

DIABETES-RELATED DISTRESS AND GLYCEMIC CONTROL OUTCOMES  
AFTER A DIABETES SELF-MANAGEMENT INTERVENTION FOR NATIVE  
HAWAIIANS AND PACIFIC ISLANDERS

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## **Abstract**

Native Hawaiians and Pacific Islanders tend to have a higher prevalence rate of type 2 diabetes than Caucasians. Culturally adapted diabetes interventions are needed to reduce the diabetes-related morbidity and mortality rates among Native Hawaiians and Pacific islanders. The purpose of this study is to test the effectiveness of a culturally-adapted diabetes self-management intervention. Participants were randomly assigned in an unbalanced design to the Partners in Care intervention (n=48) or wait list control group (n=34). Assessments of hemoglobin A1c and diabetes-related distress were measured at baseline and 3 months (post intervention). Analysis of covariance was used to test between-group differences. Intervention participants experienced a significant improvement in A1c values ( $P<0.002$ ) in contrast to the delayed group. A1c among intervention participants improved by 1.5% compared to 0.4% in the delayed group. The change in diabetes-related distress was not significant in both the intent to treat and complete case analysis. This study showed no correlation between the change in A1c and the Problem Areas in Diabetes (PAID) in the intervention group after three months.

A culturally-adapted diabetes self-management intervention was effective in improving glycemic control and reducing diabetes related distress. There was no correlation between the change in A1c and the PAID in the intervention group after three months. Future studies should examine improved methods for assessing diabetes-related distress among populations that may tend to provide socially desirable responses or not feel comfortable providing information about emotional and mental health status.

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## **Background and Introduction**

Diabetes is a serious common and costly disease that can lead to early mortality and morbidity. In 2011, 25.8 million people or 8% of the US population had been diagnosed with type 2 diabetes (CDC, 2011 & ADA, 2011). In 2010 alone, 1.9 million people over the age of 20 in the United States were newly diagnosed with diabetes (CDC, 2011). It is estimated that in 2010, 72,000 to 100,000 people in Hawaii had diabetes, with 25,000 of them being undiagnosed (Hawaii Diabetes Report, 2004).

In Native Hawaiians, the prevalence of diagnosed diabetes is 11.5%, with reported prevalence ranging from 19% to 22% for type 2 diabetes (Mau et al., 2009). The age-adjusted prevalence of diabetes and having impaired glucose tolerance in Native Hawaiians are 22.7% and 15% respectively (Mau et al., 2010 & Grandinetti et al., 1998).

Furthermore, different ethnic groups in Hawaii have differential prevalence of diabetes. People who are Native Hawaiian, Filipino and or Japanese have a higher prevalence of diabetes than whites (Hawaii Diabetes Report, 2004). Prevalence of type 2 diabetes and impaired glucose tolerance tend to be higher among Native Hawaiian or Pacific Islanders than Caucasians (Mau et al., 2009 & Grandinetti et al., 1998). Native Hawaiians have a diabetes mortality rate that is 3 times higher than whites (Mau et al., 2010 & Grandinetti et al., 1998).

## **Risk Factors**

Risk factors for type 2 diabetes are older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity (CDC, 2011). According to the American Diabetes Association in 2011, certain racial and ethnic groups including Asian Americans and Pacific Islanders have an increased risk for developing diabetes. People with diabetes need to maintain their blood glucose at an optimum level (HbA1C <7%) in order to reduce the risk of developing serious complications such as heart, kidney, and eye disease (ADA, 2004).

### **Physical Complications**

Diabetes is the leading cause of kidney failure, non-traumatic lower limb amputations, and new cases of blindness among adults in the United States (CDC, 2011). Other types of physical complications include heart disease, stroke, high blood pressure, retinopathy and neuropathy (ADA, 2011).

### **Psychosocial Complications and Quality of Life**

People with diabetes live with a disease that requires not only drug therapy and blood glucose control, but must also maintain a healthy weight through diet and exercise. Having diabetes may have a psychological impact on individuals and increase their perception of a poor quality of life (Pera, 2011). It is known that chronic complications are the major consequence of type 2 diabetes, which can reduce the quality of life of diabetic patients (Liu et al., 2010). In people with diabetes, the prevalence of depressive symptoms has been reported to be as high as 31.7% compared to 10% prevalence of depressive symptoms among the general population (Kaholokula et al., 2006). The prevalence of depressive symptoms among Native Hawaiians with diabetes was 26.9%, significantly higher than those with other chronic illnesses and those without chronic illnesses (Kaholokula et al., 2006). Depressive symptoms are related to psychosocial hardships including the burden of illness on the quality of life. Depressive symptoms in people with diabetes are of concern because they are associated with poor diabetes self-management and an increased risk for diabetes-related complications (Kaholokula et al., 2003). Studies have found a significant negative correlation between depressive symptoms and health related quality of life in a population of people with type 2 diabetes (Kaholokula et al., 2006). There has been an increasing interest in the association between the quality of life of diabetic patients and their glycemic control. Poor glycemic control may result in an increase of a diabetic patient's risk of developing complications that will lead to a poor quality of life (Imran et al., 2010).

## **Previous Research**

In 2001, Mau et al., conducted a study with Native Hawaiians with diabetes and their ohana (family) support. The association of stage of change with diet and exercise in response to lifestyle intervention was examined. It was determined that participants in the family support intervention group were more likely to advance from the pre-action to maintenance stage when regarding fat intake and physical activity as compared to the standard intervention group.

A study by Kaholokula et al., (2006) examined correlations between glycemic status and health related quality of life and depressive symptoms in Native Hawaiians. The relation between depressive symptoms and health related quality of life was influenced by glycemic status, sex, education, marital status, and social support.

One study by Beckham et al.,(2008) examined the effectiveness of a culturally tailored diabetes management program in Native Hawaiians, Samoans and Tongans with a pre-post study design. The hemoglobin A1c level in the majority of the participants in the intervention group was lowered by 2.2% as compared to those who declined the intervention, in which a majority of those people had a 0.2% decrease in A1c level (Mau et al., 2009).

A study done by Mau et al., (2009) looked at cardiometabolic health disparities in Native Hawaiians and other Pacific Islanders. It was concluded that behavioral risk factors for diabetes, including psychological distress, were highly prevalent in Native Hawaiians and Pacific Islanders. It suggested that future research move toward intervention studies, as opposed to observational studies, that will engage Native Hawaiian and Pacific Islander communities in the process of creating the intervention while also maintaining the same scientific rigor (Mau et al., 2009).

Although previous research has been done on Native Hawaiians and Pacific Islanders and diabetes in the past, none have done a randomized control trial with Native Hawaiians and Pacific Islanders receiving a culturally tailored intervention. Therefore, the specific aims of this study were:



### **Specific Aims/Hypotheses**

1. Assess the changes in quality of life scores based on the Problem Areas in Diabetes questionnaire. *Patients in a culturally relevant, community delivered diabetes self-management intervention will report improved quality of life compared to a control group.*
2. Compare the Hemoglobin A1c levels of the patient, pre and post intervention. *Patients in a culturally relevant, community delivered diabetes mellitus self-management intervention will have improvement in Hemoglobin A1c levels compared to a control group.*
3. Examine the association between Hemoglobin A1c levels and quality of life scores. *There will be a statistically significant correlation between hemoglobin A1c changes and PAID scores.*

### **Study Objective**

The objective of this study was to measure and assess changes in diabetes-related distress among Native Hawaiian and Pacific Island individuals participating in a culturally-adapted diabetes self-management intervention called Partners in Care.

## Methods

**Participants Eligibility and Recruitment-** Trained community researchers from 3 community organizations each recruited between 25-29 individuals (total study N=82) aged 18 years and older with physician-diagnosed type 2 diabetes from their respective communities and the larger Native Hawaiian and Pacific Island population on O‘ahu to participate in the culturally adapted, community-based group diabetes self-management program over a 1-year accrual period. This was a feasibility study and no power calculation was conducted.

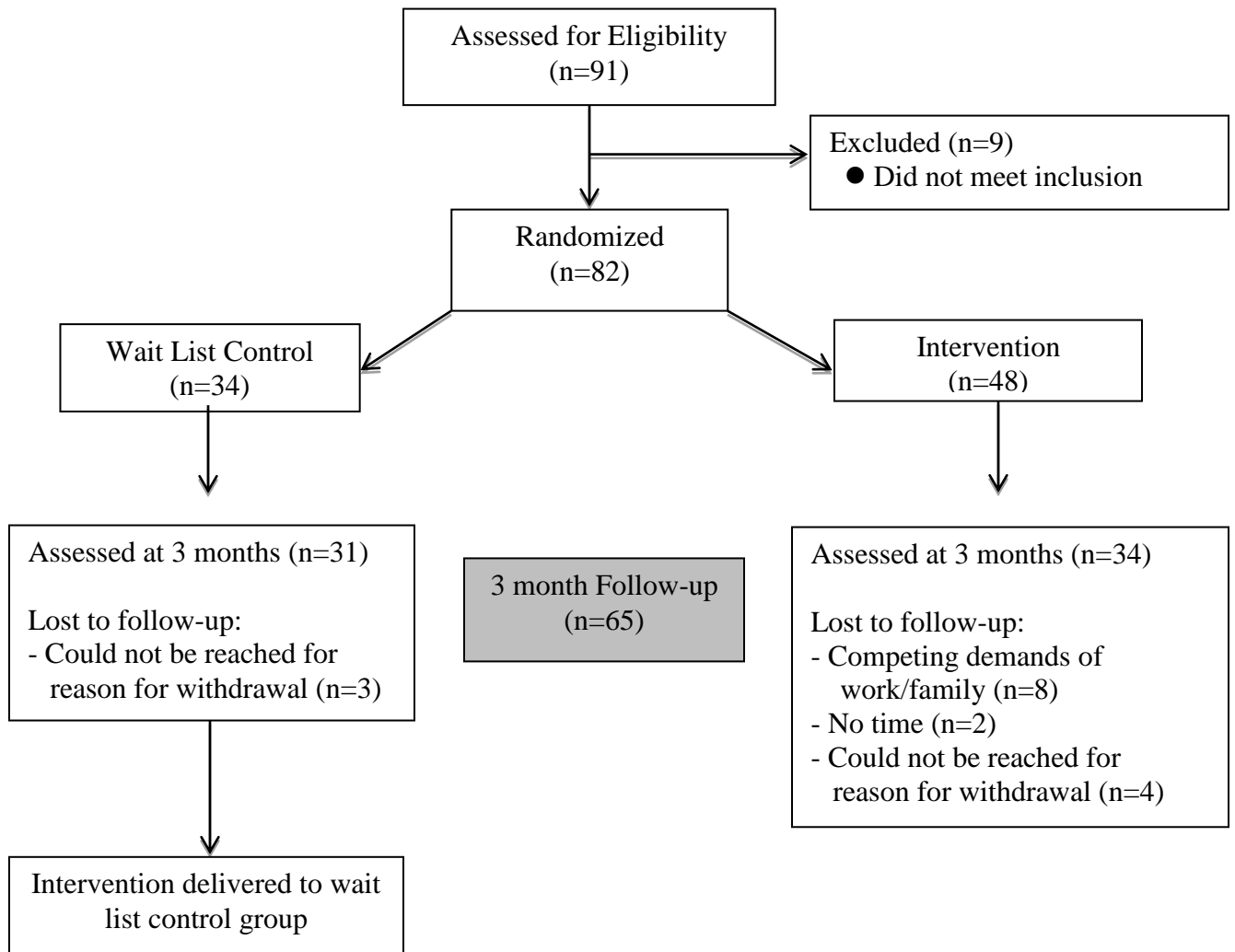
### Inclusion Criteria

- a) Self-reported Native Hawaiian, Filipino, or other Pacific Islander ethnic background,
- b) Adults age  $\geq 18$  years of age,
- c) English-speaking,
- d) Physician-diagnosed type 2 diabetes, and
- e) Baseline hemoglobin A1c  $\geq 7\%$ .

### Exclusion Criteria

- a) Survival less than 6 months,
- b) Planning to move out of the community during the intervention study period,
- c) Pregnancy,
- d) Any co-morbid condition (physical and mental disabilities) that would prevent the individual from participating in the intervention protocol (i.e., major psychiatric illness).

Figure 1. Partners in Care study participation.



**Participant Assessment.** Each participant underwent an assessment prior to randomization, and again after all intervention participants completed the 3-month educational intervention. The delayed CG group underwent a third assessment after completing the 12 classes. Contact information and socio-demographic data was collected at the baseline assessment. In addition, information regarding diabetes self-management practices and beliefs, social support, use of clinical care, hemoglobin A1c,

blood pressure, a lipid panel, and height and weight was collected at baseline and post intervention for each participant. However, for the purposes of this paper only age, hemoglobin A1c and PAID scores were analyzed.

**Baseline Assessment and Randomization.** If the baseline assessment confirmed eligibility, they were randomized based on an unbalanced design by community site to either the DSMG or the delayed CG. Participants randomized to the DSMG attended 12 weekly group-based educational meetings, with each meeting lasting about 1 hour. After the DSMG participants completed the 12 meetings (3 months after baseline), intervention and delayed intervention participants completed the post intervention assessments. The delayed CG was then offered the intervention, and underwent an assessment after completion of the 12 classes. All participants received a gift card valued at \$20.00 to a local store for completing each assessment for a total of \$40.00 for the DSMG group, and \$60.00 for the delayed CG.

### **Intervention**

The intervention was delivered to small groups (10-15) of participants in a community setting by trained community peer educators. The community peer educators were trained by the Department of Native Hawaiian Health principal investigator of the study. The Partners in Care was adapted for Native Hawaiians and Pacific People by Ka`imi Sinclair, the principal investigator of the study. It was originally developed and evaluated with Southwest American Indians in 1999. In 2002, the educational curriculum was adapted for African Americans and Latinos residing in low resource neighborhoods in Detroit, Michigan.

The Partners in Care educational curriculum is designed to reduce risk factors associated with diabetes complications by increasing participants' understanding of diabetes self-management, self-efficacy (Bandura, 1986), and autonomous motivation (Resnicow et al., 2001). Focus group research conducted with community residents

during the tailoring phase guided the general content, format and method of delivery of the intervention.

### Cultural Adaptation

Cultural adaptation has been defined as the process of creating culturally sensitive interventions, often involving the adaptation of existing materials and programs for racial/ethnic populations (Pasick et al., 1996). A process described by Resnicow et al. for developing culturally sensitive interventions was used here to illustrate how Partners in Care was culturally tailored (Resnicow et al., 1999). Cultural sensitivity is defined as, “the extent to which ethnic/cultural characteristics, experiences, norms, values, behavioral patterns and beliefs of a target population as well as relevant historical, environmental, and social forces are incorporated in the design, delivery, and evaluation of targeted health promotion materials and programs” (Resnicow et al., 1999).

Cultural adaptation of Partners in Care was primarily addressed by matching materials to “surface” characteristics of both groups. Surface structure, one of the two primary dimensions of cultural sensitivity, refers to matching intervention materials and messages to observable characteristics of the intended population, such as pictures of people, places, language, food, locations, and clothing familiar to intervention participants (Resnicow et al., 1999). Surface structure also includes identifying how and where the intervention will be delivered, and by whom. Deep structure, the second primary dimension of cultural sensitivity, is defined as an understanding of the cultural, social, historical, environmental and psychological forces that influence the target health behavior in the intended population, including how racial/ethnic populations differ in core cultural values, and understanding how members of the intended audience perceive the cause, course and treatment of an illness. Both surface structure and deep structure dimensions were incorporated into the development of Partners in Care to varying degrees.

Selected cultural symbols and themes, cultural patterns and concepts, values, norms, and relationships were incorporated to reflect cultural characteristics and

preferences of Native Hawaiian and Pacific People. Focus group participants had also recommended that programs be conducted in a convenient community location and delivered by people that could relate to participants' life situations. As a result, peer educators were hired and trained to deliver the intervention. The peer educators contributed local and cultural knowledge to each curriculum during adaptation, identified appropriate images, and reviewed content.

To enhance receptivity and acceptance of the curriculum materials, images of Native Hawaiian and Pacific People engaging in diabetes self-management activities (e.g., healthy eating, physical activity, etc.) was presented. Foods and physical activities were modified to reflect cultural preferences and geography.

In addition to addressing healthy eating and physical activity, Partners in Care includes basic information about risk factors for diabetes and diabetes-related complications, how to reduce the risk for complications, and the relationship between diabetes, stress and depression. Also, a story depicting local characters, Uncle Tommy and his grandson Kaipō, begins each meeting. The topic of the story is related to the topic of the meeting where Uncle Tommy is teaching Kaipō about all the activities he must do to manage his diabetes and stay healthy. While a story was not mentioned as something essential for an intervention, it was considered an integral part of the cultural component of the intervention, and provides an example of deep structure.

Psychotherapists have used stories to inspire people to address tasks or other complex issues they might not otherwise consider. Moreover, stories enable people to have sudden insight (Zuniga, 1992). Barker (1985) also indicated that use of stories allow people to apply the content in their own way, and make sense of their unique situations (Barker, 1985).

Current recommendations from the American Diabetes Association and the CDC guided dietary and physical activity content (ADA 2001; CDC 2001). The content was written in a conversational tone in plain English so that it could be read word for word, and increase fidelity to the intervention across sites.

## **Theoretical Framework**

The conceptual foundation of the Partners in Care intervention was social cognitive theory (SCT) with an emphasis on behavioral capability, self-control procedures, emotional coping response, and self-efficacy (Bandura, 1986; Baranowski, Perry et al., 1997). SCT provides a framework for designing and implementing comprehensive behavioral change programs that include environmental, personal and behavioral constructs. SCT recognizes that an individual's behavior is determined by interactions among environmental, personal and behavioral factors (Baranowski et al., 1997). Previous research and focus group data demonstrate that diet, physical activity, and diabetes self-management behaviors are influenced at multiple levels, i.e., individual, family, and community levels (Glasgow & Toobert 1988; Sucher & Kittler 1996; Baranowski et al., 1997; Jack, et al., 1999; Kieffer et al., 2004).

While SCT provides a comprehensive framework, it has also been criticized for being too broad in its formulation. When constructs are used to explain both negative and positive findings, the theory is no longer falsifiable and explains nothing (Glanz, 1997). Additional criticisms of SCT include its limited ability to predict behavior, and the linear relationships proposed by all of the single constructs (Glanz, 1997). Thus, the processes and pathways for behavior change have not been clearly identified using SCT.

Despite its limitations, SCT has proven an effective theoretical framework in prior diabetes self-management interventions (Padgett et al., 1988; Norris et al., 2001). Padgett et al. (1988) and Norris et al. (2001) reviewed the effectiveness of diabetes education interventions and found approaches based on social cognitive theory to be the most effective interventions with physical outcomes and knowledge most improved (Padgett et al., 1988; Norris et al., 2001).

The Partners in Care intervention combined social cognitive theory constructs with culturally congruent content that built on ethnic group identity and social support to promote self-care activities, including blood glucose monitoring, healthy eating, exercise, and stress reduction.

The combination of theory and ethnic group identity and social support was hypothesized to bring about significant and lasting self-management changes among participants. Activities were included to enhance behavioral capability, self-control, coping skills, and self-efficacy through reflection, group and individual problem-solving, goal setting, role-playing, cognitive restructuring and hands-on activities. Research has shown that diabetes education is most efficacious when coupled with goal setting, self-monitoring, self-reward, personal feedback, and contracting (D'Eramo-Melkus & Hagan, 1991; Clement, 1995)

### Peer Educator Training

The peer educators attended a four-hour implementation training. A peer educator's curriculum was developed to ensure that all educators used standard instructional content and methods, and to assist them with the delivery of the information and activities. The principal investigator conducted the training using experiential techniques to present the behavior change approach to physical activity and healthy eating, a meeting-by-meeting review of the curriculum, and practice in presenting meetings and activities.

Given the limited diabetes self-management, nutrition and physical activity expertise of the peer educators, and to ensure implementation of theory components, and continuity and accuracy of information across groups, peer educators were instructed to deliver the curriculum as scripted. Group discussion and activities were incorporated into the content to encourage participant interaction and enhance teaching and learning.

The curriculum training provided to the peer educators made no attempt to foster an in-depth understanding of nutrition, physical activity or diabetes self-management. Peer educators were instructed to refer participants with detailed questions to their health care providers so that the appropriate professional might address them, and to increase interactions between participants and their health care providers.



## Measures

### Problem Areas In Diabetes

The Problem Areas in Diabetes questionnaire (PAID) assesses a range of emotional problems that are frequently reported in patients with Type 1 and Type 2 diabetes (Speight et al., 2009). It is a brief self-report measure of diabetes related distress that has shown to be valid and clinically useful. The PAID scale was developed by researchers associated with the Joslin Diabetes Center and Harvard Medical School. Items were developed from patient input from diabetes healthcare professionals and pilot testing. Items focus on patients' feelings and moods associated with specific aspects of having diabetes. The PAID scale originally used a summary score but now uses a 0-100 scale score, with the higher numbers indicating more diabetes related distress (Watkins et al., 2004).

The PAID scale contains 20 items summed to provide a total score of diabetes distress. The scale asks about feelings of guilt, anxiety, worry, loneliness, and burnout around diabetes, feelings about diabetes care providers, and level of comfort with social situations, among other things (Fonda et al., 2009). Each item can be rated on a 6-point Likert scale ranging from 1 ("not a problem") to 6 ("a serious problem"). Completing the PAID questions can take approximately 3–5 minutes (Snoek et al., 2000)

Hemoglobin A1c (HbA1c) as measured with the Bayer DCA 2000 via a fingerstick sample of whole blood was the primary outcome measure. Reductions in hemoglobin A1c have been associated with reduced risk of diabetes-related complications, such as nephropathy, neuropathy, and retinopathy. Thus, avoiding complications is related to improved quality of life in individuals with diabetes. Through diabetes self-management education, individuals may be more likely to adhere to diabetes regimens and seek clinical care.

Secondary Outcome Variables: Serum Cholesterol (including HDL and LDL) and triglycerides will be measured with the Cholestech LDX lipid profile system which requires a fingerstick sample of whole blood. Study staff were trained to obtain the blood

sample via fingerstick and completed a University of Hawaii bio-safety course. Blood Pressure was measured using an automatic blood pressure cuff. Weight was measured with the participant fully clothed and shoes off. Height was measured with shoes off. Psychosocial Adaptation is the extent to which a patient has successfully adjusted to the cognitive, social and emotional aspects of living with diabetes and its self-management. We used the Diabetes Care Profile (DCP) negative and positive attitude subscales. These subscales have been found to be valid and reliable as well as sensitive to empowerment-based interventions. Each of the two subscales contains five Likert-type items.

### **Statistical Analysis**

All data were entered and verified, and scores were calculated for multiple-item instruments. Summary statistics including frequency distributions, means and other descriptive analyses of variables were conducted to provide an overview of the characteristics of participants in both groups. We also examined descriptive statistics to ensure that data met statistical test assumptions. T-tests and  $\chi^2$  were used to test baseline between-group differences. Analyses were conducted using all available data at baseline (n=82) and 3 months (n=65) assuming data were missing at random. Intent-to-treat analyses were also conducted by imputing missing data with the baseline observation carried forward.

To test between-group differences in A1c at 3 months we used the change value (Baseline A1c – 3 month A1c) as the dependent variable in the analysis of covariance (ANCOVA) model adjusting for baseline A1c. Despite three significant baseline differences between the intervention and control group, we did not include education, systolic blood pressure, or diet/meal plan adherence as covariates in the final models because: 1) they were not correlated with our outcome (Table 3), and 2) including them

as covariates yielded the same results (data not shown) as those in the final models reported in Table 2.

Withdrawal from the study was significantly higher in the intervention group compared to the wait list group ( $p=0.02$ ). Participants that withdrew from the study were significantly younger ( $p=0.001$ ) and had a lower score on the Diabetes Care Profile that measured understanding of self-management ( $p=0.03$ ). Therefore, age and baseline understanding of diabetes self-management were included as covariates in all between group comparisons at 3 months. Effect sizes were obtained in the ANCOVA modeling procedure and are based upon the comparison of the change scores between the intervention and control group. Analyses were conducted using SPSS version 20.0 (SPSS, Inc., Chicago, IL) and SAS 9.2 (SAS Institute Inc., Cary, NC). All reported  $p$ -values are for two-sided tests with effects considered statistically significant at  $p<0.05$ .

## Results

Table 1. Baseline characteristics of Partners in Care study participants by treatment group.			
Variable	Partners in Care N=48	Control N=34	Group differences ( <i>p</i> value)
Age, years, mean (SD)	53 (12)	55 (10)	0.36
Female (%)	63	62	0.99
Education, ≤High School (%)	83	62	0.04
Marital Status (%)			0.82
Currently Married	60	58	
Never married/divorced/widow	40	42	
Employment Status (%)			0.31
Working	31	35	
Looking for Work	13	3	
Other (Retired, student, homemaker)	56	62	
Ethnicity (%)			0.20
Native Hawaiian	54	62	
Samoan	6	0	
Micronesia	27	32	
Filipino	13	6	
Age first told you had diabetes, years, mean (SD)	38 (18)	39 (16)	0.73
Previously taken a diabetes class (%)	48	58	0.12
Currently following a diet or meal plan (%)	23	53	0.01
Prescribed diabetes pills (%)	69	76	0.36
Prescribed insulin (%)	56	46	0.32
A1c, mean (SD)	9.9 (2.0)	9.8 (2.2)	0.80
Systolic Blood Pressure, mean (SD)	190 (27)	208 (35)	0.02
Diastolic Blood Pressure, mean (SD)	113 (23)	119 (22)	0.30
Lipids, mean (SD)			
Total Cholesterol	189 (51)	195 (51)	0.56
LDL	101 (38)	105 (44)	0.73
HDL	36 (10)	35 (12)	0.78
Triglycerides	270 (167)	272 (135)	0.94
Body Mass Index, kg/m <sup>2</sup> , mean (SD)	36 (12)	38 (8)	0.51
Problem Areas in Diabetes Score, mean (SD)	31 (29)	24 (24)	0.30
Diabetes Care Profile, mean (SD)	30 (9)	33 (11)	0.16
Summary of Diabetes Self-Care Attitudes, mean (SD)	19 (5)	20 (5)	0.45

Group differences *p* value based on  $\chi^2$  and *t* tests, as appropriate.

- Problem Areas in Diabetes: scored 0-100 with higher numbers indicating more diabetes-related distress.

- Diabetes Care Profile: range from 12-60 with higher scores indicating more understanding of diabetes self-management activities.
- Summary of Diabetes Self-Care Attitudes: Range from 7-28 with higher numbers indicating a higher frequency of engaging in diabetes self-management activities during the past 7 days.

Table 2. Intervention effects on primary and secondary outcomes at baseline and 3 months				
	Baseline <i>M</i> (SD)	3 month <i>M</i> (SD)	Change ±SE	Group Differences ( <i>p</i> value)
<b>A1c</b>				
<i>Intention-to-treat</i>				
Partners in Care (n=48)	9.9 (2.0)	8.9 (1.7)	-1.1 ±0.2	0.001
Control (n=34)	9.8 (2.2)	9.4 (2.2)	-0.3 ±0.2	
Effect Size		0.13		
<i>Complete cases</i>				
Partners in Care (n=34)	9.7 (2.1)	8.2 (1.1)	-1.6 ±0.2	<0.0001
Control (n=31)	9.8 (2.3)	9.4 (2.2)	-0.3 ±0.2	
Effect Size		0.22		
<b>Diabetes Care Profile</b>				
<i>Intention-to-treat</i>				
Partners in Care (n=46)	30 (9)	43 (14)	13.1 ±1.5	<0.0001
Control (n=34)	33 (11)	34 (11)	1.8 ±1.8	
Effect Size		0.23		
<i>Complete cases</i>				
Partners in Care (n=33)	32 (10)	50 (9)	18.8 ±1.5	<0.0001
Control (n=29)	31 (10)	33 (11)	1.5 ±1.5	
Effect Size		0.53		
<b>Summary of Diabetes Self-Care Activities</b>				
<i>Intention-to-treat</i>				
Partners in Care (n=47)	19 (5)	24 (4)	4.9 ±0.6	<0.0001
Control (n=34)	20 (5)	21 (5)	1.4 ±0.7	
Effect Size		0.17		
<i>Complete cases</i>				
Partners in Care (n=35)	19 (4)	26 (3)	6.6 ±0.6	<0.0001
Control (n=26)	19 (5)	21 (6)	1.8 ±0.7	
Effect Size		0.30		

<b>Problem Areas in Diabetes</b>				
<i>Intention-to-treat</i>				
Partners in Care (n=48)	31 (29)	23 (24)	-6.9 ±2.1	0.18
Control (n=34)	25 (24)	24 (22)	-2.5 ±2.4	
Effect Size		0.02		
<i>Complete cases</i>				
Partners in Care (n=35)	31 (31)	20 (22)	-9.4 ±2.6	0.08
Control (n=30)	24 (23)	23 (21)	-3.0 ±2.6	
Effect Size		0.07		

**Table 3**

Pearson correlations among variables of interest in the Partners in Care intervention group at 3 months.

	1	2	3	4
1 Change in A1c	1.0			
2 Change in diabetes-related distress	-0.02	1.0		
3 Number of classes attended	-0.01	-0.41*	1.0	
4 Age	0.08	-0.42*	0.47**	1.0

Effects of baseline values of A1c, diabetes understanding, performance of self-management activities, and diabetes-related distress on 3 month outcomes partialled out.  
 \*Correlation is significant at the 0.05 level (2-tailed).  
 \*\*Correlation is significant at the 0.01 level (2-tailed)

## **Participants**

Of the 82 randomized participants, 48 were assigned to the Partners in Care intervention and 34 to the delayed group (Table 1). Participant's average age was 53 in the intervention group and 55 in the delayed group. More than half of participants in each group were female and were currently married. Significantly more intervention participants had a high school education or less. There was no significant difference in baseline clinical measures except for systolic blood pressure, which was significantly higher among delayed group participants. More delayed participants reported currently following a diet or meal plan. Finally, there were no significant between group differences in baseline diet or exercise behaviors, diabetes-related distress, knowledge, or self-care scores.

## **Retention**

Of the 48 participants assigned to the intervention, 34 (71%) completed the 3 month assessment, and 33 (69%) completed the 6 month assessment. Of the 34 participants allocated to the delayed group, 31 (91%) completed the 3 month assessment, and 27 (79%) completed the 6 month assessment. Reasons for withdrawing from the study included competing demands of work and family and no time. Participants without 3 month data were significantly younger and more likely to be unmarried.

## **Intervention Effects**

We compared between group differences in A1c at 3 months using a complete case analysis and an intent-to-treat analysis. Both analyses yielded similar results. We chose to analyze complete cases (i.e., participants with a baseline and 3 month A1c). At the 3 month assessment, there were significant between group differences in A1c, knowledge, and self-care activities (Table 2). Intervention participants experienced a significant improvement in A1C values ( $P < 0.002$ ) in contrast to the delayed group. A1c among intervention participants improved by 1.5% compared to 0.4% in the delayed group.

Changes in clinical measures of cholesterol, blood pressure, and BMI did not reach statistical significance. There was significant improvement in knowledge and self-care activities scores in the intervention group compared to the delayed group.

There wasn't a statistically significant change in the PAID scores between the intervention and control groups after controlling for age, baseline PAID score, baseline A1c, Group, and Ethnicity

This study showed no correlation between the change in A1c and the PAID in the intervention group after three months (Table 3).

## **Discussion**

Partners in Care was a pilot study using a randomized controlled trial design in which 82 Native Hawaiians and Pacific Islanders were randomized to either a 3 month diabetes self-management intervention or a wait list control group. The results suggest that the culturally adapted, community-based diabetes self-management intervention delivered by peer educators over twelve sessions can significantly improve glycemic control and reduce risk factors associated with diabetes complications among Native Hawaiians and Pacific Islanders. Epidemiological analysis of the United Kingdom Prospective Diabetes Study showed that for each 1% reduction in hemoglobin A1C, there was a corresponding 21% reduction in any endpoint related to diabetes, with a 14% reduction for myocardial infarction, 12% reduction in stroke, and a 37% reduction for microvascular complications (Jarab et al., 2012). A  $\geq 1.0\%$  change was defined as a clinically significant improvement according to National Institute of Diabetes and Digestive Kidney Diseases (Sun et al., 2012).

The Partners in Care intervention findings are consistent with prior studies showing the efficacy of diabetes lifestyle interventions in improving understanding of diabetes self-management, performing self-care activities, and glycemic control (Steinsbekk et al., 2012). Similar diabetes education interventions with minority populations have achieved a 1% reduction in A1c post intervention (Kim et al., 2009, Sun et al., 2012). This study also replicates a previously successful diabetes self-management intervention in a different setting, population, geographic location, and peer educators



(Two Feathers et al., 2005). Partners in Care is the first diabetes self-management intervention for Native Hawaiians and Pacific Islanders in Hawaii using a randomized controlled trial design (Mau et al., 2009).

There was no statistically significant change in diabetes-related distress among participants in both the intent to treat and complete case analyses. The lack of change in the Problem Areas in Diabetes score may be due, in part, to several of the Micronesian participants' cultural norm of not wanting to complain about the impact of their diabetes on their lives (reported by the Micronesian peer educator). When analyzed separately, there was a significant difference in the mean baseline diabetes-related distress score for Micronesians and Native Hawaiians/ Pacific Islanders (5.0 vs 42.0). An alternative method of measuring diabetes-related distress may be needed for some populations. Although one of the inclusion criteria for participation included English speaking, a language barrier may have contributed to the low scores reported by the Micronesians as some have limited understanding of the English language..

When comparing the A1c levels and PAID scores among participants in the intervention group, there was no significant correlation. Similar results were found in a previous study by Sperl-Hillen et al., (2012) and suggested that more complex mechanisms were involved. Future studies should examine improved methods for assessing diabetes-related distress among populations that may tend to provide socially desirable responses or not feel comfortable providing information about emotional and mental health status.

Despite the positive results, there are study limitations that deserve mention. While the overall retention rate was fairly high (79%), the attrition rate was higher among younger participants. One previous study with depression also had a high attrition rate among younger participants. It was felt that this was due in part to the relationship between older age and a perceived need for treatment (Warden et al., 2009). In a previous study, patients who were younger than 45 and aged 65 years and older were more likely to have higher attrition rates. Older age has been reported as being a barrier to access resources to attend the diabetes self-management interventions (Gucciardi et al., 2007) Future studies should include methods to facilitate younger individual's

participation, such as offering classes after work or on weekends and providing childcare if needed.

Another possible limitation could result from potential bias within the control group. The hemoglobin A1c levels and PAID scores showed slight decreases from baseline to three months in the wait list control group. In most control groups, the scores would be likely to stay the same or increase due to the continued lifestyle without the benefit of an intervention. The control group could have experienced attention bias due to the fact that they had knowledge of belonging to the wait list control group. Participants who knew they were being observed for certain behaviors may have been more vigilant in adhering to their diabetes control which could have explained the decrease in levels without any intervention.

This study demonstrated that an appropriately designed, community-based program requiring little technology and few health care resources can have positive effects by improving understanding, self-care behaviors, and glycemic control among Native Hawaiians and Pacific People with type 2 diabetes. If the significant improvement in A1c can be sustained, the Partners in Care intervention has the potential to substantially reduce microvascular complications, morbidity, and health care utilization costs (Keers et al., 2005, Strine et al., 2005). Future research efforts should be aimed at confirming, enhancing, and sustaining the effect of this type of intervention among populations where health disparities exist. With the large number of Native Hawaiians and Pacific Islanders suffering from diabetes-related morbidity and mortality, a great need exists for improvement in methods of reaching people with diabetes that are culturally appropriate and have been systematically developed, implemented, and evaluated.

### **Public Health Importance**

Depressive symptoms in people with diabetes are of concern because they are associated with poor diabetes self-management and an increased risk for diabetes-related complications. By assessing and addressing depressive symptoms, we may be able to improve diabetes self-management and prevent or delay diabetes-related complications. While A1c was significantly improved in the intervention group compared to the control

group, the findings of this study indicates a need for improved measures of diabetes-related distress among some Pacific Island populations.

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