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## Culturally responsive approaches to health promotion for Native Hawaiians and Pacific Islanders

Joseph Keawe‘aimoku Kaholokula<sup>1</sup>, Claire Townsend Ing<sup>1</sup>, Mele A. Look<sup>1</sup>, Rebecca Delafield<sup>1</sup>, and Ka‘imi Sinclair<sup>2</sup>

<sup>1</sup>Department of Native Hawaiian Health, John A. Burns School of Medicine, University of Hawai‘i at Mānoa

<sup>2</sup>Initiative for Research and Education to Advance Community Health (IREACH), Washington State University

### Abstract

**Context**—Obesity, diabetes, and cardiovascular disease (CVD) have reached epidemic proportions among Native Hawaiians/Pacific Islanders (NHPI). Culturally responsive interventions that account for their interpersonal, sociocultural, and socioeconomic realities is a public health priority.

**Objective**—To describe cultural adaptation and cultural grounded approaches to developing health interventions for NHPI and to review the culturally responsive approaches used by, and outcomes from, two long-standing community-based participatory research projects (CBPR) in Hawai‘i: PILI ‘Ohana and KāHOLO Projects.

**Methods**—A literature review of 14 studies from these two projects were done to exemplify the methods applied to culturally adapting existing evidence-based interventions and to developing novel interventions from the “ground up” to address health disparities in NHPI. Of the 14 studies reviewed, 11 were studies of the clinical and behavioral outcomes of both types of interventions.

**Results**—Both cultural adapted and cultural grounded approaches using community-based assets and NHPI cultural values/practices led to establishing sustainable and scalable interventions that significantly improved clinical measures of obesity, diabetes, and hypertension.

**Conclusion**—Several recommendations are provided based on the lessons learned from the PILI ‘Ohana and KāHOLO Projects. Multidisciplinary and transdisciplinary research using CBPR approaches are needed to elucidate how human biology is impacted by societal, environmental, and psychological factors that increase the risk for cardiometabolic diseases among NHPI to develop more effective health promotion interventions and public health policies.

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Corresponding author: Joseph Keawe‘aimoku Kaholokula; Department of Native Hawaiian Health; 677 Ala Moana Blvd., Suite 1016, Honolulu Hawai‘i 96826; kaholoku@hawaii.edu.

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The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## Keywords

Native Hawaiians; Pacific Islanders; health promotion; intervention; obesity; diabetes; cardiovascular disease; cardiometabolic

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## Introduction

Obesity, diabetes, and cardiovascular disease (CVD) are interrelated cardiometabolic conditions that have reached epidemic proportions among Pacific Islander populations (Hawley and McGarvey 2015; Mau et al. 2009), people with origins from the Pacific regions known as Melanesia (e.g., Fiji and Vanuatu), Polynesia (e.g., Hawai'i, Sāmoa, and Tonga), and Micronesia (e.g., Chuuk and Guam). The highest rates of obesity and diabetes in the world are found in the Pacific Region (e.g., Nauru, American Sāmoa, and Vanuatu) (Chan et al. 2014). Once healthy and robust populations, their health has been negatively impacted by centuries of colonization and exploitation by foreign powers, leading to cultural loss and economic deprivation (Spickard, Rondilla, and Hippolite Wright 2002). Economic conditions, limited health care and educational opportunities, and the effects of global warming in the Pacific has led to a diaspora of Pacific Islanders to countries such as New Zealand, Australia, and the United States, where they continue to face economic and acculturation-related challenges and discrimination that impact their physical and mental health status (Spickard, Rondilla, and Hippolite Wright 2002; Ahlgren, Yamada, and Wong 2014).

In the United States, Native Hawaiians (NH) and other Pacific Islanders (PI) face discrimination and experience socioeconomic circumstances that place them at risk for cardiometabolic related disorders (Kaholokula, Nacapoy, and Dang 2009). The combined prevalence of overweight and obesity is 73.4% among NHPI, which is 20% greater than non-Hispanic Whites (Schiller, Lucas, and Peregoy 2012). The prevalence of diabetes (Kirtland, Cho, and Geiss 2015) and heart disease is 19% and 19.7%, respectively, among NHPI compared to 5% and 6.6% for non-Hispanic Whites (CDC 2014; Grandinetti et al. 2007; Kirtland, Cho, and Geiss 2015). NHPI also suffer a stroke an average of 10 years younger than non-Hispanic Whites, in part, due to poorer hypertension management (Nakagawa et al. 2012). In Hawai'i, the state with the largest NHPI population in the U.S., they are more likely to live in obesogenic environments (Mau et al. 2008) and experience a decade shorter lifespan than Japanese and Chinese, the longest living ethnic groups in Hawai'i (Wu et al. 2017). Thus, reducing the risk of cardiometabolic disorders in NHPI through the development of health interventions and policies is a public health priority (Cook et al. 2010).

The high prevalence of cardiometabolic disorders among NHPI have been attributed to genetic/biological dispositions (Minster et al. 2016), lifestyle behaviors (e.g., calorie-dense diet and physical inactivity) (Kolonel et al. 2000), socioeconomic deprivation (e.g., lower income and education levels), sociocultural challenges (e.g., colonization and acculturation stressors) (Kaholokula, Nacapoy, and Dang 2009), psychosocial stressors (e.g., discrimination) (Kaholokula, Iwane, and Nacapoy 2010), environmental conditions (Mau et

al. 2008), and complex permutations of these variables (Kirtland, Cho, and Geiss 2015). Health interventions targeting cardiometabolic disorders in NHPI communities need to be culturally responsive and account for their interpersonal, sociocultural, and socioeconomic realities.

In this article, an overview of culturally responsive approaches to health intervention development – cultural adaptation and cultural grounded – in the context of community-based participatory research (CBPR) is first provided. Following is a literature review of studies from two long-standing CBPR projects in Hawai‘i, *The PILI ‘Ohana Project*<sup>1</sup> and the *KāHOLO Project*<sup>2</sup>, that developed health interventions for NHPI using cultural adaptation and cultural grounded approaches. The principles and steps involved in both approaches will be illustrated and the clinical, behavioural, and psychosocial outcomes resulting from these interventions will be discussed. Table 1 summarizes the characteristics and findings of the intervention outcome studies from the two projects reviewed in this article.

## Culturally responsive approaches to health intervention

Health interventions not aligned with the cultural values, perspectives, and preferred modes of living of the target population are presumed to be less effective than culturally responsive interventions that account for these factors (Jumper-Reeves et al. 2014). Most evidence-based interventions (EBI) are developed using Western-centric theories of behaviour change and behavioural strategies tested in samples of predominately non-Hispanic Whites. For example, the Diabetes Prevention Program – Lifestyle Intervention (DPP-LI) is an EBI found effective in reducing a person’s risk for diabetes by addressing excess body weight (Hamman et al. 2006), which has been widely disseminated (Dunkley et al. 2014; Hall et al. 2016; Jiang et al. 2013). However, weight-loss outcomes between ethnic groups have shown to differ given the same EBI targeting their lifestyle behaviors, with non-Hispanic Whites often having better outcomes (Kumanyika et al. 2002; West et al. 2008). These differences in outcomes may be due to cultural differences between ethnic groups not accounted for by an EBI developed and tested with a dissimilar cultural group (Kumanyika 2008; Kumanyika et al. 2002).

Although NHPI share many cultural similarities (e.g., deep ancestral origins, adaptation to island living, family/community orientation, and cultural changes due to occupation by Western powers), especially when compared to European or Asian cultures, there are also many cultural dissimilarities (e.g., language, socio-political structures, and aspirations) that should be considered during intervention development. Okamoto et al. (2014) describes a continuum of approaches in developing culturally responsive health interventions, anchored on one end by cultural adaptation and the other by cultural grounded approaches. Culture as defined by Haynes, Kaholokula, and Tanaka-Matsumi (2018) is “the shared patterns of behaviors and interactions, cognitive constructs, and affects that are learned through a process of socialization and that distinguish members of a group from members of another group.”

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<sup>1</sup>PILI is the Hawaiian word for “to cling to” or “to join together” and the acronym for Partnerships to Improve Lifestyle Interventions. ‘Ohana is the Hawaiian word for “family” to include extended relations.

<sup>2</sup>KāHOLO is a basic hula footwork and used as an acronym for Hula Optimizing Lifestyle Options.

Cultural adaptation is the most common approach to adapting an EBI for a new population; that is, modifying an intervention found efficacious through rigorous scientific study in another population with different cultural characteristics to fit the cultural characteristics of a new population. Essentially, the goal of cultural adaptation is to preserve the core elements of the original intervention while incorporating culturally relevant elements. Adaptations can take the form of surface structure modifications, such as changing the program's name, terms used, and food/eating examples to be culturally specific (e.g., using the native language and metaphors) and geographically local (Castro, Barrera, and Martinez 2004). Adaptations can also take the form of deep-structure changes in which substantial changes are made to the EBI, such as incorporating the new cultural group's perspectives (e.g., worldviews and values) and practices into the core elements (Resnicow et al. 1999).

Cultural grounded approaches are those in which the sociocultural context is at the core of the intervention and elements of the program are based on the worldviews, beliefs, and customs of the target population (Lauricella et al. 2016; Palmer-Wackerly et al. 2014). These types of interventions are referred to as originating from the "ground-up" because they emerge from the cultural group's own worldviews and preferred practices rather than relying solely on Western notions of health promotion (Walters et al. in press). Okamoto et al. (2014) recommended cultural grounded approaches for populations where there is a high need for intervention, the science to inform adaptation is lacking, and there is high scientific and health impact that could result from the development of "ground up" interventions. Ironically, many of the cultural grounded approaches proposed are actually a return to traditional worldviews and practices that were part of everyday life for indigenous communities and a source of their wellbeing prior to Western intrusion. In Pacific cultures, such cultural grounded approaches have involved the use of traditional dances to reduce CVD risk (Look et al. 2012) and dietary patterns for obesity treatment (Shintani et al. 1999) and connecting health to spirituality for improving cancer awareness and screening (Aitaoto et al. 2007).

## **Community-based participatory research approaches in health interventions**

CBPR is an approach to research that equitably and meaningfully involves relevant stakeholders of a specified community, such as its members, leaders, and community-based organizations (e.g., churches, community health centres, and cultural groups), in all aspects of the research; that is, from conceptualization to dissemination (Minkler and Wallerstein 2011). Researchers often define "community" by race/ethnicity, religious or sexual orientation, acculturation and socioeconomic status, and geographic locale. CBPR has been used extensively as a research approach with NHPI communities to address a range of infectious and chronic diseases (Nacapoy et al. 2008; Braun, Allison, and Tsark 2008; Dela Cruz et al. 2016; Chung-Do et al. 2016; Aitaoto et al. 2015).

CBPR is well suited as a research approach to the cultural adaptation of existing EBI (Jumper-Reeves et al. 2014) as well as develop novel cultural grounded interventions (Walters et al. in press). Qualitative approaches to solicit cultural expertise for the adaptation

of an EBI have been used in NHPI communities, such as the use of focus groups with community members, informant interviews with community leaders and health professionals (e.g., elders and gatekeepers), and “windshield tours” of the community infrastructure and resources (Mau et al. 2010). Cultural grounded approaches for intervention development are more challenging because of the intimate cultural knowledge and community involvement needed to design such interventions from the “ground up.” It may require participation by cultural experts as the interventionists (versus informants) because of their particular cultural knowledge and credibility. In the subsequent sections, we describe the process and outcomes of culturally adapting EBIs (PILI ‘Ohana Project) to address obesity and diabetes, and the development of an intervention from the “ground up” to reduce CVD risk (KāHOLO Project) in NHPI communities using a CBPR approach.

## The PILI ‘Ohana Project: Partnerships to overcome obesity disparities

### Project background

The PILI ‘Ohana Project (POP) is a long-standing CBPR initiative to address obesity and diabetes disparities in NHPI communities in Hawai‘i. The POP was funded consecutively for 11-years (2005 to 2016) by the National Institute of Minority Health and Health Disparities (NIMHD) of the National Institutes of Health (NIH). The partnership was originally formed by community leaders and academics from the following non-profit organizations: 1) Hawai‘i Maoli of the Association of Hawaiian Civic Clubs, serving a confederation of 62 clubs across Hawai‘i and the continental U.S., 2) Kula no nā Po‘e Hawai‘i (KULA), serving the education and health needs of the Hawaiian Homestead communities of Papakōlea, Kewalo, and Kalāwahine, 3) Ke Ola Mamo, a Native Hawaiian Health Care System for the island of O‘ahu providing health services to primarily low income Native Hawaiians, 4) Kōkua Kalihi Valley Comprehensive Family Services (KKV) providing health services to immigrant Pacific Islanders and Asians, 5) Kalihi-Pālama Health Centre, a health clinic also serving a predominately Pacific Islanders and Asians, and 6) Department of Native Hawaiian Health in the John A. Burns School of Medicine, a clinical department focusing on health disparities in NHPI. For more details about the POP partnership, see Kaholokula, Kekauoha, et al. (2014) and Nacapoy et al. (2008).

### Key steps to cultural adaptation and development of the intervention

**Establishing an equitable research environment**—Prior to conducting any research, the POP developed a CBPR governance infrastructure overseen by two co-directors, one co-director representing the community and the other representing the academic interests and perspectives, and governed by a Project Steering Committee (PSC) comprising all of the community and academic partners. All members had shared decision-making authority, equal access to financial resources, and met monthly to oversee the projects and its resources. The POP partnership developed and codified the principles and guidelines for overall governance in a document, which described the partnership’s mission and purpose, partners’ roles and responsibilities, decision-making processes, and data ownership.

With the CBPR governance and infrastructure in place, the POP integrated community wisdom with the scientific method to culturally adapt and test two evidence-based

interventions for NHPI communities: 1) the *PILI Lifestyle Program* based on the DPP-LI and 2) *Partners in Care*, a diabetes self-management intervention that integrate the American Diabetes Association (ADA) standards of care into a culturally responsive education intervention.

**Formative data collection to inform intervention adaptation**—The community-based researchers first conducted community-wide assessments of their respective communities (i.e., catchment area or neighbourhood) served by each of the five original participating CBOs to inform the adaptation of the DPP-LI. Consistent with the intent of CBPR in building community capacity, the community partners themselves conducted all assessments with training and assistance from the academic partners. From the perspectives of NHPI living and health professionals working in these communities, the assessment goals were to identify 1) facilitators and challenges to achieving and maintaining a healthy lifestyle, 2) practical health promoting strategies, and 3) existing community resources that could be incorporated into, or help facilitate, a lifestyle intervention.

Face-to-face qualitative data collection methods, such as focus groups and informant interviews, were used primarily because it allows for open-ended questioning and for respondents to share information in their own words. They are important to gathering information needed for adapting existing interventions to a new cultural context while also respecting the preferred information-sharing method of NHPI. They allow the respondent to gauge the intentions of the interviewer and develop rapport. These data collection methods are particularly important here because NHPI often prefer a “talk story” format (i.e., free-flowing information sharing through story telling) consistent with their oral traditions of relaying information in the context of their own lived experiences. It also allows the respondent to determine what they want to share, at the pace they want to share it, and to what degree.

A series of focus groups were convened with 112 Native Hawaiians, Samoans, Chuukese, and Filipinos to elicit their perspectives and ideas. Informant interviews were conducted with 15 community leaders and health professionals working with NHPI, and 206 mail-out surveys of NHPI households were returned of the 500 mailed out to obtain a broader representation of perspectives (Mau et al. 2010). The results of these assessments were aggregated to formulate a multilevel, socioecological conceptual framework specific to NHPI to guide intervention development and adaptation going forward.

Figure 1 depicts the socioecological model and the key common factors identified across Pacific Islander groups at the individual, family, and community level, adapted here from Kaholokula, Kekauoha, et al. (2014). At the individual level, self-efficacy (i.e., a person’s belief in his or her ability to succeed in specific situations or accomplish a task), assertiveness (i.e., ability to state one’s preference to others), past weight loss attempts (i.e., frustration with inability to maintain weight loss efforts), weight loss expectations, and stress management were identified as common issues for NHPI. At the family level, economic and family stressors were identified as major challenges to practicing a healthy lifestyle, such as affording healthier foods and securing childcare while exercising. At the larger social and community level, the safety of neighborhoods, the availability of healthy food options and

physical activity venues, and having community role models were factors related to supporting a healthy lifestyle. The availability of culturally relevant forms of physical activity (e.g., hula and ballroom dancing) and managing cultural expectations regarding eating were culture-related factors either supporting or hindering (e.g., larger portion size expectation) the adoption and maintenance of a healthy lifestyle.

**Cultural adaptation process**—In addition to the community assessments, the community partners of the POP and their staff also reviewed the DPP-LI core curriculum and materials. Based on data from the community assessments and their cultural lens, they provided input to where surface and deep structure modifications should be made to the curriculum foci and materials. The original DPP-LI lessons covered topics and behavioural strategies/activities (e.g., portion control, self-monitoring and goal setting) to lower dietary fat and caloric intake, to increase daily physical activity (e.g., 30 min/day of moderate aerobic exercise such as brisk walking or biking), to manage stress and time for a healthy lifestyle, and to deal with challenging social situations. The core curriculum was informed by the social cognitive theory of behaviour change (Diabetes Prevention Program Research 2002).

Surface structure modifications to the DPP-LI included the use of pictures/images of and familiar to NHPI and words/idioms and food examples specific to NHPI communities as well as those common to local Hawai'i culture. Deep structure changes involved modifications to how the lessons should be delivered (e.g., in groups rather than individually) and by whom (i.e., community peer educators) as well as expanding aspects of the core curriculum to a family and community focused adjunct weight-loss maintenance component. In order to make room for a family and community focused component to the DPP-LI, the community partners reduced the original 16 DPP-LI lessons to eight lessons, but maintained all the original topics, strategies, and foci (i.e., the core components). Two additional topics important to the community partners were added to the adapted DPP-LI, which focused on the economics of healthy eating (i.e., how to eat healthy within your budget) and talking with your doctor (i.e., communicating effectively with your healthcare provider). Kaholokula, Wilson, et al. (2014) provide a summary of the adapted DPP-LI curriculum and its comparison to the original DPP-LI curriculum.

The family and community focused component extended the DPP-LI topics and activities to the family and community environment with the individual participants as the agent of change. The rationale for this component was that the maintenance of long-term weight loss requires a supportive family and community environment as indicated from the community assessments. Studies have demonstrated the importance of a person's social and community environment in influencing his or her lifestyle behaviors (Baranowski et al. 2003). As a weight-loss maintenance component to the culturally adapted DPP-LI, the family and community level factors identified from the community assessments were added into the curriculum. The family and community focused component aimed to help participants elicit support from their friends and family, increase family activities around eating and being active, manage challenging social situations, effectively communicate one's healthy lifestyle goals, and identify and utilize community resources (e.g., parks and farmers markets). Kaholokula, Mau, et al. (2012) provide a summary of the family and community curriculum.

## PILI Lifestyle Program

**Characteristics of the developed intervention**—The adapted DPP-LI and the family and community adjunct component, combined, was named the *PILI Lifestyle Program* (PLP), consisting of two phases. The first phase was the adapted DPP-LI delivered in eight lessons over 3 months covering topics on healthy eating, staying active, and managing stress and difficult social situations (e.g. baby 1<sup>st</sup> year birthday and graduation celebrations) to initiate weight loss. The second phase was the family and community component for weight-loss maintenance developed for pilot testing to consist of six sessions delivered over 6 months. This phase was lengthened in later iterations to 15 and 9 months in additional community and worksite-based implementation, respectively. All lessons were accompanied by a participant workbook or handouts. The participants were supported by a community peer educator in goal setting and developing an action plan to meet their personal healthy lifestyle goals and those of their family. The weight loss goal of the PLP was a modest 3% (for pilot testing) to 5%. In addition to weight loss and other clinical outcomes, the community investigators also believed it was important to focus on improving physical functioning because of its impact on other aspects of quality of life (i.e., social functioning). The PLP materials can be viewed and downloaded at <http://www2.jabsom.hawaii.edu/pili/>.

Having the PLP delivered by NHPI community peer educators was part of the pursuit to develop a culturally responsive intervention and to enhance community capacity for sustainability. Studies have shown that community peer educators are as effective as health professionals (e.g., nurses and social workers) in delivering a lifestyle intervention to include the DPP-LI (Ali, Echouffo-Tcheugui, and Williamson 2012). Community peer educators are better able to provide the sociocultural context for an intervention curriculum to ensure relevance and applicability and to serve as relatable role models for community participants. They are part of the community and, in many cases, know the participants and their families intimately.

**Outcome studies of the PILI Lifestyle Program**—The adapted DPP-LI phase of the PLP was first pilot tested in the five partnering CBOs with 169 NHPI participants with excess body weight (Body mass index [BMI]  $\geq 25$  or  $\geq 23$  for Filipinos), of which 52% were NH, 27% Chuukese, 12% Samoan, 5% Filipino, and 3% Other Pacific Islander/Non-NHPI (Mau et al. 2010). Pre- and post-3-month intervention assessments indicated significant weight loss and improvements in systolic and diastolic blood pressure, physical functioning, exercise frequency, and dietary fat consumption. Table 2 provides the data for the key clinical and behavioural outcomes in the first column. Furthermore, weight loss was significantly higher among NHPI participants who completed all lessons in the PLP weight-loss phase (−1.8kg) compared to those who did not (−0.70kg).

Since the initial testing, the adapted DPP-LI phase of PLP has been examined in other studies to address excess body weight to include another community-based sample of 239 NHPI (Kaholokula, Kekauoha, et al. 2014), a sample of 217 employees (majority NHPI) as part of a worksite lifestyle intervention called, PILI@Work (Townsend et al. 2016), and a sample of 343 NH who were part of a dissemination project across Hawai'i (Delafield 2016). With the exception of a few sites that used health professionals (e.g., psychology

interns and nutritionists), trained community or worksite peer educators, for the most part, delivered the intervention in groups ranging from eight to 20 and in their respective CBO sites or worksites. Table 2 summarizes the key outcome data across these different studies regarding the 3-month adapted DPP-LI. Significant pre-post weight loss was achieved, ranging from -1.7 kg to -1.2 kg. There were also significant improvements in systolic and diastolic blood pressure, physical functioning, exercise frequency, and dietary fat consumption. Within each study, there were differences across CBO sites (or worksites) in the degree of improvements in these outcomes (data not shown in Table). The CBOs with predominately NH participants (compared to heterogeneous groups of PI participants) and the intervention groups that were ethnically homogenous (i.e., all participants of the same Pacific Islander ancestry) had greater weight loss (Kaholokula, Wilson, et al. 2014). These findings speak to the importance of ethnic specific sociocultural support and context for positive behaviour change.

To test the weight-loss maintenance efficacy of the 6-month family and community phase of the PLP, 144 NHPI who completed the adapted DPP-LI in the original study (Mau et al. 2010), and were willing to continue on, were randomized to either receive the PLP family and community intervention (n = 72) or to a standard behavioural follow-up (n = 72) (Kaholokula et al., 2012). The latter included once a month phone calls and mailers to follow-up with participants on the adapted DPP-LI lessons and as a check-in. Among the participants who completed at least three of the six PLP lessons, they were 5.1 fold more likely to have maintained their initial weight loss than those of the standard follow-up group (n = 72). Again, the finding of attending and receiving all lessons as prescribed in increasing weight loss success speaks to the importance of dose effects in behavioural interventions (Greaves et al. 2011).

In a subsequent study, the 6-month family and community component of the PLP was expanded to 15 months with 17 lessons in total to increase its focus on the social environment (Kaholokula et al. 2016). After completing the adapted DPP-LI component, participants (n=239) were randomized to either receive this 15-month intervention in groups delivered by a community peer educator, or to receive the same intervention individually delivered by DVD technology, or to a control group. The control group received monthly mailers (18 mailers over the 15-months) with educational information on healthy living (e.g., benefits of a healthy diet, physical activity, and time management). The DVD version was developed to address the challenge of many NHPI participants in being able to make fixed face-to-face lessons at pre-specified times because of shift work or other work-related issues. The results showed no significant differences amongst the two intervention groups and control group in weight-loss maintenance at 12 and 18 months from starting weight loss efforts (i.e., baseline). Participants of the control group were just as likely to have maintained their initial weight loss compared to those who received the intervention regardless of delivery mode. However, greater weight loss during the 3-month adapted DPP-LI phase predicted significantly greater weight loss at both 12- and 18-month follow-up for all participants. A bulk of the weight loss actually occurred during the adapted DPP-LI phase. Other studies have also shown the importance of early weight loss success for longer-term weight loss maintenance (Unick et al. 2015; Thomas et al. 2015).

The family and community component of the PLP was adapted to a 9-month version as a worksite-based intervention to be inclusive of co-workers influence and the work environment. After completing the 3-month adapted DPP-LI, worksite cohorts (n =22 from 15 different worksites) were randomized to receive the intervention either from a worksite-peer educator in a group setting or by DVD technology individually (or with other co-workers). Of the 217 participants across all 15 worksites who completed the adapted DPP-LI, 83 received the face-to-face version and 73 received the DVD version. As in the previous POP intervention study, results showed no significant difference between the two intervention groups in continued weight loss or weight loss maintenance. Attendance during the 3-month adapted DPP-LI and higher baseline systolic blood pressure were both significantly associated with increased percent weight loss at 12-month follow-up.

When considering the combined effects of both phases of the PLP, it was found that 51% of NHPI who received the 9-month version of PLP (i.e., 3-month adapted DPP-LI plus 6-month family/community phase) lost 3% or greater of their initial body weight compared to 31.4% of those who received the 3-month adapted DPP-LI combined with the 6-month standard behavioural follow-up (Kaholokula et al. 2013). For NHPI in both groups, greater 3-month weight loss significantly increased the likelihood of reaching 3% or greater weight loss at 9-month follow-up. Furthermore, Chuukese participants were more likely to achieve  $\geq 3\%$  weight loss at 9 months than Native Hawaiians and other Pacific Islanders. Although not specifically examined, the greater weight loss of Chuukese participants might be related to the close-knit nature of this group being recent immigrants to Hawai'i who rely on each other for economic and social support. The community peer educators did observe that they would engage in group-related activities with other participants outside of the intervention lessons.

### Summary of the PILI Lifestyle Program

Findings from the PLP studies reviewed here show that significant, albeit modest weight loss, and improvements in other clinical and behavioural factors related to body weight among NHPI are achievable with a culturally adapted EBI aimed at lifestyle behaviors. NHPI who lost more weight early on in the intervention were more likely to achieve longer-term weight loss and weight-loss maintenance success, which was a consistent finding across several studies. Aside from early weight loss success, other factors were also found to be significant correlates of weight loss in NHPI. For example, Townsend et al. (2016) found that improvements in locus of weight control (toward internal locus), physical activity, and perception of community support were associated with three-month weight loss. However, Townsend et al. (2014) found that eating self-efficacy level at baseline was associated with 12-month weight loss. The focus of future studies with NHPI should be on developing strategies to achieve greater weight loss sooner (i.e., first three months) in a lifestyle intervention for NHPI with excess body weight – perhaps by addressing locus of weight control and eating self-efficacy early on in an intervention to increase long-term motivation.

In further understanding the significance of these findings, it is important to note that the PLP, for the most part, was delivered by lay community members with no prior experience in health promotion and to a NHPI population that were mostly in the severe obesity range

(BMI > 35), an often difficult population to reach. Studies of the original DPP-LI found that for every kilogram of excess body weight a person loses reduces his or her risk for diabetes by 16% (Hamman et al. 2006). It was the original intent of the POP partnership to make the PLP a low-to-moderate intensity lifestyle intervention to increase its reach and sustainability across different community settings with limited resources. Thus, PLP offers the promise of improving obesity and its related chronic diseases in NHPI populations.

### **Partners in Care: A diabetes self-care intervention**

Partners in Care, the second EBI culturally adapted by POP, was designed as a community-based behavior change intervention for NHPI that integrates the ADA standards of care into culturally responsive diabetes self-management education to promote self-care activities. Partners in Care includes a curriculum that promotes healthy eating and physical activity, glucose monitoring, social support, and medication adherence, with an overall goal of improving blood sugar levels as measured by a hemoglobin A1C (A1C) test to reduce and/or prevent diabetes-related complications (Sinclair et al. 2013).

**Formative data collection**—The Partners in Care curriculum was previously designed and evaluated with American Indians in the Southwest (Gilliland et al. 2002) and African Americans and Latinos in Detroit (Two Feathers et al. 2005a; Two Feathers et al. 2005b). Prior studies with these populations resulted in statistically significant improvements in A1C using a quasi-experimental design to test its effectiveness. To adapt the intervention for NHPI, four focus groups were conducted with 38 community members served by four of the participating CBOs of POP. The purpose of the focus groups was to identify factors that both facilitate and impede self-management of diabetes; knowledge of diabetes-related complications and prevention; interest in a group-based educational intervention; and views about who should deliver the intervention.

Major focus group themes that emerged included difficulties in adhering to a healthy diet and physical activity regimen to control blood sugar, side effects of diabetes medications, prevention of diabetes-related complications, how to better communicate with healthcare providers, and family and friends, how stress affects blood glucose control, and how to interpret HbA1C results. Many of these topics were similar to reported those reported by the other populations and thus were already included in the curriculum. Therefore, minimal adaptations were required for the self-management recommendations and behavior change strategies. The PSC members and community peer educators from the participating communities who were trained to deliver the intervention also contributed local and cultural knowledge during adaptation by reviewing written materials and making suggestions for visuals and hands-on activities.

**Cultural adaptation process**—Both surface and deep structure modifications were made to the curriculum. Images of Hawai'i, local foods, physical activities, and NHPI persons were included to convey relevance to participants. Peer educators used "local" language, analogies, and examples to convey some of the educational content. By using a culturally relevant context to discuss behavior change, the information about diabetes self-management becomes more meaningful for the participants (Kreuter et al. 2003). These sociocultural

strategies presented diabetes in the context of cultural values and characteristics of the participants and were incorporated into the intervention to increase salience. For example, a story depicting local characters at the beginning of each lesson helped to reinforce the tradition of families and communities working together and facilitated the sharing of participants' personal stories of diabetes and its management. Storytelling allowed the peer educators to use metaphors to link the participant's situation to effective self-management behaviors. For centuries, preliterate Pacific Islanders have told stories to transmit information, share histories, and teach important lessons, which continues to be a preferred form of communication among many NHPI today referred to as "talk story". Research findings suggests that a person's brain naturally seeks out a coherent narrative structure in the stories we hear and tell. This structure helps individuals absorb the information in a story, and connect it with their own experiences in the world (Green 2004; Green, Strange, and Brock 2002). At the end of each Partners in Care lesson, participants were asked to set a goal that was related to the topic of the lesson. The peer educator devoted time for participants to discuss successes and challenges to achieving their goals at each subsequent meeting.

**Characteristics of adapted Partners in Care**—Curriculum materials emphasized American Diabetes Association clinical guideline goals for blood glucose (as measured by A1C), blood pressure, and cholesterol management (American Diabetes Association 2013). Social cognitive theory provided the conceptual foundation for Partners in Care with an emphasis on self-efficacy, emotional coping response, behavioral capability, and self-control procedures. Social cognitive theory constructs (Bandura 1986; Baranowski, Perry, and Parcel 1997) were combined with values, norms, cultural symbols and themes, and relationships to promote self-care activities. In total, Partners in Care included 12 lessons delivered over 12 weeks.

**Outcome studies of adapted Partners in Care**—To evaluate Partners in Care with NHPI, a randomized controlled trial design was used in which 48 participants were assigned to the Partners in Care intervention and 34 to a waitlist control group (Sinclair et al. 2013). Partners in Care was superior to waitlist control in improving A1C at 3-month follow-up based on both an intent-to-treat (−1.1 vs. −0.3) and complete case analyses (−1.6 vs. −0.3). Additionally, Partners in Care participants significantly improved their understanding of diabetes and performing diabetes self-management compared to the waitlist control group. In post-intervention surveys, 97% reported high satisfaction with the curriculum and activities and 91% reported that the classes and materials were useful, applicable, and culturally appropriate. Participants also appreciated the peer educators and reported that group classes provided an opportunity for social support.

To explore the impact of social support on the maintenance of Partners in Care outcomes, a subsequent study examined the effects of a diabetes-specific social support group delivered after completion of Partners in Care compared to a control group that only received Partners in Care (Ing et al. 2016). Participants (n=47) first completed the 3-month Partners in Care and then were randomized to either a 3-month, 6-session social support group (n = 25) or a control group (n = 22). At 3-month assessment, receiving the Partners in Care intervention

led to significant decreases in A1C and increases in diabetes-related self-management knowledge and behaviors. However, there were no significant differences in A1C between the social support group and control group from 3-month to 6-month follow-up. Although, participants in the social support group had a significant decrease in their mean systolic blood pressure from 3-month to 6-month assessment while the control group did not.

### Summary of Partners in Care

The Partners in Care study demonstrated that an appropriately designed, community-based intervention requiring little technology and few health care resources could have positive effects on self-care behaviors and glycemic control among NHPI with type 2 diabetes. If the significant improvement in glycemic control (e.g., 1% reduction in HbA1c) can be sustained, the Partners in Care intervention has the potential to reduce microvascular (e.g., diabetic neuropathy) and macrovascular complications (e.g., CVD), and health care utilization costs (United Kingdom Prospective Diabetes Study Group. 1998; Wagner 2001; Stettler et al. 2006). With the high prevalence of diabetes-related morbidity and mortality among NHPI, a significant need exists for improvement in methods of reaching people with diabetes that are culturally responsive and have been systematically developed, implemented, and evaluated.

## The KāHOLO Project: Preventing cardiovascular disease

### Background

The KāHOLO Project builds on a decade of collaboration between NH communities, NH cultural experts, and biomedical scientists to understand how *hula*, the indigenous dance of NH, can be used as a cultural grounded intervention to address CVD (Kaholokula, Look, Wills, et al. 2017). The KāHOLO Project is a five-year study funded by the National Heart, Lung, and Blood Institute (NHLBI) of NIH to evaluate the efficacy of a hula-based intervention on systolic blood pressure (SBP) to reduce CVD risk in NH with poorly managed hypertension and to elucidate the underlying sociocultural and psychosocial mechanism underlying these improvements. In subsequent sections, the preliminary work and studies that led to the KāHOLO Project will be reviewed to exemplify steps undertaken to develop a cultural grounded approach to health promotion program for NHPI.

### Key steps to developing a cultural grounded intervention

**Cultural grounding process and rationale**—In many traditional Pacific Islander cultures, including NH, dance is used to visually convey and recount their oral tradition, epic tales, historical events, and connection to the natural world (Kaeppler 1993; Stillman 1998). Hula continues to be practiced by NH as a form of cultural and creative expression that reconnects them with their native language, values, history, and ancestral lands. Often misperceived solely as entertainment for tourists, it is the most prolific of all NH cultural practices performed by men and women of all ages and other people from diverse ethnicities. Presentations of hula are often included in community gatherings, school events, family get-togethers as well as festivals and theatric performances. *Kumu hula* (hula experts) are the educators and guardians of the hula tradition recognized as important cultural resources. While hula can be taught within families or through casual lessons, formal

training is undertaken through numerous *hālau hula* (hula schools) where hula and cultural education, including NH language and traditional protocols and practices, are perpetuated.

A decade ago, in response to the priority placed on CVD research by NHPI community leaders, scientists from the University of Hawai‘i, and the cultural practitioners of hula formed a CBPR partnership to develop and evaluate a cardiac rehabilitation program based on hula (Look et al. 2012). Because this was the first time hula was used as part of a biomedical research study, it was critical to establish how this dance form should be utilized in a health intervention that was both culturally appropriate and clinically relevant. The research team purposely included members with a background in both biomedical research and hula. Mixed-method studies were performed to gather community and cultural perspectives and the clinical applicability of hula as a health promotion strategy. These foundational studies included informant interviews with six prominent kumu hula and focus groups with 17 NHPI with CVD to assess acceptability and collect cultural insights on utilizing hula in a CVD intervention (Look et al. 2012; Look et al. 2014). The results across these groups were consistent in that hula was believed to have significant health benefits beyond simply as a form of physical activity. Hula was seen as a means to preserve a strong NH identity and to overall wellbeing because it was seen as promoting emotional, social, and spiritual wellbeing through its focus on language, cultural values, and connection to others persons and the natural world.

Most important to the development of a cultural grounded intervention, such as hula as a cultural practice, is the active involvement of cultural experts. In this case, the kumu hula community needed to be actively engaged and incorporated as part of the research team to ensure cultural fidelity and acceptability through all stages of development and testing. Kumu hula Māpuana de Silva of *Hālau Mōhala ‘Ilima*, a renowned school of hula and cultural arts, served as the study’s cultural expert who participated in all aspects of development from conceptualization to the various stages of its development and testing. She assisted in standardizing the hula training while ensuring its cultural integrity (de Silva et al. 2017). Another noted kumu hula, Cy Bridges, served on the external scientific advisory committee to provide an objective perspective of the use of hula for health promotion and to also ensure cultural integrity.

**Cultural practice and science integration**—To test the benefits of hula as a physical activity, a metabolic equivalence test (MET) of hula was conducted to determine its physical activity benefits. Nineteen elite hula dancers were recruited to determine the MET values for various forms, intensities, and styles of hula measured with a portable indirect calorimetry device (Usagawa et al. 2014). It was found that the mean MET were 5.7 (range 3.17–9.77) and 7.55 (range 4.43–12.0) for low-intensity and high-intensity hula, respectively, which met national guidelines for recommended exercise levels.

Based on these initial studies, and under the cultural leadership of kumu hula de Silva, the hula intervention called, *Ola Hou i ka Hula* (restoring health through hula; referred to a Ola Hou from here on), was developed as a 12-week program consisting of two 60-min hula training per week and three hours of hypertension education. The hula classes were led by a kumu hula that received training on research requirements, maintaining cultural integrity of

the hula lessons, and health safety awareness (i.e., hydration). The hypertension education curriculum was delivered over six, 30-min sessions immediately after the 60-min hula sessions from week 2 through week 7 adapted from previously developed materials from heart failure study of NHPI (Mau et al. 2014). The curriculum included four modules: (1) signs and symptoms of hypertension, (2) managing medication, (3) heart healthy eating to include sodium reduction, and (4) physical activity and managing negative emotions. Community peer educators led the education sessions and brief interactive activities, such as cooking demonstrations of healthy recipes of NHPI ethnic foods and practicing of self-monitoring and stress management strategies.

**Initial outcomes study of Ola Hou i ka Hula**—Although conceptualized originally as a cardiac rehabilitation program, the idea of using hula for health promotion was applied to hypertension management for NHPI (Kaholokula, Look, Mabellos, et al. 2017). Two of the POP original community partners, KKV and KULA, participated in a pilot study to test the feasibility and initial efficacy of Ola Hou in improving SBP management in NHPI with poorly controlled hypertension (SBP  $\geq$  140 mmHg). Community peer educators recruited and enrolled 55 NHPI (i.e., Native Hawaiians and Chuukese) who were randomized within each of the two CBO sites to either receive Ola Hou i ka Hula (n = 27) or to a waitlist intervention control group (n = 28). Kumu hula who resided in their communities were recruited to deliver the hula lessons while community peer educators delivered the education lessons. The findings indicated that participants of the hula intervention significantly reduced their SBP compared to control (−18.3 vs. −7.6 mmHg, respectively) from baseline to 3-month post-intervention follow-up. In both groups, the improvement in SBP was associated with improvement in reports of bodily pain and social functioning.

### Summary of Ola Hou i ka Hula

The findings for the pilot trial of Ola Hou was very promising in showing a significant positive effect on improving SBP in NHPI with hypertension. Although hula is a NH practice, Pacific Islanders of Chuukese descent with hypertension were just as likely to benefit from the hula intervention as were NH. There was no ethnic difference in its effects on SBP reductions. Hula also appeared to resonate with the Chuukese participants as a cultural practice probably because of shared Pacific Islander values, such as enhancing connectedness to other participants and to the natural world around them. Also worth noting is that perceptions of ethnic discrimination decreased for both NH and Chuukese participants who underwent the intervention. Previous studies have linked perceptions of discrimination to hypertension (Kaholokula, Iwane, and Nacapoy 2010) and to indices of physiological stress (Kaholokula, Grandinetti, et al. 2012). A cultural grounded intervention, such as hula, could have more than just clinical benefits but sociocultural benefits as well. The latter benefit is consistent with how NHPI participants of the formative studies conceptualized health and wellbeing as being more than physical/clinical in nature, but also involving social, cultural, and spiritual aspects.

A larger clinical trial is currently underway to definitively establish the efficacy of Ola Hou in improving SBP control as well as CVD risk (based on Framingham Risk Scores) in 250 NH adults with poorly managed hypertension as part of the KāHOLO Project. An additional

3-month maintenance component, based on self-regulation theory, was added to the 3-month Ola Hou program to improve its long-term effects on SBP control. The underlying sociocultural and psychosocial mechanism by which the intervention works to improve SBP control and reduce CVD risk will also be examined.

## Conclusion

NHPI are distinct racial and ethnic populations with unique and rich cultural perspectives, traditions, and aspirations that differ from those of Western-European populations, the cultural group for which many EBI for health promotion favor. Both cultural adaptation of existing EBI and the development of cultural grounded interventions are necessary to “close the gap” in cardiometabolic inequities between NHPI and other ethnic groups across the Pacific and in the Western countries in which they reside. To close this gap, and to improve health promotion efforts, it will take a more deliberate and multidisciplinary approach with active involvement by NHPI communities at all stages of development and testing, as illustrated by the health interventions reviewed here, the PILI ‘Ohana Project and the KāHOLO Project. Also illustrated was how NHPI community peer educators can be very effective in delivering a health intervention in their respective community settings. Although not reviewed in this article, the involvement of NHPI communities from the beginning, and in the intervention delivery itself, is also critical to expedite the dissemination and implementation of these interventions into CBO serving NHPI (Delafield et al. 2016).

As a summary to the key strategies and lessons learned from the two projects reviewed here, the following recommendations to cultural adaptation and cultural grounded approaches for NHPI communities are provided.

- A CBPR approach based on stakeholder engagement and participation across all phases of research (from conceptualization to implementation and evaluation), as investigators and advisors, is necessary to effectively develop and test the efficacy of adapted EBI and interventions developed from the ground up.
- For cultural adaptation of EBI, the core curriculum should undergo deep-structure modifications, in addition to surface structure modifications, to be truly culturally responsive.
- Formative research using qualitative approaches (i.e., focus groups and semi-structured interviews) to gather information for intervention adaptation or design is necessary for gleaning the cultural values, practices, and other contextual factors that facilitate health promotion; how they can be incorporated into or adapted for an intervention; and how to best deliver and evaluate the intervention. These data collection methods are also congruent with the preferred method of information sharing of Native Hawaiians and Pacific Islanders as well as an opportunity for relationship building.
- In addition to or in the absence of relevant published literature, formative research can also assist in developing a conceptual model to guide intervention development (e.g., foci and behavioral strategies) and evaluation (e.g., potential mediators and moderators of the intervention and desired outcomes). The

evaluation plan should also consider measuring factors important to Native Hawaiian and Pacific Islander communities.

- Native Hawaiians and Pacific Islanders are culturally diverse and “one size” may not fit all. An intervention can include cultural elements common to multiple Pacific groups or be Pacific group specific. For the former case, it is important to identify and incorporate these common cultural elements in an intervention and evaluate how the different Pacific Islander groups respond to the intervention.

Notwithstanding, continued efforts need to be made that are both multidisciplinary and transdisciplinary in nature and based on CBPR approaches to elucidate how human biology interacts with or is impacted by societal, environmental, and psychological factors that place NHPI at a greater risk for cardiometabolic related diseases. For example, the emerging field of epigenetics (i.e., the study of changes in humans due to modification of gene expression in response to environmental factors) could help to explain the underlying mechanism (e.g., chronic inflammation due to chronic activation of the human stress response) of cardiometabolic disease risk in NHPI (Ko’omoa and Maunakea 2017). Advances in epigenetics, and other areas such as the science involving behavior change theories relevant to NHPI, will likely inform the development of more effective and culturally responsive health promotion strategies and public health policies that target important modifiable biological, behavioral, and environmental protective and risk factors. As an ancient Hawaiian proverb states, *‘A‘ohe pau ka ‘ike i ka hālau ho‘okahi*, which translates as *Not all knowledge is learned from one school* (Pukui 1983).

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## Biographies

Joseph Keawe’aimoku Kaholokula, Ph.D. is a Professor and Chair of Native Hawaiian Health in the John A. Burns School of Medicine at the University of Hawai‘i at Mānoa. He serves as the principal investigator for the PILI ‘Ohana Project and the KāHOLO Project. His community-based participatory research (CBPR) involves developing and testing community-based health programs to address cardiometabolic health inequities experienced by Native Hawaiians and other Pacific Islanders and identifying the biological, behavioral,

and psychosocial factors that affect their risk for cardiometabolic-related diseases (e.g., diabetes and heart disease).

Claire Townsend Ing, Dr.PH, is an Assistant Professor in the Department of Native Hawaiian Health in the John A. Burns School of Medicine at the University of Hawai‘i at Mānoa. She previously served as project coordinator for the PILI ‘Ohana Project, as is currently a junior investigator with both the PILI ‘Ohana Project and the KāHOLO Project. Dr. Ing’s interests include the use of a community-based participatory research approach to identify, understand, and address multilevel determinants of health disparities in Native Hawaiian and other Pacific Islander communities.

Mele Look is Director of Community Engagement in the Department of Native Hawaiian Health in the John A. Burns School of Medicine at the University of Hawai‘i at Mānoa. She founded and facilitates the Ulu Network, a cardiometabolic health community coalition which has grown to 30 community-based organizations with over 70 sites that serve Native Hawaiians and other Pacific Peoples across Hawai‘i and the continental U.S. She has been an investigator on the HELA, and Ola Hou pilot study and with the KāHOLO Project. Her research includes pioneering studies in the area of Native Hawaiian mortality and recently has been focusing on initiatives that merge cultural practices and health objectives.

Rebecca Delafield’s research focuses on health disparities in Native Hawaiian and other Pacific Islander populations. She received her MPH from the University of North Carolina at Chapel Hill. She is currently a doctoral student at the University of Hawai‘i Office of Public Health Studies in the Community-based and Translational Health Research program and a research coordinator in the Department of Native Hawaiian Health (DNHH) at the University of Hawai‘i, John A. Burns School of Medicine

Ka’imi Sinclair, PhD, MPH is an Assistant Professor in the College of Nursing and the Initiative for Research and Education to Advance Community Health at Washington State University. In her prior work in the Department of Native Hawaiian Health, she was the project lead of the Partners in Care study. Dr. Sinclair is the principal investigator of several NIH funded diabetes and hypertension management interventions with Native Hawaiians and Pacific Islanders residing in Washington State. She also works with American Indian communities across the U.S. using a community based participatory approach to address cardiometabolic disparities.

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**Figure 1.** Socioecological model for Health Promotion in NHOPI communities modified from Kaholokula et al. 2014

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**Table 1** Characteristics of the intervention outcomes studies from the PILI ‘Ohana and KaHOLO Projects reviewed.

Source	Participants	Target condition	Design	Intervention	Key Findings
Mau et al. 2010	169 NHOPI adults with BMI ≥ 25 <ul style="list-style-type: none"> <li>NH 52%</li> <li>Chuukese 27%</li> <li>Samoaan 12%</li> <li>Filipino 5%</li> <li>OPI 1%</li> <li>Non-OPI 2%</li> </ul>	Overweight/obesity	Pre-post evaluation; CBPR	PLP’s 3-month culturally adapted DPP-LJ phase	Mean weight loss was -1.5 kg (95% CI -2.0, -1.0) at 3-months, with 26% losing >3% of their baseline weight. Mean weight loss among those who completed all 8 lessons was significantly higher (-1.8 kg, 95% CI -2.3 -1.3) than those who completed less than 8 lessons (-0.70 kg, 95% CI -1.1, -0.29).
Kaholokula et al. 2012	144 NHOPI adults with BMI ≥ 25 <ul style="list-style-type: none"> <li>NH 52%</li> <li>Chuukese 26%</li> <li>Samoaan 11%</li> <li>Filipino 7%</li> <li>OPI 3%</li> <li>Non-OPI 3%</li> </ul>	Overweight/obesity	RCT; CBPR	PLP’s 6-month family and community focused WLM phase (n=72) vs. standard behavioral follow-up group (SBG; n=72)	Participants of both groups achieved significant weight loss maintenance ( $p \leq .05$ ) after completing the 3-month CA DPP-LJ. PLP participants who completed at least half of the prescribed sessions were 5.1-fold (95% CI = 1.06, 24; $p = .02$ ) more likely to have maintained their initial weight loss than SBG participants.
Sinclair et al. 2012	82 NHOPI adults with type 2 diabetes and A1c ≥ 7%	Diabetes	RCT; CBPR	3-month culturally adapted PIC program (n = 48) vs. waitlist control (n = 34)	Significant baseline adjusted differences found at 3 months between PIC and waitlist control group in intent-to-treat (-1.6 vs. -0.3; $p < 0.001$ ) and complete case analyses (-1.1 vs. -0.3; $p < 0.0001$ ) for A1c and in diabetes understanding and in performing diabetes self-management.
Kaholokula et al. 2013	100 NHOPI adults with BMI ≥ 25 <ul style="list-style-type: none"> <li>NH 71%</li> <li>Chuukese 22%</li> <li>OPI 22%</li> </ul>	Overweight/obesity	Observational; CBPR	9-month PLP and SBG	Ethnicity, sex, initial weight loss, fat in diet at baseline, change in SBP, and intervention type were associated ( $p \leq .05$ ) with ≥ 3% weight loss at 9 months. Adjusted for other variables, Chuukese (OR = 6.04; CI = 1.14-32.17), participants with greater weight loss in the 1 <sup>st</sup> 3-months (OR = 1.47; CI = 1.22-1.86), and those who were in the PLP (OR = 4.50; CI = 1.50-15.14) were more likely to achieve ≥ 3% weight loss at 9 months.
Kaholokula et al. 2014	239 NHOPI adults with BMI ≥ 25 <ul style="list-style-type: none"> <li>NH 52%</li> <li>Chuukese 9%</li> <li>Samoaan 7%</li> <li>Filipino 5%</li> </ul>	Overweight/obesity	Pre-post evaluation; CBPR	PLP’s 3-month culturally-adapted DPP-LJ phase	Significant improvements in weight (-1.7kg ± 3.5), SBP (-3.3 mmHg ± 18.6), DBP (-3.4 mmHg ± 12.5), physical functioning measured by 6 min walk test (106.6 ft ± 238.4), exercise frequency, and fat in diet were found. Larger baseline weight ( $p = .002$ ) and type of CBO ( $p = .007$ ) delivering the intervention predicted weight loss. CBO with predominately NH and ethnically homogenous intervention groups had greater weight loss.

Source	Participants	Target condition	Design	Intervention	Key Findings
Townsend et al. 2014	<ul style="list-style-type: none"> <li>• OPI 1%</li> <li>• Non-OPI 7%</li> </ul> <p>112 employees of 10 NH serving organizations with BMI <math>\geq 25</math></p> <ul style="list-style-type: none"> <li>• NHOPI 60%</li> <li>• Other 40%</li> </ul>	Overweight/obesity	Preliminary pre-post evaluation; CBPR	PLP's 12-month culturally-adapted DPP-LI and family and community WLM (workplace version)	Significant improvements in weight ( $-1.86\text{kg} \pm 4.16$ ), physical functioning measured by 6 min walk test ( $93.37 \text{ ft} \pm 145.47$ ), exercise frequency, fat in diet, weight locus of control, eating self-efficacy, and family support were found at 12-month follow-up. Eating self-efficacy at baseline was associated with weight change at 12-month from baseline ( $p < 0.001$ ).
Townsend et al. 2016	<p>217 employees of 15 NH serving organizations with BMI <math>\geq 25</math></p> <ul style="list-style-type: none"> <li>• NH 38%</li> <li>• OPI 21%</li> <li>• Asian 21%</li> <li>• Caucasian 14%</li> <li>• Other 2%</li> </ul>	Overweight/obesity	Pre-post evaluation; CBPR	PLP's 3-month culturally-adapted DPP-LI phase (workplace version)	Significant improvements in mean weight loss ( $-1.2 \text{ kg} \pm 2.63$ ), BMI ( $-0.45 \pm 0.97$ ), SBP ( $-2.8 \pm 12.5$ ), DBP ( $-2.01 \pm 8.05$ ), physical functioning 6 min. walk test ( $74.65 \pm 154.71$ ), fat in diet scores, physical activity level, family support, and eating self-efficacy were achieved at 3-month follow-up. Baseline weight and change in DBP, physical activity level, community support, and locus of weight control were independently and significantly associated with 3-month weight loss.
Ing et al. 2016	<p>47 NHOPI adults with type 2 diabetes and A1c <math>\geq 7\%</math></p> <ul style="list-style-type: none"> <li>• NH 57%</li> <li>• Micronesians 34%</li> <li>• Filipino 4%</li> <li>• Other 4%</li> </ul>	Diabetes	RCT; CBPR	3-month culturally adapted PIC program and randomization to either SSG (n = 25) or control (n = 22)	Significant improvements in HbA1c ( $-0.76 \pm 1.86$ ), diabetes-related self-management knowledge ( $0.73 \pm 0.97$ ), and self-management behaviors ( $-1.1 \pm 21.87$ ). While the SSG group had a significant decrease in systolic blood pressure from 3- to 6-month assessment and the control group did not, there were no significant differences across the groups.
DeLafield et al. 2016	<p>343 NHOPI adults with BMI <math>\geq 25</math></p>	Overweight/obesity	Pre-post evaluation; CBPR	PLP's 3-month culturally adapted DPP-LI phase	Significant overall (N=343) improvements in mean weight loss ( $-1.4 \text{ kg} \pm 3.41$ ), BMI ( $-0.51 \pm 1.23$ ), SBP ( $-3.89 \pm 17.19$ ), DBP ( $-2.36 \pm 11.38$ ), physical functioning 6 min. walk test ( $111.54 \pm 277.99$ ), fat in diet scores, and physical activity level were achieved at 3-month follow-up.
Kaholokula et al. 2017	<p>240 NHOPI adults with BMI <math>\geq 25</math></p>	Overweight/obesity	RCT; CBPR		Participants of both PLP groups who lost $\geq 3\%$ at start of WLM efforts were significantly ( $p < .05$ ) more likely to lose $\geq 5\%$ at 12- (44% for GS; 56% for DVD) and 18-month follow-up (57% for GS; 43% for DVD) follow-up than those who started at $< 3\%$ initial weight loss. There was no significant difference amongst the control participants in their continued weight-loss efforts between those who lost $\geq 3\%$ versus those who lost $< 3\%$ .
Kaholokula et al. 2017	<p>55 NHOPI adults with uncontrolled hypertension (SBP <math>\geq 140 \text{ mmHg}</math>)</p> <ul style="list-style-type: none"> <li>• NH 49%</li> <li>• OPI 46%</li> </ul>	Hypertension	RCT with waitlist control; CBPR	Ola Hou i ka Hula program (n = 27) vs. waitlist control (n = 28)	Significant differences found between participants of the hula program (Ola Hou i ka Hula) and those in the waitlist control group in SBP improvements ( $-18.3 \text{ vs. } -7.6 \text{ mmHg}$ , respectively; $p \leq 0.05$ ) from baseline to 3-month follow-up. Improvements in the health-related quality of life measures

Source	Participants	Target condition	Design	Intervention	Key Findings
	<ul style="list-style-type: none"> <li>• Other 5%</li> </ul>				of bodily pain and social functioning were significantly associated with SBP improvements in both groups.

*Note.* CBPR = community-based participatory research; RCT = randomized controlled trial; DPP-LJ = Diabetes Prevention Program-Lifestyle Intervention; PLP = PII Lifestyle Intervention; WLM = weight loss maintenance; PIC = Partner's in Care; SBG = standard behavioral follow-up group; SSG = social support group. For Filipino participants, a BMI  $\geq 23$  was used to determine overweight status for studies that include this subpopulation.

**Table 2**  
 Three-Month Changes in Key Clinical and Behavioral Measures After Completing the Adapted DPP-LI Across Studies with NHOPI

Outcome Measures	Pilot Study <sup>d</sup> (N = 169) M ± SD	Intervention Study <sup>b</sup> (N = 239) M ± SD	Worksite Study <sup>c</sup> (N = 217) M ± SD	Implementation Study <sup>d</sup> (N = 343) M ± SD	Average Across Studies M ± SD
Weight (kg)	-1.5 ± 3.5	-1.7 ± 3.5	-1.2 ± 2.6	-1.4 ± 3.4	-1.5 ± 3.3
BMI	-0.58 ± 1.4	-0.6 ± 1.3	-0.45 ± 1.0	-0.5 ± 1.2	-0.53 ± 1.2
Systolic BP (mmHg)	-6.0 ± 18.0	-3.3 ± 18.6	-2.8 ± 12.5	-3.9 ± 17.2	-4.0 ± 16.8
Diastolic BP (mmHg)	-2.8 ± 11.0	-3.4 ± 12.5	-2.01 ± 8.1	-2.4 ± 11.4	-2.7 ± 10.7
6 Minute Walk Test (ft)	42.0 ± 124.0	106.6 ± 238.4	74.7 ± 154.7	111.5 ± 278.0	83.7 ± 198.8

Note. All measures across all studies are statistically significant pre-post improvements at  $p < .01$ .

<sup>a</sup>Mau et al. 2010

<sup>b</sup>Kaholokula, Wilson, et al. 2014

<sup>c</sup>Townsend et al. 2016

<sup>d</sup>Delafield et al. 2016