

Learning from “Our Relations” Indigenous Peoples of Australia, Canada, New Zealand, and United States: A Review of Culturally Relevant Diabetes and Obesity Interventions for Health

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Article abstract

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Learning from “Our Relations” - Indigenous Peoples of Australia, Canada, New Zealand, and United States: A Review of Culturally Relevant Diabetes and Obesity Interventions for Health

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Learning from “Our Relations” - Indigenous Peoples of Australia, Canada, New Zealand, and United States: A Review of Culturally Relevant Diabetes and Obesity Interventions for Health

Abstract

Globally, Indigenous Peoples suffer disproportionately higher rates and complications of diabetes and obesity than non-Indigenous people. Western health interventions combined with culturally appropriate Traditional approaches can reduce incidence, prevalence, and related co-morbidities. This literature review reports effective culturally relevant Traditional and Western diabetes and obesity prevention and management intervention programs for Indigenous populations in Australia, Canada, New Zealand, and the United States. Experiential, immediate, interactive, and low-cost programs, co-developed and delivered by local Indigenous people within the communities they live, are most effective in improving health and wellbeing. Key themes of success, *Togetherness*, *Empowerment*, and *Local Familiarity*, inform action for policy and practice changes adaptable for chronic disease prevention, treatment and self-management programs for Indigenous Peoples globally.

Keywords

Indigenous Peoples health and wellness, diabetes/obesity, culturally relevant health policy interventions, cultural safety, togetherness, empowerment

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Learning from “Our Relations”—Indigenous Peoples of Australia, Canada, New Zealand, and United States: A Review of Culturally Relevant Diabetes and Obesity Interventions for Health

Globally, Indigenous Peoples are disproportionately and negatively impacted by diabetes, obesity, and their co-morbidities. Type 2 diabetes (T2D) and obesity rates in Indigenous adults, children, and youth in Australia, Canada, New Zealand, and the United States of America (USA) are 2-5-fold higher compared to the general population (Batal, & Decelles, 2019; Best Practice Advocacy Centre New Zealand, 2018; Centers for Disease Control, 2018; Magliano, et al., 2008; Narayan, et al., 2003; Public Health Agency of Canada [PHAC], 2011; Statistics Canada, 2019; World Health Organization [WHO], 2000, 2021). The risk of developing T2D increases after the age of 40 in the general population. However, among many Indigenous Peoples incidences of diabetes and obesity, as well as the related complications in children and adolescents, are 3-5 times greater than in settler populations (Best Practice Advocacy Centre New Zealand, 2018; Crowshoe et al., 2018; Maple-Brown, et al., 2010; WHO, 2020). Furthermore, rates of diabetes and obesity related mortality, including avoidable mortality (deaths that may have been averted by prevention or treatment), exceed those of the general population by 2-3-fold in Canada (Walker, 2020) and globally (Park, 2015).

The root causes of T2D and obesity are significantly more complex for Indigenous Peoples. The ongoing impact of historical and contemporary colonialism has resulted in loss of lives, land, and cultural identity and continuity. Further, perpetuation of racism, discrimination, and inequality have led to ongoing intergenerational trauma, along with forced migration, urbanization, commercialism, and acculturation. Together, these factors link to poverty, disrupted relations, overcrowding, inability to afford healthy foods, and decreased physical activity, along with a dramatic increase in the risk of chronic disease (Gracey & King, 2009).

Western (mainstream) health systems have had limited success in providing effective health care for Indigenous Peoples. These systems fail to address the root causes and structural issues that contribute to socio-economic disparities, health care gaps, and mortality (Crowshoe et al., 2018; Henderson, et al., 2020; PHAC, 2011). Western diabetes and obesity programs often lack local community engagement, cultural relevance, wholistic Traditional practices and healing, all of which are critical to decrease gaps in health care and lessen the burden of disease that cause Indigenous Peoples to suffer unnecessarily (Crowshoe et al., 2018; Henderson, et al., 2020; PHAC, 2011). Health care services and outcomes for Indigenous People are improved by shifting from colonial control to community ownership and control. Services, programs, and outcomes need to be inclusive of Indigenous knowledge, cultural values, language, Traditional healing and practices, self-determination, and governance (Halseth & Murdock, 2020).

An essential component of culturally appropriate care is the inclusion of Indigenous Peoples as providers and teachers of Traditional practices and healing (Harfield et al., 2018; National Aboriginal Health Organization, 2017). Culturally relevant, more acceptable local initiatives are effective alone or when combined with Western interventions (Azzopardi et al., 2012; Cunningham-Sabo et al., 2008; Kenyon,

2013; Kurtz et al., 2014). In their systematic review, Trembley et al. (2020) described seven studies that demonstrated moderate evidence supporting three strategies (health provider education, culturally safe clinical environments, and Indigenous health provider engagement) that were associated with improved access (to care), and diabetes-related outcomes among Indigenous Peoples. In the community-based Kahnawake School Diabetes Prevention Project, culturally based activities included social and interactive sessions, learning about cultural Traditions, foods, spirituality, mindfulness and breathing, and participation in physical activities. Adult participants felt spiritual, emotional, mental and physical health benefits, which were attributed to culturally based activities (Murdoch-Flowers et al., 2019). Another study, among Cherokee youth, family, and communities in the USA, reported living within one's cultural Traditions and values lowered the risk of obesity and stress (Kelley & Lowe, 2018).

Given the relevance of and evidence for effective culturally safe community interventions, it is vital to understand the key characteristics of these activities that contribute to improvements in health and wellbeing. Thus, the purpose of this review is to explore the common factors associated with the delivery of effective, culturally relevant Indigenous diabetes, obesity, and other health promotion programs. This knowledge will help to inform the planning, implementation, and evaluation of a community-led Indigenous diabetes and obesity multi-site partnership research study with urban and rural Indigenous communities in Western Canada. The project involves a team of Indigenous and non-Indigenous university, health authority, and community partner researchers, Research Elder Advisors, and a collective of six distinct urban Indigenous communities, each with site Community Advisory Teams and Community Research Liaisons. At the request of the communities, we are exploring how best to incorporate Western (mainstream) and Traditional practices and healing knowledge in the prevention, treatment and self-management of obesity and T2D among Indigenous Peoples. In particular, we were interested in "Our Relations," Indigenous populations with whom we share similar historical and contemporary generational impacts of colonization and health disparities (Australia, Canada, New Zealand, and USA). From this, we decided on a research question for this review: What characteristics of effective culturally responsive health policy interventions facilitate more beneficial and successful health promotion programs for Indigenous populations in Australia, Canada, New Zealand, and USA?

Methods

Data Sources and Searches Inclusion and Exclusion Criteria

A systematic search of Medline, EMBASE, CINAHL, and PsycINFO was conducted with a combination of keyword and subject heading terms tailored to each database. Four broad categories of search terms were used: (1) Indigenous populations (i.e., "First Nations", "Native", "Indian", "Aboriginal", "Indigenous", "Māori") (2) diabetes and/or obesity (i.e., "diabetes", "overweight", "obesity", "sugar" ...), (3) cultural or Traditional component (i.e., "cultural safety", "traditions", "wheel" ...), (4) promotion or prevention (i.e., "education", "outreach", "health and wellness" ...). These four concepts were linked together with AND. A full search strategy for Medline, conducted by Janke, a research librarian with expertise in Indigenous population health, is included in Appendix 1. Other sources, in addition to the

article indexes outlined below, included preliminary literature searches, readings of papers prior to the systematic search, and reviewing reference lists of retrieved primary studies and literature reviews).

Inclusion criteria included: written in English, empirical, reporting urban and rural off-reserve Traditional and/or culturally based approaches to prevention and/or management and self-management of diabetes, obesity, or health promotion for Indigenous populations in Australia, Canada, New Zealand, and USA. Exclusion criteria: populations outside of Australia, Canada, New Zealand, and USA, general focus on chronic disease(s), results or approach not reported separately or specifically for Indigenous population(s), review articles, and clinical trials. Articles were included or excluded based specifically on these criteria.

In order to get an indication of the quality of the evidence presented in the studies, we assessed the risk of bias as follows. The National Institute for Health and Care Excellence (NICE) checklist (National Institute for Health and Care Excellence, 2012) for risk bias assessment was used on each article for inclusion. In addition, components of the Cochrane method of bias assessment, including the ROBINS-I assessment tool (Higgins et al., 2021) were used to analyze potential bias.

A total of 2783 articles published between 2005 and November 20, 2020, were identified: 2738 (736 in Medline, 1369 in EMBASE, 449 in CINAHL, and 184 in PsycINFO), and an additional 45 identified through other sources (above). After removal of duplicates, the research assistant (RA), an Indigenous researcher trained in Indigenous health and research methodology, screened abstracts of the remaining 1376 articles for relevance to inclusion criteria. The 167 research articles that met inclusion criteria (based on abstract screening) were read in full by the RA, with 70 primary research articles suggested for review. Through this process there were also a number of review papers identified which contributed to the background section of the paper. The principal investigator (PI), an Indigenous research scholar, performed an additional check for consistency of screened-in articles by reviewing relevant abstracts screened in by the RA (n=167). Forty articles were selected for full independent assessment after consensus discussions by the RA and PI. However, following further consensus discussion and comparison of the relevance of articles, 30 articles met the inclusion criteria. Two pods of two to three reviewers/data extractors (each comprised of at least one Indigenous research team member) were each assigned one half of the articles. The pods included the PI, RA, librarian, a health equity, Indigenous health researcher, a community-based participatory clinical researcher and Indigenous ally. A summary of the literature search and study selection process is detailed graphically in Figure 1.

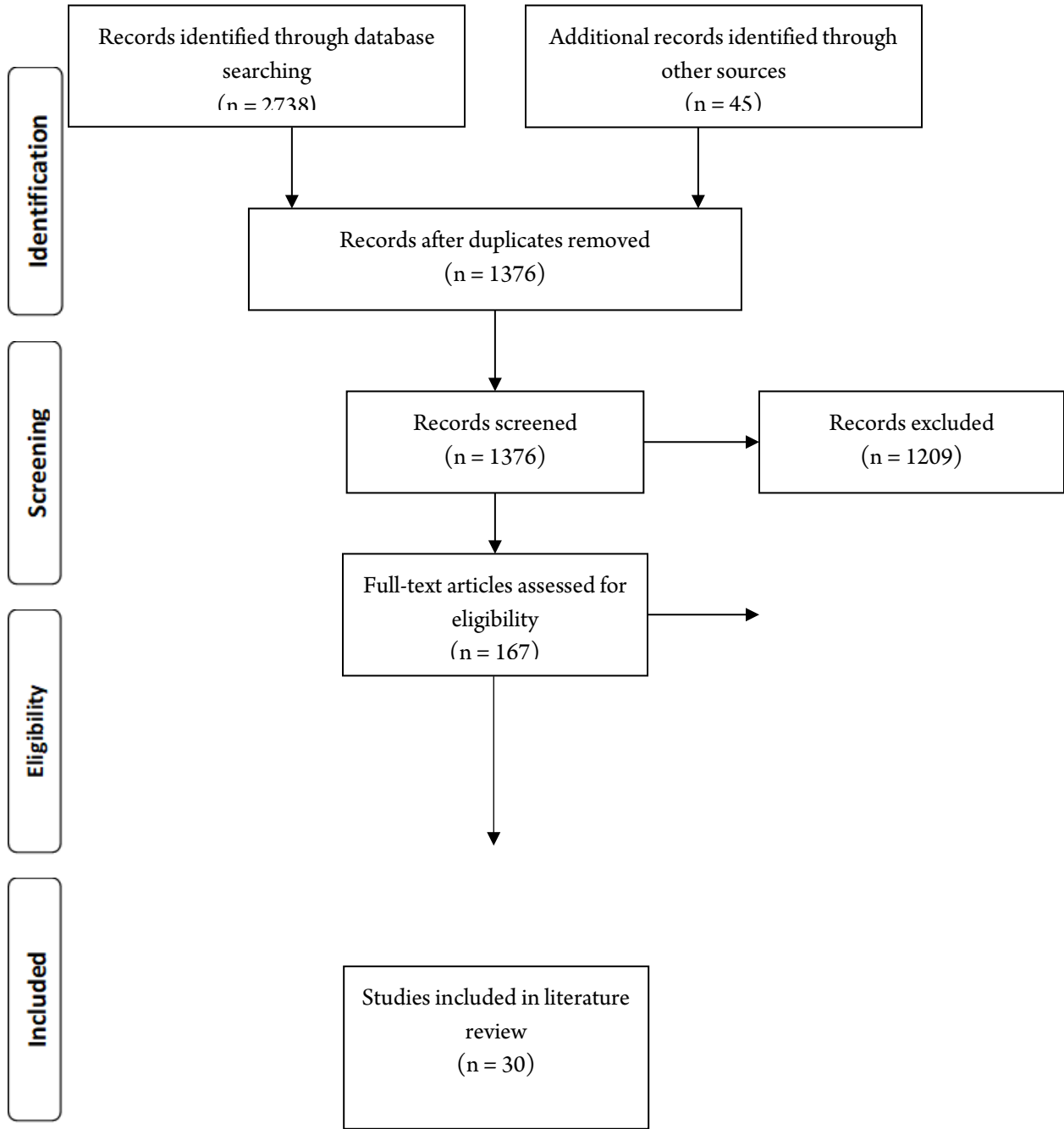


Figure 1. Summary of Literature Search and Study Selection Process.

Adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Medicine 6(7): e1000097. doi:10.1371/journal.pmed1000097

Data Extraction and Management

The selected 30 research studies are summarized in Table 1. Data in the table includes: author, year, type of study, location of study, population, intervention and risk of bias. Articles with overlapping data from a single research study were collapsed into a single entry to include all relevant information. Beyond study identification, it was important to assure that all inclusion criteria were met and documented. Most importantly, referring to the table should give the reader insight as to why we came to the conclusions that we did. Thematic analysis (Braun & Clarke, 2020) was used to identify themes and characteristics of interventions in each paper that were then organized into common patterns of meaning or themes that provided an answer to the research question. Thematic analysis was performed using a Two-Eyed Seeing approach (Bartlett et al., 2012), which respects and honours both Indigenous and Western knowledge and perspectives. Reviewers in each pod independently undertook a thematic analysis approach for each paper. Findings were discussed and consensus reached within each pod and then for both pods (all papers) on the themes or characteristics of interventions in each paper that helped to answer the research question. Success of interventions was assessed using the reported outcomes in the source articles, i.e., significant changes in fruit and vegetable intake, significant increase in weekly physical activity, increased nutrition knowledge or self-awareness, or attitudinal changes about healthy living.

Table 1. Summary of Articles

Author (year), type	Location	Population	Intervention	Results and risk of bias
Abbott et al. (2010), qualitative	Urban Australia	Adults N = 23 Aboriginal & Torres Strait Islanders	Practical cooking 4-hour, 8-week program offered every 6 months over a 5-year period. Taught by local Aboriginal women with a focus on budget home cooking for diabetes/obesity control and group work in a culturally appropriate setting.	Strengths included practical, culturally relevant content and a culturally appropriate setting. Weight loss and improved nutrition knowledge for healthier cooking and shopping, well-being, and motivation for lifestyle change. Family and group learning were crucial motivators for healthy eating success. Familiar recipes and ingredients preferred. <i>Moderate risk of bias.</i>
Arora et al. (2013), qualitative	Rural/Urban Canada	Adults N = 10 Indigenous	Community tele-ophthalmology clinic for diabetes eye-screening services. Used religious/cultural artifacts and practices, ceremonies led by Cree spiritual leaders, and Indigenous nurses.	Incorporation of cultural activities were helpful. Participants trusted Indigenous nurses more than Caucasian health workers. Patients' view of own health and diagnoses included physical, mental, emotional, and spiritual health. <i>High risk of bias.</i>
Bachar et al. (2006), mixed methods	Rural USA	Whole community N: not specified	3-part elementary school mentoring program, which included worksite wellness for adults, and church-based health promotion, all supported by social marketing component. Emphasis on Cherokee family, intergenerational learning, and spiritual health.	Increased physical activity amongst adults, self-reported knowledge about healthy food choices amongst students, community messaging about physical health, and fresh fruit/vegetable options in school meals. <i>High risk of bias.</i>
Brown et al., (2020), mixed methods	Rural USA	Adults N = 9 (interviews); N = 20 (feasibility study) American Americans	A community-based participatory approach (CBPR) and social-ecological model (SEM) of health behaviour were used to understand opportunities and barriers related to gardening and using locally grown foods on an American Indian reservation. This project sought to assess the feasibility of implementing a group gardening program and potential of collecting health outcome measures.	In general, community members were not knowledgeable about growing food. In the group gardening intervention, there were no differences in-between group changes (body mass index, blood pressure, or HgbA1C). The Profile of Mood States (POMS) Inventory scores showed consistently positive (i.e., lower) change in score for the treatment group versus the comparison group. <i>Moderate risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Castro et al. (2009), quantitative	Urban USA	Adults N = 249 American Indians	5-classes - Stanford University Chronic Disease Self-Management Program with a curriculum of Traditional health care, and regular exercise classes with a focus on mind, body, spiritual, and emotional health. Services were provided by a diabetes case manager. Used intergenerational community events, Talking Circles, and employed Traditional healers.	Improved participant's diabetes self-management, including knowledge of resources for managing diabetes. Changes were observed by 98% of participants in one or more of: exercising, coping with diabetes stress, communicating with health care provider, and/or improving their eating plan. <i>Moderate risk of bias.</i>
Cueva et al. (2020), qualitative	Rural USA	Youths N = 44 American Indians	Using photovoice, American Indian youths described their perceptions of an obesity-prevention initiative, Feast for the Future, which focused on cultural connectedness and Traditional food revitalization.	Common identified themes were: (1) Traditional food is farmed or gardened; (2) Traditional foods are healthy; (3) Feast for the Future supported positive connections to culture; (4) Hope for more farming and gardening for future generations; and (5) Store or less nutrient-dense food is unhealthy. <i>High risk of bias.</i>
DeBruyn et al., (2020), mixed methods	Rural USA	Whole communities N: not specified American Indians	The Traditional Foods Project (TFP) provided modest funding and support to 17 American Indian/American Native communities who designed their own T2D interventions to meet the needs of their communities.	Grantee partners embraced the TFP's community-based, tribally driven approach. There were seven main themes: (1) Traditional knowledge and grassroots; (2) Connections to health; (3) The power of stories and storytelling; (4) Community engagement; (5) Knowledge sharing and gratitude; (6) Flexibility to do what works; and (7) Program sustainability. Data did not include aggregated health measures for individual participants (e.g., weight change over time) due to funding restrictions and more focus on environment and community. <i>Moderate risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Dreger et al. (2014), qualitative	Rural/Urban Canada	Adults N = 11 Indigenous	8-week mindfulness intervention for diabetes management developed with community leaders and facilitated in familiar locations. Used culturally relevant images and Traditional activities such as storytelling.	Non-medical/alternative approach, cultural aspects, practicality, cultural social component, and interactive nature encouraged participation. Time commitment was a barrier. Outcomes of participation included increased awareness, improved health and well-being, behavioural and attitudinal changes, and positive regard for program/practices. <i>Low risk of bias.</i>
Farmer et al., 2018, qualitative	Unspecified New Zealand	Families N: not specified Māori	A culturally appropriate documentary created for Māori individuals at risk for T2D. Māori beliefs about diabetes, healthy eating, and exercise were gathered using community engagement, informant interviews and focus groups (hui).	Bandura's Social cognitive theory was used as a culturally sensitive theory for behaviour change messaging along with positive messaging rooted in wholistic health for changes across family, children, grandchildren. Māori health model was used. Local role models and Māori health providers were included to inspire the audience. Tribal Chairman opened the documentary with a Karakia (prayer) ensuring the spiritual elements of Te Whare Tapa Wha incorporated. <i>Low risk of bias.</i>
Fleischhacker et al., 2012), qualitative	Rural/Urban USA	Whole Community N: not specified American Indians	"Tools for Healthy Tribes" Toolkit and web resources. Culturally appropriate tribe specific focus on community insights about local food environment and ways to stimulate action by tribal leaders and grassroots level. The CBPR intervention used mentoring and role models and modified Talking Circles.	Participants appreciated the empowering tone, practicality, and emphasis on Talking Circles. Interest in more low-cost, immediate approaches to address economic development and health. Future programs should: integrate Traditional messages/stories and community role models, use intergenerational approaches and emphasize family, and address historical trauma. <i>High risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Janssen et al. (2014), mixed methods	Rural/Urban New Zealand	Adults N: not specified Māori	6-week 'Wellness with Diabetes' course followed by optional diabetes support group and one-on-one meetings with nurse educators. Used a "Family togetherness" approach and cultural activities such as sharing food, healthier ways of preparing Traditional Māori foods, and songs/prayers.	Participants valued the relaxed interpersonal relationship and disclosure from staff, use of humour, family togetherness, and learning from and being motivated by others with diabetes. Participants reported gaining new knowledge and awareness related to diabetes and how to make personal changes. No other improvements in health outcomes over the program were reported. <i>Low risk of bias.</i>
Jernigan & Lorig (2011), qualitative	Rural/Urban USA	Adults N = 27 (AI); N = 27 (non-AI) American Indians Alaska Natives	6-week online workshop. Topics on physical, mental, emotional, and social health with pictures and quotes from Indigenous individuals, who co-developed or had taken the course. Used a circular model for Indigenous concepts of health and wellness.	Blood glucose, fitness, and action planning tracking tools were most helpful. Participants appreciated interaction with other Indigenous people via online 'bulletin boards', and the cultural relevance of circular curriculum model. <i>Low risk of bias.</i>
Jiang et al. (2013), qualitative	Rural/Urban USA	Adults N = 834 American Indians Alaska Natives	16-lesson CBPR Diabetes Prevention Project with curriculum focused on diet, exercise, and behaviour modification, supplemented with monthly individual lifestyle coaching sessions. Communities translated the intervention into tribal languages and incorporated aspects such as Talking Circles, Indigenous foods, or drumming.	Participants who attended all 16 classes had a lower risk of diabetes than those who attended fewer. Weight loss and physical activity levels were greater (baseline to 3-year follow-up). Systolic and diastolic blood pressure were improved at post program and 1-year follow-up. HDL-C levels were increased (at all annual assessments) with reduced levels of LDL-C and triglycerides (post-program and annual assessments). <i>Low risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Kaholokula et al. (2014), quantitative	Urban USA	Families N = 239 Native Hawaiian Pacific Islanders	Adapted Diabetes Prevention Program curriculum focused on diet, physical activity, and emotional health/management. Included group work with participants encouraged to bring a family member or friend. Lessons on economical healthy eating and communicating effectively with doctors were added.	Improved (pre-post program) weight loss, systolic and diastolic blood pressure, physical activity frequency, 6-minute walk test, and dietary fat intake. Number of lessons received was not associated with weight loss. Baseline weight and the community-based organization at which the intervention took place were predictors of weight loss in multivariate analyses. <i>Low risk of bias.</i>
Kelley (2017), qualitative	Rural/Urban USA	Youth N = 112 American Indians	Cooking with Kids (CWK), a school-based food and nutrition education curriculum used Photovoice, where youth were given three disposable cameras to take pictures over a 2-week period of: (1) opportunities for healthful eating in their environment; (2) barriers/challenges; and (3) Native/Traditional foods and customs. Photos taken were discussed in individual semi-structured surveys and a group discussion.	Youth perspectives were presented in collage exhibits to their parents, school administrators, and tribal leaders. Youth identified-themes included: (1) This is better than that; (2) Catering to picky eaters; (3) Temptations at home; (4) If that's what they give me at school, it must be good for me; (5) If I'm not overweight, I can eat what I want; (6) Fast food is an obstacle; (7) We live in a food desert; and (8) Traditional foods. <i>Low risk of bias.</i>
Kimes et al. (2014), qualitative	Rural USA	Adults N: not specified American Indians	Weekly classes for women about healthy eating and physical activity, led by native community lay health educators with the incorporation of religious messages into curriculum.	Churches became hubs for healthy living policies and physical activity and involved families. Barriers included time stresses leading to high fast-food and processed-food consumption, pressure from families to cook Traditional foods which often included high-fat ingredients, and cost of healthy ingredients. <i>Moderate risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Lai et al. (2019), mixed methods	Rural/Remote Canada	Adults N = 15 Indigenous	Thirteen-week walking activity, 30-45 min (weekly), facilitated by an Indigenous community leader. Individualized plans (3 days/week) based on intensity (mild to moderate), time (15-20 min/day) and type of activity (walking). Motivational interviewing (focused on goals), held in a sharing circle format, was facilitated by community leaders.	Improved VO ₂ max with greatest improvements seen in individuals with lower baseline VO ₂ max. Resting heart rate, resting systolic blood pressure, and resting diastolic blood pressure decreased. Self-reported and accelerometry-measured frequency of MVPA increased, and total MVPA minutes were above international recommendations. VO ₂ max change was correlated with change in self-reported and accelerometry-measured MVPA minutes. No changes in weight, body mass index, waist circumference, body fat, grip strength, and flexibility. Motivational interviewing (through storytelling and knowledge sharing practices) integrated four of 93 specific behaviour change techniques. <i>Low risk of bias.</i>
Mau et al. (2010), mixed methods	Rural/Urban USA	Adults N = 351 Native Hawaiians Pacific Islanders	8 lessons, using a modified curriculum (translated to less formal language), were delivered over 12 weeks by community peer educators. Topics included economical healthy eating and communicating effectively with doctors.	Themes identified included: food-related issues; physical activity-related issues; social support; using existing community assets; economics of eating healthy; and more effective communication with doctors. Improved (pre-post program) weight, mean systolic and diastolic blood pressure, 6-minute walk test, mean dietary fat intake, and mean physical activity. <i>Moderate risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Mendenhall et al. (2010), quantitative	Urban USA	Adults N = 36 American Indians	3-hour bi-weekly sessions over 6 months involved peers checking and recording symptoms and measures of diabetes, cooking, eating, discussing Traditional meals, and educational components using Talking Circles or other Traditional activities. The CBPR design with whole-family participation encouraged.	Improved systolic and diastolic blood pressure, and metabolic control (HbA1c) at 3 months post program with weight loss reported at 6-month post-program. <i>Moderate risk of bias.</i>
Mercer et al. (2013), mixed methods	Rural New Zealand	Adults N = 70 Māori	Focus on replacing unhealthy activities with healthy activities. Each community was free to establish unique interventions, using a CBPR approach. Established interventions included: community gym, community gardens, cooking lessons, and class on portion sizes. Emphasis on self-determination, inclusion of whole family, use of Traditional Māori activities, and adaptation of exercises to make them more 'Māori'.	Socialization, group work, use of empathy rather than judgement, and intergenerational learning were important. <i>High risk of bias.</i>
Pirrit et al., (2019), mixed methods	Unspecified New Zealand	Adults N = 13 Pacific Peoples (however, did not exclude based on ethnicity)	1-hour sessions delivered over 8 consecutive weeks (community hall; weekday evening). Each session included: physical activity, <i>talanoa</i> about successes and challenges, nutrition education, goal setting, recording of body weight, and preparing/tasting a quick and affordable healthy meal.	The program was highly acceptable with high attendance. Improved eating behaviour, emotional well-being, physical activity, and mean weight. <i>High risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Pylypchuk et al. (2008), quantitative	Rural Canada	Adults N: not specified Indigenous	Development of various client and health care provider-oriented initiatives, including annual programs of prevention and awareness, healthy living displays and classes, ongoing awareness programs to promote community-based participatory diabetes action prevention, and training of home care nurses to become diabetes educators. Cree language.	Nonsignificant observations included trends toward a decrease in mean systolic blood pressure, lower levels of smoking, and improved healthy diet choices over two years. <i>High risk of bias.</i>
Rosecrans et al. (2007), qualitative	Rural/Urban Canada	Whole Community N: not specified Indigenous	Five 6–10-week long phases focusing on local First Nation foods and behaviours integrated across schools, local health and social services, and stores. School curricula used storytelling and participatory activities. Held kick-off feasts and community walks.	Teachers were satisfied with lessons but reported time constraints. Parents found curriculum culturally relevant and acceptable. Suggestions for improvement included shortening lessons, more hands-on activities and exposure to promoted foods. In stores, one-on-one communication with people was appreciated by customers and providers, and was perceived as more effective than shelf labels and posters. Kick-off events and walking clubs were the most successful health and social services/community events. Suggestions included using incentives for activities and shortening physical activity challenges. <i>Moderate risk of bias.</i>
Saksvig et al. (2005), quantitative	Rural Canada	Children N = 122 Indigenous	School-based intervention for grades 3-5 over one school year using four components: curriculum, family-based, peer-led, and environmental (school-wide). Inclusion of First Nation Traditional foods and feasts, and activities, and learning from Elders with the health education material delivered by storytelling.	Increased dietary intention, dietary preference and knowledge, dietary self-efficacy, and curriculum knowledge was observed over the intervention. <i>Low risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Satterfield et al. (2016), qualitative	Rural/Urban USA	Whole Community N: not specified American Indians Alaska Natives	Cooperative agreement to increase and reclaim access to local and Traditional foods and physical activity, revive and create stories around healthy Traditional ways, and engage communities in addressing diabetes. Focused on Traditional knowledge and community-driven planning for discussions about Traditional food sheds/food pathways, land, and fostering intergenerational relationships.	Key program components included: providing workshops on cooking, hunting, gathering, fishing, preserving foods, and environmental stewardship, communicating Traditional knowledge orally, reinforcing values through storytelling, gratitude for the gifts of the earth, and generosity, engaging Elders and fostering intergenerational learning, using Traditional foods to facilitate conversations about health, and emphasizing education. <i>High risk of bias.</i>
Seear et al., (2019), mixed methods	Remote Australia	Youth/Young Adults N = 10 Aboriginal	A Diabetes Prevention Program, held over 8 weeks with each session including: exercise circuit, outdoor cooking, and education (max of 30 min) with topics consistent with the Diabetes Prevention Program.	The program attendance was inconsistent, but the length, venue, and format were acceptable and local Aboriginal facilitators seen as appropriate and effective. Program measures, checklists, activities, and resources were also appropriate but limited availability of Indigenous-specific resources was reported. Reported improvements included: learning new information, healthy eating knowledge and awareness, and healthy eating. <i>Moderate risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Tipene-Leach et al. (2013), qualitative	Rural New Zealand	Whole community N: not specified Māori	Diabetes Population health intervention program/implementation plan across sectors, schools, retailers, employers, and tribal organizations. Focused on community-wide health promotion initiatives, community education and monitoring strategies, and modifying local environments. Initiatives were broadcasted over local tribal radio, and print resources featured photographs of local scenes and events.	Findings indicated that a successful community-wide health promotion diabetes project requires listening to and involving community members, cultural and religious values. Changes included water-only and health lunch box initiatives in schools, school gardens, and community nutritionist services. <i>Moderate risk of bias.</i>
Umaefulam et al., (2020), mixed methods	Rural/Urban Canada	Adult women N = 78 First Nations Métis	mHealth intervention that disseminated diabetes-eye related text messages for 12 weeks via SMS (bulk messaging). Sharing Circles were used to explore the impacts of the mHealth intervention.	Pre-intervention Sharing Circle themes included: (1) Information on diabetes-eye care (sub-themes: information/resources on complications, prevention, and management of diabetes and diabetic retinopathy [DR]); and (2) Strategy for information dissemination. Post-intervention: Improvements reported for: knowledge scores, attitude score, and median practice score. DR-adjusted attitude and practice post-scores increased (those with diabetes compared to at-risk of diabetes). Age and education status were factors in improved knowledge and practice pre-post-change scores. <i>Low risk of bias.</i>
Warbrick et al., (2020), qualitative	Rural New Zealand	Adult males N = 23 Māori	"The best exercise for Māori men"; a 12-week structured, "culturally enhanced" exercise program included three 30-35 min weekly sessions of standard resistance training, cross training, or high-intensity interval training.	Four main themes emerged: (1) the Bros - having fellowship and mutual motivation, (2) being better informed about exercise, (3) impacting overall wellbeing, and (4) disseminating findings to beyond the study. <i>Low risk of bias.</i>

Table 1. Summary of Articles (continued)

Author (year), type	Location	Population	Intervention	Results and risk of bias
Willging et al. (2006), qualitative	Urban USA	Adults N: not specified American Indians	Focused on women using storytelling to share insights about diabetes. Young American Indian women, as role models, implemented the curriculum. Traditional images and themes such as the medicine wheel were utilized.	Intercultural aspects of the intervention were not sufficiently interwoven. Some participants disliked the focus on family and materialism. Participants wanted more acknowledgement of historical traumas, interactive skills-building activities, and web-based interventions. <i>High risk of bias.</i>

Results and Discussion

Thirty articles (Table 1), described culturally-relevant approaches for diabetes (Arora et al., 2013; Bachar et al., 2006; Brown et al., 2020; Castro et al., 2009; DeBruyn et al., 2020; Dreger et al., 2015; Farmer et al., 2018; Janssen et al., 2014; Jernigan & Lorig, 2011; Jiang et al., 2013; Kaholokula et al., 2014; Mau et al., 2010; Mendenhall et al., 2010; Satterfield et al., 2016; Seear et al., 2019; Pylypchuk et al., 2008; Rosecrans et al., 2007; Tipene-Leach et al., 2013; Umaefulam et al., 2020; Willging et al., 2006), and obesity (Cueva et al., 2020; Fleischhacker et al., 2012; Kelley, 2017; Lai et al., 2019; Mercer et al., 2013; Pirritt et al., 2019; Saksvig et al., 2005; Warbrick et al., 2020), or both (Abbot et al., 2010; Kimes et al., 2014). Studies also described interventions designed specifically for Indigenous Peoples in Australia (Abbot et al., 2010; Seear et al., 2019), Canada (Arora et al., 2013; Dreger et al., 2014; Lai et al., 2019; Pylypchuk et al., 2008; Rosecrans et al., 2007; Saksvig et al., 2005; Umaefulam et al., 2020), New Zealand (Farmer et al., 2018; Janssen et al., 2014; Mercer et al., 2013; Pirritt et al., 2019; Tipene-Leach et al., 2013; Warbrick et al., 2020), and USA (Bachar et al., 2006; Brown et al., 2020; Castro et al., 2009; Cueva et al., 2020; DeBruyn et al., 2020; Fleischhacker et al., 2012; Jernigan & Lorig, 2011; Jiang et al., 2013; Kaholokula et al., 2014; Kelley, 2017; Kimes et al., 2014; Mau et al., 2010; Mendenhall et al., 2010; Satterfield et al., 2016; Willging et al., 2006). Study designs included qualitative (Abbot et al., 2010; Arora et al., 2013; Cueva et al., 2020; Dreger et al., 2014; Farmer et al., 2018; Fleischhacker et al., 2012; Jernigan & Lorig, 2011; Jiang et al., 2013; Kelley, 2017; Kimes et al., 2014; Rosecrans et al., 2007; Satterfield et al., 2016; Tipene-Leach et al., 2013; Warbrick et al., 2020; Willging et al., 2006), quantitative (Castro et al., 2009; Kaholokula et al., 2014; Mendenhall et al., 2010; Pylypchuk et al., 2008; Saksvig et al., 2005), or mixed methods (Bachar et al., 2006; Brown et al., 2020; DeBruyn et al., 2020; Janssen et al., 2014; Lai et al., 2019; Mau et al., 2010; Mercer et al., 2013; Pirritt et al., 2019; Seear et al., 2019; Umaefulam et al., 2020). All but one of the articles (Willging et al., 2006) reported favorable outcomes related to integrating a variety of culturally relevant strategies into their interventions. These successes were almost all attributed to meaningful integration of cultural components throughout the process, in contrast to superficial or piecemealed approaches (Willging et al., 2006). While not mutually exclusive, three overarching themes or characteristics were associated with effective culturally relevant diabetes and obesity interventions: *togetherness*, *empowerment*, and *local familiarity*.

Togetherness

Togetherness, which we define as a feeling of 'oneness' with one's culture, family, and community, is paramount to creating successful culturally appropriate interventions in all four countries (Abbott et al., 2010; Bachar et al., 2006; Dreger et al., 2015; Fleischhacker et al., 2012; Janssen & Nelson, 2014; Mercer et al., 2013; Satterfield et al., 2016). The common theme of togetherness was reflected in approaches that focused on the *family*, *intergenerational communication*, *peer support* and *Tradition*.

Family Togetherness

Family was often reported as both a crucial barrier and a motivator (Abbott et al., 2010) for healthy eating and living in Australia. In Canada (Saksvig et al., 2005), New Zealand (Farmer et al., 2018; Janssen et al., 2014), and among families and youth in the USA (Fleischhacker et al., 2012; Kelly, 2017), individual health practices are nestled within everyday routines (such as the sharing of local foods) and family Traditions (such as the inclusion of tribal leaders and the gathering of extended families). These routines and family Traditions are recognized and emphasized in supporting one's health. Successful programs encourage family members or friends to attend interventions, emphasize family activities, or promote discussion of family goals and values to exemplify the Traditional value of family togetherness in New Zealand (Mercer et al., 2013), and the USA (Kaholokula et al., 2014; Mendenhall et al., 2010). Māori men shared that whanau health (immediate and extended family health) was positively impacted from their participation in a 12-week exercise program (Warbrick et al., 2020).

Togetherness Through Intergenerational Communication

The opportunity to engage in intergenerational communication, within and between families, is an important feature of many of the successful interventions primarily in New Zealand (Mercer et al., 2013) and the USA (Bachar et al., 2006; Fleischhacker et al., 2012; Satterfield et al., 2016). Intergenerational communication is effectively supported by the inclusion of Elders in teaching program content and in the use of role modeling in the development and facilitation of programs in Canada (Saksvig et al., 2005) and the USA (Satterfield et al., 2016). Several interventions included school mentoring programs, in which older Indigenous children were healthy role models for younger children in Canada (Pylypchuk et al., 2008) and the USA (Bachar, et al., 2006; Fleischhacker et al., 2012). In addition, older Indigenous children peer-led the activities in Canada (Saksvig et al., 2005). These programs facilitate mutual benefit and intergenerational engagement when older student mentors designed health education lessons for delivery to younger students. A similar mentoring approach was adapted for adults, with Indigenous community mentors/role models and Elders facilitating programs in all four countries (Farmer, et al., 2018; Fleischhacker et al., 2012; Mercer et al., 2013; Saksvig et al., 2005; Seear et al., 2019). In all five of these studies, intergenerational knowledge sharing and learning components were reported to be beneficial and further strengthened overall 'togetherness' among participants and role models, thereby increasing their investment in participating in the interventions.

Peer Support Fostering Togetherness

Peer support was effective across interventions in Canada (Saksvig et al., 2005) and the USA (Fleischhacker et al., 2012; Mau et al., 2010, Mendenhall et al., 2010). In a Canadian study (Pylypchuk et al., 2008), the development of deep interpersonal relationships between fellow participants and facilitators or mentors was self-reported to improve social support, uphold Traditional values of the community around open communication, and improve the success of T2D and obesity interventions. To achieve these similar goals, Janssen and Nelson (2014) recommend that interpersonal relationships

among all those involved in the intervention (Māori people) should be relaxed and informal. Community-based interventions that involved group work in Australia (Abbott et al., 2010), New Zealand (Mercer, et al. 2013; Tipene-Leach et al., 2013), and the USA (Kaholokula et al., 2014), as well as social or cultural activities facilitated by local lay educators and health professionals, increased the social networking and participant engagement in these program activities. For example, in New Zealand, important strategies included providing regular updates about community festivities or gatherings through local tribal radio, and printed resources/photographs of local events (Tipene-Leach et al., 2013). These informal and locally meaningful presentations and communications may provide a welcome relief from the typically strict manner of administering health care in Indigenous communities.

Tradition Weaved into Togetherness

Emphasis on using oral Tradition to share information was beneficial in communities and programs, in Canada (Dreger et al., 2015; Lai et al., 2019; Rosecrans et al., 2007; Saksvig et al., 2005; Umaefulam et al., 2020), New Zealand (Farmer et al., 2018; Pirrit et al., 2019), and the USA (DeBruyn et al., 2020; Kimes et al., 2014; Satterfield et al., 2016; Willging et al., 2006). Often, storytelling was used to deliver educational interventions. This helped unravel and clarify medical jargon and relate new information in a more familiar and meaningful way. Traditional stories, local characters and legends were used to convey health messages. For instance, Willging et al. (2006) reported Indigenous women using storytelling, Traditional images, and the medicine wheel in their teachings. In a 12-week diabetes-related eye complication mobile health (mHealth) intervention for First Nations and Métis women in Canada, text messages incorporated aspects of the medicine wheel, and Sharing Circles were offered to explore impacts of the intervention (Umaefulam et al., 2020). In the USA, DeBruyn et al. (2020) found storytelling was associated with increased interest and engagement in gardening and/or subsistence gathering, hunting, or fishing as part of a Traditional Foods Project. In Canada, Dreger et al. (2015) co-developed, with community members, a mindfulness intervention for diabetes management that included cultural aspects, which improved health, well-being, and behavioural change. Satterfield et al. (2016) suggested interventions were more effective when oral Traditions were used to share knowledge about cooking, hunting, and gathering. Traditional food and feasts and learning from Elders were also an important part of an Ojibway-Cree school-based health promotion intervention in Canada (Saksvig et al., 2005). In addition, Rosecrans et al. (2008) worked with teachers and parents in Canada to include Traditional foods and Traditional storytelling as part of school curricula. Kimes et al. (2014) found low-cost healthy eating and physical activity interventions that included religious and spiritual oral sharing of knowledges and were led by native community health educators in the USA increased relevance of health messages. Oral sharing of knowledge was also done by local Elders and community health educators in New Zealand who developed a community documentary in which storytelling and exercise demonstrations were used to teach healthy eating and exercise (Farmer et al., 2018).

Pirrit et al. (2019) incorporated the interactive process of *talanoa* ("talking about nothing in particular"), used by Pacific populations, to nurture empathy between Pacific adults. Weekly *talanoas*

were held for participants to share knowledge and emotions about previous weeks' successes and challenges. Talking Circles are effective ways of sharing Traditional oral stories and providing an appropriate setting to come together for reflective listening and meaningful dialogue to learn about diabetes and obesity. They include cultural and personal experiences, knowledge, challenges, and successes. Talking Circles were used to help integrate Western interventions into more familiar Traditional activities in Canada (Lai et al., 2019; Umaefulam et al., 2020), New Zealand (Janssen & Nelson, 2014), and the USA (Castro et al., 2009; Fleischhacker et al., 2012; Jiang et al., 2013; Mendenhall et al., 2010).

Empowerment

Empowerment, both individual and community, was a common theme in all articles included in this review. Individual empowerment refers to the acquisition of personal knowledge and skills related to self, while community empowerment embraces and acknowledges local knowledge and the steps taken collectively to engage the whole community (DeMarco & Healey-Walsh, 2019). The distinction between individual and community empowerment was seen as critical and connected to life and relationships within Indigenous communities. Both are deeply intertwined. Individual empowerment was achieved through feelings of self-esteem, belonging, and togetherness within the community. Many used local knowledge, Traditional stories, and inclusion of community role models and local customs related to healthy life choices (Traditional foods and activities). Intergenerational connectedness was integrally embedded among individuals and community, as well as across communities, and emphasized family and community collectiveness as a way to address the underlying historical trauma that impacts health and wellbeing.

Two studies, one with Māori peoples (Farmer et al., 2018) and the other with American Indians (Fleischhacker et al., 2012), noted the importance of local knowledge, and culturally appropriate community-informed strategies for successful programs. They integrated intergenerational approaches among tribal leaders and community members. Engagement of community leaders in the development and delivery of these programs improved community interest and attendance. Tribal leaders were empowered, and often expected to leverage their authority to influence community commitment in raising healthier generations of American Indian children (Fleischhacker et al., 2012). Respectful attitudes, and the expression of empathy led participants to feel less judged, stigmatized, or disempowered, as recipients of Western diabetes and obesity care (Fleischhacker et al., 2012). The Māori principle related to reciprocity (manaakitanga) situates being Māori as a strength/advantage over a cause of illness/weakness. Manaakitanga led to a mutual relationship of respect and gratitude between the Māori men and exercise trainers (Warbrick et al., 2020). Mercer et al. (2013) found government-wide strategies for obesity, physical and social programs that were developed and delivered by local Māori coordinators resulted in trusting relationships, which were pivotal for a successful program. Researchers also reported that appropriate health literacy levels should be considered for oral and written educational content, materials, and diagrams. In addition, humour was considered an

important part of teaching and learning in New Zealand (Janssen & Nelson, 2014) and the USA (Mau et al., 2010).

Individual empowerment depended heavily upon health education regarding Western aspects of diabetes (Janssen & Nelson, 2014). Many participants had little understanding of the pathophysiology of these conditions prior to participating in interventions, resulting in challenges in self-management and difficulties in interactions with health care providers (Janssen & Nelson, 2014). Being fully engaged and able to relate to health and wellness information provided was key. For example, curriculum was translated into less formal medical and scientific language to help teach terms used by health professionals, or in client materials (Mau et al., 2010). Rather than lecturing, storytelling helped engage audiences in real life situations and solutions for affordable healthy eating in the USA (Kaholokula et al. 2014; Satterfield et al., 2016). The most important outcome of a Māori community developed healthy foods and exercise documentary was that change is considered the responsibility of the collective, now and for the mokopuna (Grandchildren) in the future (Farmer et al., 2018). According to Lai et al. (2019), a culturally appropriate way to improve community health and wellness in Canada is through empowering Indigenous leaders to be key advocates of health behaviour change.

Promoting community empowerment was also demonstrated through the creation of community gardens, in which interventions integrated experiential learning experiences such as producing foods, sharing expertise, working with the land, and engaging in physical activity. In addition, there was mutual benefit of cost savings in food sharing as a Traditional practice that also emphasized the importance of community support in New Zealand (Janssen & Nelson, 2014; Mercer et al., 2013) and the USA (Brown et al., 2020; Satterfield et al., 2016). Additionally, some interventions in Canada incorporated community-wide activities such as celebratory feasts, or large community walks, where a sense of community-level empowerment was felt (Rosecrans et al., 2008; Saksvig et al., 2005).

Overall, empowerment was demonstrated through partnerships and respectful involvement of community members, mentors, teachers, stakeholders and health providers in shaping programs and activities. Culturally responsive approaches provided space for self-determination, community ownership, and inclusion of local knowledge, stories, language, customs, and family in taking action to influence what was most relevant to impact health and wellness.

Local Familiarity

Local cultural and Traditional activities were essential for increased group and community engagement and participation in all but Australia (Janssen & Nelson, 2014; Mendenhall et al., 2010; Mercer et al., 2013; Saksvig et al., 2005). Local familiar Traditional physical and non-physical activities, ceremonies, and practices were incorporated into interventions to ground them within the contexts of the communities in which they took place Warbrick et al. (2020) demonstrated an example of respecting Māori culture in a 12-week "culturally enhanced" exercise program, with the initial meeting between

Māori men and researchers being held in a “Whare Tupuna on a local Marae (a cultural meeting house located on a culturally significant meeting site)” (p. 799). To simultaneously support cultural relevance, build community, and integrate diabetes and obesity education, locally specific Traditional non-physical activities such as basket-making, beading, berry-picking, drumming, snow games, role playing, play acting, drum-making, kite-making, and Traditional singing were employed in the USA (Jernigan & Lorig, 2011; Mendenhall et al., 2010) and waiata (Māori Traditional songs), karakia (Māori Traditional prayer or chant), and hongi (Māori Traditional greeting) in New Zealand (Janssen & Nelson, 2014; Warbrick et al., 2020).

Integration of local Indigenous culture with health education was reported to have a positive impact for participants. Health education activities were adapted to include relevant and meaningful cultural teachings within diabetes and obesity self-management. In Canada, Arora et al. (2013) invited participants in a diabetes intervention to make bracelets in a particular way so that the order of colored beads served as reminders to take prescribed medications at specific times. Traditional physical activities such as walking, drumming, adapted chair dancing, and aerobics were used as physical activity interventions in the USA (Jernigan & Lorig, 2011; Mendenhall et al., 2010).

Cultural Expertise of Spiritual and Traditional Local Community Leaders

Familiarity was key to the success of many interventions. Some interventions in Canada incorporated ceremonies led by local spiritual leaders (Arora et al., 2013), while others in the USA included Traditional healers who taught Traditional knowledge to supplement biomedical diabetes and obesity education (Castro et al., 2009). Many interventions included lessons or workshops on Traditional Indigenous foods. These interventions featured classes or workshops on the preparation of Traditional foods and found that the use of familiar recipes and ingredients was important. Some interventions in the USA used Traditional foods as a starting point for the facilitation of further dialogue and learning about health and nutrition (Satterfield et al., 2016). In Australia, participants easily integrated new knowledge into their daily lives by sharing healthy Traditional recipes among participants, mentors, and facilitators (Abbott et al., 2010), a common strategy also used in New Zealand (Farmer et al., 2018). Similarly, discussion around local Traditional food pathways and foodsheds (a geographic region/place in which food can be produced at the community) were used to facilitate further conversation among participants in New Zealand and the USA (DeBruyn et al., 2020; Janssen et al., 2014; Kelly, 2017; Satterfield et al., 2016). Some interventions took a broader focus by including workshops not only on accessing and cooking Traditional foods, but also on hunting, gathering, fishing, and preserving foods, as well as the environmental stewardship associated with these activities (Kimes et al., 2014; Satterfield et al., 2016).

Familiarity with Local Foods and Land

Comparison of Traditional and modern Western diets was another successful component of interventions in each country. For instance, in New Zealand, suggestions were provided on how to make

familiar Traditional foods healthier, along with simple nutritional recommendations that could be easily adapted (Janssen & Nelson, 2014). Other programs compared Traditional and modern Westernized diets to demonstrate shortcomings of modern diets, and to provide recommendations on how to adapt current diets to better align to healthier Traditional diets (Abbott et al., 2010; Fleischhacker et al., 2012; Jiang et al., 2013; Saksvig et al., 2005).

Familiarity with Information Sharing and Intervention Delivery

Emphasis on visual learning is important in culturally appropriate interventions. Visuals used in interventions were effective in increasing feelings of recognition and familiarity with the material/content in all countries except Australia. A variety of culturally relevant images, such as Traditional art (Dreger et al., 2015), food (Farmer et al., 2018), and images of the Medicine Wheel and Storyteller (Willging et al., 2006) enhanced health messages. Some interventions used images of individuals who had assisted with the development of, or participated in interventions, as motivators and models for embodying the health messages provided (Jernigan & Lorig, 2011). Images of local scenery and events offered a unique, homegrown familiarity to each intervention (Tipene-Leach et al., 2013). Youth took photos of healthy eating, Traditional foods, where food comes from, how foods are packaged, and barriers/challenges to obtaining healthy foods (Cueva et al., 2020; Kelly, 2017). Photos were made into collages and shared with parents, school administrators, and tribal leaders to highlight their need for more nutritious foods and culturally Traditional nourishing foods.

Overall, local adaptation was found to be key in constructing effective interventions with and for Indigenous Peoples in many studies across the four countries. In recognition of the commonalities and differences among and between different Indigenous Peoples, adequate time must be provided to individual communities to ensure the inclusion of local culture in the modification of interventions (Fleischhacker et al., 2012; Jiang et al., 2013). This was accomplished in many interventions where local Indigenous people taught or facilitated interventions and applied their own specialized knowledge in the implementation. For example, in Canada, culturally relevant, extensive community engagement and locally led interventions, facilitated by local community members, leaders, restorative justice workers, qualified exercise professional, and community nurses, resulted in significant improvements in cardiometabolic health and physical activity behaviour (Lai et al., 2019). Successful interventions were also often locally adapted by including or sharing teachings of local Elders, health workers, and others in health promotion and education materials (Farmer, et al., 2018; Tipene-Leach et al., 2013).

In order to navigate between Western and Traditional diabetes and obesity wellness, it was important to understand the factors that make culturally responsive diabetes and obesity interventions effective for Indigenous Peoples. Through this review of literature, we identified three key themes associated with successful diabetes, obesity, and other health promotion interventions or programs: 1) togetherness through family, intergenerational communication, peer support, and Tradition; 2) empowerment of individuals, community, and partnerships; and 3) familiarity of local Spiritual and Traditional leaders,

community participants, and cultural and Traditional ways of information sharing and intervention delivery. While the ways in which Indigenous Peoples experience and practice ceremony and cultural practices in each of these countries are very diverse and unique, there are inherent commonalities. “Relationship is at the core of Indigenous knowledge(s)” (Greenwood, 2013, p. 99) and Indigenous being (Martin, 2012; Wilson, 2008), or being Indigenous. Our findings are consistent with others in acknowledging the impact of “social-relational interconnections” (Hovey et al., 2014).

Our Relations embraces the complex web of realities “that connect us to our ancestors, relations, all people, the earth, universe and beyond” (Kurtz, 2011, p. 274). This interconnectedness is part of our healing journey as Indigenous Peoples that traverses intergenerational traumas related to historical and contemporary colonization, racism, loss of land, family, spirituality, and cultural identity. The intersectional realities of togetherness are grounded in ethical and respectful relationships with peers, family, Elders, community, local culture and Tradition, allies, individuals, and communities. Together, they nurture our self-determination, and empowerment which are necessary to achieve balance and achieve greater wholistic health and well-being (Reading & Wien, 2013).

Limitations

Globally, Indigenous Peoples are unique and geographically diverse, yet share ancient cultural, sacred, and Traditional knowledge and practices. As a result, this literature review is not generalizable to any particular Indigenous group or population. Overall, 30 articles met our inclusion criteria and surprisingly, only two from Australia. Given the 10-year history of the well-funded, “Closing the Gap” initiative in Australia (Close the Gap Campaign Steering Committee, 2020) we expected to identify a plethora of recent studies. The limited number of articles in this review may be due to the challenges and possible barriers in publishing Indigenous work in academic journals, as opposed to publishing in the “grey” literature, which we did not include in this review. Additionally, the oral nature of sharing Traditional knowledge in health and healing activities may contribute to the lack of published research or ‘recorded’ evidence about the effectiveness of including Indigenous Traditional healing and practices with Western interventions. Although limited in our ability to demonstrate success among all four countries, the work done mostly in the USA followed by Canada and New Zealand, all of which provided rich information to share with community partners and inform future interventions.

This review adds to the literature as it brings forth suggestive evidence for successful diabetes, obesity, and health promotion wellness programs that include both Traditional local protocols, customs, and practices and Western approaches, that are associated with improved health equity and outcomes for Indigenous Peoples living in Australia, Canada, New Zealand, and the USA. Sharing the wisdom of “Our Relations” can inform changes in policy, and provide insights for chronic disease prevention, management, and self-management programs for Indigenous Peoples globally.

Conclusion

This review was completed to better understand the factors associated with effective culturally relevant diabetes, obesity, and health promotion interventions among Indigenous Peoples in Australia, Canada, New Zealand, and USA. Culturally appropriate diabetes, obesity, and health promotion interventions are more effective when co-developed and delivered locally by Indigenous Peoples within the communities they live. The majority of programs (85%) reported Traditional components as critical for successful engagement and improved knowledge and wellness for Indigenous Peoples and communities. This work provides an in-depth understanding of what underlies the success of culturally relevant and safe interventions. It is through engendering feelings of closeness or togetherness, intergenerational communication, peer support and teaching, interwoven local/familiar culture and tradition, that greater self-determination is realized among individuals and communities. These strengths-based approaches combat the pervasive generational impacts of colonization and loss of cultural identity, from which optimal wholistic wellness can be achieved. Health care organizations that provide health promotion, illness prevention, and self-management services for Indigenous Peoples globally could adapt their current policies and practices to promote togetherness, empowerment, culture, and tradition in ways that include:

- a. Co-development of programs with communities.
- b. Emphasis on local Indigenous knowledge and Traditional teachings.
- c. Culturally relevant content and setting such as culturally relevant images, Circles, and visual learning.
- d. Local Indigenous teachers and knowledge keepers, and Indigenous health care providers.
- e. Traditional cultural group activities including Talking (Sharing) Circles, food and feasts, ceremony, songs, drumming, spiritual and religious components, use of local language, intergenerational activities and learning, and Indigenous specific focus on concepts of health and wellness.
- f. Interventions that are easily accessible within the community, practical, low-cost experiential, immediate, interactive, and empowering (strength-based).
- g. Acknowledgement of the importance of intergenerational participation, feelings of togetherness, local familiarity, and community/practitioner co-led interventions to enhance success of culturally adapted interventions.

By including these elements in intervention designs, diabetes and obesity health disparities and co-morbidities may be better addressed, and wholistic health improved across Indigenous generations. The

shift from a marginally successful scientific Western, medicalized approach to Indigenous health, to the inclusion of Tradition is a big step toward realization and support of Indigenous rights. According to the United Nations Declaration on the Rights of Indigenous Peoples (2008), “Indigenous peoples have the right to their Traditional medicines and to maintain their health practices, including the conservation of their vital medicinal plants, animals and minerals. Indigenous individuals also have the right to access, without any discrimination, to all social and health services” (p. 9).

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Appendix 1. Detailed Medline Search Strategy

Database: Ovid MEDLINE(R) and In-Process & Other Non-Indexed Citations <1946 to November 20, 2020>

Search Strategy:

-
- 1 (first nation or first nations).tw. (1579)
 - 2 (native\$ or indian\$ or aborigin\$ or indigenous).tw. (329338)
 - 3 (inuit or eskimo\$ or metis or Māori or "pacific islander\$").tw. (9861)
 - 4 exp American Native Continental Ancestry Group/ (21614)
 - 5 exp Oceanic Ancestry Group/ (10463)
 - 6 or/1-5 (345146)
 - 7 (diabete\$ or overweight or obes\$ or weight\$ or sugar\$ or glucose).tw. (2005932)
 - 8 exp Glucose Metabolism Disorders/ (459869)
 - 9 exp Obesity/ (216788)
 - 10 or/7-9 (2133745)
 - 11 (cultur\$ adj (safe\$ or competen\$ or divers\$ or factor\$ or sensitiv\$ or aware\$ or influence\$ or appropriate\$ or responsive\$ or adapt\$ or knowledge or specif\$ or focus\$ or considerat\$ or grounded or informed or tailor\$ or relevant or congruen\$ or consisten\$ or ident\$ or socializ\$ or sovereign\$)).tw. (39623)
 - 12 Culturally Competent Care/ (1560)
 - 13 Cultural Diversity/ (11619)
 - 14 Acculturation/ (6466)

- 15 Health Services, Indigenous/ (3359)
- 16 (Tradition\$ or Holistic or wholistic or Wheel or talking circle or medicine man or Healer\$ or
Spiritual\$).tw. (436294)
- 17 exp Health Promotion/ (77965)
- 18 exp Health Education/ (246224)
- 19 exp Primary Prevention/ (154113)
- 20 exp Secondary Prevention/ (20701)
- 21 exp Tertiary Prevention/ (160)
- 22 (Prevent\$ or promot\$ or educat\$ or outreach).tw. (2821544)
- 23 (Healthy or Wellness).tw. (833517)
- 24 or/11-16 (487979)
- 25 or/17-23 (3790377)
- 26 6 and 10 and 24 and 25 (922)
- 27 limit 26 to (abstracts and english language and yr="2005 -Current") (736)