

# Effects of lifestyle interventions on weight amongst Pasifika communities: A systematic review and meta-analysis



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## Summary

**Background** Pasifika populations experience high incidence and prevalence of obesity and T2DM. However, no international review of lifestyle intervention studies amongst Pasifika communities exists. This study seeks to identify the effect and translatability of lifestyle strategies on weight amongst Pasifika populations.

**Methods** Lifestyle studies involving  $\geq 90\%$  adult Pasifika participants measuring weight change were eligible for inclusion. Database searching was carried out up to December 2021. Databases searched were MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCOhost) and ProQuest Central. Risk of bias was assessed using RoB2 (RCTs) and the National Heart, Lung and Blood Institute (NHLBI) quality assessment tool. Meta-analysis and meta-regression used a bivariate random-effects model. Strategies were coded against pre-identified components of the newly proposed Cultural and Sustainability Assessment of Intervention (CSAI) framework.

**Findings** Twenty-three studies ( $n = 4258$  participants) met inclusion and exclusion criteria. Thirty-two lifestyle strategies targeting weight loss (WL) and 7 targeting weight maintenance (WM) were extracted. Meta-analysis estimates small but significant effect of  $-0.26$  standard deviations (95% CI  $-0.51$  to  $-0.02$ ), with RCTs demonstrating a non-significant effect of  $-0.23$  standard deviations (95% CI  $-0.49$  to  $0.035$ ). Culturally relevant strategies included community and peer support facilitators and team-based activities. The CSAI identified 14 out of 23 studies with low cultural competency and sustainability scores ( $< 60\%$ ).

**Interpretation** Qualitative and quantitative analysis show tailored lifestyle interventions has had an estimated small but beneficial effect on WL amongst Pasifika communities. Potential for tailored interventions design to incorporate psychosocial and behavioural considerations. The CSAI has the potential for systematically identifying cultural and sustainability components of efficacy in interventions.

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**Keywords:** Obesity; Type 2 diabetes; T2DM; Pacific islanders; Pasifika; Oceania; Weight loss; Weight maintenance; Culturally and linguistically diverse populations; intervention evaluation tool

## Introduction

Non-communicable diseases (NCDs) continue to be a burden for Asia-Pacific, particularly in the Pacific Island nations of Oceania. Oceania covers Melanesia (islands of Papua New Guinea, Solomon Islands, Fiji, New Caledonia, Torres Strait and Vanuatu), Micronesia (Federated States of Micronesia, Palau, Kiribati, Marshall Islands, Guam, and Nauru) and Polynesia (Cook Islands, Samoa, Tonga, Tuvalu, Tokelau, Niue, French

Polynesia, Māori, and Native Hawaiians). Obesity, defined by a high body mass index (BMI), is a risk factor for multiple NCDs and is the single most important risk factor for type 2 diabetes (T2DM).<sup>1</sup>

Changing food environments and trade liberalisations in Pacific Island countries (PIC) have escalated rates of obesity and T2DM.<sup>2</sup> Data from the World Health Organization (WHO) STEPwise Approach to NCD Risk Factor Surveillance (STEPS) report 2015 found that 9 out of 15 PICs had obesity prevalence rates exceeding 25%<sup>3</sup> – more than double the global prevalence rate of 9.3%.<sup>4</sup> With high prevalence rates of obesity and T2DM, and the direct association between diabetes and other chronic illnesses, such as chronic

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### Research in context

#### *Evidence before this study*

Pacific Island Nations in Oceania report some of the highest rates of diabetes type 2 (T2DM) prevalence. Prior research has demonstrated reductions in T2DM incidence using lifestyle behaviour change interventions. However, there is limited evidence of strategies targeting weight effectively amongst Pasifika. With strong links between increasing weight and T2DM it is important to consider all lifestyle-based strategies delivered amongst those of Pacific descent (Pasifika). This review searched databases including MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCOhost) and ProQuest Central up to December 2021. Grey literature searching was also included to capture a complete picture of the available evidence. Only lifestyle-based studies including  $\geq 90\%$  adult Pasifika reporting weight change was included. Twenty-three studies ( $n = 4258$  participants) with 39 WL and WM strategies identified. Meta-analysis estimated small but significant effect of  $-0.26$  standard deviations (95% CI  $-0.51$  to  $-0.02$ ), with RCTs demonstrating a non-significant effect of  $-0.23$  standard deviations (95% CI  $-0.49$  to  $0.035$ ) on weight change amongst Pasifika.

#### *Added value of this study*

This international systematic review used a qualitative and quantitative analysis to demonstrate tailored lifestyle interventions has had a small but beneficial effect on WL amongst Pasifika communities. This study also proposes a tool to determine cultural competency and sustainability strength of studies. This adds value to scholarship in the field seeking to design and develop culturally competent and sustainable lifestyle interventions.

#### *Implications of all the available evidence*

This study confirms the findings of previous international research around the efficacy of using lifestyle-based interventions to target weight change. This study also identifies areas such as duration and participation as potentially culturally conducive approaches. Also, strategies pertinent for Pasifika include strategies that considers its cohesive social constructs and collectivism using community and peer support facilitators. Using an assessment framework such as the Cultural and Sustainability Assessment of Intervention (CSAI) framework presents opportunities for future work in this field.

kidney diseases (CKD), there is a concern of increasing end-stage renal failure. Unsurprisingly, Oceania is identified as one of the three top regions with a higher-than-expected burden of CKD.<sup>5</sup> A recent study in Samoa found the prevalence of end-stage renal disease (ESKD) in the population to be 629 patients per million population<sup>6</sup> (compared to global rates of between 4.902 and 7.083 patients per million).<sup>7</sup> Pasifika (those of Pacific descent) residing in neighbouring countries of

Australia, New Zealand and Hawaii also report high ESKD prevalence rates, ranging between two to ten times higher than the general population.<sup>8</sup> These complications of obesity, largely due to T2DM, represent heightened economic costs in the struggling economies of the PIC<sup>9</sup> and an overrepresentation of Pasifika in health care systems elsewhere.<sup>10</sup>

Large multi-centre randomised controlled trials (RCTs), including the Diabetes Prevention Program (DPP)<sup>11</sup> and the Finnish Diabetes Study (DPS),<sup>12</sup> have demonstrated reductions of up to 58% in T2DM incidence using lifestyle behaviour interventions.<sup>13</sup> However, despite relative successes of translational programs based on the DPP,<sup>14</sup> there is limited evidence of strategies targeting weight effectively amongst Pasifika. Considering the alarmingly high prevalence of obesity and T2DM amongst Pasifika and co-morbidities, an international review on the effects of lifestyle interventions in Pasifika communities is warranted. Further, given the Pacific's low peer-reviewed publication rate,<sup>15</sup> such a review requires both peer-reviewed and grey literature consideration.

As such, the primary objective of this systematic review and meta-analysis was to pool the effects of lifestyle interventions to identify average effect size of weight (and or BMI and waist circumference (WC)) change amongst Pasifika populations. Secondly, we aimed to identify the translational capacity of these strategies into real-world community settings.

With significant challenges in assessing translatability<sup>16</sup> frameworks have been found beneficial in assessing interventions.<sup>17</sup> The Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM)<sup>18</sup> is the most widely used in evaluating the impact and even designing of interventions.<sup>19</sup> More recently, the Tailored Implementation for Chronic Diseases (TICD)<sup>20</sup> framework (originally a project) has demonstrated viability in its comprehensive assessment of external and organisational factors affecting interventions.<sup>21</sup> To satisfy the study's second objective, a novel approach was taken to develop a new framework based on the RE-AIM and TICD frameworks to focus the assessment.

This study defines effectiveness as a combination of statistical, sustainability, and cultural competencies.

### Methods

The conduct and reporting of the study followed the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) 2020 guidelines.<sup>22</sup>

#### **Inclusion and exclusion criteria**

A population, intervention, and outcome (PIO) framework for systematic reviews was used to determine the eligibility criteria and establish a search strategy.

**Population.** Studies of Pasifika adults ( $\geq 18$  years) originating from a specified PIC were included. To ensure

strategies identified were targeted and relevant to Pasifika, studies with mixed ethnicities (non-Pasifika) were included if participants were  $\geq 90\%$  Pasifika or if Pasifika outcomes were reported separately. Studies including persons  $< 18$  years and pregnant women were excluded. Studies with Torres Strait Islanders were included if outcomes were reported separately from Indigenous Aboriginal people of Australia. Separating these ethnic groups was based on the distinctive genetic and biological differences between Torres Strait Islanders and Indigenous Aboriginal people.<sup>23</sup>

**Intervention.** Studies were included if they involved any lifestyle behaviour change intervention in improving diet and or physical activity. Clinical interventions, including medication or surgery (e.g. bariatric surgery), were excluded, including interventions offering both (e.g. metformin plus lifestyle change). No limit was set on intervention duration and setting.

**Outcome.** The primary outcome was weight change (kg), with the secondary outcome change in BMI (kg/m<sup>2</sup>) and or WC (cm).

No publication date or language limit was set. Searches were conducted in English only.

#### Search strategy and selection criteria

Databases searched were MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCOhost) and ProQuest Central in May 2020, with the search rerun in December 2021. Title, abstract, and keyword searching were used, with search terms adapted for each database. Pre-identified countries from Polynesia, Melanesia and Micronesia were searched, including MeSH terms of Pacific Islands or Oceanic Ancestry Group. Intervention terms included adapted terms for lifestyle, faith and or community-based intervention/challenge or program. MeSH terms used included health promotion/or healthy people or weight reduction programs. Lastly, outcome terms of weight, body mass index, waist circumference, and/ impaired glucose tolerance (IGT) and/ T2DM were extracted. MeSH terms included body weight and measures, waist circumference, waist-height ratio, waist-hip ratio, diabetes mellitus, type 2 or diabetes, gestational/ or prediabetic state. A detailed search strategy is provided in Supplement Table 1.

Grey literature searching was undertaken between June and December 2020. Search terms were adapted for ProQuest Dissertation and Thesis and the Canadian Agency for Drugs and Technologies in Health (CADTH) Grey Matters search tool.<sup>24</sup> Consultation with experts in the field included directly contacting Pacific ministries of health (when contacts were available). Grey literature searching was not repeated in anticipation that the COVID-19 pandemic affected field

implementation globally. One researcher (EP) undertook database and grey literature searches with two researchers (FM and KAM) independently screening 50% of identified references. Discrepancies for inclusion between researchers were resolved by discussion until consensus.

#### Data collection

Data on study design and methodology, participant and intervention characteristics, intervention effects (raw mean change) and relevant statistics were extracted. The original search criteria did not include differentiating the intervention phases of WL vs WM. However, data from studies were extracted, and WM was reported separately, as strategies differ. Studies with multiple papers were reported as single studies.

#### Risk of bias assessment

The Cochrane Risk of Bias (RoB2)<sup>25</sup> assessment tool assessed selection, detection, attrition and reporting bias in RCTs. Performance bias was not considered relevant as participants could not be blinded (i.e. they knew if they received the intervention or not). Studies were graded with a score against the five domains. If a domain had an area of concern, no score was awarded. A score of 1 was given to studies with no area of concern. The NHLBI Quality Assessment for Before-After Studies with No Control Group<sup>26</sup> was used for before and after and quasi-experimental studies. The NHLBI presents 12 questions to assess the quality of 1) study design and methodology, 2) sampling and outcome measures and 3) consideration of individual and group measures. The question around blinding of researchers was removed as studies were before and after studies, hence, only the intervention was delivered. Studies were scored against the remaining 11 questions. Studies were determined as “Good” quality if rated  $\geq 9$ ; “Fair” if 8–6, and “Poor” if  $\leq 5$ . Risk of bias ratings were independently assessed (RZ) and then mutually determined by two authors (EP and RZ).

**Publication bias.** Egger’s regression test for funnel plot asymmetry used a mixed-effects meta-regression with standard error as the predictor to determine publication bias.

#### Data synthesis and statistical analysis

Determining effectiveness can be difficult, and its distinction from efficacy is acknowledged. Fritz and Cleland (2003)<sup>27</sup> identify effectiveness as testing the impact of a program in real-world settings are adopted. Considering the need to translate and scale strategies, this study considered a combination of statistical effectiveness, sustainability and cultural competency.

**Meta-analysis and meta-regression.** To determine statistical effectiveness, a meta-analysis was undertaken, using standard mean difference (SMD) when comparing two groups and raw mean (MN) when comparing single-armed interventions (before and after studies) with standard deviation (SD) as the variance. A random-effects model was carried out to estimate a pooled effect size.

In extracting mean difference (kg) and SD, if the SD of the difference was not available, it was calculated based on standard error (SE) or 95% confidence intervals and p-values in-line with the Cochrane Handbook.<sup>28</sup> Attempts to obtain missing data were made; however, if irretrievable, studies were excluded.

A meta-regression testing for effect modifiers of gender, age, number of strategies, retention rate and study duration (in weeks) was also carried out for studies included in the meta-analysis. All calculations were conducted using RStudio.<sup>29</sup> One researcher (EP) conducted all statistical analysis and reviewed and validated by a second researcher (RT).

**Assessment framework.** RE-AIM has been used for over two decades to evaluate and design evidence-based interventions.<sup>19</sup> It is valued for its holistic approach to addressing individual and system-level changes. An assessment framework was developed using elements from the RE-AIM<sup>18</sup> and TICD<sup>20</sup> frameworks to synthesise data on translational components of included interventions systematically. The TICD framework was developed to address additional translational components, such as incentives and resources and capacity for

organisational change. Components identified as relevant for this review include outcome efficacy, cultural adaptation, participant attrition (retention rates) and demand on participants. Organisation-relevant components include intervention cost and resourcing needs, scalability and transferability. The resulting Cultural and Sustainability Assessment of Interventions (CSAI) Framework (Figure 1) incorporates a tailored set of considerations for assessment of studies via a checklist (see Supplement 2). A point system was used with points awarded if evidence of relevant consideration was reported (Yes = 1, No = 0), with a maximum possible point of 16. Criteria of ‘staffing’ (paid resourcing) and ‘demand on participants/ community’ a ranking of LO=1, MED=2, HIGH=0 was awarded. A medium rank was considered optimal with medium staffing costs and medium demand on the participants, seen as having greater likelihood for sustained engagement and cost efficiencies. A high ranking was awarded for >1 paid staff and or too frequent reporting and meetings. Low rating was determined if full autonomy by community members (lack of leadership or structure) and minimal face to face interactions.

Retention rates and participation data was awarded a point each. With retention rates >80% (<20% drop out) awarded a point and another if participation data was recorded. Participation data refers to collating participation in individual activities delivered in the intervention.

Total points were added and converted to a percentage to facilitate comparison between studies. Studies with grades of ≥60% are considered to have high sustainability and cultural competencies and low if ≤60%.

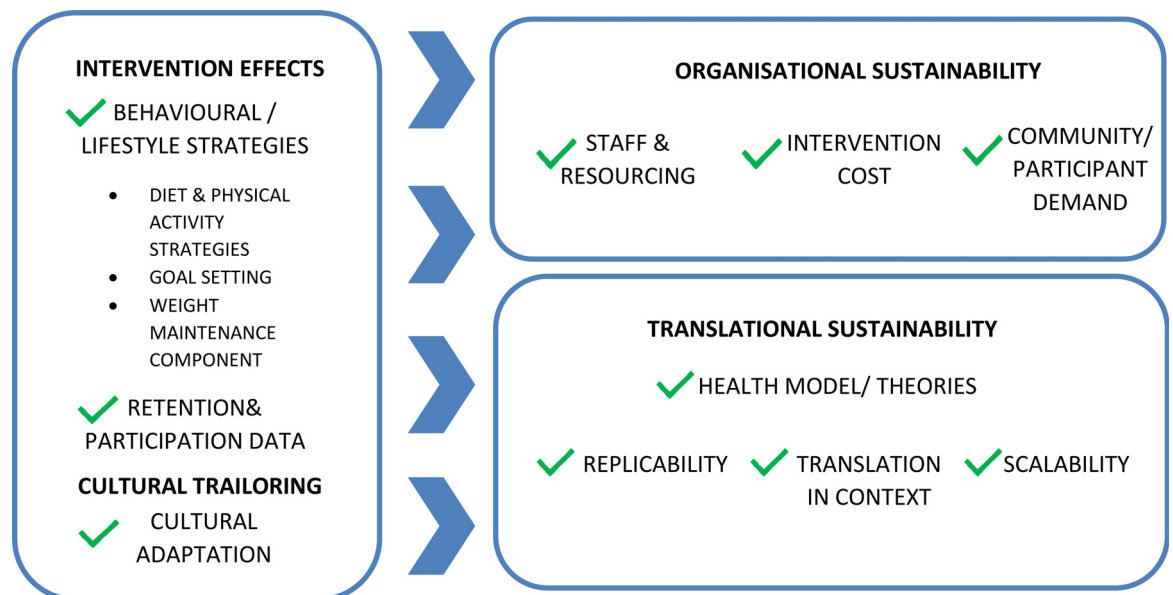


Figure 1. Cultural and Sustainability Assessment of Interventions (CSAI) framework.

### Role of the funding source

The funding source was not involved in the study design; collection, analysis or interpretation of the data; and in writing of the manuscript or in the decision to submit the manuscript for publication.

## Results

### Study selection

Database searching located 1240 citations, of which 393 were duplicates (Figure 2). The remaining 850 records were screened against the inclusion/ exclusion criteria. Grey literature searching primarily yielded six studies from experts in the field, three from reference list searching and none using searching tools. Forty-three records met the inclusion criteria following title and abstract review. Full-text review resulted in 23 studies being included.

### Study characteristics

A total of 25 papers yielded 23 unique studies meeting the inclusion criteria. Two studies: PILI 'Ohana in Hawaii<sup>30,31</sup> and the WEHI trial<sup>32,33</sup> in New Zealand, are reported as single studies with their associated papers. Studies were published between 1999 and 2021, with 19<sup>14,32-48</sup> identified from peer-reviewed journal databases, 3<sup>49-51</sup> studies from snowball searching and one<sup>52</sup> study from consultation with experts in the field. Studies included 3 RCTs, 4 quasi-experimental studies, and 16 before and after studies. Study follow-up ranged from 6 to 104 weeks. Study characteristics are reported in Table 1.

The total number of participants was 4258, 2607 (61%) were female; mean age was 41.2 years. One study,<sup>32,33</sup> had an inclusion criterion of >16 years old, although the mean age was 45 years (1 participant was 17 years old at intervention start). A decision was made

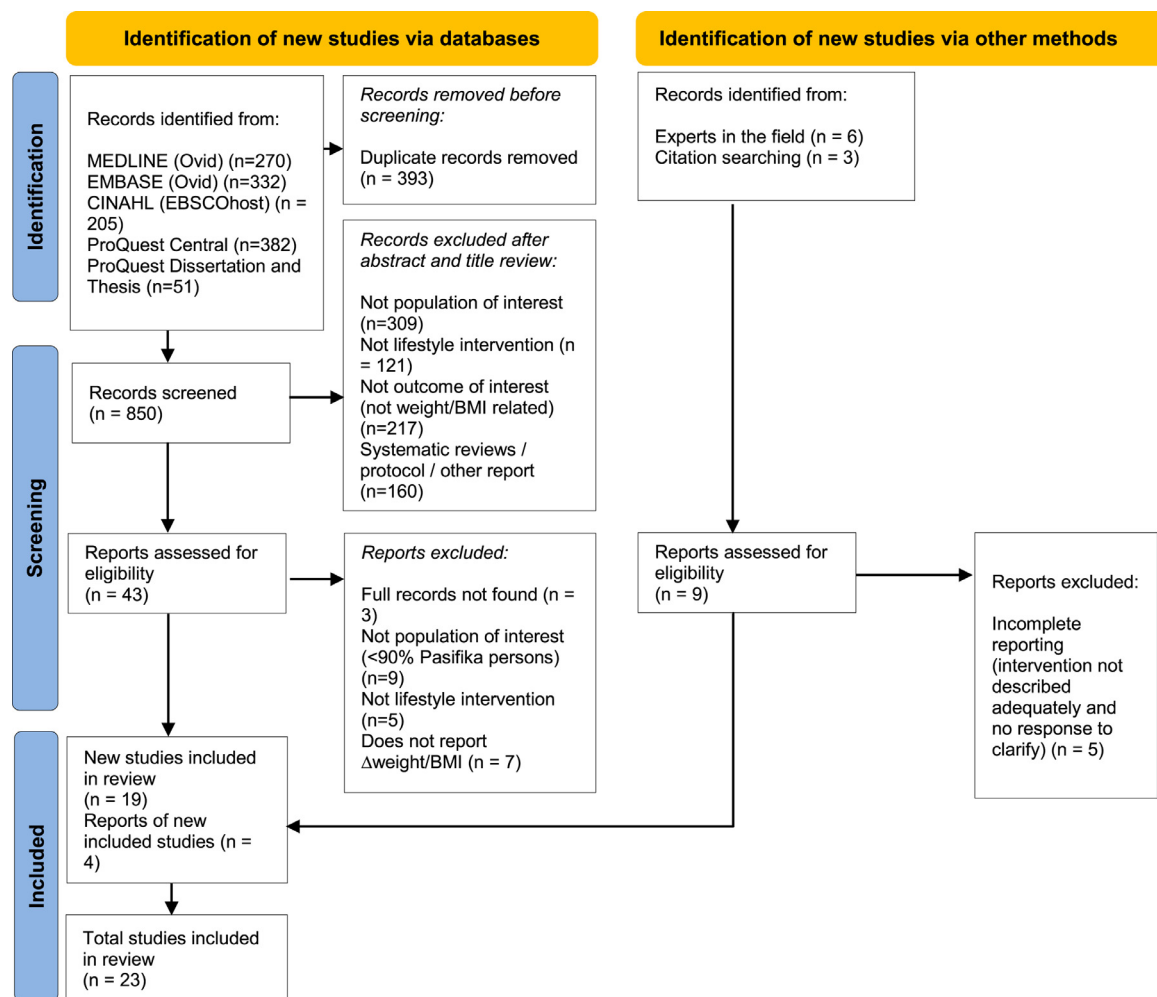


Figure 2. PRISMA flow diagram.

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion/exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI/WC & Risk of Bias Rating)
<i>Randomised controlled trials or quasi-experimental trials with WL as primary outcome</i>							
Bell, A. C. et al. (2001) <sup>35</sup>	Test impact of community-based exercise and nutrition program on weight amongst Samoan church communities between 1995 and 1997. Study design: Quasi-experimental	12 months	N = 471 (61%) Intervention n = 365 (60%) Control n = 106 (64%)	Ethnicity: Samoans Country: New Zealand (Auckland) Context: Church communities	Recruitment: Participants were recruited by in-person invitation at a church meeting with the support of the church health committee.  Inclusion Samoan; members/association with church; $\geq 20$ years  Exclusion Pregnant women	Weekly 1-hour educational sessions (total 31 sessions), 9 sessions to overall church context cooking session aimed at feasting options.  Nutrition: low fat/cut-off/remove fat from meat, increase vegetables and fruits, dilute coconut milk in meals. PA: 30+ mins daily, exercise as a church; aerobics sessions by trained instructors (NZS2/session) total 170 sessions, average of 23 persons per session. Influencers: identified ministers to be trained as leaders in healthy lifestyle programs. Diabetes support groups: arranged small group meetings for those with diabetes to discuss diabetes-related education and self-monitoring information. Identified as not popular/ found helpful by the broader group. Identified cost efficiencies in partnering with local health groups to deliver PA sessions. No explicit WL goal is encouraged.	Intervention: Mean WL (MWL): -0.4 kg $\pm$ 1.63 kg (-0.95, 0.19), $p = 0.039$ Control: +1.3 kg (0.32, 2.28) Risk of Bias = "Good" (Low risk) (NHLBI)
Brooking, L. A. et al. (2012) <sup>36</sup>	To understand the impact of a fibre rich carbohydrate and fat reduction (HCHF) diet vs a high protein (HP) diet adapted to indigenous people (Māori). Study design: RCT Health model/framework: Kaupapa Māori Framework	6 months	HCHF n = 31 (74%) HP n = 28 (71%) Control n = 25 (64%)	Ethnicity: Māori Country: New Zealand Context: Clinical setting/lab (reported together with health clinic)	Recruitment: Direct invitation by word of mouth and connection with researchers.  Inclusion: <75 years; WC $\geq 100$ cm for men; $\geq 90$ cm for women; self-reported as Māori  Exclusion: Previously diagnosed with diabetes, pregnant, lactating, currently attempting to lose weight / lost 2kg+ in past 2 months, chronic disease, taking any medication to influence glucose/body weight. Other medication is permitted if consistently used in the past 4 months and no dosage change during the study period.	Focused on nutrition only. No PA is recommended. 1. High protein (HP) diet: 30% energy from protein, 40% from carbohydrates; traditional protein sources such as muttonbird, abalone or fish. Fruits and vegetables are recommended for carbohydrates, and fats are allowed in moderation. 2. High carbohydrate, high fibre (HCHF) diet: 55% energy from carbohydrates, 30% fat, and 15% protein. Encouraged two servings of fruit per day, three servings of vegetables and six servings of whole grain and cereals; one serving meat (or equivalent) and two low-fat dairy foods. Frying was avoided, and excess fat was removed. Unsaturated spreads are recommended. Phase 1 (0-8 weeks): one to one weekly meetings with researchers; meals were prescribed, relevant food groups and	Intervention HCHF (n = 22) at 24 weeks MWL: -1.6 (-3.0, -0.3) kg, $p = 0.038$ 8 weeks: -2.4kg 16 weeks: +0.9kg HP (n = 22) at 24 weeks MWL: -2.63(-4.42, -0.84) kg, $p = 0.004$ 8 weeks: -3kg 16 weeks: -1.2kg Control: 24 weeks: -2kg 16 weeks: -2.1kg 8 weeks: -0.1kg Risk of Bias = Low Risk (RoB2)

Table 1 (Continued)

First Author (Year published)	Research question / health model / framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+/W/C & Risk of Bias Rating)
Glover, M. (2019) <sup>12,23</sup>	To determine the efficacy of using incentives to adhere to dietary and behavioural goals in a WL competition. Study design: Quasi-experimental Health model/framework: Te Whare Tapa Wha (the four-sided house) Māori holistic health model.	6 months (originally designed for 12 months)	N = 130 (82%)	Ethnicity: Māori & Other Pasifika (97%) Country: New Zealand Context: Community	Recruitment: Referral and promotion via Māori and Pacific health providers and their networks. Inclusion: Māori/Pacific, $\geq 16$ years, obese (BMI $\geq 30$ kg/m <sup>2</sup> ); at risk of T2DM or diagnosed with T2DM (HbA1c $> 50$ mmol/mol) / have a cardiovascular disease (CVD) Exclusion: those that did not meet the inclusion criteria	quantity emphasised. Participants were encouraged to lose weight—no specific WL goal was given. Phase 2 (8—16 weeks): Focused on WM. Meals prescribed. Phase 3 (Weeks 16—24): Written information was provided with a food gift basket and advised to continue independently. Control: followed standard healthy dietary recommendations. Competition: Competition involves earning points for your team in achieving daily challenges. Diet-related messages centred around 6 diet-related (sugar-free drink day, 3+ vegetables day, 1/4 1/2 dinner day, fast & fried-free day, sweet treat-free day, water first day) and 3 exercise/strength related messages (exercise day, stand up day, build me up day). Group support: teams formed based on geographical location. Teams of 7 (total 17 teams of 7 and 2 teams 5—6 participants). Teams were to meet weekly, and groups did not necessarily know each other before the competition. Incentives: used monetary prizes (won for nominated local charity) to motivate adherence to behavioural goals. Disincentives: Points deducted from participants who did not complete challenges for the week. Online delivered education and support: Competition ran completely online with challenges self-reported online. Used website & online reporting mechanisms to capture daily progress. Goal setting: an essential component of this intervention, where goals were set and achieved daily. No explicit WL goal was incorporated.	Intervention MWL: $-3.1$ kg ( $-7.7$ , $1.5$ 95% CI, $p = 0.16$ ) Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model / framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+WC & Risk of Bias Rating)
Ministry of Health, Fiji (2018) <sup>52</sup> (Symposium presentation)	To reduce the number of patients requiring NCD-related treatment services in Fiji by preventing the early onset of NCDs. Study design: RCT	3 months	Group 1 (individual counselling) n = 69 (71%) Group 2 (Group counselling) N = 64 (75%) Group 3 (Controls) N = 63 (78)	Ethnicity: Fijian and Fijian Indians Country: Suva, Fiji Context: Workplace	Recruitment: Via workplaces working in partnership with health insurance and ministry of health. Inclusion: obese adults (BMI > 30, $\geq 18$ yr) working in one of the two workplaces where intervention was delivered in Suva Fiji volunteered to participate Exclusion: Pregnant women and BMI < 30 kg/m <sup>2</sup>	Tracking/monitoring tool: Group counselling sessions provide self-monitoring tools to follow and track progress. Exercises: Both intervention arms ran Zumba classes at workplaces. Weight-loss goal: 500 g/week Intervention: Individual counselling sessions: 1. Phone sessions with a nurse practitioner, 45 min Month 1, follow-up 20 min Month 2, 15 min on Month 3 (final call). Group counselling session: 2. Face to face sessions: 70 min Month 1, 60 min Month 2, 60 min Month 3 (final month). Control: participated in orientation session and health talks on PA and nutrition but asked to wait for the 3 months before receiving the Group 2 intervention.	Intervention MWL: -3.1 (-4.0, -2.1) kg. p = 0.000 Risk of Bias = Some Concern (RoB2)
Simmons, D. et al. (1998) <sup>44</sup>	To evaluate the impact of a comprehensive diabetes-related lifestyle program on diabetes knowledge, PA habits, diet, weight control in a Samoan congregation Study design: Quasi-experimental	24 months	Intervention n = 67 (66%) Control n = 115 (61%)	Ethnicity: Samoan Country: New Zealand (Auckland) Context: Church communities	Recruitment: Church members took a health assessment and were invited to participate in the study. Inclusion: church members or association of members, $\geq 18$ years and willing to participate Exclusion: those that do not meet the inclusion criteria	Community-led & delivered: Intervention coordinated by a diabetes nurse specialist and two members of the church health committee. The church self-organised to award prizes quarterly for attendance with a significant prize at the end of the year. Group support: Participants formed diabetes support and information group. Samoan videos, leaflets, and flipcharts were explicitly created for the group sessions. Nutrition: low fat, 3+ vegetables, 2+ fruits. Cooking demonstrations were also self-initiated by the church. Exercise: walking sessions were encouraged with sitting exercises / low impact aerobics and sports. Sessions were held weekly for the first year and then twice weekly after the first year. Other support/benefit: local gym provided reduced membership fees; exercise equipment donated to the church.	Intervention MWL: -0.0 $\pm$ 4.8kg Control MWL: +3.1 $\pm$ 9.8kg Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)



First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI-/WC & Risk of Bias Rating)
Simmons, D et al. (2004) <sup>45</sup>	To compare the impact of weight and exercise on a 2-year church-based diabetes risk reduction program in four churches in South Auckland, New Zealand Study design: Quasi-experimental	24 months	Intervention Samoa SDA n = 67 (66%) Tongan LDS n = 167 (52) Control Samoa SDA n = 115 (61%) Tongan LDS n = 86 (49%)	Ethnicity: Tongan and Samoa (2 church communities) Country: New Zealand (Auckland) Context: Church communities	Recruitment: Churches were identified through a household survey. Members of the church invited research partners to help design and run a diabetes intervention. Inclusion: Member of churches $\geq$ 18 years, consent to study Exclusion: Those that did not meet the inclusion criteria	Based on Simmons et al. (1998) with improvements. Community-led & delivered: used church structure of health committee to adapt, enhance and coordinate program (in close liaison with nurse specialist program). Conducted diabetes awareness and nutrition sessions. Churches decided when to run sessions, ranging from 1 session per week to 1 per month. Nutrition: added more tailored dietary information to island foods, different foods and cooking methods. Exercise: Group exercises included modified exercises and island music, such as sitting exercises. Group support: Diabetes groups formed and delivered education sessions.	Tongan Intervention MWL: $+4.3 \pm 11.2$ , $p = 0.05$ Control MWL: $2.0 \pm 5.5$ kg NB: Only the Tongan intervention is reported; Samoan intervention is reported in Simmons et al. (1998) Risk of Bias = "Good" (Low risk) (NHLBI)
<b>Randomised controlled trial and quasi-experimental trial with WL as secondary outcome</b>							
Kent, L. (2020) <sup>49</sup>	To determine the efficacy of adapting the Complete Health Improvement Program (CHIP) (called the "Live More Abundantly / LIMA") to improve health and wellbeing in Fiji Cluster randomised controlled trial (cluster-village) Note: CHIP is primarily a program designed for coronary risk reduction. Study design: RCT	3 months	N = 44 (50%)	Ethnicity: Fijian Country: Fiji Context: Community	Recruitment: Villages were invited to the study if they met the inclusion criteria. Participants were invited to be part of the study through a village meeting. Inclusion: Villages with low literacy rate/ education level, committed to participating in either intervention or control arm (as allocated) and at least 40% overweight residents (visual assessment) Participant inclusion: $\geq$ 18 years live permanently in the village (for the duration of the study), waist circumference $\geq$ 92 cm for men and $\geq$ 80 cm for women, able to participate in the study, and can provide their meals. Participant exclusion: Unstable angina, myocardial infarction in the previous 12 months of study, other medical contraindications for dietary change, or increased PA as determined by a medical professional.	Adaptation of the CHIP to context using the Regenerated Freirean Literacy through Empowering Community Techniques (REFLECT). 18 sessions delivered over 90 days. First 30 days, participants met 3x weekly, then 1x weekly for the rest of the study. Completion was determined by completing at least 14 (out of the 18) sessions. Intervention: Nutrition: low-fat, plant-based diets, emphasising whole foods, grains, legumes, fruits and vegetables and at least 30 min of moderate PA. Group activities: sessions focused on providing information on NCDs, reflecting on challenges and barriers and how to overcome them. Participatory sessions using mapping, calendar, matrix and role-play to aid learning. Control: provided printed health education material from the local Ministry of Health. Assessment points were used to follow up and provided opportunities to ask health-related questions.	Intervention: WC: 30 days WC Loss: $-4.1 (-6.1, -2.2)$ cm BMI Mean Loss: $-0.6 (-0.9, 0.3)$ kg/m <sup>2</sup> 90 days WC Loss: $-1.6 (-4.0, 0.7)$ cm BMI Mean Loss: $-0.9 (-1.4, -0.4)$ kg/m <sup>2</sup> Control: 30 days WC Loss: $-2.4 (-6.9, 2.1)$ cm BMI Mean Loss: $-0.3 (-1.4, 0.7)$ kg/m <sup>2</sup> 90 days: WC Loss: $-2.3 (-6.2, 1.7)$ cm BMI Mean Loss: $-0.9 (-2.4, 0.5)$ kg/m <sup>2</sup> Risk of Bias = High Risk (RoB2)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+WC & Risk of Bias Rating)
<p><i>Before and after studies with WL as primary outcome</i></p> <p>Egger, G. (1999)<sup>37</sup></p>	<p>To assess the effectiveness of translating the GutBusters program in indigenous men on Thursday Island</p> <p>Health model/framework: Analysis Grid for Environments Link to Obesity (ANGELO) framework<sup>33</sup></p>	12 months	N = 57 (0%)	<p>Ethnicity: Torres Strait Islanders</p> <p>Country: Australia (Thursday Island)</p> <p>Context: Community</p>	<p>Recruitment: Participants identified via an independent population survey. Those that met the study inclusion criteria were invited to participate.</p> <p>Inclusion Men in Thursday Island, <math>\geq 18</math> years, waist circumference <math>&gt;100</math>cm</p> <p>Exclusion Females; males <math>&lt;18</math> years old; <math>&gt;100</math> cm waist circumference</p>	<p>Nutrition: Low-fat diet, increase dietary fibre</p> <p>Exercise: 30+ minutes PA, sports (communally).</p> <p>WL goal Goal setting: to achieve diet, exercise and Weight loss goal, aimed at 'waist loss' of at least 1% reduction or getting below 100 cm.</p> <p>Community or local support: GutBusters delivered in face-to-face groups. Trained a local volunteer to deliver, but the visiting consultant was taken more seriously. The consultant visited once a quarter.</p> <p>Adapting to local context: the material was translated into the local language and illustrated by a local artist.</p>	<p>Intervention: MWL: <math>-4</math> kg (<math>-6.1, -2.18</math>; <math>p = 0.001</math>) Risk of Bias = "Good" (Low risk) (NHLBI)</p>
<p>Eggleton, K. (2018)<sup>38</sup></p>	<p>To test the effectiveness of Muay Thai kickboxing exercise programme built on the Kaupapa Māori framework</p> <p>Health model/framework: Kaupapa Māori framework</p>	3 months	N = 93 (80%)	<p>Ethnicity: Māori (96% Māori)</p> <p>Country: New Zealand</p> <p>Context: Māori Health Clinic</p>	<p>Recruitment: Word of mouth in the community or referral by the RIA Ora Ngātahi clinical team (Pacific health clinic)</p> <p>Inclusion Māori, <math>\geq 18</math> years, consented to participate</p> <p>Exclusion No exclusion criteria</p>	<p>Exercise: 1-hour fitness and exercise program using Muay Thai kickboxing principles, at least 3x/week. Involved high resistance training (shorter sessions) and low-intensity aerobic exercise (longer sessions)</p> <p>Group support: used connections with family and friends as support to encourage participation in Muay Thai kickboxing.</p> <p>Health model/framework: Kaupapa Māori Framework.</p> <p>Online support: Facebook page is used to keep participants connected</p>	<p>Intervention: MWL: <math>-5.2</math>kg Mean BMI change: <math>1.8</math> kg/m<sup>2</sup> Risk of Bias = "Poor" (NHLBI)</p>

Table 1 (Continued)

First Author (Year published)	Research question / health model / framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome (Δ Weight (kg), SD (95% CI) or BMI+ /WC & Risk of Bias Rating)
Engelberger, L. (1999) <sup>39</sup>	To report the results of the Tonga Healthy Weight Loss Program	6 months (1995) 6 months (1996) 4 months (1997)	1st comp n = 322 (63%) (1 main island) 2nd comp n = 652 (68%) (4 island groups) 3rd comp n = 643 (73%) (4 island groups)	Ethnicity: Tongan Country: Tongatapu (main island), Vava'u, Ha'apai, Eua (island groups of Tonga) Context: Community	Recruitment: TV and radio were used to raise awareness of the program and draw participants. Inclusion ≥18 years old, male/female Exclusion pregnant women	3 competitions (1995 – 6mths, 1996 – 6 months, 1997 – 4 months) Competition: national WL competition using cash prizes as an incentive. Competition and momentum of national engagement, monetary prizes awarded by King of Tonga; pushed towards losing fast and big. Incentives: Cash prizes; high-level political support (King of Tonga led the campaign and personally awarded the prizes) TV and radio; mass media used to drive demand for engagement and raise awareness of the program. Demand was so high 1st comp went from 15 stations to 26 stations in 2nd and 36 stations for 3rd comp. There were not enough resources to cater. Group exercises: aerobics sessions and competitions were based on people enjoying their activity, walking groups and working out together (based on exercise centres). Motivational group meetings were also delivered, guest speakers, cooking classes, and some televised sessions. Weight loss goal: 500 g-1 kg / week.	Intervention: 1st comp MWL: -3.6kg 2nd comp MWL: -2.0kg 3rd comp MWL: -1.8kg Risk of Bias = "Fair" (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome (Δ Weight (kg), SD (95% CI) or BMI-1/WC & Risk of Bias Rating)
Grace, N. E. (2016) <sup>21</sup>	To evaluate the Kaupapa Maori Weight Loss and Lifestyle Change Model Health model/framework: kaupapa Maori Framework	3 months	N = 31 (84%)	Ethnicity: Maori / Pacific persons Country: New Zealand (Wellington) Context: Community	Recruitment: participants were invited by word of mouth, and a Facebook page was set up to invite participants to the study. At a specified date, all participants that had not enrolled were removed from the page, and only those that met inclusion criteria and completed registration for the study were recruited. Inclusion Maori, ≥18 years, consented to the study and completed registration via FB (closed private page) Exclusion No exclusion was stated, but no further participants were included once the Weight Loss Challenge started.	Weight loss goal: 1. Hauora Homies: lose 500 grams/week 2. Kick in the Butt: lose 'biggest loser style', as much as fast as you like (specific aim set by participants) Challenges: 12-week weekly challenges (both PA and food-related) were conveyed to the participants via FB. Included challenges in trying new foods, sharing recipes on the FB page, cycling 20 km over the week, 15 min relaxation, breathing exercise, and drinking water. Online: FB was used for recruiting, i.e. shared information about joining and those who did not complete registration and consent were removed from the FB and FB page then used as a private page for connecting participants (both Hauora Homies and Kick in the Butt). Incentives: Cash prizes were set with money for prizes collected via registration fees - \$50 joining fee (\$5/week) for Hauora Homies and \$20 for Kick in the Butt (10 weeks). Total cash went into a pot for prizes at the end of the challenge. Disincentives: Hauora Homies charged a fee for not meeting the WL goal of 500 g/week. Challenges were also points based. Points were lost on not completing weekly challenges but can be purchased back for \$10. Group activities: participants exercised together and grew to know each other. Some of these relationships translated into	Intervention: Hauora Homies MWL: -5.76kg Kick in the Butt: Mean WL: -3.67kg Risk of Bias = "Fair" (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI-/WC & Risk of Bias Rating)
Hughes, C. K. (2001) <sup>60</sup>	To determine the efficacy of a culturally appropriate program geared toward improving the health of Native Hawaiians	12 months	16 (25%)	Ethnicity: Hawaiian Country: Hawaii Context/setting: Traditional Hawaiian fighting art club	Recruitment: Those that were part of the traditional fighting art club were invited to participate. Inclusion Adults $\geq 18$ years; members of traditional Hawaiian fighting art organization Exclusion Those that did not meet inclusion criteria.	Nutrition: Phase 1 (3 weeks) - low fat / high complex carb / more water; 5x a week prepared lunch and dinner following education sessions. Ph2 (8 weeks) 2 days per week prepared dinner. Phase 3 at (9 months) self-directed diet. Exercise: Phase 1 (3 weeks) 1.5-2 hr x 5times a week exercise; Ph2 (8 weeks) - only 3x a week evening exercise. Phase 3 (9 months) self-direct exercise. Relaxation (lomilomi/massage) - 2 times over 5 days lomilomi (massage) (after morning and evening exercise), 3x / week lomilomi. Phase 3 (9 months) self-directed lomilomi/massage.	Intervention MWL -3.7kg p = 0.355 Risk of Bias = "Poor" (High risk of bias) (NHLBI)
Kaholokula, J. K. (2014) <sup>73</sup> & Mau, M. K (2010) <sup>54</sup>	To assess the feasibility and effectiveness of the Pili Ohana Lifestyle Intervention (POLI) in promoting WL amongst Native Hawaiians and Other Pacific Islanders (NHO-PI)  (An adaptation and translation of the DPP into the Native Hawaiian context)  Health model/ framework: used Community-based Participatory Research (CBPR) to develop its own based on DPP	3 months	N = 169 (83%)	Ethnicity: Native Hawaiian and Pacific Islanders Country: Hawaii Context: Health care setting	Recruitment: Delivered and promoted via the community health providers. Participants were recruited by referral. Inclusion: 1. self-identify as Native Hawaiian, or other Pacific Islander, 2. $\geq 18$ years, 3. overweight or obese (BMI $\geq 25$ kg/m <sup>2</sup> ), 4. willing to follow a behavioural WL program involving 150 mins of brisk walking/week and follow food /diet choices to reduce weight by 500 g-1 kg/week and 5. Identify a family member/co-worker as support throughout the study duration. Exclusion: Those with comorbid conditions advised to get medical approval to join study.	Translated/adapted the Diabetes Prevention Program into community context using CBPR. 8 sessions delivered over 12 weeks. Nutrition: ways to eat less fat, understanding where fat can be found, healthy eating plate, understanding calories and nutrition labels, right ways to eat- ing out, economics of healthy eating. Exercise: Being active, exercising safely, move those muscles, making it fun, heart strengthening activities. Goal setting and tracking: setting goals, ways to stay motivated, tracking progress, keeping it going. Group/ family support: getting your family members and co-workers support/ involvement throughout the study duration. Weight loss goal: 500 g-1 kg / week Other behavioural messages: benefits of lifestyle change, battling temptation, make social cues work for you, talking it out and problem solving, talking to your doc (effective communication), managing negative thoughts and controlling stress.	MWL: -1.5kg SD:3.5 95%CI=-2.0 kg to -1.0kg Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome (Δ Weight (kg), SD (95% CI) or BMI+WC & Risk of Bias Rating)
Masters-Awatere, B. et al. (2021) <sup>42</sup>	To evaluate a whānau-centred, community-based lifestyle programme (Kimi Ora) and its impact on Māori whānau and communities with diabetes or pre-diabetes. Health model/framework: Kaupapa Māori framework	8 weeks	N = 34 (91%)	Ethnicity: Māori Country: New Zealand Context: Community	Recruitment: Participants were identified via the Te Kohao client database. Those that met inclusion criteria were invited to also invite others they knew (whether in the same household or not) to join. Inclusion: Māori adults with pre-diabetes / T2DM. Exclusion: Those that did not meet inclusion criteria and pregnancy.	Primarily focused on the familial and social community links to encourage the individual behaviour change. Nutrition: food intake and nutritional education was key. Weekly cooking sessions were run with discussions around menus and participants able to taste-test new recipes. Skills such as reading nutritional food labels was included in the material. Exercise: tailored physical activities adapted centre around social meetings. For e.g. guided walks to cultural sites with whānau. Group/ family support: focused around involving others in their household or in the community.	Intervention MWL: -4.71 kg SD: -3.2 kg, p<0.001 Control MWL: +0.2 kg, SD: -1 kg Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model / framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI-/WC & Risk of Bias Rating)
Oatzei, J. et al. (2020) <sup>15a</sup>	To assess the effectiveness of using the He Pikinga Waiora (HPW) Implementation Framework to address health inequities Health model / framework: HPW Implementation Framework	12 weeks	Cohort 1 N = 6 (0%) Cohort 2 N = 24 (0%)	Ethnicity: Māori Country: New Zealand Context: Cohort 1: Church Cohort 2: Gym	Recruitment: Cohort 1: Church members were invited (open to associations of members) via a Facebook call. Cohort 2: Recruited by a trainer at a local gym. He recruited via his network and the network of participants. Inclusion: Cohort 1: Māori male, BMI $\geq$ 25 kg/m <sup>2</sup> , but women partners were allowed to join (results not included in study) Cohort 2: Māori male (partners not included), BMI $\geq$ 25 kg/m <sup>2</sup> Exclusion: Those that did not meet the inclusion criteria.	The intervention was built on DPP tailored for the Māori group of men. Tailoring the primarily in using of community peer health worker for support and using motivating factors for participation. Physical activity: Cohort 1: Self-selected activity groups from 1) walking group + box fit (moderate intensity) or Zou fit (high intensity interval training) classes; 2) walking group only; 3) Boxing and or Zou fit class and 4) self-organising group with different activities such as touch rugby and walking. Cohort 2: physical activity tailored to the individual via consultation (included education, workout plans, and physical activity sessions). Participants were free to choose means of delivery's g, phone, face to face or home visits. Nutrition Cohort 1: Weekly 1 hr diabetes sessions Cohort 2: Weekly 30 mins nutrition education session provided via a booklet Support: Cohort 1: delivered by Tuakana (senior mentor) also a participant Cohort 2: kaiarahi (guide or community health worker) Frequency of meetings for Cohort 1 was 3x per week 1 hr sessions; Cohort 2 was determined by the participants. Incentives: Monthly prizes were awarded to those with greatest percentage of weight lost for Cohort 1 and they were connected via a group dedicated FB page and participant information booklets. Cohort 2 were not given any incentives. They were only screened and then referred to their GPs, if required.	Cohort 1 MWL: -4.82kg SD: -0.11kg Cohort 2 MWL: -5.84kg SD: -2.68kg Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome (Δ Weight (kg), SD (95% CI) or BMI-/WC & Risk of Bias Rating
Rolleston, A. (2017) <sup>45</sup>	To determine the effectiveness of a 12-week exercise and lifestyle management program (built on Kaupapa Māori framework) to reduce the risk of a first cardiac event. Health model/framework: Kaupapa Māori framework	3 months	N = 9 (33%)	Ethnicity: Māori Country: New Zealand (Auckland) Context: Healthcare clinic setting	Recruitment: Word of mouth from a Kaupapa Māori healthcare service Inclusion Māori, more than two cardiovascular disease (CVD) risk factors and no previous history of cardiac events Exclusion Previous myocardial infarction, previous stroke, unstable angina pectoris, hypertrophic cardiomyopathy, decompensated heart failure, symptomatic aortic stenosis, and severe pulmonary hypertension	Nutrition: Healthy diet recommendations provided by lead researcher to increase vegetable and fruit intake, reducing refined carbohydrates, increasing water and exchanging energy dense foods (like pies, bakery foods etc) for less dense, more nutritious foods. Cooking demonstrations were held at a local marae (traditional meeting place). Exercise: participants attended an exercise physiology facility as part of the programme assessment. Participants were prescribed individualised exercise programmes, although they could attend as a group over the 12-week period. First 6 weeks consisted of aerobic only exercises, then last 6 weeks incorporated a resistance training programme. Relaxation: Other sessions included yoga and stress management, breathing classes and exercise for health classes. These sessions were not attended and discontinued. Group activities: opportunities were provided for informal gathering following the 12-week period. No specific support – Just gathering to know each other and socialise.	Intervention: MWL: -3.1 kg (-7.7; 1.5 95% CI, p = 0.16) Waist (cm) change: -3.7 (-7.3, -0.1 95% CI, p = 0.05) Risk of Bias = "Fair" (Low risk) (NHLBI)

Table 1 (Continued)



First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+WC & Risk of Bias Rating)
<p><i>Before and after studies with WL as secondary outcome</i></p> <p>Afele-Famullu, S. (2009)<sup>34</sup></p>	<p>To test the effectiveness of a culturally tailored exercise and nutrition interventions for adults living in Tutuila, American Samoa</p> <p>Primary outcome: improvement in healthy eating knowledge</p>	3 months	N = 95 (66%)	<p>Ethnicity: Western Samoans</p> <p>Country: American Samoa</p> <p>Context: Church communities</p>	<p>Recruitment: participating villages were identified via partnership with the American Samoan government. Village residents were then invited via their council of chiefs.</p> <p>Inclusion</p> <p>Adults <math>\geq 18</math> years</p> <p>Residents of the island of Tutuila, American Samoa</p> <p>Exclusion</p> <p>&lt;18 years</p>	<p>A comparison of using nutrition and education vs nutrition-education only vs PA (3 intervention arms)</p> <p>Nutrition: eating local fruits and vegetables, high-fibre foods, reducing overall fat especially from store-bought processed meats. Presented health information specific to population group.</p> <p>Exercise: Low impact aerobic exercise sessions 3x a week, 45mins-1 hour sessions. Exercises were designed (by trained aerobics instructor) to incorporate traditional daily chores (picking breadfruit, climbing trees, weeding etc).</p> <p>Group activities: Nutrition-ed sessions consisted of group lessons and discussions.</p> <p>Group exercise: (by village) was also carried out by trained instructor.</p> <p>Heavy emphasis on cultural adaptation i.e. using local language, translating traditional dance movements into aerobics and using local social structure as support/influence for intervention delivery.</p>	<p>MWL (N = 95):</p> <p>Mean WL: -4.63kg</p> <p>Risk of Bias = "Poor" (High risk of bias) (NHLBI)</p>
<p>McAuley, K. A. (2003)<sup>41</sup></p>	<p>To test the effectiveness of an intensive lifestyle program acceptable to Maori.</p> <p>Primary outcome: improvement in insulin sensitivity</p>	4 months	N = 36 (78%)	<p>Ethnicity: Māori</p> <p>Country: New Zealand (Otago)</p> <p>Context: Community</p>	<p>Recruitment: Used snow balling method to identify participants for the study.</p> <p>Inclusion:</p> <p>Māori and willing to be part of the study</p> <p>Exclusion: No exclusion criteria. Reported cultural sensitivity in excluding those approached/identified</p>	<p>Nutrition: Individually prescribed diet and PA practices; based on participants reported intake/ calculated energy level that will lead to gradual WL.</p> <p>Some foods provided free, such as cereals, low fat foods, and canola oil. Recipes also provided.</p> <p>Exercise: participants encouraged to exercise 5x weekly for 20mins at 80-90% max heart rate and 2 days of resistance training. Gym membership was provided free of charge to participants.</p>	<p>Intervention</p> <p>MWL: -3.1 (-4.0, -2.1) kg.</p> <p>p&lt;0.001</p> <p>Risk of Bias = "Fair" (NHLBI)</p>

Table 1 (Continued)

First Author (Year published)	Research question / health model / framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome (Δ Weight (kg), SD (95% CI) or BMI+WC & Risk of Bias Rating)
Naviga, D. W. (2020) <sup>48</sup>	To assess effectiveness of church-based interventions delivered by community coach facilitators and peer support facilitators on risk factors for T2DM (including HbA1c, weight, PA and diet) and 2) diabetes knowledge and 3) impact on quality of life and readiness to change lifestyle behaviour amongst Australian Samoans in Western Sydney Primary outcome: HbA1c improvement Health model/framework: Trans-theoretical Model / Social Cognitive Theory	12 months	N = 68 (57%)	Ethnicity: Samoan Country: Western Sydney, Australia Context: Church community	Recruitment: Samoan churches were invited to participate. Study participants was recruited via a pre-sentation and invite to churches. Inclusion Members and those associated with members of church, ≥ 18 years, consent to participate Exclusion: Those that do not meet inclusion criteria	Adaptation from the Te Wai A Rona (Simons 2008) <sup>44</sup> . Nutrition: increase fruits and vegetables (minimum 4+ fruits and vegetables per day); drink more water; eat less sugar; eat less fat; choose a greater variety of protein containing foods; watch the portion size eat more fibre. Exercise: look for more ways to be active daily; move more and add more steps; reduce sedentary time; choose to be strong; increase daily exercise and include intense exercise. Diabetes management: understanding what diabetes is, diet & PA with diabetes; the struggle, complications of diabetes, health checks, foot care, social aspects and mental health. Peer support facilitators (PSF) and social support: program trained volunteers within the church-community to lead, deliver and support the rest of the participants. Connection with church (involving families and friends) were encouraged and used as a strength for the program. Goal setting: participants were to set weekly goals in achieving the 12 messages for the program. Support structure: apart from the PSF's, the program employed two Community Activators (Samoan speakers) that facilitated connection with church-community. A reference group (made up of key influences in the community) was also set up to initiate and oversight design and delivery.	Intervention MWL: +0.2kg p = 0.051 Risk of Bias = "Good" (Low risk) (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI/WC & Risk of Bias Rating)
Reddy, R. (2009) <sup>47</sup>	To assess effectiveness of translating of a type 2 diabetes education curriculum to the Republic of Marshall Islands Primary outcome: improvement of glycaemic control	6 months	N = 17 (71%)	Ethnicity: Marshallese Country: Ebeye, Republic of Marshall Islands Context: Clinic	Recruitment: Participants were recruited via the Ebeye Public Health Promotion clinic referrals. Inclusion: Patients of the Ebeye Public Health Clinic with T2DM. Exclusion: No stated exclusion criteria.	Nutrition: weekly educational sessions, group cooking classes, demonstrating local meals. Recommended traditional fresh foods like fish, breadfruit and pandanus; change cooking methods to boiling, broiling and stir-frying (using less fats and less saturated oils). There were weekly sessions on type 2 diabetes and diabetes management. Exercise: encouragement of walking groups by those living in villages close to each other. Group activities: participants were encouraged to share with each other their progress throughout the week, new-found knowledge in food preparation or exercise routines. There were also sessions on glucose monitoring and administering insulin by health educators.	At baseline 28.6% (5) had lost more than 10 lbs (4.54 kg). At the 6-month mark 57.1% (10) had lost more than 10 lbs (4.54 kg). Risk of Bias = "Fair" (NHLBI)
Siefken, K. (2012) <sup>50</sup>	To assess the effectiveness of a PA workplace program targeted at women in urban Vanuatu. Primary outcome: increased PA	3 months	N = 133 (100%)	Ethnicity: ni-Vanuatu Country: Vanuatu Context: Workplace	Recruitment: Email invitation to attend a program launch and for female civil servants to participate in the study was sent from the Vanuatu Ministry of Health to all government employees in Port Vila, Vanuatu. Inclusion: Females $\geq$ 18 years, ni-Vanuatu, working civil servants Exclusion: Males	Groups or teams: participants asked to form teams; teams formed were 3–7 people overall 40 teams, with a team captain to keep score. Teams were to compete against each other in keeping their walking scores. Exercise: priority focus was on increasing walking steps to 10 K daily (gradual increase over 12 weeks). Nutrition: nutrition information was provided at start of the intervention on healthy eating and cooking.	WC: $-3.9$ cm (SD= $\pm$ 10.3 kg) Risk of Bias = "Fair" (NHLBI)

Table 1 (Continued)

First Author (Year published)	Research question / health model/framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+/-WC & Risk of Bias Rating)
Simmons, D. (2008) <sup>14</sup>	To assess effectiveness of a Māori Community Health Worker (MCHW) approach amongst Māori to prevent/delay the progression of impaired fasting glucose (IFG)/impaired glucose tolerance (IGT). Primary outcome: 35% reduction in diabetes incidence rates amongst Māori Health model / framework: Trans-theoretical Model & Social Cognitive Theory	12 months	Vanguard n = 160 (66%) Controls n = 52 (60%) Others in the area n = 1143 (66%)	Ethnicity: Māori Country: New Zealand (Waikato) Context: Community	Recruitment: Māori households were identified via the broader Te Wai a Rona Trial and allocated to the Vanguard study. Media and public awareness were raised via a communication's campaign (includes flyers and posters) Inclusion: Geographically located in a Māori Health Provider area with a MCHW who was ready to start; registered with Te Wai Rona and received results at time of pilot were invited to participate. Exclusion: Those who did not make the cut off recruitment / enrolment time for Vanguard study. Excluded non-residents in catchment area or who had a terminal illness.	Community health worker: MCHW trained to deliver intervention. MCHW was provided with a toolkit, scales and PDA for entering data. Nutrition: increase fruits and vegetables (minimum 4+ fruits and vegetables per day); drink more water; eat less sugar; eat less fat; choose a greater variety of protein containing foods; watch the portion size; eat more fibre. Exercise: look for more ways to be active daily; move more and add more steps; reduce sedentary time; choose to be strong; increase daily exercise and include intense exercise. Social support: participants were asked to inform family members. Goal setting: was a major part of the intervention with participants deciding on the goals that they focused on through the use of messages.	Intervention MWL = -1.3 ± 3.6 kg, p<0.001 No diagnosed IGT Mean = -0.3kg±5.3kg Diagnosed IGT/IFG Means = -3.7kg±5.6 p<0.01 Control No diagnosed IGT Mean = +0.6 ± 8.5 kg, p = 0.0464 Diagnosed IGT/IFG Means = -1.9 ± 3.4 kg, p = 0.317 Risk of Bias = "Good" (Low/risk) (NHLEB)
Weight maintenance pre-test/post-test studies Bell, A. C. (2001) <sup>25</sup>	No specific WM research question	12 months	NR	Some as reported above	Recruitment: From those that were part of the original trial (previous 12 months) Inclusion Those that had been part of the original study followed up after a 1-year period	No specific strategy. Participants were left as is, measurements taken after 1 year.	Maintenance Intervention: MWL = +0.8kg±2.05 Control: NR
Simmons, D. (2008) <sup>14</sup>	No specific WM research question	12 months	NR	Some as reported above	Recruitment: From those that were part of the original trial (previous 12 months) Inclusion Those that had been part of the original study	No specific strategy. Participants were left as is, measurements taken after 1 year.	Maintenance Intervention: MWL = -1.3 kg SD = 3.6kg Control: NR

Table 1 (Continued)

First Author (Year published)	Research question / health model/ framework	Duration (months)	N (%Females)	Ethnicity, country and context/setting	Recruitment and inclusion / exclusion criteria	Weight loss strategy	Outcome ( $\Delta$ Weight (kg), SD (95% CI) or BMI+/WC & Risk of Bias Rating)
Weight maintenance randomised controlled trials							
Kaholokula, J. K. (2012) <sup>26</sup>	To explore the feasibility and efficacy of a culturally appropriate program to improve health of Native Hawaiians  Health model/ framework: adapted framework adapted for Native Hawaiians and Other Pacific Islanders <sup>30</sup>	6 months	PLP n = 72 (78%) SBP n = 72 (92%)	Ethnicity: Native Hawaiians and other Pacific Islanders (NHOPi) Country: Hawaii Context: Community Organisation delivery	Recruitment: those that completed the initial phase of the PLP and met the inclusion criteria were invited to be part of the study.  Inclusion: Pacific Islander; completed the 3-month PILI Ohana WL program; willing to enrol in the 6-mth WL maintenance program  Exclusion: All others	Delivered through 5 community organisations that had delivered the PILI WL program.  Group delivery: The PLP offered 6 sessions delivered over 6 months (session per month) lasting 1.5 h, delivered in groups of 6–10 participants.  Peer educators: Trained community peer educators to support participants at each site once a month.  WL Goal: participants not to regain pre-intervention mean weight $\leq 3\%$  Sessions included lessons to discuss family goal setting and family eating habits, how to identify community resources and manage social events and cultural expectations around food. It also considered social support in the home and how to manage negative thoughts and emotions.	PLP MWL=+0.075 $\pm$ 4.7(–1.0, 1.2) kg, $p \leq 0.05$ SBP Mean=+0.581 $\pm$ 2.7 (–0.06,1.2), $p \leq 0.05$ Risk of Bias = Low risk (RoB2)

**Table 1: Study methods, participant characteristics and WL strategy used.**

NR= Not reported.

by consensus to include the study (individual results could not be extracted). Of the total participants across included studies, 52% were Tongan ( $n = 2211$ ), 18% Māori ( $n = 802$ ), 17% Samoan ( $n = 731$ ), 9% Native Hawaiian and Other Pacific Islanders (NHOPI) ( $n = 399$ ), 7% Fijian ( $n = 292$ ), 3% ni-Vanuatu ( $n = 133$ ), 1% Torres Strait ( $n = 45$ ), and 0.4% Marshallese ( $n = 17$ ). Some papers use 'indigenous' to describe Pasifika communities although this was not used in our search.

Studies were primarily conducted in community settings ( $n = 8$ ), churches ( $n = 6$ ), health care clinics ( $n = 6$ ), workplaces ( $n = 2$ ), and clubs or gyms ( $n = 2$ ). Studies with multiple settings, the primary location was selected. For example, Kaholokula et al.<sup>31</sup> implemented in a community and a health centre. Delivery was primarily carried out in the health centre setting, with outcome results used in this review. Therefore, the health centre setting was recorded.

One national study conducted in Tonga contributed 49% of total study participants ( $n = 2107$ )<sup>39</sup> but was not included in the meta-analysis due to incomplete data.

### Risk of bias

In assessing study quality, of the 4 RCTs, one<sup>49</sup> study scored 3/5 (high risk), one<sup>52</sup> study scored 4/5 (some concerns), and two<sup>36,56</sup> scored 5/5 (low risk). Bias was detected in results reporting<sup>49,52</sup> and missing outcomes.<sup>49</sup> All 4 quasi-experimental studies scored  $\geq 9$  (good).<sup>32,33,35,44,45</sup> Of the 15 before and after studies, 6<sup>14,31,37,42,43,48</sup> scored  $\geq 9$  (good), 6<sup>39,41,46,47,51,57</sup> scored 6–8 (fair), 3<sup>34,38,51</sup> scored  $\leq 5$ , 7 (poor). Areas of concern with studies scoring  $< 5$  were mainly due to poor design and method studies resulting in weak statistical analysis. The majority of studies (RCT, quasi-experimental and before and after studies) were considered fair quality and at low risk of bias (Supplement 1 Table 3). Risk of bias was undertaken independently (EP and RZ) with interrater reliability calculated to be 80% for RoB2 and NHLBI.

No evidence of publication bias was found, (*Test for funnel plot asymmetry*)  $z = -0.32$ ,  $p$ -value  $> 0.05$  ( $p = 0.75$ ).<sup>58</sup>

### Meta-analysis results

To allow for an estimated effect size measured in kilograms (kg), three<sup>47,49,57</sup> studies with unreported change in weight (kg) could not be included in the meta-analysis, but still included in the narrative assessment. Studies excluded represented total population of 0.04% of the total study population ( $n = 171$ ).

Twenty-one study arms were identified as being eligible for meta-analysis. Weight maintenance arms and studies with missing data were excluded. A pooled effect size of -2.56 kg (-3.58 kg to -1.54 kg) was found across

studies ( $n = 21$ ) (Figure 3). However, heterogeneity was high ( $I^2 = 99.0\%$ ), probably due to comparing across multiple study designs. When risk of bias was accounted for  $n = 11$  studies with a RoB rating of "Low" (RoB2  $> 4$  and NHLBI  $\geq 9$ ), a significant loss of -2.00 kg (95%CI -3.23 kg to -0.77 kg) was found, with high heterogeneity  $I^2 = 98.8\%$ .

**Sensitivity analysis.** Sensitivity analyses was undertaken to estimate the effect of the WL strategies ( $n = 21$ ). A sub-group analysis using RCTs ( $n = 4$ ) testing for effect size using SMD resulted in a non-significant effect of -0.23 standard deviations (95% CI -0.49 to 0.035) with minimal heterogeneity ( $Q(df=3) = 0.25$ ,  $I^2 = 0.00\%$ ). When pooling RCTs and quasi-experimental studies ( $n = 7$ ) a similar but significant loss of -0.26 standard deviations (95% CI -0.51 to -0.02) was found, with moderate heterogeneity at  $Q(df=6) = 14.09$ ,  $I^2 = 56\%$ .

Meta-regression results ( $n = 21$  studies) show a significant negative relationship between duration of study and WL, i.e. with increasing weeks, a weight gain of 0.054 kg (95%CI 0.03 kg to 0.08 kg) was observed, as expected. Retention rates were also a predictor of WL and significantly associated with WL of -0.09 kg (95% CI -0.15 kg to -0.06 kg). For RCTs and quasi-experimental studies ( $n = 7$ ), retention rates were also a significant predictor of WL -0.012 kg (95%CI -0.21 to -0.003 kg). No other results were statistically significant.

### Results reported against the CSAI framework

Studies were graded based on pre-identified criteria and checklist (Supplement 2), with 10<sup>14,31-34,38,47,48,51,52,56</sup> of 23 studies scoring  $\geq 60\%$ , indicating high sustainability and cultural competency (Table 2). Of these 4<sup>14,31-33,48,56</sup> studies were low risk of bias. Three<sup>36,41,44</sup> studies scored low due to high staffing and high participant demand<sup>36,44</sup> and or no consideration of replicating or scaling the intervention.<sup>41</sup> Studies were assessed independently by EP and a subset by FM with discrepancies discussed until consensus. Reviewer interrater reliability was 82%.

Strategies were assessed if they contained both a diet and physical activity component, in line with current evidence-based practice.<sup>59</sup> Only one study<sup>38</sup> tested a physical activity only strategy, and one<sup>36</sup> study a nutrition/diet only strategy. All other studies included a diet and physical activity strategy as the most common intervention design. Seventeen<sup>14,30-33,35-38,40-45,48,51,52,57</sup> studies indicated some level of goal setting, with 7<sup>30,31,37-39,51,52,56</sup> out of 17 of these studies reporting a specific WL goal. The number of lifestyle intervention strategies in studies ranged between 6 and 16 (Figure 3). A total of 39 strategies were identified with 32 targeting WL and grouped into seven themes of 1) diet-related, 2)

First Author (Year)	Behavioural/lifestyle strategies					Retention%/ participation data	Cultural tailoring	Organisational sustainability			Translational sustainability				Grade
	Diet	PA	Goal setting	Total lifestyle & behavioural strategies found	Maintenance strategy			Staffing	Intervention cost	Demand on community/ participants	Health theories / health models	Replicability	Translation different context	Scalability	
Afele-Fa'amuli, S. (2009) <sup>34</sup>	✓	✓	×	6	×	100% / X	✓	MED	×	MED	×	✓	×	×	62.5%
Bell, A. C. (2001) <sup>35,60</sup>	✓	✓	×	11	✓	71% / ✓	✓	MED	×	HIGH	×	×	×	×	50%
Brooking, L. A. (2012) <sup>36</sup>	✓	×	×	10	✓	73% / X	✓	HIGH	×	HIGH	✓	×	✓	×	37.5%
Egger, G. (1999) <sup>37</sup>	✓	✓	✓	9	×	79% / X	✓	HIGH	×	LO	✓	×	✓	×	56%
Eggleton, 201,8 <sup>38</sup>	×	✓	✓	10	×	93% / X	✓	MED	×	LO	✓	✓	×	×	62.5%
Englberger, L. (1999) <sup>39</sup>	✓	✓	✓	11	×	Ave 46.4% / X	×	HIGH	✓	MED	×	✓	×	×	50%
Glover, M. (2019) <sup>32,33</sup>	✓	✓	✓	13	×	50% / ✓	✓	LO	✓	HIGH	✓	×	×	✓	62.5%
Grace, N. E. (2016) <sup>51</sup>	✓	✓	✓	16	×	81% / ✓	✓	MED	✓	HIGH	✓	×	✓	×	75%
Hughes, C. K. (2001) <sup>40</sup>	✓	✓	×	12	×	100% / ✓	✓	MED	✓	HIGH	×	×	×	×	56%
Kaholokula, J. K. (2014) <sup>31</sup> & Mau, M. K (2010) <sup>30</sup>	✓	✓	✓	12	×	100% / ✓	✓	MED	✓	MED	✓	×	×	✓	87.5%
Kaholokula, J. K. (2012) <sup>56</sup>	✓	✓	✓	10	✓	68% / ✓	✓	MED	✓	MED	✓	×	×	✓	87.5%
Kent, L. (2020) <sup>49,61</sup>	✓	✓	×	9	×	45.8% / ✓	✓	MED	×	HIGH	×	×	✓	×	50%
McAuley, K. A. (2003) <sup>41</sup>	✓	✓	×	8	×	86% / X	×	HIGH	✓	HIGH	×	×	×	×	31%
Masters-Awatere, B. et al. (2021) <sup>42</sup>	✓	✓	✓	11	×	100%/X	✓	HIGH	×	MED	✓	×	×	×	56%
Ministry of Health, Fiji (2018) <sup>52</sup>	✓	✓	✓	10	×	91% / ✓	×	MED	✓	LO	×	×	×	✓	69%
Ndwiga, D. W. (2020) <sup>48</sup>	✓	✓	✓	14	×	68% / X	✓	HIGH	✓	MED	✓	×	×	✓	62.5%
Oetzel, J. (2020) <sup>55</sup>	✓	✓	✓	13	×	88% vs 100% / ✓	✓	HIGH	×	HIGH	✓	×	×	×	50%
Reddy, R. (2009) <sup>47</sup>	✓	✓	×	7	×	94% / ✓	✓	MED	✓	LO	×	×	✓	×	69%
Rolleston, A. (2017) <sup>46</sup>	✓	✓	×	7	×	75% / X	✓	MED	✓	HIGH	✓	×	×	×	56%
Siefken, K. (2015) <sup>57</sup>	✓	✓	×	8	×	64% / X	×	MED	✓	LO	×	✓	✓	×	56%
Simmons, D. (1998) <sup>44</sup>	✓	✓	×	12	×	74.6% / X	×	HIGH	✓	HIGH	×	✓	×	×	37.5%
Simmons, D. (2004) <sup>45</sup>	✓	✓	×	12	×	62% / X	×	MED	×	MED	✓	×	✓	×	56%
Simmons, D. (2008) <sup>44</sup>	✓	✓	✓	13	✓	100% / X	✓	MOD	×	HIGH	✓	×	✓	×	62.5%

**Table 2: Weight loss Strategies and evidence of sustainability.**

Key:.

✓ = reported; PA= Physical activity; X = not reported in study or other associated publications.

HIGH= >1 meeting weekly (usually face to face), 1+ full-time staff allocated, >12 weeks consistent engagement required. Individualised consultations are also considered high/ heavy resourcing.

MED= weekly meetings, 0.5 or 1 staff allocated with trained peer support volunteers, <12 weeks of consistent engagement required.

LO= monthly meetings, intervention fully delivered by participants with researchers only following up to measure progress, minimal face to face meetings.

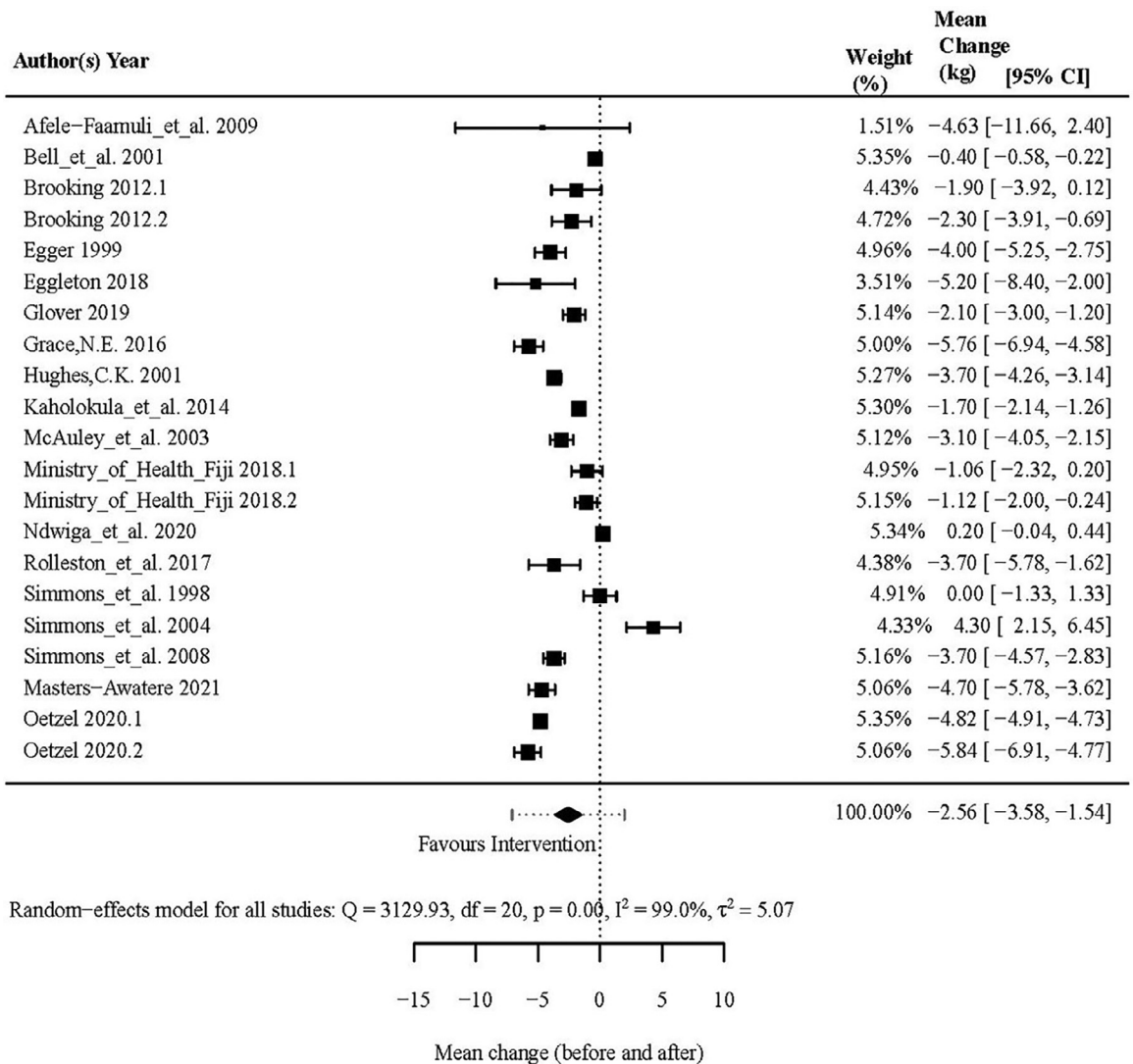


Figure 3. Pooled mean WL.

physical activity-related, 3) team or group orientated, 4) goal setting, 5) competition-based, 6) stress and emotion management (Figure 4).

Of the 39 strategies identified only 7 targeted WM—found only in one<sup>56</sup> study. Two<sup>14,35</sup> studies identified a maintenance phase but did not design or include WM strategies.

Fifteen studies reported using a health model/framework to guide intervention delivery. The most commonly used was the Kaupapa Māori framework. However, there was high variability in intervention components utilised. Table 1 records the specific framework used in each study.

One<sup>37</sup> study used the ANGELO framework to undertake an environmental audit resulting in an attempt to increase fresh fruit and vegetables and low-fat dairy products in retail outlets. High-level advocacy efforts

resulted in one private food store outlet not selling fried take-away foods supporting the program. Other environmental barriers identified, such as wild animals (including crocodiles and sharks) hindering physical activity (e.g. walking or swimming), were recognised as requiring longer term solutions and beyond the program's scope.

Four<sup>32,33,38,39,49</sup> included studies reported  $\geq 50\%$  dropout. Reasons for high dropout include crossing the Christmas period,<sup>32,33</sup> disqualifying a study arm due to contamination,<sup>49</sup> and one study<sup>39</sup> (a WL competition) did not report a reason for dropouts but only reported increasing retention with succeeding campaigns. Notably, this study<sup>39</sup> used mass media (TV and radio) to drive demand and raise awareness, possibly leading to early engagement though engagement was not sustained. Financial incentives (cash prizes) and the involvement of influential leaders (e.g. the King of



DIET RELATED (14)	PHYSICAL ACTIVITY RELATED (6)	TEAM/ GROUP ORIENTATED (3)	GOAL SETTING (4)	COMPETITION BASED (4)	STRESS & EMOTION MANAGEMENT (2)	MAINTENANCE (7)
<ul style="list-style-type: none"> <li>•Low Fat</li> <li>•Portion Control</li> <li>•Reduce fast foods/ fried foods</li> <li>•Increase Water</li> <li>• Reduce Sugary Drinks &amp; avoid foods high in sugar</li> <li>•Fruit &amp; Veg</li> <li>•Eat Breakfast</li> <li>•Eating Sweets</li> <li>•High Carbs</li> <li>•High Protein</li> <li>•Wholefoods / High Fibre</li> <li>•Pre-prepared meals</li> <li>•Nutrition Education Sessions</li> </ul>	<ul style="list-style-type: none"> <li>•Low Impact Exercises</li> <li>•Walking</li> <li>•Sport</li> <li>•Intensive Exercise</li> <li>•Sedentary Time</li> <li>•Relaxation</li> </ul>	<ul style="list-style-type: none"> <li>•Community / Peer Support / Local Volunteer</li> <li>•Team / Group Activities</li> <li>•Family orientated</li> </ul>	<ul style="list-style-type: none"> <li>•Weight Loss Goal</li> <li>•Weekly/ Daily Goal Setting</li> <li>•Self Monitoring &amp; Tracking</li> <li>•Self identifying and selecting of goals</li> </ul>	<ul style="list-style-type: none"> <li>•Disincentives (Fines)</li> <li>•Incentives</li> <li>•Weight Loss Competition</li> <li>•Challenges</li> </ul>	<ul style="list-style-type: none"> <li>•Managing Negative Emotion</li> <li>•Identifying Support/ Help</li> </ul>	<ul style="list-style-type: none"> <li>•Family Goal Setting Exercise</li> <li>•Family Eating History &amp; Planning Exercise</li> <li>•Identifying Community Resources</li> <li>•Family Activity Exercise</li> <li>•Family Difficult Social Events &amp; Food</li> <li>•Social Support In The Home</li> <li>•Managing Negative Thoughts &amp; Emotions</li> </ul>

Figure 4. Lifestyle strategies categorised.

Tonga participating and presenting awards) may also have played a role in the high interest and early engagement.

All intervention strategies described indicated some level of cultural adaptation with <sup>9,14,34,38,42,46,48,51,54,55</sup> studies reporting culturally relevant strategies. These components included community and peer support,<sup>14,42,43,48</sup> utilising social influences (family and friends)<sup>32,42,43,46,51,54</sup> and culturally relevant materials and resources.<sup>34</sup> Two<sup>32,55</sup> studies identified the influence of motivating factors (as an ethnically relevant category) and their role in supporting engagement and retention. Only one study<sup>55</sup> tested the role of family and social networks in increasing motivation towards well-being and influencing lifestyle behaviours, with one<sup>32</sup> identifying it as a gap in hindsight.

In assessing organisational and translational components, the evidence against staffing intervention cost, demand on participants, health models/framework used for design and implementation, and considerations around scaling was sporadic. Thirteen<sup>31,32,39,41,44,46,47,51,52,56,57</sup> of the 23 studies reported some information around intervention costs, and 18 reported either one of the components of replicating, transitioning to a new context or sustainability. All studies provided information on human resourcing or teams involved in planning and delivering the intervention.

## Discussion

### Statistical analysis

Review findings estimate lifestyle-based tailored interventions amongst Pasifika communities can result in a demonstrable small WL of  $-0.26$  standard deviations (95% CI  $-0.51$  to  $-0.02$ ). It is acknowledged that using weight change, measured by kilograms and or BMI change, has been reconsidered amongst Pasifika.<sup>62</sup> Pasifika have greater muscle mass than Europeans,<sup>62</sup>

with recent studies advocating for greater focus on behavioural and cultural strategies.<sup>33,42,43</sup> However, weight plays a significant role in T2DM incidence and its progression to severe illness and complications. Hence considering interventions resulting in weight change remains relevant, despite ethnicity.

Statistical analyses identified an inverse relationship between increasing study duration and reduced retention rates with WL. There is evidence from intensive lifestyle interventions (ILI)<sup>63</sup> in DPS<sup>12</sup> and the Look Ahead Trial,<sup>64</sup> showing WL even at 12 months and four years.<sup>63</sup> Whilst international literature may support lengthened periods of ILI, perhaps in Pasifika culture, motivation for consistent prolonged engagement may not be culturally conducive. There may be a case for shortened periods of planned intense activities targeted at WL (ensuring engagement), followed by low activity periods characterised by WM strategies in Pasifika. The planned intentional component of such an approach differentiates it from yo-yo dieting. However, such an approach will need to be empirically tested.

A major limitation of this study is the age of the studies and the subsequent meta-analysis and regression analysis. This review includes publications over two decades old with studies of varying quality. Peer-reviewed tools developed in the last decade have increased transparency in reporting study statistics. Although risk of bias was undertaken, some studies may have been ranked higher due to unreported statistics. For example, one<sup>39</sup> study representing 53.4% ( $n = 2278$ ) of the study population was not included in the meta-analysis due to missing/unreported SD. Also, only studies where effectiveness was assessed could be included, potentially omitting effective but non-evaluated studies.

The review included RCTs, quasi-experimental studies and before and after studies. Although we postulated the effect of WL to be a combination of RCT and quasi-experimental study arms, there is a real challenge in delivering

truly randomised trials in real-world community settings. Pooling results is challenging, given varying inherent biases, but with most studies implemented in community contexts, adherence to published protocol and delivery of RCT and quasi-experimental studies was likely affected. We understand community-based participatory research (CBPR) has been used to address some of the challenges in implementing RCTs in community settings.<sup>65</sup>

### WL and WM strategies

This review identified 39 unique strategies addressing both WL and WM amongst Pasifika populations. Strategies accounting for cultural considerations include community-based or peer support strategies and team or peer-to-peer facilitators. There is international evidence of the efficacy of such approaches.<sup>66,67</sup> We understand Pasifika are known for their cohesive social constructs, and studies have identified the potential for social networks to influence individual decision-making amongst Pasifika and other ethnic groups.<sup>42,43,68</sup> However, there is yet to be a study amongst Pasifika that quantifies the effect of such networks.<sup>69</sup>

There were also studies<sup>32,55</sup> that include psychosocial behaviours such as motivation,<sup>42,43</sup> the freedom of choice (i.e. self-selecting goals and self-monitoring and tracking) and addressing social compulsions over feasting and social events.<sup>30,31,56</sup> Future studies seeking to tailor and target Pasifika communities and ethnic minorities would benefit from considering the linkages between individual motivation and collectivism. Matenga-Ikhele et al<sup>70</sup> highlights the importance of 'meaningful partnerships' with Pasifika communities. Although partnerships are not addressed in our study, establishing and maintaining strategic engagement before commencement is critical.

### CSAI as an evaluation tool

Our study demonstrated efficiencies in developing an assessment tool to give a sustainability and cultural competency score. The CSAI is not yet validated, but does incorporate evidence-based knowledge, such as identifying lifestyle components of diet and physical activity and goal setting (setting specific WL goals vs WM); as essential to outcome efficacy.<sup>12,13</sup> We understand other tools exist to determine scalability of interventions, such as the Intervention Scalability Assessment Tool (ISAT).<sup>71</sup> However, cultural and behavioural components are not included in the ISAT, components considered essential for delivering culturally appropriate interventions in ethnic populations. To ensure a comprehensive approach to identifying truly efficacious and sustainable interventions, it is essential to read the CSAI's competency score against study risk of bias scores (or other intervention relevant components).

Tools or frameworks such as REAIM and CSAI are evaluation tools with potential for use as design tools for a streamlined, systematic approach to intervention planning and design. Also, each component identified within the CSAI may need in-depth consideration beyond the scope of this review. For example, community engagement and cultural adaptation are essential, but the two may overlap for Pasifika. In our assessment, studies reported identifying and working within social constructs (e.g. the chiefs in a village or matai) considering this as cultural adaptation.<sup>72</sup> An intervention cannot be initiated without engagement from the community at large; however, if intervention demand is onerous, disengagement may result. On disengagement, intervention delivery is critical. Pasifika's strong sense of community collectivism<sup>73</sup> may need strong consideration in deciding to deliver solely online interventions, as in the case of Glover et al.<sup>32,33</sup> (although high drop-outs was attributed to crossing the Christmas season). A combination of face-to-face and online delivery may be feasible for Pasifika.

We acknowledge limitations in applying an assessment framework retrospectively. Although the CSAI identified gaps in the design and reporting of interventions, its application across studies of different designs can oversimplify studies to enable comparisons. We also acknowledge limitations to the CSAI components in targeting only sustainability and cultural competence. The CSAI components were identified as relevant and seen as a gap in the existing literature. However, the CSAI can be used with other tools for completeness (such as the ANGELO framework<sup>53</sup>).

### Potential for future research

Our study findings are limited to comparing individual studies which combined several lifestyle and behavioural strategies. As the review is retrospective in nature and strategies were not tested individually, it is beyond the scope of this study to state which strategies are most effective. However, our results confirm tailored lifestyle-based interventions have been effective in reducing weight amongst Pasifika communities, with opportunities for further research.

It was challenging to identify fully described studies with quantitatively measured and reported outcomes in the grey literature search. Perhaps this presents opportunity for the region to benefit from a repository of PIC health-related studies. The Pacific Data Hub may offer such a solution, reducing duplication and research fatigue whilst supporting evidence-based practice in the region.

Our findings highlight the need for tailored interventions in Pasifika communities to go beyond language translations (though still necessary) and incorporate Pasifika social construct considerations, such as using community or peer support facilitators, and potentially

also incorporating psychosocial, behavioural considerations such as motivation goal setting choices and emotional wellbeing. There exist potential opportunities to quantify the social networks that exist within Pasifika communities and to understand frameworks such as the CSAI presents opportunities for a systematic approach to designing and evaluating sustainable and culturally competent interventions.

These findings may be applicable not only for Pasifika communities but also for other ethnic communities with high diabetes prevalence rates where cultural tailoring is required.

### Contributors

Author contributions include conceptualisation, methodology, and visualization by EP with supervision by FM, KAM and DS. Data curation and writing of original draft by EP. Writing, reviewing, and editing carried out by FM, KAM and DS. RT provided statistical validation and RZ RoB validation.

### Declaration of interests

Authors declare no conflict of interest. Where studies in this review were written by authors their assessments were carried out by other authors.

### Data sharing statement

Data for statistical calculations in this review is available on GitHub.

### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.lanwpc.2022.100483](https://doi.org/10.1016/j.lanwpc.2022.100483).

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