Culturally Targeted Strategies for Diabetes Prevention in Minority Populations: A Systematic Review and Framework

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Abstract

Purpose—The purpose of this study is to (a) assess the effectiveness of culturally tailored diabetes prevention interventions in minority populations and (b) develop a novel framework to characterize four key domains of culturally tailored interventions. Prevention strategies specifically tailored to the culture of ethnic minority patients may help reduce the incidence of diabetes.

Methods—We searched PubMed, EMBASE, and CINAHL for English-language, randomized controlled trials (RCTs) or quasi-experimental (QE) trials testing culturally tailored interventions to prevent diabetes in minority populations. Two reviewers independently extracted data and assessed risk of bias. Inductive thematic analysis was used to develop a framework with four domains (FiLLM: Facilitating [i.e., delivering] Interventions through Language, Location and Message). The framework was used to assess the overall effectiveness of culturally tailored interventions.

Results—Thirty-four trials met eligibility criteria. Twelve studies were randomized controlled trials, and 22 were quasi-experimental trials. Twenty-five out of 34 studies (74%) that used cultural tailoring demonstrated significantly improved Hemoglobin A1C, fasting glucose, and/or weight loss. Of the 25 successful interventions, 21 (84%) incorporated at least three culturally targeted domains. Seven studies used all four domains and were all successful. The least utilized domain was delivery (4/34) of the intervention's key educational message.

Conclusions—Culturally tailoring interventions across the four domains of facilitators, language, location, and messaging can be effective in improving risk factors for progression to diabetes among ethnic minority groups. Future studies should evaluate how specific tailoring approaches work compared to usual care as well as comparative effectiveness of each tailoring domain.

Registration—(PROSPERO registration: CRD42015016914)

Ethnic minority groups in high-income countries such as the United States (US) and the United Kingdom (UK) suffer disproportionately from diabetes-related complications ¹. In the UK, ethnic minority groups such as African Caribbean and South Asians have an estimated 5.7% prevalence rate of type 2 diabetes (T2DM) compared to 1.7% of whites ¹. Similarly in the U.S., the risk of diabetes is 77% higher among African Americans and 55% higher in Latino Americans than among non-Latino white Americans ². While genetic differences may partially account for these differences, failure to consider cultural and social factors may also limit the efficacy of strategies to prevent diabetes in ethnic minority groups.

The landmark US Diabetes Prevention Program (DPP) study showed that modest lifestyle changes (>7% reduction of weight and physical exercise of >150min/ week) reduced the risk of progression of pre-diabetes to diabetes ³. Interventions incorporating such lifestyle changes found similar reductions in diabetes incidence in countries as diverse as Finland, India, and China ^{4,5}. While promising, none of these studies explicitly targeted ethnic minority populations. This gap is important because a growing body of evidence suggests greater effectiveness of targeted health programs compared to generic programs in ethnic minority groups ^{6,7}. Fisher et al.⁸ noted that prior researchers have used the terms cultural competence, cultural tailoring, and cultural targeting in interchangeable ways to define strategies to address culture. In this paper, the terms cultural targeting and tailoring include strategies that improve the health of a racial and ethnic population by taking into account their cultural practices, attitudes, and beliefs. The distinction between targeting (which is often thought as group level programming), and tailoring (which is thought of as individual level programming as these concepts often overlap in community-based interventions), is not made.

Recently, a number of pilot studies and randomized controlled trials (RCTs) have tested targeted programs to prevent diabetes in specific populations. While reviews evaluating culturally tailored interventions for diabetes management strategies exist ⁸⁻¹³, these do not focus exclusively on diabetes prevention interventions across ethnic groups. Moreover, none of these studies, to our knowledge, to have sought to develop a framework to characterize and evaluate the efficacy of different tailoring domains.

Accordingly, the specific aim of this systematic review is to answer the question: What is the effectiveness of culturally targeted interventions in preventing diabetes onset, improving control, or reducing weight in adult ethnic minority groups? To answer this question, qualitative methods were used to develop a framework that characterizes the modalities of cultural targeting within each intervention to better understand which domains were necessary to build successful interventions.

METHODS

Information Sources and Search strategy

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations in conducting this meta-analysis ¹⁴. With the assistance of a medical research librarian (MC), we performed serial literature searches for English language articles. MEDLINE via PubMed, CINAHL, and EMBASE were searched for

studies published between 1997 and 2016 using Medical Subject Headings (MeSH) and keywords based on diabetes prevention interventions, cultural targeting, and ethnic minority groups (Appendix Table 1: Search strategy). All human studies published in full-text were eligible for inclusion; no publication date or status restrictions were placed. Additional studies of interest were identified by hand searches of bibliographies. The search was last updated on May 5, 2016.

Study Eligibility and Selection Criteria

Two reviewers (PL and MH) independently screened titles and abstracts for eligibility. Articles were included if: (1) the intervention targeted ethnic minority groups, defined as people who differing in physical or cultural traits, race, nationality, or religion from the dominant group of the community they live in; (2) the intervention's objective was diabetes prevention with one or more of the following outcomes: a reduction in Hemoglobin (HgbA1C), fasting glucose, or weight; (3) the participants were adults (18 years or older) at risk for type 2 diabetes but not currently having a diagnosis of diabetes; and (4) the study utilized a randomized or quasi experimental trial design. Studies not meeting all of these criteria (e.g., diabetes management, observational designs) were excluded.

Data Extraction

Two reviewers used a standardized form adapted from the Cochrane Collaboration¹⁵ to extract data from the included studies independently and in duplicate. For all studies, we extracted the following data: study design, setting, population characteristics, intervention design and duration, cultural strategies (e.g. facilitators, language, location, and message), delivery staff, outcome measures, and major findings. Studies were dichotomized into successful and unsuccessful based on statistical significance of results. Therefore, a study was categorized as being successful if the majority of participants demonstrated a statistically significant ($p < 0.05$) improvement in at least one of the following outcomes: HgbA1C, fasting glucose, or weight loss. If/when a study did not report p-values, we required that greater than 80% of participants had to show improvement in HgbA1C, fasting glucose, or weight loss to be considered successful. We picked this definition of success as the majority of included studies were pilots and were not powered to detect the conventional 5–7% weight loss goal that the original diabetes prevention program study used³.

Assessment of Study Quality

Two authors (SP and ST) independently assessed risk of bias via the Quality Assessment Tool for Quantitative Studies, an instrument developed by The Effective Public Health Practice Project. This tool utilizes the following elements to assess quality: selection bias, study design, confounders, blinding, data collection methods, and withdrawals and drop-outs. A score of 1 therefore indicates a low risk of bias, while 3 indicates a higher risk of bias. Accordingly, we assigned studies scores of 1 to 3 to all studies¹⁶.

Any discrepancies or disagreements in data review, extraction, or assessment of quality were resolved by a third reviewer (PL).

Framework Development

Prior studies have tried to assess cultural competency with various tools including the Cultural Competency Assessment Tool (CCAT)¹⁰. However, this tool only provides an overall competency score that is heavily weighted to assess cultural competency of providers and facilitators and does not intuitively allow evaluators to identify the specific domains of cultural targeting that are utilized by each intervention. In addition, this tool requires an investigator to have the tool accessible to systematically score each study. For this reason, we used an inductive thematic analysis approach to develop a framework to assess cultural targeting, focusing on the underlying intervention within included studies to establish common domains that could more easily be implemented¹⁷.

We began by compiling a list of cultural targeting competent concepts by listing every culturally relevant targeting strategy incorporated into each intervention to create a conceptual model of cultural targeting. Using these constructs, each study was then categorized independently by two coders (SP and ST) into four central domains: facilitators, language, location, and messaging (Fig. 1). For example, strategies that involved targeting the content of the intervention in the areas of faith, food choices, gender or family were collapsed into the messaging domain. Theoretically, facilitators (i.e., who delivers the program) potentially increase participant recruitment, engagement, and efficacy by addressing language (linguistic concordance to local dialect or health literacy), location (faith-based or community-based center as a venue for the intervention), and messaging (targeting either the content or the mode of delivery of the educational message). In comparison, targeting to language, location, and messaging work as individual components that can directly increase participation in interventions regardless of the program facilitators. We named the taxonomy, FiLLM, an acronym for “Facilitating Interventions through Language, Location, and Message.”

To assess the performance of our novel framework and for informational purposes (as no gold standard tool to assess cultural targeting exists), we compared performance to an available cultural competency assessment tool (CCAT)¹⁰. Each evaluated intervention was scored from 0–100% on a scale of cultural competency¹⁰. The CCAT score was then compared to the number of culturally targeted domains (1–4) each study addressed (Appendix Table 2).

Definitions of FiLLM Domains

Within the facilitators (i.e. the staff who delivered the intervention) domain, community health workers (CHWs) were defined as formally trained health personnel from the community who shared cultural, economic, linguistic or other core characteristics with the patients they are serving. Community-based facilitators were defined as members from the community of the same racial and ethnic identity that spoke the same language who did not undergo any formal health related training. Health care professionals encompassed physicians, nurses, or research investigators. Within the language domain, linguistic concordance was defined as the translation of presentation or materials to the preferred language of the participants¹⁸. Literacy was defined as a modification of the curriculum to fit the language competence of the target population. The location domain encompassed the

setting or venue where the intervention took place and was hypothesized to improve health outcomes by improving access to health interventions. The messaging domain included both the educational content of the intervention as well as the mode of delivery of the intervention. Message content targeting clustered into four subcategories: diet, faith, family, and gender. Community-based participatory research (CBPR) was defined as engaging the community in all aspects of the research process (i.e. study design, implementation, and evaluation), whereas community engagement has some, but limited, input from community members¹⁹.

RESULTS

Our literature search retrieved a total of 1242 articles. Initial screening eliminated 1149 articles at the title and abstract level for not fitting the inclusion criteria of targeting adult ethnic minority groups, focusing on diabetes prevention with a measurable outcome of Hemoglobin A1C, fasting glucose, or weight change, or not utilizing a randomized or quasi-experimental trial design. Following full review of each remaining article, 39 articles were eliminated because they were either: (1) not interventions, (2) not addressing diabetes prevention, or (3) not culturally targeted (Fig. 2). Three studies screened for diabetes at the onset of the study and did include some participants with a diagnosis of diabetes. These studies were included as the primary focus was diabetes prevention and the majority of participants did not carry a diagnosis of diabetes^{20–22}. The 34 articles that met the eligibility criteria are summarized in Table 1.

Study Characteristics

Twenty-six studies were based in the United States, 2 in India, 2 in Canada, 1 in New Zealand, 1 in the United Kingdom, 1 in Norway, and 1 in the Netherlands. Participants in the studies included African American (11), Hispanic/Latino (10), Arab American (1), Native Hawaiian and Other Pacific Islander (2), Native North American (2), Alaskan Eskimo (1), Canadian Aborigines (1), South Asian (5), Chinese Americans (1), Korean Americans (1) ethnic groups. Eighteen studies explicitly stated that the intervention targeted low-income populations.

The majority of included studies (22/34) were quasi-experimental trials; twelve studies were randomized controlled trials (RCT). Two-thirds (22/34) of the studies engaged the community: fourteen studies used CBPR principles in the intervention, and the other 8 studies used community engagement. The majority of interventions were set in a community center (32/34) with two set in a healthcare clinic^{19,23}. Interventions were delivered by a number of individuals including CHW (14/34), community-based facilitators (10/34), or health care professionals/others (10/34). Only 9/34 studies had interventions lasting longer than 12 months. Table 2 describes the study characteristics in detail. Specifics on how each intervention used the four FiLLM domains are provided in the next four sections.

Facilitators

Of the 34 included studies, two-thirds (27/34) were conducted by members of the community. These individuals were from the same cultural and social background as the

ethnic minority group, thus furthering the cultural targeting of the intervention. Fourteen studies used CHWs as facilitators^{24–36}. Balagopal et al. specifically stated that CHWs were selected to strengthen the links among project personnel, the community, and existing community networks³⁷. Ethnically similar facilitators were purposefully selected to help break down the mistrust of research and researchers in the community in one study³⁸. Gutierrez et al., a study located in a faith-based location, selected facilitators based on religious orientation³⁹.

All but eight (N=27) of the interventions that used culturally targeted facilitators were successful. Faridi et al., one unsuccessful study, used CHWs yet found no significant difference in weight loss, BMI, physical activity, or dietary habits between intervention and control²⁹. Although this study used CHWs as facilitators, the authors noted that the CHWs designed their own curricula and subsequently had varied approaches with participants, an inconsistency that may explain the negative results observed²⁹. Ho et al., the second unsuccessful study, noted that their facilitators did engage the community members while planning a culturally appropriate activities however they often had limited time to work with the community as they were only employed part-time²².

Language

Twenty-two of the 34 studies used language as a strategy to culturally target their intervention with bilingual facilitators provided in 21 of these interventions. In addition, a few studies incorporated linguistically appropriate curriculum materials targeted to their participants' preferred language^{27,28,38,40–44}. For example, Islam et al. targeted Sikh Asian Indians and therefore developed curriculum materials in English, translated them into Punjabi and reviewed the material with bilingual study staff²⁸. Similarly, Ockene et al. printed questionnaires in Spanish and English and administered the intervention orally in Spanish for its Caribbean Latino participants. Ockene et al. also utilized visual adaptation and hands-on experiences of the materials to simplify complex concepts⁴³.

Eleven studies also used low-literacy materials in their interventions^{20,27,34,35,40,43–48}. For example, Kaholokula et al. rewrote the Diabetes Prevention Program Lifestyle Intervention to simplify the language into "plain language" and Balagopal et al. adjusted the curriculum for low levels of health literacy as 41% of its target population of rural Indians had less than a 5th grade education.

Almost all interventions that used language as a cultural targeting strategy were successful with a statistically significant change in HgbA1C, fasting glucose, or weight loss (19/22; $p < 0.05$).

Location

The majority of studies used location as a strategy to culturally target their interventions (30/34). Nine of these studies used a faith-based center (e.g. church) in hopes of increasing trust, engagement, and recruitment in their respective populations^{24,29,31,39,42,44,49–51}. For example, both Simmons et al. and Gutierrez et al. reported selecting churches as the venue for their program since the population targeted used the church as a source of support and frequently attended church^{39,42}.

Twenty two studies (22/34) used community-based centers such as senior centers, social service agencies, cultural centers, and schools to culturally target their intervention. Ruggiero et al. noted that community-based centers were chosen as a location to increase access for participants³². Seven of the 30 studies using location as a means of cultural targeting were unsuccessful. Four out of the seven unsuccessful studies used community centers, such as schools and stores, and found no significant change in BMI or weight loss^{20,22,34,52} and three studies were conducted in a faith-based centers^{29,51,53}.

Message

More than half of the studies (27/34) targeted the content of the message of their intervention, with three studies targeting the mode of delivery. Twenty studies tailored their intervention message content to the diet of the participants^{21,23,27,28,30,33–35,39,41–43,48,51,52,54–57}. For example, Ebbesson et al. targeting Alaskan Eskimos worked to reverse the trends of acculturation by encouraging more traditional, healthier foods and less consumption of store-bought unhealthy foods²¹. Ockene et al. also used customized traditional recipes for a Caribbean Latino population⁴³. Similarly, Vincent et al. conducted cooking demonstrations using a low-fat version of traditional Mexican American foods to incorporate the traditional dietary patterns of his Hispanic population³⁰.

Twelve studies targeted their content based on faith^{24,28,31,39,41,42,44,49–51,54,58}. Conlon et al. focused on honoring spiritual beliefs and “encouraged Black and Hispanic/Latino participants to use spirituality and their spiritual community as a coping mechanism⁵⁴.” Amongst a Sikh Asian Indian community, Islam et al. discussed the “Saint-Soldier,” a concept in Sikhism that emphasizes discipline in spiritual practice and social responsibilities²⁸.

Five studies tailored messages based on participant gender^{37,41,48,52,59}. Jaber et al. hypothesized that Arab American women tend to have more influence over the family’s nutritional intake, so specifically targeted the health messaging towards women⁴¹. In addition, this study created gender-specific sessions and segregated physical activity classes. Balagopal et al. also tailored the messaging for health education based on gender³⁷.

Eight studies targeted content based on family^{23,33,35,36,41,44,45,56}. For example, Jaber et al., noting the central role of the family among Arab Americans, actively recruited family members to participate in activities and sessions⁴¹. Family was also utilized to enhance male participation and promote communication within the family about healthy food participation⁴¹. Another study targeting Native Hawaiians and other Pacific Islanders, similarly noted that participants endorsed strong family values during orientation and sought to identify and focus on social/community and family factors in their curriculum⁴⁵. Vincent et al. invited the participants to bring a support person because of the cultural importance of family amongst his target population of Hispanics³⁰.

There was significant overlap among the four subcategories of content (food choices, faith, family, and gender) and 14 out of 27 studies tailored to more than one subcategory.

Only three studies considered how to deliver the message to the target population^{20,22,43}. Ockene et al noted that watching soap operas was a popular activity among Caribbean Latinos and thus used a *telenovela* to deliver part of the intervention⁴³. In addition, Daniel et al. targeted Canadian Aboriginals by using local television and radio stations to “carry stories” to the community²⁰. Ho et al. altered the timing of the delivery of the message based on community recommendations and conducted the demonstrations at stores on pay-days to increase participation in the intervention²².

Seven studies that culturally tailored the messaging were unsuccessful^{23,33,34,51–53,58}. Two of these studies only tailored the mode of delivery and did not tailor the content of the message^{20,22}.

Outcomes Based on Use of FiLLM Domains

Eleven studies that used all four FiLLM domains were successful^{27,28,30,35–37,39,41,43,45,57}. Of the 25 successful studies, 21 (84%) incorporated at least three culturally targeted domains in their study. In contrast, only one of the nine unsuccessful studies tailored to all four domains³⁴.

The majority of studies culturally tailored to location of intervention (30/34), but fewer tailored to language (22/34), message (25/34) and program facilitators (27/34). Of the messaging domain, however, a very small minority (4/34) tailored the mode the delivery.

In addition, there was some concordance with the CCAT tool and the number of FiLLM domains utilized irrespective if they were categorized as successful. Twelve studies, irrespective of if they were successful or not, used all four domains and all of these scored on average 95% on the CCAT tool. In contrast, 10 studies used 2 or less FiLLM domains and their average CCAT score was 75% (Appendix Table 2).

Quality Assessment

Using the Quality Assessment Tool for Quantitative Studies⁶⁰, 27 of the studies were determined to be at low risk of bias^{20,22,23,25–29,31,32,34,35,37,39–41,43–49,51,52,54,57,59,60}, whereas seven were rated as having a moderate risk of bias^{21,24,33,36,42,50,55}. Of those four studies, three scored as having a higher risk of bias due to participant withdrawals and drop-outs^{21,24,33,55}. Simmons et al. scored as higher risk due to data collection methods, as the participants were highly mobile and the population changed as measurements were taken⁴². O’Brien et al. and Davis-Smith et al. were scored at a higher risk due to study design with small sample sizes^{36,61}.

DISCUSSION

In this systematic review of culturally tailored diabetes prevention programs among adults belonging to ethnic minority groups, a majority (25/34) of the reviewed interventions were effective at reducing HbA1C, weight and BMI. Overall, studies that tailored interventions to all four domains of facilitators (program deliverers), location, language, and messaging, were successful. Conversely, the unsuccessful studies targeted to fewer domains. Finally, the least utilized domain was culturally targeted messaging content and delivery.

Our findings reinforce the fact that cultural tailoring is a necessary means to adapt interventions to specific ethnic minority populations. In addition, our findings expand on prior work by better identifying how the effectiveness of an intervention might vary according to the number and type of culturally specific domains included. For example, within the facilitators domain, we found that the majority of studies employed CHWs or program facilitators similar to the target population in language and ethnicity. Our results align with a prior review that found that interventions delivered through CHWs are an especially promising strategy for improving diabetes outcomes specifically in low-income and racial and ethnic minority populations⁶². CHWs and other facilitators theoretically improve their relationships with participants by working through FiLLM's three other domains of language, location, and messaging. In addition, our review found that interventions resulted in better patient outcomes when linguistic concordance and literacy were taken into account. These results are in agreement with prior research that has shown that ethnic minority patients were more likely to trust their providers when there were interpreters or when the physician spoke their language⁶³. Finally, with respect to location, we found that almost every study (30/34) chose a culturally specific location, making location the most utilized cultural targeting domain. By tailoring to location, these studies theoretically created a safe, comfortable environment and also increased convenience by picking locations that were familiar to the participants.

By separating the specific cultural targeting domains and the effectiveness of each of these domains, we highlight gaps in the current literature and opportunities for future research. Most notably, none of the studies in our review were designed to specifically evaluate the mechanisms by which different forms of cultural targeting affect patient outcomes. In order to maximize the benefits from targeting interventions to culture, future studies must focus on potential mediators of such effects including level of trust, understanding, satisfaction with information, support, self-efficacy, and level and type of motivation. This level of tailoring has been termed deep structure tailoring and evaluates what cultural values and experiences change populations' perceptions of their health and their health related behavior⁶⁴. This deep level of tailoring also accounts for acculturation, which was not well measured in the majority of the studies or specifically evaluated as an effect modifier in any of these studies. In addition, it will be useful to assess characteristics of participants who most benefit from different forms of cultural tailoring and how that also may enhance participation retention. Furthermore, only four studies specifically designed a culturally targeted mode of delivery for the messaging. As health systems utilize innovative health technology and mobile health tools, researchers should study how to build culturally competent messaging and delivery models to engage a diverse population⁶⁵. Finally, as policy makers consider widespread implementation and dissemination of diabetes prevention programs, future studies should further elucidate the types of cultural targeting most successful in increasing recruitment, engagement, and maintenance in intervention programs. More detail is necessary on the strategies used to culturally tailor the content and delivery approaches of interventions as well as on the extent to which evidence-based behavioral strategies were used in the interventions to promote behavior change, and if so, which ones.

This study has important limitations. First, we restricted our literature search to English language articles. Therefore, relevant studies published in other languages may have been

missed. Second, due to variability in outcomes and a limited number of randomized trials a formal meta-analysis was not conducted. However, the search did yield three protocols published in the last two years for randomized controlled trials that will provide updated evidence and may allow formal meta-analyses in the coming years^{66–68}. This study will help guide such future research with respect to evaluation of intervention efficacy and fidelity across four domains while considering potential mediators of health outcomes (e.g. engagement, trust). Third, success was defined as a dichotomous outcome based on statistical significance and p-value of <0.05 , an approach that may overestimate the number of successful studies and not capture clinical significance. With only nine unsuccessful studies included, predictions on what cultural tailoring factors may lead another study to be unsuccessful cannot be made. Fourth, comparisons between ethnic populations could not be performed, as some ethnic subgroups had too few studies to make such comparisons. Theoretically, different domains may not be weighted equally for all populations. For example language may not be as important as facilitators and messaging in an African-American population compared to a Latino population. Finally, the majority of the studies included did not have a comparison group, and none evaluated the comparative effectiveness of different tailoring strategies. Future work should also compare which specific types of tailoring within each domain are most effective.

This study also has notable strengths. First, to our knowledge this is the first systematic review that focuses on cultural targeting in diabetes prevention among ethnic minority groups. Diabetes prevention programs are currently a priority for policy and community advocacy groups worldwide⁴⁹. Thus, the focus on studies that evaluate prevention and not diabetes management interventions among ethnic minority populations addresses a critically important need^{3–5}. Second, this study introduces a novel four-domain taxonomy, FiLLM, to both evaluate and explicate results. Third, it identifies domains that can be easily harnessed and utilized by researchers, community leaders, and policy experts who are interested in designing and implementing culturally targeted interventions addressing a range of health conditions in ethnic minority groups. Fourth, this study shows gaps and highlights avenues for future research in examining mediators and moderators within targeted interventions.

IMPLICATIONS

In conclusion, this systematic review presents the state of evidence on culturally tailored diabetes prevention interventions in ethnic minority groups. It further identifies a framework of four key domains that can be easily adopted and utilized when designing and evaluating future culturally targeted interventions. By targeting interventions across all four of these domains, future interventions can more effectively help ethnic minority populations adopt healthier behaviors to reduce their risk of diabetes and other preventable conditions. As diabetes prevalence continues to increase worldwide, sound research design and evaluation of culturally targeted diabetes prevention needs to be a key priority amongst researchers and policy makers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

FiLLM Conceptual Framework

FiLLM (Facilitating interventions through Language, Location, and Messaging) Conceptual Framework. Depicts how facilitators (i.e. program deliverers) affect participant outcomes through language, location, and message.

Figure 2.
PRISMA Flow Diagram

Table 1

Characteristics of the Interventions

Characteristic of Intervention	Successful*	Unsuccessful
Design		
Randomized Controlled Trial	9	3
Quasi-experimental	16	6
Research Approach		
Traditional	8	4
Community Engaged	7	1
CBPR [‡]	10	4
Country of Intervention		
USA	20	6
Canada	--	2
India	2	--
New Zealand	1	--
UK	1	
Norway	1	
Netherlands		1
Setting		
Clinic	1	1
Community	24	8
Duration		
<6 months	12	4
6–12 months	6	3
>12 months	7	2
Ethnicity		
African American	7	4
Hispanic/Latino	10	--
Arab Americans	1	--
Native Hawaiian and Other Pacific Islanders	2	--
Native North Americans	1	1
Alaskan Eskimos	1	
Canadian Aboriginals	--	1
South Asian	4	1
Chinese Americans	1	
Korean American		1
Socio-economic Status (SES)		
Low-income	13	5
Income not stated	12	4

Characteristic of Intervention	Successful*	Unsuccessful
Cultural Tailoring Strategies		
Facilitators	19	8
Language		
Linguistic Concordance	18	3
Literacy	9	2
Location		
Community Center	17	5
Faith-based Center	6	3
Message		
Content		
Diet	15	5
Faith	9	3
Gender	4	1
Family	6	2
Delivery	1	2

* Successful defined as if the majority of participants demonstrated a statistically significant ($p < 0.05$) improvement in at least one of the following outcomes: HgbA1c, fasting glucose, or weight loss. If a study did not report p-values, greater than 80% of participants had to show improvement in HgbA1c, fasting glucose, or weight loss.

[†] CBPR= Community Based Participatory Research

Table 2

Study Characteristics

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILLM) *	Outcome Measures	Major Findings†	Quality Rating
Admiraal <i>et.al.</i> , 2013	RCT	The Hague, Netherlands	Hindustani Surinamese (South Asians) SES: N/A Mean age: 44.7 n = 177 62.5% retention	n = 158	Study on lifestyle intervention and impaired glucose tolerance Maastricht (SLIM)-based intervention Goal: lifestyle intervention 6–8 individual sessions in the first 6 mo, 2 booster sessions in the next 6 mo, 20 wk physical activity programme Duration: 1 yr intervention, 2 yr follow up	Student dietitians	F: Dietitians La: N/A Lo: N/A M: diet and exercise, family	<i>Primary:</i> Weight, BMI, waist circumference, fat mass <i>Secondary:</i> glucose metabolism, blood pressure, lipid profile after 1 year	<i>Non-significant:</i> change in weight, BMI, waist circumference, fat mass, glucose metabolism, blood pressure, lipid profile	QR: 1
Auslander <i>et.al.</i> , 2002	RCT	St. Louis, MO, USA Urban	African American Females SES//: low-income (monthly income: \$1367.8 +/- \$1047) Mean age: 41.2 n = 138 73.7% retention	n = 156	Eat Well Live Well Nutrition Program: community-based dietary change program Goal: decrease dietary fat, increase low-fat dietary patterns Six group sessions and six individual sessions Duration: 3 mo, 6 group/6 individual sessions	Peer educators	F: peer educators La: N/A Lo: community center M: diet, gender	<i>Primary:</i> BMI, height and weight, dietary habits—reducing fat intake <i>Secondary:</i> Dietary knowledge (i.e. label-reading), eating habits, cultural relevancy	<i>Significant:</i> eating more low fat, reduced fat food, (%) calories from fat, knowledge of fat in diet <i>Non-significant:</i> change in weight	QR: 1
Balogopal <i>et.al.</i> , 2008	QE CE	Alamarathupatti, Tamilnadu, India Rural	Asian Indians SES: low-income (51.8% < 3,000 Rs) Mean Age: 40.3 n =703(total), 585(adults) 74% response rate	N/A	Educational intervention aimed at dietary modification, PA and simple relaxing breathing techniques Goal: Non-pharmacological lifestyle modifications to address Type 2 Diabetes risk factors and self-care Duration: 7mo, 10 individual encounters	Science graduates trained at Gandhigram Rural Institute	F: N/A La: linguistic concordance & literacy Lo: community based/homes M: N/A	<i>Primary:</i> FBG, BMI, weight, height, fat intake, fiber intake <i>Secondary:</i> Dietary knowledge and behavior, PA, stress relaxation, cultural relevancy	<i>Significant:</i> decrease in BMI, FBG, increase in dietary fiber and protein intake, decrease in carbohydrate intake, total calorie intake (in IFG subgroup), showed increase in WC, SBP, DBP <i>Non-Significant:</i> change calories from carbohydrates, protein, fat	QR: 1
Balogopal <i>et.al.</i> , 2012	QE CBPR	Gujarat, India Rural	Asian Indians Adults from a rural community, 25 km from Vadodara, Gujarat SES: low-income (<1500 Rs) vs. high-income (>3500 Rs) Mean age: 40.3 n =1638 81.9% retention	N/A	10 face-to-face health education encounters (5 one-on-one, 5 group based) were given to participants Goal: Using CHWs to improve knowledge of diabetes, lifestyle modification behavior, and stress management Duration: 6 mo, 10 sessions	CHW's	F: CHW's La: linguistic concordance Lo: community center M: gender	<i>Primary:</i> BMI, WC, systolic and diastolic BP, FBG <i>Secondary:</i> healthy diet (i.e. fat/fiber intake), diabetes knowledge, stress relaxation techniques, PA	<i>Significant:</i> reduction in FBG, BP, diabetes knowledge (in impaired fasting glucose group) <i>Non-significant:</i> BMI, CVD knowledge, WC	QR: 1
Benyshek <i>et.al.</i> , 2013	QE	Las Vegas, Nevada, USA	American Indians/ Alaskan Natives SES: N/A Mean age: 39.6 n=22 54.5% retention rate	N/A	Life in Balance (LJB) Goal: community-based participatory intensive lifestyle intervention Duration: 16 lessons, 16 weeks	LJB Native Lifestyle Coach	F:Native Lifestyle Coach La: N/A Lo: community based information and resource center M: diet and exercise	<i>Primary:</i> BMI, waist circumference, blood pressure, fasting blood glucose, and blood lipids (HDL, LDL and Triglycerides) <i>Secondary:</i> Qualitative data on patient experience	<i>Significant:</i> decrease in body weight, decrease in waist circumference, increase in HDL cholesterol <i>Not significant:</i> triglycerides, blood	QR: 2 withdrawal and drop-outs

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILM)*	Outcome Measures	Major Findings [†]	Quality Rating
									pressure, and fasting glucose	
Bhopal <i>et al.</i> , 2014	Cluster RCT	Edinburgh, and Glasgow, Scotland, UK	Indian and Pakistani origin SES: N/A Mean age: 52.8 n = 85 98% retention among participants in families 95% retention among family volunteers	n = 86	Prevention of Diabetes and Obesity in South Asians (PODOSA) Goal: Family-based lifestyle intervention; diet and exercise intervention; 15 visits over 3 years, annual group visits	Dietitian	F: N/A La: language concordance Lo: homes M: family, diet and exercise	<i>Primary</i> : weight change at 3 yrs <i>Secondary</i> : changes in oral glucose tolerance test, progression to type 2 diabetes, BMI, waist circumference, and hip circumference at 3 yrs	<i>Significant</i> : body weight, BMI, waist and hip circumference, losing 2.5kg+ <i>Not significant</i> : progression to diabetes	QR: 1
Boltri <i>et al.</i> , 2011	QE CBPR	Macon, GA, USA Rural	African American SES: N/A (authors did not state income) Mean age: 57.2 n = 37 68.7 and 56.6% attendance for 6-session and 16-session programs, respectively	N/A	Two group based programs: an intensive 16-week program and a 6 session program Goal: improve lifestyle modification behavior & diabetes knowledge, increase PA, weight loss in a cost-effective group setting Duration: 16 weeks, two groups 16 vs. 6 sessions (60–90 min)	Research assistant, 2 physicians, and a nurse educator	F: N/A La: N/A Lo: faith-based center M: faith	<i>Primary</i> : participation rates, changes in fasting glucose, BMI, and weight, cost-effectiveness <i>Secondary</i> : BP, dietary and diabetes knowledge	<i>Significant</i> : 6-session and 16-session showed decrease in FBG, weight, BMI <i>Non-significant</i> : BP	QR: 1
Buckley <i>et al.</i> , 2014	QE Clinic	Providence, RI, USA Urban	Hispanic (89% Spanish primary language) SES: low-income (41.1% below poverty level) Mean age: 51 n = 192 65.6% participants completed 6 out of 8 sessions of the Vida Sana program	N/A	2 hr sessions once per week over 5 weeks, then health-focused social activities over next 3 weeks for a total of 8 sessions Goal: improve diabetes knowledge and chronic disease management, using linguistically and culturally tailored educational material Duration: 12-month, 8 sessions (120 min)	Trained peer educators (Navegantes)	F: peer educators La: linguistic concordance & literacy Lo: clinica esperanza M: N/A	<i>Primary</i> : weight, BMI, blood glucose, low-density lipoprotein (LDL) cholesterol, WC, and BP <i>Secondary</i> : Health literacy, diabetes knowledge and prevention	>80% of participants lost weight, WC, SBP; health literacy (8wk) <80% of participants achieved improvement in blood glucose, LDL (8wk) SBP goal was met at 1–7 mo follow up for >80% [‡]	QR: 1
Cone <i>et al.</i> , 2013	QE CBPR	Franklin, Halifax, & Wilson Counties, NC, USA Rural	African Americans SES: N/A (average poverty level for 3 counties: 23.2%, total 72% <\$40,000 income) Mean age: 57 n = 104 43% completed more than 75% of the sessions	N/A	Twelve 60–90 minute interactive sessions led by facilitators in small groups Goal: Power to Prevent Program used to improve diabetes lifestyle modification behavior, fat reduction, and blood glucose control in community settings Duration: 7.5 mo, 12 sessions (60–90 minutes)	CHWs, curriculum facilitators	F: CHWs La: N/A Lo: faith-based center M: faith	<i>Primary</i> : blood glucose, BP, BMI <i>Secondary</i> : diabetes knowledge and goals	<i>Significant</i> : improvement in diabetes knowledge and goals <i>Non-significant</i> : BG, BP, weight, BMI	QR: 2 Withdrawals and dropouts
Conlon <i>et al.</i> , 2014	QE	Bronx County, NY, USA Urban	55.4% African American 26.5% Hispanic 18.1% other 100% cancer survivors SES: low-income (authors state participants from low-income neighborhoods) Mean age 60.5 n = 83 62.5% retention	N/A	Weekly group nutrition education (60–90 minutes) and exercise (60 min) class Goal: independently created BOLD program to improve nutrition and PA in cancer surviving diabetes using buddy system through behavioral modifications and goal-setting skills Duration: 4 or 12 weeks, 12 modules	Registered dietitian-nutritionist, exercise physiologist, fitness instructor, dietetic interns, medical resident, program coordinator, English-Spanish translator	F: N/A La: linguistic concordance & literacy Lo: community center M: diet & faith	<i>Primary</i> : anthropometrics (BMI and WC), dietary modifications (fat and fiber intake) <i>Secondary</i> : health-related QOL Participants' satisfaction, goal-setting skills	<i>Significant</i> : WC, health related QOL <i>Non-Significant</i> : BMI	QR: 1

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILM)*	Outcome Measures	Major Findings [†]	Quality Rating
Daniel <i>et al.</i> , 1999	QE CBPR	Vernon, Penicton, & Spalluncheon, Okanagan Region, British Columbia, Canada Rural	Aboriginal/Registered Indians SES: low-income (Median income: CAD \$2,000-CAD \$9,999) Mean age: 49.1 n = 62 70.5% retention	n=43	Aerobics and gentle exercise classes, walking group, health events, cooking demonstrations Media campaign with educational articulators and newsletters for tips with exercises Stores carried in municipal newspapers and television and radio stations Goal: Okanagan Diabetes Project focused on improving diabetes management and knowledge through behavioral modifications, educational materials, dietary interventions, and exercise classes Duration: 16 mo, group meetings every 2 months	Indigenous health workers	F: N/A La: linguistic concordance & literacy Lo: community center M: delivery	<i>Primary:</i> diabetes knowledge, HgbA1c, BMI, SBP, sweat-producing activity/wk <i>Secondary:</i> Diabetes control, behavior modifications, disease management, dietary behavior (fat intake)	<i>Significant:</i> diabetes knowledge, sweat producing activity/wk <i>Non-significant:</i> HgbA1c, BMI, SBP	QR: 1
Davis-Smith <i>et al.</i> , 2007	QE	Macon, GA, USA Rural	African American SES: N/A (authors did not mention income) Age: 18 [§] n = 10 78% attendance rate	N/A	Modified DPP for church-based group setting Goal: Group and faith-based modified DPP program that results in participant weight loss and sustained 150 minutes of PA weekly Six sessions, 2 nutrition, 2 PA, and 2 behavior change Duration: 19 weeks	Volunteer healthcare professional, Research assistant	F: N/A La: N/A Lo: faith-based center M: faith	<i>Primary:</i> Attendance rates, FBG, weight, BMI <i>Secondary:</i> Dietary behavior (fat and calories intake), group exercise program, healthy food options	<i>Significant:</i> weight, FBG <i>Non-significant:</i> BMI	QR: 2 Small sample size
Dodani <i>et al.</i> , 2010	QE CBPR	Evans County, Georgia, USA	African Americans SES: N/A Mean age: 46 n=40 87.5% retention rate	N/A	Fit Body and Soul program Goal: behavioral faith-based diabetes prevention program Duration: 1 session/wk for 12 weeks, 9 month f/u	church health advisors: nurses, research team, pastor	F: church health advisors La: N/A Lo: faith-based M: faith, diet	<i>Primary:</i> weight loss of at least 5%	<i>Non-significant:</i> weight loss 48% lost 5% weight	QR: 1
Duggan <i>et al.</i> , 2014	RCT CE	Lower Yakima Valley, WA, USA	Hispanic men and women SES: N/A mean age: 50.6 n=166 74.4% retention rate	n=154	Goal: home-based educational intervention Duration: 1 hr session/wk for 5 weeks	community health workers (Promotores de Salud)	F: promotores de Salud La: linguistic concordance and literacy Lo: participants' homes M: family, diet and exercise	<i>Primary:</i> HbA1c levels (3mo), fruit and vegetable consumption, PA <i>Secondary:</i> HbA1c (6mo)	<i>Significant:</i> HbA1c Not significant: frequency of leisure-time PA, fruit and vegetable consumption	QR: 1
Ebbesson <i>et al.</i> , 2005	QE	Bering Strait, Alaska, USA	Alaskan Eskimos SES: N/A (authors did not mention income) Age: 25 [§] n = 454	A Siberian Yupik and Central Yupik village, received a single handout once a year by mail listing healthy foods	Personal counseling and educational intervention for 30–60 min a year Goal: Diabetes Prevention Project of Alaskan Siberian Project focused on improving diabetes outcomes through education, exercise, and dietary changes to high omega-3, low palmitic acid traditional diet Duration: 4 years, annual review sessions	10 volunteer physicians, nurse practitioners, technicians, principal investigator	F: N/A La: N/A Lo: community center M: diet	<i>Primary:</i> FBG, LDL cholesterol levels, BMI, weight, BP, EKG exams <i>Secondary:</i> PA, dietary behavior nutritional choices	<i>Significant:</i> reduction in LDL, HDL, glucose, glucose tolerance, DBP <i>Non-significant:</i> triglycerides, weight, SBP	QR: 2 Withdrawals and drop-outs
Faridi <i>et al.</i> , 2010	QE CE	New Haven & Bridgeport, CT, USA Urban	African Americans SES: low-income [$< \$29,999$ (\$1.89%)] vs.	N = 125 in Bridgeport, CT	CHA-led diabetes prevention: more experimental, less didactic	CHAs selected by church pastors	F: CHAs La: N/A Lo: faith-based center	<i>Primary:</i> BP, weight, BMI, groups social support, diabetes knowledge	<i>Significant:</i> energy expenditures	QR: 1

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FIL LM) *	Outcome Measures	Major Findings [†]	Quality Rating
			high income (>=\$50,000 (26.42%)] Age: 18–79 [§] n=121 62% retention	62% retention	Community outreach events to raise diabetes awareness Goal: community-based modified DPP model focused on reducing diabetes effects through PA, dietary pattern modifications, social support, and exercise Duration: 1 year		M: faith	<i>Secondary:</i> PA, dietary pattern, energy expenditure, calories from food	<i>Non-significant:</i> PA, dietary pattern, weight, BMI, calories from food, groups social support, diabetes knowledge	
Gutierrez <i>et al.</i> , 2014	QE CBPR	Bronx & Harlem, NY, USA Urban	African Americans and Hispanics Participants from 15 churches (7 black American churches, 7 Hispanic churches, 1 West African church) SES: low-income (authors stated participants from low-income neighborhoods) Age: 18 [§] n=253 76% retention	N/A	Session includes 1-hr nutrition discussion and 1-hr exercise session Goal: independently developed DPP program that uses spiritual messaging and peer support to to increase exercise, fruit intake, and nutritional knowledge in a cost-effective program Duration: 12 weeks, 12 sessions	Two consultants from the community with faith orientation and content expertise (one fluent in Spanish) 2 bilingual trainers	F: community members La: linguistic concordance Lo: faith-based center M: diet and faith	<i>Primary:</i> Health related quality of life, self-reported knowledge (weight logs), PA, dietary behavior <i>Secondary:</i> BMI, weight	<i>Significant:</i> Improvement in knowledge, PA, weight <i>Non-significant:</i> dietary behavior	QR: 1
Ho <i>et al.</i> , 2008	QE	NW Ontario, Canada Rural	Native North Americans SES: low-income (33.3% <\$20,000 income) Mean Age: 40.3 n=57 88% retention	n=38	Three components (school, store, community) were integrated through 5 thematic phases lasting 6–8 weeks each Goal: address diabetes risk factor prevention techniques by improving diet and increasing PA among adults (through children as change agents) Duration: 9 mo, 16 lessons	community members, research staff, students	F: community members La: N/A Lo: community center M: delivery	<i>Primary:</i> anthropometric status, BMI <i>Secondary:</i> self-reporting of food- and health-specific behaviors, PA, cultural relevancy	<i>Significant:</i> healthy food acquisition, food knowledge <i>Non-Significant:</i> PA, self-efficacy, BMI	QR: 1
Islam <i>et al.</i> , 2013	RCT CBPR	New York City, New York, USA	Korean Americans mean age: 59 /n=25 84.0% retention rate for treatment group 60.9% retention rate for control group	n=23	Project Reaching Immigrants through Community Empowerment (RICE) Goal: culturally tailored community based participatory research Duration: 6, 2-hr group sessions every 3 weeks, 4, 5 months	community health workers, programmatic staff at community organization	F: CHW La: linguistic concordance and literacy Lo: community center and home M: diet	<i>Primary:</i> weight, BMI, hip-to-waist ratio reduction, access to and utilization of care, and knowledge and practice of physical activity and healthful eating at 3mo, 6mo <i>Secondary:</i> qualitative data on program implementation	<i>Significant:</i> diabetes knowledge <i>Not significant:</i> WC, weight, social interaction, confidence engaging in physical activity, portion control, and preparation, planning, and buying healthy foods	QR: 1
Islam <i>et al.</i> , 2014	RCT CBPR	NYC, NY, USA Urban	Sikh Asian Indian SES: low-income(authors assume low-income with USA Census trends for foreign born nationals) Mean age: 46.3 n = 76 92% retention	n= 50	Six CHW-facilitated interactive group sessions, 2 hrs in length Follow up phone calls Goal: reduce diabetes risk factors through diabetes prevention education, nutrition, PA, stress management, social support, and accessing health care resources Duration: 6 mo, sessions every 3 weeks	CHW's	F: CHW's La: linguistic concordance Lo: community center M: diet & faith	<i>Primary:</i> Weight, BMI, weight circumference, BP, glucose and cholesterol levels <i>Secondary:</i> health behaviors (nutrition and food behavior), diabetes knowledge, social support, PA	<i>Significant:</i> weight, BMI, glucose, PA, food behavior, diabetes knowledge <i>Non-significant:</i> weight circumference, BP	QR: 1

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILM)*	Outcome Measures	Major Findings [†]	Quality Rating
Jaber <i>et al.</i> , 2011	QE CE	Dearborn, MI, USA Urban	Arab Americans SES: N/A (authors did not mention income) Goal: improve feasibility and acceptability of community based modified DPP program through >7% weight loss and 150 minutes PA n =71 86% retention	N/A	Adapted DPP, into 12 sessions Goal: improve feasibility and acceptability of community based modified DPP program through >7% weight loss and 150 minutes PA Duration: 12 weeks, 12 weekly sessions	Bilingual personnel who were racially and ethnically identified with the community	F: community members La: linguistic concordance Lo: community center M: diet, faith, family & gender	<i>Primary:</i> achieve 7% weight loss and >150 min/week of PA <i>Secondary:</i> weight, BMI, waist/hip circumference, nutritional intake (total calories and fat)	<i>Significant:</i> weight, BMI, WC, hip circumference, nutritional intake <i>Non-significant:</i> >150min/week of PA	QR: 1
Kaholokula <i>et al.</i> , 2014	QE CBPR	Hawaii, USA	Native Hawaiians/Pacific Islanders SES: N/A Mean age: 50.8 n=239	N/A	PILI 'Ohana Project (POP) Goal: Duration: 24 weeks, 16 lessons (4 weekly, 4 bi-weekly)	Community health advocates (CHAs)	F: CHAs La: literacy Lo: community based organizations M: family	<i>Primary:</i> weight, physical activity, diet <i>Secondary:</i> SBP, DBP, BMI intake	<i>Significant:</i> weight, SBP, DBP, physical activity, dietary fat intake	QR:1
Millard <i>et al.</i> , 2010	QE CE	Hidalgo County, TX, USA Rural	97% Mexican, 100% females SES: low-income (35% below poverty level) Mean age: 36 n=38 79.2% attended at least half the meetings	n=43 In a comparison group	<i>Promoters</i> taught seven weekly interventions in this project > Goal: DMII prevention through enhanced nutrition education and PA Duration: 8 weeks, 20 min PA per session	CHWs (<i>promotoras</i>)	F: CHWs La: linguistic concordance Lo: community center M: gender	<i>Primary:</i> BMI, height, weight <i>Secondary:</i> process evaluation of the intervention activities, cultural relevancy	<i>Significant:</i> BMI Participants found project culturally and economically appropriate <i>Non-significant:</i> N/A	QR: 1
O'Brien <i>et al.</i> , 2015	QE	Philadelphia, USA	Hispanic women (Latinas) SES: Low Mean age: 44.5 n=20 90% retention rate	N/A	Promotora-Led Diabetes Prevention Program (PL-DPP) based off of Group Life Balance Goal: 7% weight loss, engaging in 150min/wk exercise, dietary change Duration: 22 sessions over 12 months	CHWs promotora volunteers	F: CHW Promotora La: linguistic concordance Lo: community based organizations M: diet and family	<i>Primary:</i> weight change over 12 months, BMI <i>Secondary:</i> waist circumference, SBP, DBP, A1C, fasting glucose, insulin, and lipids Secondary: psychosocial measures including (e.g.health literacy, social support)	<i>Significant:</i> weight (5.6% weight loss) waist circumference, DBP, LDL cholesterol, insulin levels not significant: A1C and fasting plasma glucose	QR: 2 small sample
Ockene <i>et al.</i> 2012	RCT CE	Lawrence, MA, USA Urban	Spanish-speaking Caribbean Latinos (Dominicans and Puerto Ricans) SES: low-income (avg. household income: \$33,684) Mean age: 52 years n=162 94% 1-year retention rate	n=150 Assigned to usual care	3 individual sessions (1 session 1hr, 2 sessions 30 min) and 13 group sessions (1 session 1.5hr, 12 sessions 1hr) Goal: community-based, linguistically modified DPP program to reduce diabetes risk factors through weight loss and dietary and behavioral modifications Duration: 1 yr	Senior Center and YMCA staff from community, Spanish-speaking community individuals educated in nutrition	F: community members La: linguistic concordance & literacy Lo: community center M: diet & delivery	<i>Primary:</i> weight, HgbA1c <i>Secondary:</i> BMI, insulin resistance, FBG, dietary intake, PA, depression scores	<i>Significant:</i> weight, BMI, HgbA1c, insulin resistance, decreased fat intake <i>Non-Significant:</i> PA, FBG, depression scores	QR: 1
Parikh <i>et al.</i> , 2010	RCT CBPR	East Harlem, NY, USA Urban	Hispanic (89%)African American (9%) SES: low-income (62% below poverty level) Mean age: 48 years n=50 70% retention	n=49	Eight 1.5-hr sessions Goal: peer-led diabetes interventions that promote weight loss through education and behavioral modification focused on healthy food affordability, PA, portion control, and return to traditional diet Duration: 10 weeks	CHWs	F: CHWs La: linguistic concordance & literacy Lo: community center M: diet	<i>Primary:</i> weight, BMI <i>Secondary:</i> BP, WC, LDL levels, FBG, HgbA1c, PA, food intake	<i>Significant:</i> weight, WC, decrease juice and soda intake <i>Non-Significant:</i> BP, LDL, FBG, HgbA1c, PA, food intake (fruit, salad, diet soda)	QR: 1
Philis-Tsimikas <i>et al.</i> , 2014	QE	San Diego County, CA, USA	Latinas with a history of GDM SES: low-income	N/A	Dulce Mothers Goal: peer-educator-led group intervention	peer-educator, promotora, research supervisor	F: bicultural Promotora La: linguistic concordance Lo: N/A	<i>Primary:</i> Hemoglobin A1c <i>Secondary:</i> lipids, blood pressure, self-reported	<i>Significant:</i> lipids, blood pressure, physical activity, dietary fat	QR: 2 small drop-outs

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILM)*	Outcome Measures	Major Findings [‡]	Quality Rating
			Mean age: 31.93 n=84 82.4% retention rate		Duration: 2-h weekly classes for 8 weeks, 6 month f/u		M: diet, exercise, and family	physical activity, diet, overall perceived health, fatalistic beliefs, and diabetes-specific cultural beliefs	intake, and fatalistic and cultural diabetes beliefs <i>Not significant</i> : HDL-C, SBP, BMI, weight	
Ruggiero <i>et al.</i> , 2011	QE CBPR	Southwest Chicago IL, USA Urban	Hispanic SES: low-income (author infers Hispanic community is low-income) Mean age: 37.9 n=69 83% retention at 12 mo	N/A	16 core sessions over 6 mo then supplementary sessions for remaining 6 mo Goal: community-based, modified DPP program that focuses on lifestyle interventions and dietary changes (decrease fat intake) that leads to >7% weight loss and 150 min PA Duration: 12 mo	CHWs	F: CHWs La: linguistic concordance Lo: community center M: N/A	<i>Primary</i> : BMI, weight, body fat percentage, WC, Weight loss (7% of body weight) and increased PA to 150 min/week <i>Secondary</i> : self-reported diet	<i>Significant</i> : weight, BMI (6 mo), WC, body fat % (6 mo), self-reported diet (avoiding frying) <i>Non-significant</i> BMI, weight (12 mo), body fat % (12 mo), self-reported diet (modifying meat)	QR: 1
Suttin <i>et al.</i> , 2016	Cluster RCT CBPR	Augusta, GA, USA	African Americans SES: N/A Mean age: 46.5 n=317	n=287	Fit Body and Soul (FBAS) program Goal: behavioral faith-based DPP Duration: 12 weekly group 1-h core sessions and 12 month f/u	church health advisors	F: church health advisors La: N/A Lo: church M: faith	<i>Primary</i> : weight loss of at least 7% <i>Secondary</i> : FPG with a mean reduction of at least 3 mg/dl, physical activity of moderate intensity for at least 150 min per week	<i>Significant</i> : FBG, fasting insulin, DBP, 2h C-peptide <i>Not significant</i> : blood variables, blood pressure, BMI or waist circumference	QR: 1
Simmons <i>et al.</i> , 1997	QE CE	South Auckland, New Zealand	Western Samoans SES: N/A Mean age: 37 n = 78 96% retention	n = 144	Diabetes awareness sessions followed by exercise groups Goal: community-based diabetes risk reduction through lifestyle modifications leading to weight loss, decreased fat consumption, diabetes awareness and community empowerment Duration: 2 years, 4 group sessions, exercise group (weekly sessions first year, bi-weekly sessions second year)	Diabetes nurse specialist, Samoan women (Certified Diabetes Educator and aerobics instructor), pastor	F: community members La: linguistic concordance Lo: faith-based center M: faith, diet	<i>Primary</i> : weight, BMI, waist/hip circumference <i>Secondary</i> : diabetes knowledge score, PA, fat preparation	<i>Significant</i> : WC, diabetes knowledge, PA, fatty food consumption <i>Non-significant</i> : weight, BMI	QR: 2 Data collection tools not shown to be valid/reliable
Telle-Hjelset <i>et al.</i> , 2013	RCT	Oslo, Norway	Pakistani immigrant women SES: N/A Mean age: 41.5 n=101 88% retention rate for intervention group 79.4% retention rate for control group	n=97	InvvaDiab Goal: culturally sensitive DPP intervention Duration: 7 months, 6 education sessions	Multilingual female educators	F: female educators La: linguistic concordance & literacy Lo: N/A M: gender, diet and exercise	<i>Primary</i> : fasting and 2h blood glucose <i>Secondary</i> : fasting levels of insulin, C-peptide, lipids, glycated Hb, BMI, waist circumference and blood pressure	<i>Significant</i> : FBG, fasting insulin, DBP, 2h C-peptide <i>Not significant</i> : blood variables, BP, BMI, waist circumference	QR: 1
Treadwell <i>et al.</i> , 2010	QE	Lorain County, OH, USA Urban	African-American males SES: low-income (25% <\$25,000 income) Age: 18 [§] n =42 100% retention	N/A	A curriculum that included 6 educational sessions (~12 hrs), fitness activities (~30 hrs) and connecting participants to primary health care providers Goal: community-based program aimed at reducing obesity and diabetes through prevention and management strategies, increased PA,	CHWs	F: CHWs La: N/A Lo: community center M: N/A	<i>Primary</i> : glucose levels, weight, BMI, and BP <i>Secondary</i> : PA, questionnaire (depression, physician access)	98% of participants achieved goal of 150min/wk PA, Mean weight loss 2.54 kg [‡]	QR: 1

Study	Design	Setting	Sample Characteristics and Retention	Control	Intervention Design and Duration	Delivery Staff	Cultural Strategies (FILLM)*	Outcome Measures	Major Findings [‡]	Quality Rating
					decreased BP, weight, and improved primary care visits Duration: 6 weeks, 6 weekly sessions					
Vincent <i>et al.</i> , 2015	RCT CE	Arizona, USA Urban, Suburban	Hispanics SES: low-income (60% <\$20,000 income) Mean age: 50.9 years n =40 93% retention	n =20	8 weekly 2 hr sessions followed by maintenance phase of 3 mo 1hr sessions Goal: community-based, modified DPP program that addresses and reduces diabetes risk factors by focusing on improved healthy eating and PA leading to weight loss Duration: 5 mo	<i>Promotoras</i> (CHWs)	F: CHWS La: linguistic concordance & literacy Lo: faith-based center M: diet, family, and faith	<i>Primary:</i> Weight loss <i>Secondary:</i> BMI, WC, diet self-efficacy, and PA self-efficacy, fat frequency score, fruit/vegetable score, random glucose	<i>Significant:</i> weight, WC, BMI, diet self-efficacy <i>Non-significant:</i> random glucose, PA, fat frequency, fruit/vegetable score	QR: 1
Yeh <i>et al.</i> , 2016	RCT CBPR	New York City, New York, USA	Chinese Immigrants SES: N/A Mean age: 60.9 (control group) Mean age: 56.8 (intervention group) n=30 97.7% retention	n=30	Diabetes Prevention Program Goal: linguistically and culturally tailored DPP Duration: 12 bi-weekly core sessions and 6 monthly post-core sessions, 1 month f/u	bilingual lifestyle coaches	F: lifestyle coaches La: language concordance Lo: community sites M: diet and exercise	<i>Primary:</i> percent change in weight, BMI <i>Secondary:</i> percent reduction in HbA1c concentration	<i>Significant:</i> %weight loss at 3 and 6mo, HbA1c, BMI, body fat, waist circumference <i>Not significant:</i> cardiometabolic variables	QR: 1

Abbreviations: BMI= Body Mass Index, BP= blood pressure, CBPR= community based participatory research, CE = community engaged, CHW=community health worker, CVD = cardiovascular disease, FBG = fasting blood glucose, IFG= impaired fasting glucose, N/A=not available, PA= physical activity, QE= quasi-experimental study, QOL= quality of life, RCT= randomized controlled trial, WC= waist circumference

* Cultural strategies are arranged by F: Facilitators, La: language, Lo: location, M: Message

[‡] p<0.05= significant

[‡] Statistical significance not reported in study

[§] Mean age not reported

// Low-income as defined per study author