Successful Interventions in Reducing the Prevalence of Type II Diabetes in Latinos/Hispanics: A Literature Review

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Fall 2017

HPRB 5010

INTRODUCTION

Diabetes is the seventh leading cause of death in the United States and 9 out of 10 people with diabetes have type II diabetes (Center For Disease Control and Prevention, 2017). Type II diabetes is caused by cells' inability to respond normally to the hormone insulin, which is made in the pancreas. Because of this inability, the pancreas tries to compensate by making more insulin to get cells to respond but is not able to keep up, which causes glucose to accumulate in the blood. Type II diabetes is a chronic disease typically found in older adults, however it is becoming increasingly common in children and young adults (Center For Disease Control and Prevention, 2017). Type II diabetes is different from type I because in type I the body does not produce insulin. Type I diabetes is an autoimmune disease that primarily affects children, whereas type II is developed through a person's lifetime and affects the body in different ways.

Type II diabetes disproportionately affects minority groups, with Latinos experiencing a 50%-100% higher burden of illness and mortality due than White Americans (Center For Disease Control and Prevention, 2017). This could be due to many factors including low socioeconomic status, lack of health insurance, and lack of U.S. citizenship. Age is also a factor in who contracts type II diabetes. Adults aged 45 to 64 had the most diagnoses of type II diabetes at 892,000 new cases in 2012, whereas occurrences were far less for age groups 20 to 44 and over 65 (Center For Disease Control and Prevention, 2017). Generally as one gets older, the burden of disease gets worse and because mostly older adults are affect by type II diabetes, children will be left out of this review.

Some diabetes related terms that will be discussed throughout this paper are important to define. HbA1c levels are the average blood sugar levels over the past 2 to 3 months and are a good predictor of risk of diabetes. There are other blood tests that are given to test for diabetes,

but HbA1c is most commonly used in interventions to test for a reduction in in blood sugar. Also, the term Latino and Hispanic may be used inter-relatedly but it is important to note that they are not exactly the same thing. The term Latino, as defined by the Associate Director of Latino Studies Mintzi Martinex-Rivera from Indiana University, is "any person of Latin American descent residing in the United States" (Garcia-Navarro, 2015). Hispanic is defined as people who share the common language that is Spanish (Garcia-Navarro, 2015). This review includes Latinos, Hispanics, and Mexican-Americans but for the sake of consistency the term Latino will be used throughout this paper.

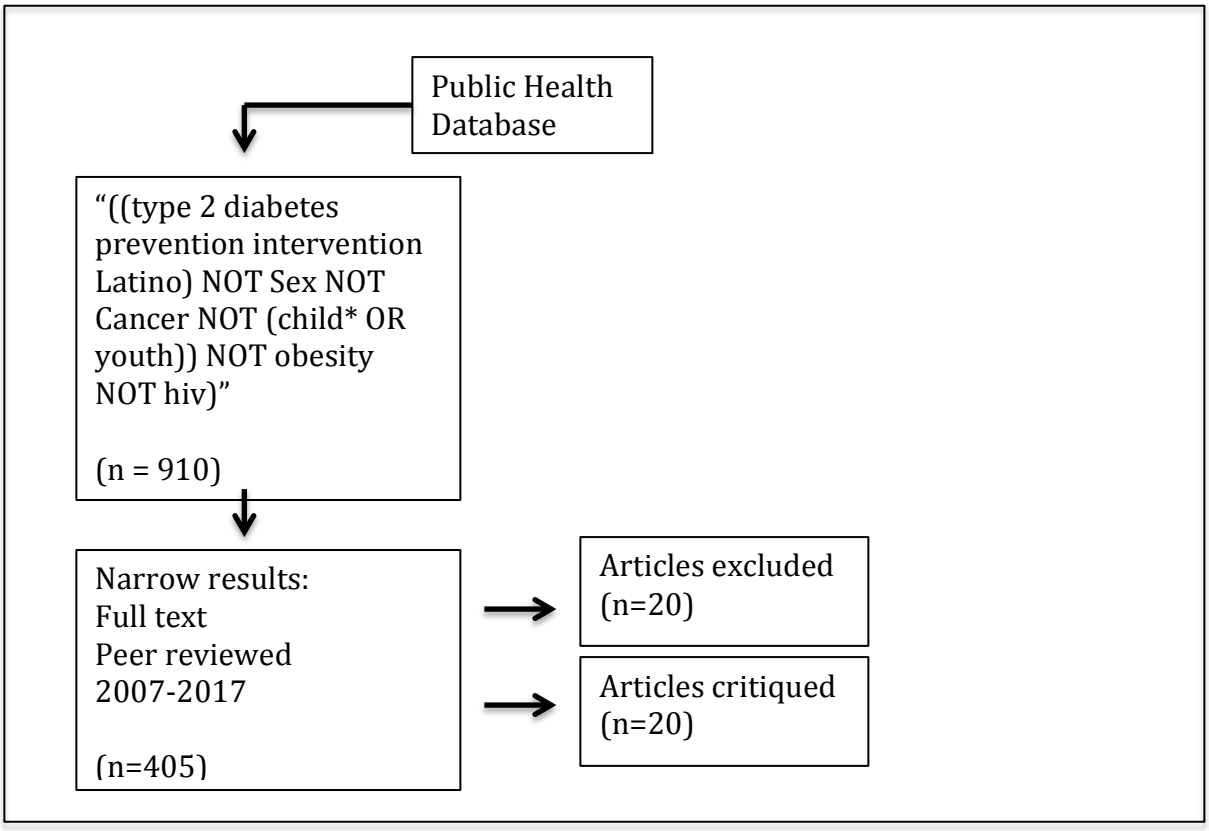
Latinos are at an increased risk for developing type II diabetes and it is crucial to identify interventions to reduce the prevalence of this disease for this population. Throughout this review of the literature, articles will be gathered to determine what types of programs and interventions are successful in promoting health and education and reducing type II diabetes and its risk factors.

METHODS

Relevant articles were found by searching through databases from the UGA Libraries websites. Databases used included PubMed, Public Health, and PsycINFO. The main search terms were "Diabetes AND Hispanic Men OR Latino Men AND Intervention NOT sex" but other variations were used such as "type 2 diabetes prevention intervention Latino men", "Diabetes AND Latino Men AND Intervention NOT sex", and "prevalence of type 2 diabetes Latino". Variations were used to find the most relevant interventions for analyses.

. Figure 1 shows an example of a search strategy.

Figure 1:



There were exclusion and inclusion criteria that factored into what articles were chosen for analysis. Articles were excluded if they included HIV because this review is focused on successful interventions for type II diabetes not HIV/AIDS. Additional exclusion factors include articles that were not peer reviewed, articles published before 2007, articles that did not focus on Latinos/Hispanics and articles that only focused on children. The searches also sometimes included some interventions about cancer, obesity, and other diseases that were not focused on reducing the prevalence of type II diabetes. Lastly, literature reviews were excluded.

Articles were included if they included a Latino or Hispanic population, included adults, and addressed the machismo complex. Articles addressing only men and only women were

included important information about Latino culture during interventions. Articles were also included if they addressed diabetes risk factors because they were working to reduce prevalence of the disease at the prevention stage.

There was some difficultly finding relevant articles that did not address other diseases and that were not literature reviews. To find articles that addressed the target population, some sources were drawn from literature reviews about successful diabetes interventions in the Latino population. This broadened the search and allowed more articles to be viewed and analyzed.

STUDIES CRITIQUED

In this review of the literature, 20 articles were analyzed to identify what types of type II diabetes interventions were successful or not. Factors that were taken into consideration during analysis included: research design, sample size and sampling techniques, purpose of intervention, results found, and date of publication. Table 1 below includes the type of intervention, author, and year of the articles that were selected for analysis for reference.

Table 1:

	Author, Year	Intervention Type		Author, Year	Intervention Type
1	Feathers, J. T., Kieffer, E., Palmisano, G., Anderson, M., Sinco, B., Janz, N., Heisler, M., Spencer, M., Guzman, R., Thompson, J., Wisdom, K., James, S. (2005).	Focus groups	11	Cruz, Yanira Hernandez-lane, Maria-eugenia Cohello, Janet I. Bautista, Christian T.	Survey
2	Carrasquillo, O., Lebron, C., Alonzo, Y., Li, H., Chang, A., & Kenya, S. (2017).	Randomized clinical trial	12	Millard, A. V., Graham, M. A., Wang, X., Mier, N., Sánchez, E. R., Flores, I., & Elizondo-fournier, M. (2011).	Focus groups
3	Castejón, A. M., Calderón, J. L., Perez, A., Millar, C., McLaughlin-Middlekauff, J. P., Sangasubana, N., Alvarez, G., Arce, L., Hardigan, P., Rabionet, S. (2013).	Focus groups	13	Parikh, P., Simon, E., Fei, K., Looker, H., Goytia, C., & Horowitz, C. R., (2010).	Randomized clinical trial
4	Philip, E. J., Shelton, R. C., Erwin, D. O., & Jandorf, L. (2012).	Survey	14	Haltiwanger, E. P. (2012).	Survey
5	Sutherland, L. L., Weiler, D. M., Bond, L., Simonson, S., & Reis, J. (2012).	Survey	15	Kollannoor-Samuel, G., Shebl, F. M., Segura-Pérez, S., Chhabra, J., Vega-López, S., & Pérez-Escamilla, R. (2016)	Randomized clinical trial
6	Osuna, D., Barrera, M., Jr., Strycker, L. A., Toobert, D. J., Glasgow, R. E., Geno, C. R., Almeida, F., Perdomo, M., King, D., Tinley Doty, A. (2011).	Focus groups	16	Kanaya, A., Santoyo-Olsson, J., Gregorich, S., Grossman, M., Moore, T., & Stewart, A. L. (2012).	Randomized clinical trial
7	Duggan, C., Carosso, E., Mariscal, N., Islas, I., Ibarra, G., Holte, S., Copeland, W., Linde, S., Thompson, B. (2014).	Randomized clinical trial	17	Valen, M., Narayan, S., & Wedeking, L. (2012).	Focus groups
8	Hawkins, J., Watkins, D. C., Kieffer, E., Spencer, M., Espitia, N., & Anderson, M. (2015).	Focus groups	18	Lujan, J., Ostwald, S. K., & Ortiz, M. (2007).	Randomized clinical trial
9	Coronado, G. D., Thompson, B., Tejeda, S., Godina, R., & Chen, L. (2007).	Survey	19	Prezio, E. A., Cheng, D., Balasubramanian, B. A., Shuval, K., Kendzor, D. E., & Culica, D. (2013).	Randomized clinical trial
10	Barrera, M., Jr., Toobert, D., Strycker, L., & Osuna, D. (2012).	Randomized clinical trial	20	Philis-Tsimikas, A., Fortmann, A., Lleva-Ocana, L., Walker, C., & Gallo, L. C. (2011).	Randomized clinical trial

RESULTS

The results of this review can be divided into three categories: focus group intervention, randomized clinical trials, and surveys/questionnaires. The results are organized in this way in order to differentiate the are the different types of programs and interventions that can be used to reduce the prevalence or risk of type II diabetes in Latinos.

Focus Group Interventions

Focus group interventions typically include multiple meetings with a smaller group of participants involving discussion about a particular topic. One successful program was called the Racial and Ethnic Approaches to Community Health (REACH), which focused on reducing diabetes-related outcomes in African American and Latino adults (Feathers et al., 2005). In this program participants gained knowledge and understanding of how healthy eating and exercise affects blood sugar. Regarding diet, there was an increase in vegetable consumption, decrease in fat intake by pouring fat off meats after cooking, increase in consumption of whole grain bread, and a decrease in consumption of regular soda and fruit-flavored drinks. Participants in the intervention improved their HbA1C values and a significant amount of them moved from the "7 or higher" category into the "7 or lower category". Levels of cholesterol, blood pressure, and weight did not change. Also, as a result of the program, Latinos were 84% more likely to understand the relationship between healthy eating and blood sugar and 89% more likely to follow a healthy eating plan. Overall, based on this program, a culturally competent, community-based program is an effective way to improve knowledge, health behaviors, and glycemic control in Latino and African Americans with type II diabetes (Feathers et al., 2005).

The REACH study was a large study conducted on type II diabetes and other studies were conducted based upon it. Another program recruited Individuals for focus groups from the

REACH Detroit partnership (Hawkins et al., 2015). Five themes were focused on in the focus groups – social support as a motivator, patient-provider relationships as facilitators of healthy behaviors, immigration status and access to resources, waiting until symptoms became severe before seeking medical attention, and structural barriers. From the focus groups the researchers found that men of color, half of which in the study were Latino, experience significant challenges to maintaining good health with type II diabetes (Hawkins et al., 2015). This shows that successful type II diabetes interventions should consider the barriers that Latino men experience when designing a study and should consider the surplus of information that focus groups can provide.

Another focus group based study was a culturally competent, pharmacist intervention that used medication therapy management, diabetes education, and help with nutrition and physical activity coaching (Castejón et al., 2013). It tested the efficacy of the Pharmacist-centered Assessment and Reinforcement of Diabetes Self-efficacy (PARDS) intervention on improving weight, BMI, and HbA1c levels and it was adapted for language, diet, family support, and culture. The study found that this type of intervention is successful in lowering HbA1c levels and aiding weight loss. HbA1c levels were reduced by $0.93 \pm 45\%$ and mean BMI was reduced by -0.73 ± 0.07 kg/m^2 in the intervention group (Castejón et al., 2013). This focus group study shows that ensuring that a program is culturally adapt to the Latino population will allow it to be successful in reducing factors related to diabetes. Additionally, one article that was analyzed included focus groups but it was a broad diabetes education program that focused on adapting to the Latino culture. The program was led by community health workers and delivered solely in Spanish in order to have the most success in the population (Valen, Narayan, & Wedeking, 2012). The sessions even included dancing to ethnic music as physical activity to adapt to the

culture of the sample population. This program showed an improvement in diabetes-related self-efficacy and diabetes knowledge in participants. There was no change in BMI, but this is difficult to achieve in people with type 2 diabetes and difficult to solve through an education program. There was also no change in HbA1c levels three-month post program, but the participants already started with HbA1c levels at or near the goal of <7.0% therefore having little room for improvement (Valen et al., 2012). Although this was an entire program, it is categorized under focus groups because it encompasses the feedback from participants to the leaders of the program and it is focused on improving diabetes knowledge and health status.

Focus groups can also tell researchers whether or not participants have a perceived threat of a disease. A study focused on type II diabetes in Latinas found through focus groups that they did not perceive a need for an intervention (Osuna et al., 2011). The program went on to intervene and although the population did not foresee a need for an intervention, there was improvement in fiber intake, social support, exercise, quality of problem-solving strategies and a decrease in saturated fat intake and BMI (Osuna et al., 2011). In addition, a pilot study that conducted focus groups in a hard-to-reach, low-income, immigrant Hispanic population found an average reduction in BMI of 0.19 (Millard et al., 2011). BMI is predictor for diabetes, so many programs focus on reducing BMI in order to reduce HbA1c levels and lower the risk of diabetes.

Focus groups provide insight to researchers about what community members want and need out of an intervention. Over a period of time, participants in focus groups gain knowledge of type II diabetes and factors that relate to the disease. Reduction in factors like BMI and HbA1c levels after focus group interventions show their success of reducing prevalence of type II diabetes.

Randomized Clinical Trials

Interventions that help type II diabetes outcomes a more controlled manner are experimental randomized clinical trials. In randomized clinical trials (RCT), the sample is randomly selected to either receive the intervention or not receive the intervention and be placed in a control group. One RCT conducted a community health worker intervention among Latinos that consisted of home visits, telephone calls, and group-level activities for the intervention group (Carrasquillo et al., 2017). Outcomes that were being measures included systolic blood pressure, low-density lipoprotein cholesterol (LDLC) levels and HbA1c levels. Results showed that the intervention lowered HbA1c levels by 0.51% but did not have any improvements in low-density lipoprotein cholesterol levels or systolic blood pressure. HbA1c is a good predictor of risk of diabetes, so although the other outcomes were not improved HabA1c is still an indicator of success of the program.

Another RCT that led a community health worker intervention used a different approach by giving five sessions at the participants' home over the course of the program (Duggan et al., 2014). There were two "arms" to the trial, the intervention arm received an immediate educational curriculum and the control arm received a delayed educational curriculum. The study found significant reductions in mean levels of Hb1AC but no significant change in diet or physical activity (Duggan et al., 2014). This study shows how a randomized control trial in the home can be successful in improving factors related to diabetes through a more one-on-one intervention approach.

From this review there were four other articles selected with similar results – reduction in HbA1c levels – from a RCT led by and centered around community health workers (Kanaya et al., 2012; Kollannoor-Samuel et al., 2016; Lujan, Ostwald, & Ortiz, 2007; Prezio et al., 2013).

One of these articles was tailored around improving nutrition education and food label use and its effectiveness on type II diabetes (Kollannoor-Samuel et al., 2016). The researchers found the overall effect of the intervention on HbA1c levels was statistically significant and 15% of the total affect of the intervention on HbA1c levels was associated with the food label use to diet quality path (Kollannoor-Samuel et al., 2016). In order to avoid repetitiveness, the other three articles had similar study designs and outcomes. They all found reduction in HbA1c levels and improvements in diabetes-related education and were led by community health workers for an intervention focused on Latinos (Kanaya et al., 2012; Lujan et al., 2007; Prezio et al., 2013)

Some interventions can be successful even when superiors do not lead them. One program was led by peers who had type II diabetes that exemplified traits of a leader and was then trained for three months to lead a program (Philis-Tsimikas, Fortmann, Lleva-Ocana, Walker, & Gallo, 2011). The intervention group attended 8 weekly, 2-hour diabetes self-management classes and monthly support groups led by a peer educator. The results found that the intervention group had greater improvements in HbA1c levels (reduction of 1.5%) and diastolic blood pressure than the control (Philis-Tsimikas et al., 2011). This intervention shows how successful a peer educator-based diabetes self-management program can be.

In any successful intervention, the researchers must take the population's culture into consideration. One RCT's objective was to implement a culturally adapted diabetes intervention in Latinas, called !Viva Bien! (Barrera, Toobert, Strycker, & Osuna, 2012). The variables analyzed were BMI, acculturation, social resources for diet and physical activity, problem solving, physical activity, and saturated fat consumption. The study found that testing for interactions between variables and acculturation is an important step and that the !Viva Bien! intervention was successful in cultural adaptation. So, measuring for acculturation could be an

import factor in a study to ensure that the participants are involved, comfortable, and willing to participate.

In addition to the RCT's led by community health workers, community involvement is important to the success of the program. A pilot diabetes prevention intervention focused on the impact of a community-based program (Parikh et al., 2010). Participants were randomized in intervention or delayed intervention groups. The intervention group attended workshop at community sites and both groups received information about prediabetes and results of their screening tests. At the end of the program the intervention group lost significantly more weight than the control group (an average of 7.2 pounds or 4.3% of their baseline weight). This was the only physiological change in the study, but it is the most effective means of diabetes prevention. This study shows how successful a community-led, community-based diabetes prevention lifestyle intervention can be (Parikh et al., 2010).

Randomized clinical trials provide information about type II diabetes interventions that could be more accurate due to the fact that the sample is randomized and not a convenience sample. The RCT's analyzed in this review found reduction in HbA1c levels, reduction in weight and BMI, and success in cultural adaptation for the community. All of these outcomes are important in creating a successful diabetes intervention in the Latino population.

Surveys/Questionnaires

Surveys and questionnaires are another way for researchers to determine if a study was successful or not. Most of these articles are secondary analysis of results of a previous study by researchers. These are important to include in this review because they can tell a lot of information about what makes a program successful or not. The machismo complex is one factor that can determine the success of a program in the Latino community. The machismo is the

strong sense of masculinity and male responsibility in Latino culture. A study reviewed was not focused on type II diabetes, but it shows the influence of men in the Latino population (Philip, Shelton, Erwin, & Jandorf, 2012). The researchers found that attendance of men at health interventions may play an important role in influencing family health behaviors and decisions. They found that one-third of male participants that were attending programs attended the cancer education program which targeted breast and cervical cancer. This is likely because of the "machismo" which is the prominent role of the male in Latino culture, making men feel responsible for gathering information about health issues even if they weren't relevant to themselves (Philip et al., 2012). Therefore, targeting males for a successful type II diabetes intervention could be more successful than just targeting females because they play a more prominent role in the community.

Although targeting males in a community can contribute to the success, interventions will also need to promote self-efficacy in the target population. In one study, data was collected through a questionnaire and using the Health Promoting Lifestyle Profile II that was available in English and Spanish (Sutherland, Weiler, Bond, Simonson, & Reis, 2012). The HPLP is a 52-item rating scale that measures the frequency of self-reported health behaviors. Biophysical measures were also collected and then all data was statistically analyzed. This study used the Health Promoting Lifestyle Profile II to measure the lifestyles of low-income and low-education, middle-aged Latinos that had concerns about diabetes. They found that there have been minimal efforts to seek medical assistance or control diabetes through lifestyle changes in this population and there was also no difference in the use of health care services by risk status (Sutherland et al., 2012). A similar study used data from a community-randomized intervention study on cancer prevention that examines the self-management practices of Hispanics and non-Hispanic whites in

a rural area (Coronado, Thompson, Tejeda, Godina, & Chen, 2007). The two groups had similar rates of use of medication but more Hispanics attended a class on diabetes management in a clinic than non-Hispanic Whites did in a hospital. The two self-management factors that stood out were that less Hispanics were on a special diet or exercise to control their diabetes and that a smaller percentage of Hispanics attended an education session on diabetes (Coronado et al., 2007). If a successful intervention is to be implemented, participants will need to build self-efficacy so that they believe they can seek medical assistance, control their diabetes through lifestyle changes (diet and exercise), and educate themselves.

In addition to improving the population's confidence that they can handle their diabetes, a program still must be successful in educating and decreasing the prevalence and risk factors of a disease. One study used pre- and post-test socio-demographic questionnaires to measure diabetes knowledge in the Latino population (Cruz, Hernandez-lane, Cohello, & Bautista, 2013). The study found that the *Salud y Bienstar* community outreach model that was conducted by community health workers was effective in improving diabetes knowledge in diabetic and non-diabetics in the Hispanic population (Cruz et al., 2013). Therefore, a study that uses a community outreach model is shown to be successful in educating people about diabetes.

The last piece of literature analyzed encompasses reduction of diabetes, improving attitudes towards diabetes, and improving self-efficacy. The study used a pretest and posttest design with self-report questionnaires and a blood test among Mexican-American older adults with type II diabetes (Haltiwanger, 2012). The HbA1c test results were significant at the $p<0.05$ levels between pretest and the 4-month posttest 2. The Diabetes self-efficacy scale responses were highly significant at $p <0.000\%$ for the pretest and 2-, 4-, and 6-month posttest. The change in responses on the Diabetes Attitude scale was highly significant at $p<0.0001$ for the pretest and

2-, 4-, and 6-month posttest. The change in responses on the Diabetes Empowerment Scale was highly significant at $p < .0005$ for the pretest and 2-, 4-, and 6-month comparisons (Haltiwanger, 2012). This study shows how an intervention can change attitudes and empowerment in a community about their diabetes in addition to reducing their HbA1c levels.

Surveys and questionnaires can be useful for getting information directly from participants like how they feel and how successful a program was. They are important to determine what types of interventions are successful and should be included in all interventions.

DISCUSSION

This review of the literature analyzed 20 articles that dealt with type II diabetes interventions in the Latino community. A successful intervention should conduct a thorough needs assessment, which can be done through surveys and questionnaires in the community. Then, most studies that conducted focus groups with the community over a long period of time were successful in reducing HbA1c levels. Randomized clinical trials are useful to design a controlled intervention while manipulating variables and they can be used in conjunction with focus groups to create a successful diabetes intervention.

The most important attribute of an intervention in addressing this population it that it is culturally competent. Many of the articles that were analyzed addressed the language barrier that Latinos experience in the United States. Researchers compensated for this by delivering the information in Spanish in order to improve the program's effectiveness. One program that wanted to increase physical activity in the population used traditional dancing with ethnic music as a way to promote exercise (Valen et al., 2012). Adapting to the culture of the target

population makes the information more accessible to participants and easier for them to relate to and learn.

A common theme found in most of the articles analyzed was the significance of involving the community. Community health workers led many of the programs that were selected and had a major impact in the success of a program. More participants are willing to be involved when a program is community based because it is a safe place with people that they know leading the program. Community members know what participants need and want so it is more likely for a program to be successful.

Although this review is comprehensive, it is not without its limitations. There was not one single search that was conducted that found 20 reliable and relevant sources. Many searches were conducted to find programs and interventions that address the Latino culture with respect to type II diabetes. It is nearly impossible to search through all of the literature, so there could have been some sources that were left out. Also, the studies that were selected had limitations in themselves. Some studies had very small sample sizes and some were potentially not generalizable to all Latinos living in the United States.

CONCLUSION

Throughout an analysis of the literature from the University of Georgia's library website, articles were selected that addressed prevention strategies and solutions to reducing type II diabetes risk factors in Latinos. Overall, a successful type II diabetes intervention should contain focus groups, randomization, and surveys/questionnaires. It is also important for the intervention to involve the community and adapt to Latino culture in order to increase the effectiveness.

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