and healthy eating.

**Rationale**

Social support Theory is relevant to this project because behavior change is driven strongly by cultural factors and social norms, according to Fleury et al. (2009). Further, social support is noted by Fleury et al. (2009) to be the most important factor in health promotion, and they additionally state that higher levels of physical activity are correlated with increased social support. This theory is highly generalizable and is empirically supported.

**Theory Application**

***Applicability of Chosen Theory***

The application of the Social Support Theory postulates that for modern family systems, social support can come from various sources such as friends, co-workers, and the community, and there is further research that indicates that these things do increase the wellbeing of the family as a whole (Anderson, 1982; Parks & Pilisuk, 1983; Powell & Unger, 1980). As social support can come from various sources, it can also vary from one community to the next. Some communities have strong public access to the food system while others do not. Social Support Theory supports continuity and equality of food systems within the community and across communities, and this may lead to increased health outcomes.

***Operational Definition***

Social Support Theory operationally defines social support to generally be a sense that one is cared for. It also denotes that there is assistance available if needed, as well as some supportive structure and a degree of social involvement on the part of the community. In regards to the concept of instrumental social support, this means that there are physical and tangible benefits to the members of the community. This includes increased infrastructure and operational policy within the city to guide how things are done to increase access to all.

***Relationship Between Concepts***

Each of the four concepts (emotional, instrumental, informational, and appraisal) can be used individually or together (Glanz et al., 2008). These concepts can be accessed and set aside freely and as often as needed to maintain a sense of stasis and continue to thrive. These concepts contribute a different facet to the social support construct, and they each can operate independently of the other. Certainly, having all four would allow for increased stability and a stronger support system.

**Methods**

**IRB and Site Approval**

The project site was a rural health clinic in Kansas, and site approval was obtained from the project clinic's Chief Executive Officer. This project was determined by the University of Missouri Kansas City Institutional Review Board to be an evidence-based quality improvement project, not human subjects research.

**Ethical Issues**

As all participants were non-pregnant adults with type II diabetes mellitus and volunteered to participate, ethical considerations were minimal for special populations of pediatrics and pregnant women as they did not meet inclusion criteria and this quality improvement project was not anticipated to cause any additional risk beyond standard care. If a woman became pregnant, the participation was terminatated as soon as that information was known by the project team leader. Participants could withdraw at any time they wished for any reason, with or without notice.

Some ethical considerations were considered during this project. These included information about the project and patient agreement on participation, privacy, confidentiality, and honesty with those involved (Butts & Rich, 2017). Another consideration was that data collected was kept secured. Castro et al. (2017) indicate that there are seven components that will foster sound ethical science to a study, and these include having a favorable risk to benefit ratio, adding social value, encompassing scientific validity, and showing respect to the participants at all times, including an independent assessment and equitable selection of participants.

**Funding**

The funding for this quality improvement project nvolved the student project team leader providing volunteer time to collect data, collaborating with the site, interacting with patients, and analyzing the data. Other materials were donated or incidental to routine care.

**Settings, Participants**

The setting for this quality improvement project was a rural health clinic in Kansas in an underserved area. Many of the patients are low income or do not have health insurance. Gaining a better understanding into methods to improve their barriers to care may benefit their health outcomes. A convenience sample consisted of non-pregnant female adults and male adults with diabetes mellitus type II. They were offered participation in this improvement project, with an anticipated convenience sample of 175 in the one cohort. Collection of age, gender, vital signs, A1C, and basic demographic information was obtained at baseline and at three months.

**Evidence-Based Practice Intervention**

The project inquiry’s main focus was an evidence-based quality improvement (EBQI) initiative. This inquiry sought to use an evidence-based practice intervention in a manner that is consistent with improving health outcomes for those with diabetes mellitus type II. The intervention used in this inquiry was the provision of a Resource Guide (RG) as supported by the SDOH screening. Evaluation of outcomes were assessed in an outpatient setting over three-months. The clinic was in a county that has an established food policy council. The patients were informed, volunteered, and met inclusion criteria.

The study focused on a single, primary care practice setting. Participants were recruited via flyers and were given an opportunity to opt-in for screening by the project team leader to see if they qualified during their regular office visit (adult, non-pregnant, decision-making capacity, voluntary, diabetes mellitus type II, A1C greater than 7%). Once screening qualified a patient, they were agreeable to proceed, and the patient has been informed of the process, then additional data was gathered, including demographical information, baseline height in inches, weight in pounds, blood pressure, heart rate, pulse oxygen, respiratory rate, and most recent A1C. They were also given the Health Leads screening tool to evaluate SDOH, which is similar to other screening tools such as the Household Food Insecurity Access Scale (HFIAS), a measure of food accessibility developed by the US Agency for International Development and validated for use in developing countries (Buckwalter, et al., 2013). The same data was collected at baseline and at completion at three months. The Health Leads Screening Tool was used to note positive indicators for SDOH and, if found, a Resource Guide was provided to the patient by the provider to increase their awareness of available community resources. The RG contained detailed lists of community resources, the services they provide, and their contact information. The county associated with the project site has a food policy council.

**Change Process and Evidence-Based Practice**

The evidence-based change process was based on Social Support Theory The application of the Social Support Theory postulates that for modern family systems, social support can come from various sources such as friends, co-workers, and the community, and there is further research that indicates that these factors do increase the wellbeing of the family as a whole. The theory of Social Support provided the basis for the inquiry as additional support in the community may include the components of knowledge, social support, and health literacy, according to Ansari et al. (2016). According to Araban et al. (2018), diabetes is known to be dependent on self-care behaviors. However, Araban et al. (2018) also noted that there are several studies that indicate that diabetic patients also have a lessened ability to care for themselves, which results in additional issues.

Making an evaluation of the strength of the theoretical basis of the inquiry was necessary to determine the validity of the inquiry. The Theory of Social Support can be evaluated for impact and effect on diabetes mellitus type II by taking initial measurements as a baseline. Additional measurements were taken at three-months. The measurements recorded included height, weight, blood pressure, A1C, age, gender, and pregnancy status as only non-pregnant adults will be observed. Questionnaires that measured knowledge and understanding of diabetes mellitus type II, number of minutes of physical activity per week, number of fruits and vegetables per day, use of food policy council-based interventions available, and perceived barriers to health were utilized to determine health literacy and the impact on behavior which may be in part due to awareness of being a study participant or from education from various sources such as the primary care provider.

The Theory of Social Support is easily adapted and can be applied to the intervention of food policy councils used to improve access to healthier food options in the community for those who otherwise might not be able to access it. This theory does not appear to have been thoroughly applied to individuals with diabetes mellitus type II. There are some studies that suggest that additional social support does have a positive impact on the health outcomes of those with diabetes mellitus type II Bakht et al. (2013). There are studies that indicate that food policy councils are useful tools to improve access to healthier food choices for those who are disadvantaged (Kenan & Popkin , 2016). There are also various sources that indicate that individuals with diabetes tend to have decreased self-care versus those who do not have diabetes, and suggest they are at a disadvantage (Araban et al., 2018).

The interventions were expected to remain sustainable after completion as they are relatively low-cost to implement. The interventions can also be defined and altered according to any changing needs of the community population. Such interventions which may be made as a result of the data and subsequent analysis of the data resulting from this projectwill likely be community-wide and have co-facilitators as a driving force to maintain them after the conclusion of this study.

**Design**

The study was a quality improvement project with pre-posttest design in one cohort with a three-month study period. There was additional data collected to analyze relationships and contributing factors such as demographical information. The data from the Health Leads Screening Tool was used at baseline and at completion to identify any positive indicators for SDOH. The improvement initiative was SDOH screening with provision of resources to those patients demonstrating unmet needs on the SDOH. Collection of age, gender, vital signs, A1C, and demographic information was obtained at baseline and at three months. The impact on A1C by social determinants of health was analyzed as well as any changes noted to A1C within the cohort.

**Validity**

The internal validity was established through using standardized measurements, including weight in pounds, height in inches, blood pressure readings following protocols established by the American College of Cardiology, and hemoglobin A1C sent to a local reference lab certified by Clinical Laboratory Improvement Amendments (CLIA) for analysis and confirmation for analysis as noted by Datema et al. (2011). These three primary outcomes were reliable, standardized, reproducible, and transferable. The Health Leads Screening Tool also demonstrated validity though 20 years of use with data collection using a variety of questions to determine the best wording at a fifth grade reading level. It is also short at 10 questions which demonstrated more effectiveness than a longer screening tool. Further, it is available in different languages.

**Outcomes**

It was anticipated that effective administration of an SDOH screening tool and provision of a RG would reduce diabetes mellitus type II and positively impact the A1C for adults with diabetes mellitus type II. The primary outcomes reviewed a change in hemoglobin A1C. The primary outcome demonstrated the effect and impact that food policy councils and RG have on the community and those participants who have diabetes mellitus type II. Secondary outcomes were blood pressure and weight.

**Sustainability**

This project intervention is sustainable as it is a low-cost initiative that does not require much time or clinical resources to implement. The Health Leads Screening Tool is printed easily from a website and copied as needed. It is written at a fifth grade reading level and can be self-administered. The RG is updated at least annually and can be adapted as needed. Copies can be made and distributed according to screening tool indicators or upon request to patients. The patients were encouraged to obtain updated labs as part of evidenced-based care. These are often covered by insurance, although some medical services are reduced by sliding scale based on household income and the RG can assist patients with gaining additional supports such as applying for Medicaid or Medicare.

**Measurement Instruments**

Height was measured at initial baseline. Weight was measured using a digital scale without shoes at the initial baseline and at three months. Trained medical staff measured blood pressure using manual blood pressure cuff and stethoscope following American Heart Association recommendations at baseline and intervention completion. Hemoglobin A1C was drawn by venous puncture and analyzed by a Clinical Laboratory Improvement Amendments (CLIA) certified reference laboratory for analysis and confirmation, as noted by Datema et al. (2011). Participants completed the Health Leads Screening Tool, self-assessment questionnaire, at baseline and three months which asked them several questions.

**Quality of Data**

The quality of the data was expected to be relevant and useful. The measurements were valid. The Health Leads Screening Tool was a valid tool and available in various languages. Patients completed the self-report tool during the clinic visit, and a copy was maintained in the chart. The tool is short in duration as well, which is also recommended. A priori power analysis in GPower using a paried t-test, power .8, alph .05, and medium effect revelated a sample size of 27. The results were discussed in comparison to the published research results pertaining to diabetes management and healthy eating.

**Analysis**

Descriptive statistics summarized the metabolic syndrome parameters of weight, hemoglobin A1C, and blood pressure. The outcome variables of weight, blood pressure, and hemoglobin A1C were compared at baseline and at three-months in the one cohort. The statistical analysis used was a paired test or descriptive for the change in A1C.

**Results**

**Setting and Participants**

This project took place at a rural health clinic in Kansas (Lyon County). This clinic primarily provides services to the underserved. The setting participants were non-pregnant adults who meet inclusion criteria. The project included a convenience sample of voluntary individuals, with a total sample size 175 individuals. Within defined parameters of clinical metrics, participants were adults with diabetes mellitus type II. The time frame for this project was December 2021 to March 2022.

**Intervention Course**

The participants were patients receiving care at the clinic. Each participant was given an opportunity to complete the Health Leads Screening Tool. This tool was self-report and then turned into the nursing staff and reviewed. If the patient was identified as having positive social determinants of health, then the Resource Guide was provided to them so that they could have increased access to community resources that target reducing the adverse impacts of social determinants of health.

**Outcome Data**

There were originally 207 participants, 12 of the 207 were minors, and 20 of the 207 were double entries as the same patient had been seen multiple times but not at an interval sufficient enough to collect a second A1C. This resulted in 175 participants for this project. Of the 175 participants, 8 of them were pre-diabetic and 20 of them had diabetes mellitus type II, 16% of the 175 were either pre-diabetic or had diabetes mellitus type II. Of those with diabetes mellitus type II, 8 were male and 12 of them were female. Of the participants with pre-diabetes, 1 of them was male and 7 of them were female. Overall, the A1C increased in both males and females for the duration of this project. The SDOH screening tool and provision of an RG did not appear to reduce the poor health outcomes associated with DM2. Overall, the A1C increased in both males and females for the duration of this project. This does not appear to support that RG is helpful though many factors may have limited effectiveness. Televideo may have impacted results and personal relationships. Project duration was short and only one clinic was involved. Pandemics disrupt access to supports, so even with RG, they may still have experienced some other barriers to support outside the scope of this project. Pandemic and clinic plans disrupted work flows (staff changes, impending remodel, focus on upcoming switch to new EMR). Some patients prefered to obtina labs at an outside facility and may not have sent updated records of to the project clinic within the timeframe of this study. Referrals were difficult to process to sources related to SDOH.

This project provides an opportunity to examine standardized screening for SDOH and the impact. Future studies will direct improvements and demonstrate impact. Social context of disease cannot be ignored. RG may have prevented participants from progressing to PDM or DM2. The holiday season also likely had some impact on the results of the A1C. Patients were able to access community resources and advocate for their own needs. They appeared to be more engaged with staff than previous as a result of this project.

**Discussion**

**Successes**

This project was able to identify some key areas of focus for future study despite operating during a pandemic. While the project was short, the participants were provided with a Resource Guide. Future studies may indicate that more time is needed for these interventions to be effective or that having them in place outside a pandemic was more impactful. Regardless, this project did allow for improved understanding of various factors influencing local population social determinants of health and did open dialogue for future training and clinical protocol.

**Study Strengths**

The strengths of this project are primarily that it was simple and easy to implement. The screening process and intervention did not take much time, training, or resources to be implemented. This lends to sustainability and a foundation upon which future work in this area can be focused for this clinic and population. The project also brought awareness to various staff inside the clinic structure and support networks of the clinic. As social determinants of health are now being measured on a regular basis in the clinic, outcomes can be tracked over a longer period to gain additional insights. This project provides opportunity to examine standardized screening for SDOH and impact.

**Results Compared to Evidence in the Literature**

The literature indicates that addressing the social determinants of health will have a positive impact on the A1C. In this project that did not appear to be the case. However, given the limitations, it is possible that there were indirect effects preventing worsening of disease or that a project longer in duration may have shown similar results aligning with the evidence in the literature. There are a variety of factors that are both known and unknown that did or may have had an impact on the outcomes in this project.

**Limitations**

**Internal Validity Effects**

The study findings do not appear to support that RG is helpful. Televideo may have impacted results and personal relationships. Project duration was short and only one clinic was involved. The pandemic and clinic plan for renovation disrupted work flows (staff changes, impending remodel, focus on upcoming switch to a new electronic medical record). Some patients prefered labwork at outside facilities and may not have sent updated records of those results to the project site clinic. In general, prior to this project, referrals were difficult to outside sources related to SDOH. This project took place over the holiday season which also likely had some impact as well. This project did account for transgender and non-binary participants, though none were pre-diabetic or diabetic.

**External Validity Effects**

A pandemic disrupts access to supports, including staffing shortages or negative impacts on workflows which are outside the regular parameters. Future study sites may benefit from having their own internal lab and primary care in-house to ensure that any A1C results for patients are reported in a timely manner. If not able to achieve this, there may be a benefit from having a release of information form on file to any outside lab or primary care clinic prior to study initiation to streamline obtaining final results. Screening patients for SDOH and providing a Resource Guide may provide support though there are many factors contributing to individual situations. Not all electronic medical records systems allow for ease of tracking gender other than binary or transgender. This is an important aspect as it not only allows for affirming care and reducing suicide risk, but also it may allow additional insight into population or gender specific issues in regards to social determinants of health that can then be supported if identified. Some electronic medical records have their own tracking programs for social determinants of health. If such exists with a high degree of validity is present, then this may be more beneficial than the Health Leads Screening Tool although it may already be contained in the chart and it does not require scanning, does not require printing, is computer generated so is easy to read, and it may be possible to generate reports from such components of a sophisticated charting system.

**Sustainability of Effects and Plans to Maintain Effects**

The screening tool and intervention evaluated in this project continue to be used in the clinic well after the project. The ease of use and validity of the screening tool make it an effective screening option. The Health Leads Screening Tool is concise, written at the fifth grade literacy level. It is also available in multiple languages if needed. This screening tool is strength-based and preserves the dignity of patients. It can be self-administered and does not take additional staff time away from other tasks to complete. The tool is valid as each question has been studied a number of times to identify the best way to word it. The tool is short in duration and can be copied as many times as needed or used as a foundational piece to create a form in the electronic medical record system.

**Interpretation**

**Expected and Actual Outcomes**

The expected outcome was that screening for SDOH with a valid screening tool and provision of community resources to facilitate patient access would have an appreciable effect on the A1C. This would have then resulted in overall improved health outcomes. The actual outcomes demonstrated different results as the A1C increased. It is possible that the short project duration may have impacted this and that a longer project duration may have actually provided expected results. Further, the effects of the pandemic and the holiday season cannot be overlooked.

**Intervention Effectiveness**

Initially, it appears that the screening tool utilized and the provision of a Resource Guide were not effective. However, it may be possible that while the A1C did increase in some, for others, they might not have developed disease or their disease did not progress. A larger sample size and duration would provide additional information from which further conclusions and interpretations could then be made. The intervention evaluated in this project would be expected to demonstrate useful data in a rural setting or underserved population in which the participants have access to primary care, a lab, and community resources identified in the Resource Guide.

**Intervention Revision**

Future studies may benefit from increasing the sample size and the duration of time and implementing a release of information for any outside lab results for A1C prior to initiation of the study. The Health Leads Screening Tool is a reliable and effective process to identify needs and obtain data. A Resource Guide can be a simple list of resources but would likely serve as a stronger tool to the patient if kept current with addresses, phone numbers, websites, and a brief description of the type of services offered. It may also be useful to group the types of resources into categories for ease of reference.

**Expected and Actual Impact to Health System, Costs, and Policy**

The social context of disease cannot be ignored. Food system changes in a rural setting as well as in urban settings require a certain degree of collaboration among stakeholders in the community to provide connection to various resources within the community (Allen at al., 2017a). In many communities, especially in rural communities, there are at-risk populations of older adults and those in poverty who may not have access to the means to acquire and prepare healthy fresh food. They may also lack the knowledge of how to prepare healthy food or other resources such as time or transportation. The RG may also have prevented participants from progressing to pre-diabetes or diabetes mellitus type II in that many local resources are available there. There is significant potential to decrease negative health effects for those with diabetes mellitus type II. This would result in a healthier community overall. It would also have a significant impact on the reduction of health care costs from both the private sector and the commercial sector. Productivity would also be expected to increase with improved health. Food inequality is expected to decrease.

**Opportunities**

There is opportunity in future projects and studies to examine the different aspects of social determinants of health. There is ample space for future work to demonstrate further value and effectiveness. A future project or study may benefit by being longer in duration, expanding to multiple sites or settings, and demonstrating a larger volume of measured A1Cs. There is also additional opportunity to tailor the foundations of this project to specific geographic areas or populations to target the needs in that area. In this way, future work would likely present more definitive information. Future studies can direct improvements and demonstrate impact.

**Conclusion**

It is important to understand and review the evidence in regards to the practical usefulness of food policy to impact diabetes mellitus type II and the A1C. A food policy council promotes the intervention of eating healthy, fresh food. This is a component of initiatives to lower the A1C to acceptable levels. In many of our communities, especially in rural communities, there are at-risk populations of older adults and those in poverty who may not have access to the means to acquire and prepare healthy fresh food. They may also lack the knowledge of how to prepare healthy food or other resources such as time. An active food policy council developing healthy initiatives in a community can make a difference in the quality of life and the health of the citizens. The A1C is measured by using a blood test once every 3 months. This project required a baseline A1C, and a second A1C at three months. The intended outcome of this inquiry was that the use of food policy councils in the community would have positive impacts on the A1C for adults with type two diabetes mellitus.

The dissemination of the information gained from this study may help guide existing food policy councils in their mission, and it may also result in additional resources being connected in a way that had not happened previously. The widest dissemination possible should be considered upon data availability and study conclusion. Further study is needed in this area as food policy council data is limited and can be difficult to study given that it is not an isolated intervention, but rather by its own design, takes place alongside other interventions. Some of those interventions may have been in place for a significant amount of time such as with patient education, diet, exercise, and others. These will have significant amounts of research to support their effectiveness. While food policy councils do not yet share this wealth of research, it would not be practical or advisable to isolate patients benefiting from proven measures in the interest of studying only the impact of food policy councils. Further studies can explore the relationships between food policy councils and effective interventions and their various impacts on diabetes mellitus type II as well as on the overall health of the community at large.

The impact of control of diabetes mellitus to healthcare is significant. Not just in the financial costs of managing diseases such as diabetes, but also in decreasing co-morbidities and increasing healthy outcomes in the communities. Accessing fresh, healthy food is an important aspect of controlling blood sugars effectively. Food policy councils have seen varying degrees of success across the United States with removing some of these barriers to allow better access to fresh, healthy food. This is of particular concern for those in rural areas and at-risk populations. This project may help to decrease the complications of type two diabetes mellitus for the rural population, have implications for other populations by establishing a connection between desired results, and removing barriers to healthy fresh food.

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**Appendix A**

Cost, Facilitators & Barriers

Estimated Cost Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Item Description** | **Quantity** | **Unit Cost** | **Anticipated Cost** |
| Scale | Standard scale | 1 | $183.00 | Donated  (Part of standard office equipment) |
| Computer | Desktop | 1 | $700.00 | Donated  (Part of standard office equipment) |
| Serum A1C | Venous puncture | 28 at baseline  28 at 3 months | $10.00 x 56 = $560 | Donated  (Patient would be getting these tests done for regular care with or without the study as part of regular care.) |
| Pens | 18 pack | 1 | $5.44 | Donated |
| Notebooks | 4 Pack, 100 sheets | 1 | $10.00 | Donated |
| Blood Pressure Cuff | Standard adult | 1 | $40.05 | Donated |
| Team Leader Hours | 20 hours a week | 600 hours | $45/hour x 600 hours = $27,000 | Donated |
| **Total** |  |  | $28,498.49 | $0.00 |

The cost of the student’s time would be considered free (600 hours, 10-20 hours per week and completed outside of regularly scheduled work hours).  The use of computer would be provided by the student and/or facility.  Any needed pens and notebooks would be provided by the student.  The A1C sampling and vital signs would be taken regardless of this study as they would be part of the regularly scheduled health care for these patients.  Paper and ink provided for questionnaires/surveys would be provided by the student. The primary care clinic and local food policy council is expected to be a facilitator of this inquiry. Barriers may come in the form of English as a second language and COVID 19 pandemic restrictions.

**Appendix B**

Definition of Terms

A1C – This is a blood test which providers may order so that they may monitor diabetes. I could

also be used in combination with other tests to make a diagnosis. Specifically, it will check for the presence of diabetes mellitus type II and prediabetes. It specifically measures the average blood glucose level over the past three months.

CLIA – CLIA stands for Clinical Laboratory Improvement Amendments. It is the regulation

branch of the Centers for Medicare and Medicaid Services (CMS). CMS regulates all of the laboratory testing on humans in the United States other than that which falls under the purview of research. CLIA is responsible for regulating approximately 260,000 laboratories.

Diabetes Mellitus Type II – This is a chronic disease which is characterized by elevated levels of

blood sugar. It is also referred to as adult-onset diabetes and the long-term effects of the disease can be decreased with good exercise and a healthy diet.

Food Policy Council – This is a group of stakeholders in the community which often includes a

diverse panel of representatives. Their goal is to improve the food environment for a particular community and so can tailor the goals and actions of the council to fit the needs assessment of the community.

Theory of Social Support – This is a theory which states that there is a perception and an

actuality when one is part of a supportive social network, when one feels cared for, and also when one can access assistance from others. There are four main components of Social Support Theory: emotional support, tangible support, informational support, and companionship support.

**Appendix C**

PRISMA 2009 Flow Diagram



Studies included in quantitative synthesis (meta-analysis)  
(n = 33)

Full-text articles excluded, with reasons  
(n = 63)

Full-text articles assessed for eligibility  
(n = 126)

Records excluded  
(n = 63)

Records screened  
(n = 159)

Records after duplicates removed  
(n = 421)

## Identification

## Eligibility

## Included

## Screening

Records identified through database searching  
(n = 663)

Additional records identified through other sources  
(n = 6)

Studies included in qualitative synthesis  
(n = 33)

**Appendix D**

Synthesis of Evidence Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **First author, Year, Title, Journal** | **Purpose** | **Research Design1, Evidence Level2 & Variables** | **Sample & Sampling, Setting** | **Measures & Reliability (if reported)** | **Results & Analysis Used** | **Limitations & Usefulness** |
| **A1C** |  |  |  |  |  |  |
| Marshall (2018). Comprehensive Diabetes Self-Management Support from Food Banks: A Randomized Controlled Trial. Am J Public Health. | To determine whether food bank provision of self-management support and diabetes-appropriate food improves glycemic control among clients with diabetes. | RCT, level 2. Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT). | 5329 adults screened for diabetes at food pantries (n = 27) affiliated with food banks in the cities of: Oakland, California; Detroit, Michigan; and Houston, Texas; between the dates of: October 2015 and September 2016. The participants were then individually randomized. 568 participants with hemoglobin A1c (HbA1c) 7.5% or greater were randomized to waitlist control or 6-month intervention including food, diabetes education, health care referral, and glucose monitoring. The primary outcome was HbA1c at 6 months. | Basic reliability testing suggested acceptable device performance (data forthcoming). There was potential contamination between intervention and control groups because participants interacted at food pantries and within their communities. It is also possible that HbA1c improvements in both groups reflected an overall shift in participating food pantries toward more diabetic-friendly practices and procedures outside of the trial. | Food security (relative risk [RR] = 0.85; 95% confidence interval [CI] = 0.73, 0.98), food stability (RR = 0.77; 95% CI = 0.64, 0.93), and fruit and vegetable intake (risk difference [RD] = 0.34; 95% CI = 0.34, 0.34) significantly improved among intervention participants. There were no differences in self-management (depressive symptoms, diabetes distress, self-care, hypoglycemia, self-efficacy) or HbA1c (RD = 0.24; 95% CI = −0.09, 0.58). | There is a noted disconnect between community interventions being integrated with clinical care to improve disease outcomes in diabetic adult patients. Several settings were used.  Realistic use. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Food Insecurity |  |  |  |  |  |  |
| Del Monte (2014). The Intersection between Food Insecurity and Diabetes: A Review. Curr Nutr Rep. | This research synthesizes the current literature on food insecurity and diabetes self-management. This synthesis is important, because nutritional self-care is the cornerstone of diabetes management and is critical to preventing diabetes-related complications. Healthcare providers and public health policymakers need to be aware of how food insecurity and diabetes intersect, with the goal of increasing accessibility of healthy foods to prevent diabetes and better manage the condition. | Systematic review, level 5. | Searched Medline, CINAHL, the Cochrane Database of Systematic Reviews, Web of Science, and PsychInfo using keywords. English-language articles published before May 2014 were reviewed if they (a) explored or measured food security, food augmentation strategies, food preferences, food access, and/or dietary intake; and (b) targeted a diabetic population. Of the 539 articles initially found, 16 articles met the inclusion criteria. Another 23 articles were identified by hand-searching the references of these 16 articles, for a total of 39 articles reviewed. | Article does not mention only looking at RCT’s and no identifying information noted for measures and reliability. | Not only do the prevalence rates of diabetes and food insecurity mirror each other, but diabetes prevalence also rises with increasing severity of food insecurity (10 % for mild household food insecurity vs. 16.1 % for severe) | This research notes that diabetes is increasing and mirrors food insecurity. It calls for action among providers and policy makers.  Realistic. |
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*1 State the specific research design or EBPG/guideline. 2 State the Hierarchy of Evidence per the Melnyk 7 level.* -

**Appendix E**

Evidence Grid

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Theme, brief phrase** | **Theme, brief phrase** | **Theme** | **Theme** | **Theme** | **Theme** |
| **Article (last name of first author, date)** | Diabetes mellitus type II is a growing epidemic and can be improved with various lifestyle changes | How agriculture affects public health | Inequalities in the food system | Lessons learned from food policy councils as a whole | Food policy efforts in food system change | Food policy councils facilitate collaboration building and integration of information from a variety of sectors to improve health outcomes |
| Clayton, 2015 |  |  |  |  | x |  |
| Campbell, 2018 |  |  |  |  | x |  |
| Schiff, 2008 |  |  |  |  | x |  |
| Alkon, 2009 |  |  |  | x |  |  |
| Allen, 2017 |  |  |  |  |  | x |
| Alkon, 2018 |  |  | x |  |  |  |
| Merrigan, 2015 |  | x |  |  |  |  |
| Cuny, 2019 |  |  | x |  |  |  |
| Holtsclaw, 2009 |  |  |  |  | x |  |
| Carroll, 2018 |  |  | x |  |  |  |
| Detroit Food Policy Council, 2020 |  |  | x |  |  |  |
| Darwish, 2015 | x |  |  |  |  |  |
| Asif, 2014 | x |  |  |  |  |  |
| American Diabetes Association, 2010 | x |  |  |  |  |  |
| National Institute of Diabetes and Digestive and Kidney Disease, 2018 | x |  |  |  |  |  |
| Marshall, 2018 |  |  | x |  |  |  |
| Del Monte, 2014 |  |  | x |  |  |  |
| Cleveland Clinic, 2017 |  |  |  |  |  |  |
| Centers for Disease Control and Prevention, 2019 | x |  |  |  |  |  |
| Buckwalter, 2013 |  |  | x |  |  |  |
| American Diabetes Association, 2020 | x |  |  |  |  |  |
| Ahrens, 2020 |  |  | x |  |  |  |
| Wijnhoven, 2014 |  |  |  | x |  |  |
| Woods, 2012 | x |  |  |  |  |  |
| Lim, 2012 | x |  |  |  |  |  |
| Ali, 2015 | x |  |  |  |  |  |
| Centers for Disease Control and Prevention, 2017 | x |  |  |  |  |  |
| Arias, 2018 | x |  |  |  |  |  |
| Kenan, 2016 | x |  |  |  |  |  |
| Alkon, 2009 | x |  |  |  |  |  |
| Centers for Disease Control, 2010 |  |  |  |  |  | x |
| Blanchard, 2001 | x |  |  |  |  |  |
| University of Kansas | x |  |  |  |  |  |

# **Appendix F**

# Logic Model

# **Student: Jena Dunham**

# **PICOT Question: The PICOT (population, intervention, comparison, outcome, time frame) for this project is: In adult males and adult non-pregnant females with diabetes mellitus type II who have an AIC of 7% or greater, do food policy council initiatives compared to those who do not benefit from a food policy council improve patients’ A1C during a six month time frame at primary care setting?**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Inputs** |  | **Intervention(s) Outputs** | |  | Outcomes -- Impact | | | |  |
|  | *Activities* | *Participation* |  | Short | Medium | Long |  | | |
| **Evidence, sub-topics**  -Diabetes mellitus type II is improved by food policy councils  -Interprofessional collaboration is needed to achieve healthy outcomes  -Food policy has made significant changes to food access  -Food inequality affects those with diabetes  -Food policy council improves access to community resources  -Policies on agriculture can impact diabetes  **Major Facilitators or Contributors**  Necessary items and team leader hours will be donated. The primary care clinic and local food policy council is expected to be a facilitator of this inquiry.  **Major Barriers or Challenges**  The venous A1c sampling for baseline, at 3 months, and at 6 months is the primary cost at an estimated $3,600.00. Barriers may come in the form of English as a second language and COVID 19 pandemic restrictions. |  | **The EBP intervention which is supported by the evidence in the Input column**  Diabetes mellitus type II adverse effects are minimized with access to resources in the community such as healthy food options.  **Major steps of the intervention**  -Site location with IRB and organizational approval.  -Recruit voluntary, competent participants meeting inclusion criteria.  - Informed consent.  - Gather demographical data and standard health metrics.  - Participant completes the HFIAS questionnaire.  - Repeat data collection and standard health metric collection at 3 months and 6 months. | **The participants (subjects)**  **Site**  Ottawa Family Practice Clinic  **Time Frame**  6 months  **Consent Needed or other**  Informed Consent from participants  **Person(s) collecting data**  Team Leader  **Others directly involved.**  Clinic staff directly associated with patient care of participants. |  | **(Completed as a student).**  **Outcome(s) to be measured with reliable measurement tool(s)**  Weight  Blood pressure  Hemoglobin A1C  **Statistical analysis to be used.**  Descriptive for each group. Comparison statistics if two independent groups. | **Outcomes to be measured (past DNP student time).**  Weight  Blood pressure  Hemoglobin A1C | **Outcomes that are potentials (past DNP student)**  Improved access to healthy food and improved diabetes control. | |  |

**Appendix G**

Outcomes, Tools, and Analysis

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | State | Measurement Instrument Name | Tool validity and reliability | Permission Need | Statistical Analysis |
| Primary Outcome | Weight  Blood pressure  Hemoglobin A1C | -Weight in pounds  -Systolic and diastolic readings through manual cuff  -Hemoglobin A1C through serum | -Standard electronic Scale  -Manual blood pressure cuff and stethoscope  -Venous puncture collected and sent to CLIA certified reference laboratory for analysis and confirmation | Public Domain | Descriptive for each group. Comparison statistics if two independent groups. This study used paired test as only one cohort with pre and post data. |
| Secondary Outcome | SDOH | -Health Leads Screening Tool | Patient reported, questions come from a validated instrument. | Not Applicable | Descriptive for each group. Comparison statistics if two independent groups. |
| Demographics | Age  Gender  Height | Not applicable | Not applicable | Not Applicable | Descriptive for each group. Comparison statistics if two independent groups. |
|  |  |  |  |  |  |
| Participant Completion of the Measurement Tool (Procedure): Health Leads Screening Tool self-completion and if criteria met given Resource Guide. | | | | | |

**Appendix H**

Intervention Protocol and Intervention Diagram

1. Site location with IRB and organizational approval.

2. Recruit voluntary, competent participants meeting inclusion criteria.

3. Informational Letter

4. Gather demographical data and standard health metrics.

5. Participant completes the HFIAS questionnaire.

6. Repeat data collection and standard health metric collection at 3 months .

**Appendix I**

Data Collection Template and Analysis

|  |
| --- |
| **Data Collection** |
| Gender |
| Age |
| No Diabetes |
| Pre-Diabetes |
| Diabetes Type II |
| Initial Weight |
| Initial Height |
| Initial Blood Pressure |
| Pre-A1C |
| Post-A1C |
| Date RG was given |
| Date Health Leads Screening Tool was administered |

|  |  |  |
| --- | --- | --- |
| **207 Total Entries** | | |
| 12 Entries are minors | 207-12= | 195 |
| 20 Entries are double entries | 195-20= | 175 |
| PDM and DM2 | 8+20= | 28 |
| Percent PDM and DM2 | 28/175= | 16% |
| DM2 Male |  | 8 |
| DM2 Female |  | 12 |
| PDM Male |  | 1 |
| PDM Female |  | 7 |

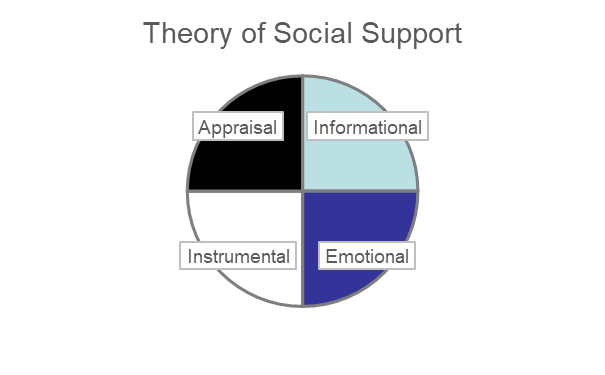
|  |  |  |  |
| --- | --- | --- | --- |
| **Pre-Diabetes** |  |  |  |
| Gender | All Entries | Double Entries | Total (All Entries - Double Entries) |
| Male | 1 | 0 | 1 |
| Female | 7 | 0 | 7 |
| Transmale | 0 | 0 | 0 |
| Transfemale | 0 | 0 | 0 |
| Non-binary | 0 | 0 | 0 |
|  |  |  |  |
| Total |  |  | 8 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Diabetes Type II** |  |  |  |  |
| Gender | All Entries | Double Entries | Total (All Entries - Double Entries) |  |
| Male | 9 | 1 | 8 |  |
| Female | 13 | 1 | 12 |  |
| Transmale | 0 | 0 | 0 |  |
| Transfemale | 0 | 0 | 0 |  |
| Non-binary | 0 | 0 | 0 |  |
|  |  |  |  |  |
|  |  |  | 20 | 28 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Diabetes Type II** | | | | | | |  |
| Males | Number | Pre A1C | Post A1C | Increased | Decreased | Not Counted |  |
|  | 1 | A1C at PCP | A1C at PCP | 0 | 0 | 1 |  |
|  | 2 | 6.7 | 6.8 | 1 | 0 | 0 |  |
|  | 3 | 8 | 8.4 | 1 | 0 | 0 |  |
|  | 4 | 5.9 | 6.8 | 1 | 0 | 0 |  |
|  | 5 | 14.3 | 11.9 | 0 | 1 | 0 |  |
|  | 6 | 8.1 | 7.6 | 0 | 1 | 0 |  |
|  | 7 | A1C at PCP | A1C at PCP | 0 | 0 | 1 |  |
|  | 8 | A1C at PCP | A1C at PCP | 0 | 0 | 1 |  |
|  | Total |  |  | 3 | 2 | 3 | 8 |
| Females | Number | Pre A1C | Post A1C | Increased | Decreased | Not Counted |  |
|  | 9 | 7.9 | 11.9 | 1 | 0 | 0 |  |
|  | 10 | A1C at PCP | A1C at PCP | 0 | 0 | 1 |  |
|  | 11 | 7.9 | 11.9 | 1 | 0 | 0 |  |
|  | 12 | 6.1 | A1C at PCP | 0 | 0 | 1 |  |
|  | 13 | 6.3 | 6.1 | 0 | 1 | 0 |  |
|  | 14 | 7.5 | 8.8 | 1 | 0 | 0 |  |
|  | 15 | 5.7 | 9 | 1 | 0 | 0 |  |
|  | 16 | 6.9 | No A1C | 0 | 0 | 1 |  |
|  | 17 | 5.9 | 6.6 | 1 | 0 | 0 |  |
|  | 18 | 5.8 | 6.4 | 1 | 0 | 0 |  |
|  | 19 | 6.2 | Beyond Project | 0 | 0 | 1 |  |
|  | 20 | 6.3 | Beyond Project | 0 | 0 | 1 |  |
|  | Total |  |  | 6 | 1 | 5 | 12 |
|  |  |  |  |  |  |  |  |

**Appendix J**

Theory to Application Diagram



**Appendix K**

Project Timeline Flow Graphic

**Appendix L**

Statistical Analysis Table Template

|  |  |
| --- | --- |
|  | **Proposal Statistical Analysis Worksheet** |
| **PICOTS, include the “C”** | The PICOT (population, intervention, comparison, outcome, time frame) for this project is, in adult males and non-pregnant females with diabetes mellitus type II, does SDOH screening improve A1C within a three-month time frame at a rural health clinic in Kansas? |
| **Purpose Statement** | The aim of this quality improvement project was to implement a SDOH screening tool to increase provider referral rates to community resources and improve diabetes mellitus type II at a rural health clinic in Kansas. |
| **One group “within “ comparison or two group “between” comparison.** | Comparison of two groups both within and between comparison. Those with intervention compared to non-intervention or a standard care group. The within comparison would be between pre and post intervention values collected in the group with the intervention. |
| **Sample size.** | 175 individuals. |
| **Null Hypothesis (required for statistician)** | In adults with diabetes mellitus type 2, screening of SDOH and referral to community resources will not improve weight, blood pressure, and hemoglobin A1C over 3 months at a rural health clinic. |
| **Independent Variable (intervention)** | Resource Guide. |
| **Primary Dependent Variable (Primary outcome measurement)** | Resource Guide impact will be evaluated by changes in A1C. |
| **Statistical Comparison Test for Primary Outcome** | Variable between and within groups will be compared pre and post. |
| **Secondary Dependent Variables, if present** | This inquiry will seek comparison of additional metrics such as weight, blood pressure, and gender. |
| **Statistical Test(s) for Secondary Outcome** | Variables between and within groups will be compared pre and post. |
| **Demographics to be collected** | Age, sex, gender, height. |
| **Statistical Test(s) for Demographics** | Descriptive identification of statistical outcomes. |
| **Priori or Post-Hoc power analysis if > 30 participants.** | Quality Improvement Project. |

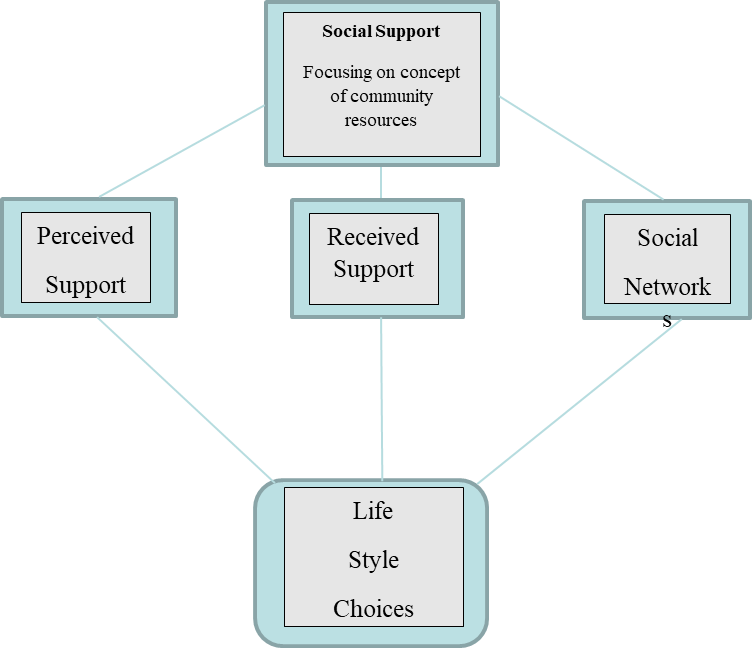
**Appendix M**

Letter Requesting Original Site Administrative Approval to Conduct Study

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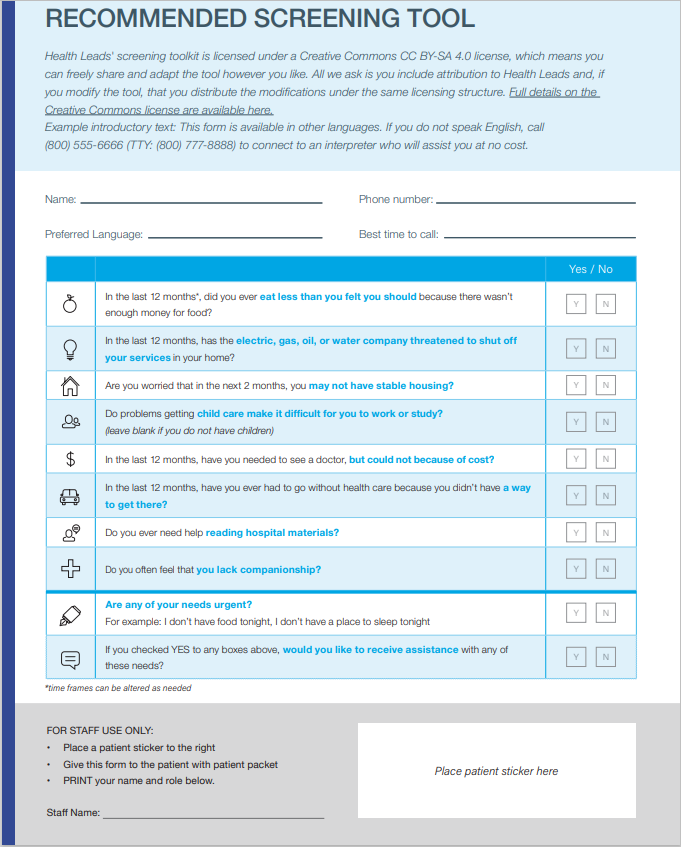
**Appendix N**

Diagram of Change



Appendix O

Health Leads Screening Tool



Appendix P

IRB Letter

