

# HAWAI‘I MEDICAL JOURNAL

A Journal of Asia Pacific Medicine

May 2010, Volume 69, No. 7, Supplement 2, ISSN: 0017-8594

## “HE HULIAU”

### A TURNING POINT, ELIMINATING HEALTH DISPARITIES IN NATIVE HAWAIIAN AND PACIFIC PEOPLES OBESITY

2010 HE HULIAU - DEPARTMENT OF NATIVE HAWAIIAN HEALTH

S. Kalani Brady MD, MPH, FACP

3

### THE PREVALENCE OF GESTATIONAL DIABETES AMONG MICRONESIANS IN HONOLULU

Ann Lee Chang MD; Reni Soon MD; and Bliss Kaneshiro MD, MPH

4

### CLOSING THE GAP “DISPARITY IN NATIVE HAWAIIAN CARDIAC CARE”

Ann Cook APRN; Coraleen T. Grothaus APRN; Carol E. Gutierrez APRN;  
Kimberly A. Kehoe APRN; and Mona R. Valentin PharmD

7

### EFFECTS OF PERCEIVED RACISM AND ACCULTURATION ON HYPERTENSION IN NATIVE HAWAIIANS

Joseph Keawe’aimoku Kaholokula PhD; Marcus K. Iwane MD; and Andrea H. Nacapoy MA

11

### DIET, PSYCHOSOCIAL FACTORS RELATED TO DIET AND EXERCISE, AND CARDIOMETABOLIC CONDITIONS IN SOUTHERN CALIFORNIAN NATIVE HAWAIIANS

Archana Jaiswal McEligot PhD; Juliet McMullin PhD; Ka’ala Pang RN; Momi Bone BS;  
Shauna Winston BS; Rebekah Ngewa MPH; and Sora Park Tanjasiri DrPH

16

### CULTURALLY-SPECIFIC PHYSICAL ACTIVITY MEASURES FOR NATIVE HAWAIIAN AND PACIFIC ISLANDERS

Karen L. Moy PhD; James F. Sallis PhD; and Sora Park Tanjasiri DrPH

21

### PERSPECTIVES ON THE CRISIS AND CHALLENGE OF CARDIOVASCULAR DISEASE IN THE DIVERSE ASIAN POPULATIONS OF CALIFORNIA

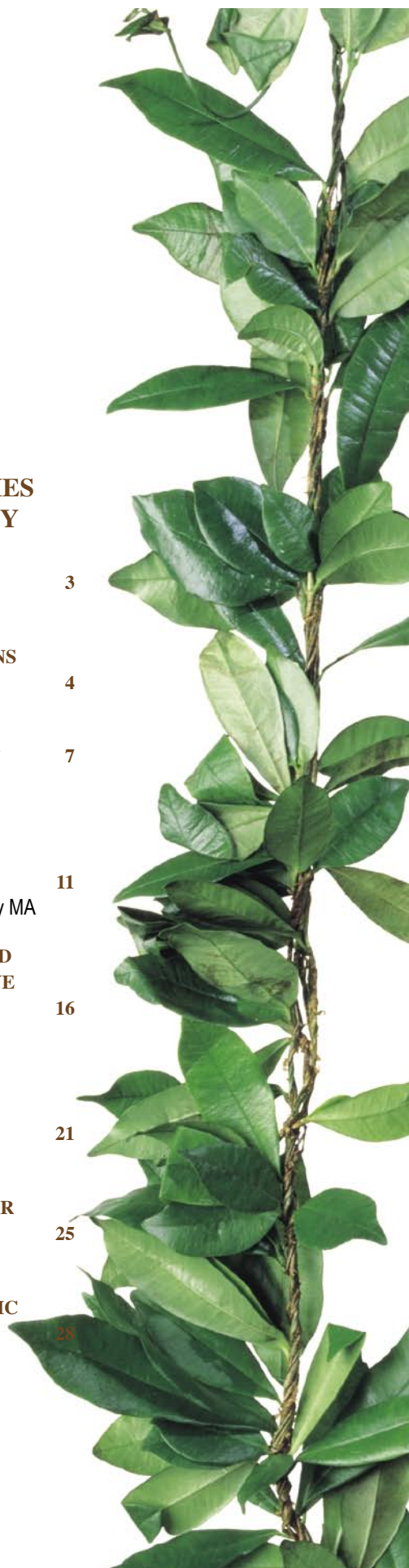
Colman Ryan MD and Richard E. Shaw PhD

25

### DIABETES CARE IN A PREDOMINANTLY NATIVE HAWAIIAN AND PACIFIC ISLANDER OUTPATIENT POPULATION

Rachel Lee MD; Janet Onopa MD; Marjorie K. Mau MD; and Todd B. Seto MD, MPH

28



# HAWAI'I MEDICAL JOURNAL

Published monthly by University Clinical,  
Education & Research Associates (UCERA)

Mail to: Editor, Hawai'i Medical Journal  
677 Ala Moana Blvd., Suite 1016B  
Honolulu, Hawai'i 96813  
Phone: (808) 383-6627; Fax: (808) 587-8565  
<http://www.hawaiiimcdicaljournal.org>  
Email: [info@hawaiiimcdicaljournal.org](mailto:info@hawaiiimcdicaljournal.org)

The Hawai'i Medical Journal was founded  
in 1941 by the Hawai'i Medical Association (HMA),  
incorporated in 1856 under the Hawaiian monarchy.  
In 2009 the journal was transferred by HMA to UCERA.

## Editors

Editor: S. Kalani Brady MD  
Editor Emeritus: Norman Goldstein MD  
Associate Editor: Alan D. Tice MD  
Contributing Editors:  
Satoru Izutsu PhD  
James Ireland MD  
Russell T. Stodd MD  
S.Y. Tan MD, JD  
Carl-Wilhelm Vogel MD, PhD

## Editorial Board

Benjamin W. Berg MD, Patricia Lanoie Blanchette MD, MPH  
John Breinich MLS, April Donahue,  
Satoru Izutsu PhD, Douglas Massey MD,  
Alfred D. Morris MD, Gary Okamoto MD,  
Myron E. Shirasu MD, Russell T. Stodd MD,  
Frank L. Tabrah MD, Carl-Wilhelm Vogel MD, PhD

## Journal Staff

Production Manager: Drake Chinen  
Subscription Manager: Meagan Calogeras  
Copy Editor: Niranda Chantavy Hartle  
Copy Editor: Janessa Ruckle

## Advertising Representative

Roth Communications  
2040 Alewa Drive  
Honolulu, Hawai'i 96817  
Phone (808) 595-4124  
Fax (808) 595-5087

Full text articles available on PubMed Central and [hawaiiimcdicaljournal.org](http://hawaiiimcdicaljournal.org)

The Journal cannot be held responsible for opinions expressed in papers, discussion, communications or advertisements. The right is reserved to reject material submitted for editorial or advertising columns. The Hawai'i Medical Journal (ISSN 0017-8594) is published monthly by University Clinical, Education & Research Associates (UCERA). Postmaster: Send address changes to the Hawai'i Medical Journal, 677 Ala Moana Blvd., Suite 1016B, Honolulu, Hawai'i 96813. Print subscriptions are available for an annual fee of \$120; single copy \$15 plus cost of postage; Contact the Hawai'i Medical Journal for foreign subscriptions. ©Copyright 2010 by University Clinical, Education & Research Associates (UCERA). Printed in the United States.

The Hawai'i Medical Journal is a monthly, peer-reviewed journal published by UCERA.

The Journal's aim is to provide new, scientific information in a scholarly manner, with a focus on the unique, multicultural and environmental aspects of the Hawaiian Islands and Pacific Rim region.



# 2010 HE HULIAU DEPARTMENT OF NATIVE HAWAIIAN HEALTH

S. KALANI BRADY MD, MPH, FACP

Since its creation by the Board of Regents of the University of Hawai'i in October 2003, the Department of Native Hawaiian Health of the John A. Burns School of Medicine has been a leader in research addressing the health of Hawai'i's host population. It has established a Center for Native and Pacific Health Disparities Research at the University of Hawai'i. The Department has found that difference in health and health care can influence and are influenced by health disparities research. The elimination of health disparities has become a widespread public health imperative. In 2000, the U.S. Congress passed the Minority Health and Health Disparities Research and Education Act, which established the National Center on Minority Health and Health Disparities (NCMHD). The National Institutes of Health were mandated to fund and coordinate research, research training, and community outreach and dissemination activities to eliminate health disparities in America. Concurrently, the Institute of Medicine released its report on "Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care," which informed public health officials and policymakers to take action to reduce and eliminate health disparities. Healthy People 2010, the agency which establishes our nation's health priorities, also established Health Disparities as one of only two public health goals for 2010 and established several targets for improvement and evaluation. The goal of health disparities research is to make scientific discoveries that will eliminate unjust differences in health and health care and promote better health for all people.

The Department of Native Hawaiian Health has hosted an annual two-day Scientific Session to provide the opportunity for presentation of research by a broad spectrum of investigators both within Hawai'i and beyond, with attendance encouraged not only by "academics" but by our community partners and healthcare workers as well. The following articles were presented at its fifth He Huliau Conference ("A Turning Point"), which occurred in southern California in 2009.

McEligot et. al. address psychosocial factors related to diet and exercise in Southern California Native Hawaiians, contrasting these variables in patients with cardiometabolic disease and those without. They noted that the psychosocial data showed significantly lower social support, social interaction, self-monitoring, and cognitive-behavioral strategies in the patients with cardiometabolic disease. Moy et. al. report about their pilot on measures of physical activity using actual monitors and culturally appropriate questionnaires in a Native Hawaiian and Pacific Islander population. Ryan and Shaw discuss the epidemic of cardiovascular disease in Filipinos in Northern California. Cook et. al. present results of several indices of excellence in care of Native Hawaiians admitted to The Queen's Medical Center for cardiovascular disease and addressed by the Integrative Care Program of the Queen's Heart Native Hawaiian Health Initiative. Kaholokula et. al. report their study of the effect of perceived racism and acculturation on the prevalence of hypertension in Native Hawaiians.

Two papers address diabetes. Lee et. al. study numerous indices of good diabetes care in an outpatient clinic, finding that while provider-initiated management met national benchmarks, Native Hawaiians and Pacific Islanders were more likely to have poor glucose control. Chang et. al. studied all delivery records of Micronesian patients in the State of Hawai'i for a decade, and report that given the high prevalence of obesity and type 2 diabetes mellitus in the Micronesian population as a whole, the prevalence of gestational diabetes was lower than would be expected.

The Department's mission is to be a center of excellence in education, research, and quality health care practices committed to the optimal health and wellness of Hawai'i Maoli (Native Hawaiian people), their families and communities that embraces traditional Hawaiian values and practices. It is our hope that this supplement will share our findings with an even broader audience committed to the elimination of health disparities!

*Dr. Brady has no relevant financial relationships or commercial interest to report.*



# The Prevalence of Gestational Diabetes Among Micronesians in Honolulu

Ann Lee Chang MD; Reni Soon MD; and Bliss Kaneshiro MD, MPH

## Abstract

**Objectives:** *There is a high prevalence of type 2 diabetes among Micronesians leading to the assumption that they are at an increased risk for gestational diabetes. The objective of this study was to determine the prevalence of gestational diabetes among the Micronesian population in Honolulu, Hawai'i. Secondary objectives were to determine factors associated with gestational diabetes and compare maternal and fetal outcomes between the Micronesian gestational diabetic and non-diabetic populations.*

**Methods:** *A retrospective chart review was performed of all delivery records from January 1997 to December 2006. Data were analyzed using measures of association and multiple logistic regression.*

**Results:** *Of the 2966 charts reviewed, 2303 met inclusion criteria. The prevalence of gestational diabetes was 6.2% and the prevalence of type 2 diabetes was 0.8%. In comparison to the non-diabetic group, the gestational diabetic population was significantly older ( $p=0.002$ ) and heavier ( $p<0.001$ ). Micronesians with gestational diabetes had higher rates of cesarean section and hypertensive disorders. However, rates of shoulder dystocia were not statistically different. Infants of gestational diabetic mothers experienced higher rates of neonatal intensive care unit admission and hypoglycemia.*

**Conclusion:** *The prevalence of gestational diabetes in the Micronesian population is lower than expected given the high prevalence of obesity and type 2 diabetes among Micronesians. Those with gestational diabetes are at an increased risk for maternal and neonatal morbidity. Future public health endeavors should address increasing rates of obesity in the United States, specifically in Pacific Islander populations.*

## Introduction

Gestational diabetes, defined as glucose intolerance with onset or first recognition during pregnancy, complicates 2-7% of all pregnancies in the United States.<sup>1,2</sup> Prevalence rates have been noted to vary greatly between ethnic and racial groups. Estimates of type 2 diabetes among individuals of Micronesian ancestry range between 20 and 41%.<sup>3</sup> Because of this markedly elevated rate compared to other groups, it has been assumed that Micronesians are also at increased risk for gestational diabetes. The true prevalence of gestational diabetes in this population, however, is unknown.

The primary objective of this study was to determine the prevalence of gestational diabetes in women of Micronesian ancestry residing in Hawai'i. Secondary objectives were to determine maternal characteristics associated with the presence of gestational diabetes and to compare maternal and fetal outcomes between the gestational diabetic and non-diabetic populations.

## Methods

A retrospective chart review was performed of all delivery records from January 1997 to December 2006 at Kapi'olani Medical Center for Women and Children (KMCWC). KMCWC is located in Honolulu, Hawai'i. It has the largest obstetric unit in the state and does approximately 6,000 deliveries per year. All individuals admitted to KMCWC are asked to self identify their race and ethnicity. Women were initially included in this study if they listed themselves in the

category of "Other Pacific Islander," (non-Hawaiian, non-Samoan") and had a singleton birth at more than 20 weeks gestation during the study period. The charts of subjects potentially meeting inclusion criteria were reviewed. At time of triage intake, the nurses recorded patients' ethnicities; upon review of the intake, additional patients were excluded if their ethnicities were not Micronesian, e.g. Tongan.

Information on the screening and diagnosis of gestational diabetes as well as maternal and neonatal outcomes were obtained utilizing the patient's delivery record, prenatal record, one-hour glucose tolerance test, and three-hour glucose tolerance test if it was performed. Using definitions established by the American College of Obstetricians and Gynecologists (ACOG), gestational diabetes was designated when the study subject had two or more elevated glucose levels on the three-hour glucose tolerance test.<sup>2</sup> Those subjects unscreened for gestational diabetes were included in the non-diabetic group for the data analysis. Subjects with type 2 diabetes which preceded pregnancy (pre-gestational diabetes) were identified by an ICD-9 code for type 2 diabetes and confirmed by chart review. These patients with pre-existing diabetes were excluded from the data analysis.

Body mass index (BMI) was calculated using the patient's height and pre-gestational weight recorded by the nurse at time of intake. Of note, the height and weight were not measured at time of intake; rather, they were obtained from the pre-natal record or by the patient's self-report if the pre-natal record was not available. Mode of delivery, fetal weight, Apgar scores, and gestational age at delivery were obtained from the delivery records. Other maternal and fetal outcomes (hypertensive disease, maternal infection, shoulder dystocia, neonatal intensive care/special care unit admission, and neonatal hypoglycemia) were identified by their respective ICD-9 codes and confirmed by chart review.

Measures of association including chi-square, t-tests and multiple logistic regression were used to analyze differences in demographics and maternal outcomes and fetal outcomes between the gestational diabetic and non-diabetic populations. Analysis was performed using SPSS version 16.0 (Chicago, Illinois). This study was approved by the Hawaii Pacific Health Institutional Review Board.

## Results

Out of the 2966 charts of persons classified as "Other Pacific Islander" that initially reviewed, 2303 subjects met inclusion criteria as being Micronesian and having a singleton birth at more than 20 weeks gestation. There were 19 subjects (0.8%) who had a diagnosis of type 2 diabetes prior to pregnancy. After excluding these 19 subjects, 1999 (87.5%) were properly screened for gestational diabetes. An additional 27 subjects (1.2%) had an elevated one-hour glucose tolerance test but never completed screening with the three-hour glucose tolerance test. There were 258 subjects (11.3%) who were not screened for gestational diabetes. Rates of diabetes and pre-gestational diabetes for the study population are presented

	Number (%)
Total Study Population	2303 (100.0)
Non-diabetic	2,141 (93.0)
Pre-gestational diabetic	19 (0.8)
Gestational diabetic	143 (6.2)
Diet-controlled	90 (3.9)
Medication-controlled	53 (2.3)

Mean (sd)	Non-Diabetic Mean (sd)	Gestational Diabetic Mean (sd)	p-value
Age in years	25.2 (5.1)	30.2 (6.0)	0.002
BMI in kg/m <sup>2</sup>	31.2 (7.0)	36.5 (7.0)	<0.001
Weight gain in pounds	30.7 (17.7)	31.5 (24.4)	0.617
Parity	1.6 (1.7)	2.0 (2.1)	0.002

	Non-Diabetic (%)	Gestational Diabetic (%)	p-value
Cesarean section	17.4	35.3	<0.001
Hypertensive diseases	6.0	16.8	<0.001
Shoulder dystocia	1.2	2.1	0.361
Operative delivery	10.2	6.5	0.247
Maternal infection	6.8	5.6	0.585

	Non-diabetic	Gestational diabetic	p-value
Weight in grams	3224(sd 548)	3421 (sd 666)	<0.001
Special care/NICU admit	7.8 %	21.7 %	<0.001
Hypoglycemia	2.0 %	4.9 %	0.019
Age at delivery in weeks	38.3 (sd 3.9)	37.7 (sd 2.0)	0.061

in Table 1. The prevalence of gestational diabetes in Micronesian patients was 6.2%.

Characteristics of the population are described in Table 2. The mean pre-pregnancy BMI of the gestational diabetic group was 36.5 versus 31.2 in the non-diabetic group ( $p < 0.001$ ). Of note, both groups had a mean body mass index (BMI) in the obese range. There was no difference in weight gain during pregnancy among the two groups. With a mean age of 30.2 versus 25.2 in the non-diabetic group, the gestational diabetic subjects were more likely to be older ( $p = 0.002$ ).

Multiple regression analysis was then performed. After controlling for age and parity, obese Micronesian women had a 4.1 fold greater risk of developing gestational diabetes compared to their non-obese counterparts (95% CI 2.39-7.04).

## Maternal Outcomes

The maternal outcomes for the study population are described in Table 3. Cesarean section rates were higher in the gestational diabetic group compared to the non-diabetic group. After controlling for age, BMI, and parity, a gestational diabetic Micronesian woman had a 1.8 fold greater risk of having a cesarean section when compared with her non-diabetic counterpart (95% CI 1.21-2.74). However, there was no significant difference in operative vaginal delivery rates. The gestational diabetic population experienced higher rates of hypertensive diseases compared to the non-diabetic population (16.8% versus 6.0%,  $p < 0.001$ ). Rates of shoulder dystocia in the gestational diabetic population were higher than in the non-diabetic population (2.1% versus 1.2%), however this difference was not statistically significant.

## Neonatal Outcomes

Neonatal outcomes are presented in Table 4. Birth weight in the gestational diabetic group was significantly higher (3421 grams versus 3224 grams,  $p < 0.001$ ). Admission to special care and neonatal intensive care units were also significantly higher for infants of gestational diabetic mothers compared to babies of non-diabetic mothers (21.7% versus 7.8%,  $p < 0.001$ ). Similarly, infants of gestational diabetic mothers also experienced higher rates of hypoglycemia (4.9% versus 2.0,  $p = 0.019$ ). There were no differences in Apgar scores, gestational age at delivery, and preterm delivery rates between groups.

## Discussion

To our knowledge, this is the first study to examine the prevalence of gestational diabetes among Micronesian women living in the United States. Previous studies have calculated the rates of gestational diabetes in Pacific Island populations. In 2006, Silva et al. determined a prevalence of 3.6% for the Native Hawaiian and Pacific Islander population in Hawai'i.<sup>4</sup> In a retrospective study examining perinatal outcomes between Asian Americans and Pacific Islanders, Rao et al reported the rate of gestational diabetes as 7.2% for Pacific Islanders.<sup>5</sup> A recent retrospective study calculating the prevalence of gestational diabetes among Asian and Pacific Islander subgroups in the United States estimated a prevalence of 5.82% for US-born Pacific Islanders and 8.38% for foreign-born Pacific Islanders.<sup>6</sup> Historically, if Micronesians were included in the analysis, they were grouped in the Asian and Pacific Islander category or the Pacific Islander subgroup, both of which include many diverse populations.

Because it has been shown that the prevalence of type 2 diabetes among Micronesians is higher than in other populations,<sup>3</sup> it was assumed that Micronesians would also have a higher prevalence of gestational diabetes. However, we found the prevalences of gestational diabetes and pre-gestational diabetes, which in this study were 6.2% and 0.8%, respectively, to be lower than recently calculated prevalences for the general population. A recent study of 209,287 patients who delivered from 1999 through 2005 in Kaiser Permanente hospitals in southern California reported a prevalence of pre-gestational diabetes of 1.3% and gestational diabetes of 7.6%.<sup>7</sup> The relatively low prevalence of gestational and type 2 diabetes in our study may be in part attributed to insufficient screening for diabetes during pregnancy and prior to pregnancy as well. Since 13.5% of our subjects were not screened in accordance with ACOG

recommendations, this could have falsely lowered our diabetes rates.

The strong association between obesity and both pre-gestational and gestational diabetes is well established. Thus, it is even more surprising that the calculated rates of pre-gestational and gestational diabetes in our study population were lower than expected when taking into consideration that the mean BMI of both the non-diabetic and gestational diabetic groups fell in the obese range. Since obesity also contributes to other maternal complications of pregnancy as well as the development of diabetes and cardiovascular disease, this study highlights the need for weight loss intervention and management in this population.

Although a number of studies have documented that self-reported weight and height is an accurate representation of a woman's body mass index,<sup>8-10</sup> the validity of this information is a limitation of this study. Because women of all weights tend to underestimate their weight and over estimate their height, this type of exposure misclassification would be non-differential and may actually underestimate the high obesity rates.<sup>8-10</sup>

Gestational diabetes has been shown to increase maternal and neonatal morbidity, and this was noted in our study as well. The clinically significant but not statistically significant difference in shoulder dystocia rates is likely secondary to the low incidence of shoulder dystocia. Both groups had mean fetal weights that were not in the range of macrosomia (>4,000 grams) but the larger mean fetal weight in the gestational diabetes group likely contributed to the higher rates of cesarean delivery.

Honolulu's hospitals are providing health care for a growing number of Micronesian patients. This study highlights the importance of providing them with comprehensive postpartum and primary care. For example, more effort should be made to have our patients undergo a two-hour glucose tolerance test six weeks postpartum to determine if they have type 2 diabetes versus gestational diabetes. The study population had a relatively low prevalence of type 2 diabetes. But they are at significantly higher risk than the general

population of developing type 2 diabetes in their lifetime. Pregnancy is thus an ideal time to initiate interventions such as weight loss and management that will decrease the risk for diabetes in this obese population. As their care is often complicated by language, cultural, and financial barriers, more studies need to be performed to better understand their health needs and to design interventions that will improve their health outcomes.

*Source of support: none*

*No potential conflicts of interest relevant to this article were reported.*

Authors' Affiliation:  
Department of Obstetrics, Gynecology, and Women's Health,  
University of Hawai'i John A. Burns School of Medicine  
1319 Punahou Street #824  
Honolulu, HI 96826

Correspondence to:  
Ann Lee Chang MD  
1319 Punahou Street #824  
Honolulu, HI 96826

### References

1. Jovanovic L, Pettitt DJ. Gestational diabetes mellitus. *JAMA*. Nov 28 2001;286(20):2516-2518.
2. ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 30, September 2001 (replaces Technical Bulletin Number 200, December 1994). Gestational diabetes. *Obstet Gynecol*. Sep 2001;98(3):525-538.
3. King H, Rewers M. Global estimates for prevalence of diabetes mellitus and impaired glucose tolerance in adults. WHO Ad Hoc Diabetes Reporting Group. *Diabetes Care*. Jan 1993;16(1):157-177.
4. Silva JK, Kaholokula JK, Ratner R, Mau M. Ethnic differences in perinatal outcome of gestational diabetes mellitus. *Diabetes Care*. Sep 2006;29(9):2058-2063.
5. Rao AK, Daniels K, El-Sayed YY, Moshesh MK, Caughey AB. Perinatal outcomes among Asian American and Pacific Islander women. *Am J Obstet Gynecol*. Sep 2006;195(3):834-838.
6. Chu SY, Abe K, Hall LR, Kim SY, Njoroge T, Qin C. Gestational diabetes mellitus: all Asians are not alike. *Prev Med*. Jul 2009. (Epub ahead of print)
7. Lawrence JM, Contreras R, Chen W, Sacks DA. Trends in the prevalence of preexisting diabetes and gestational diabetes mellitus among a racially/ethnically diverse population of pregnant women, 1999-2005. *Diabetes Care*. May 2008;31(5):899-904.
8. Le Marchand L, Yoshizawa CN, Nomura AM. Validation of body size information on driver's licenses. *Am J Epidemiol*. Oct 1988;128(4):874-877.
9. Stewart AW JR, Ford MA, Beaglehole R. Underestimation of relative weight by use of self reported height and weight. *Am J Epidemiol*. 1987 1987;125(1):122-126.
10. Palta M PR, Berman R, Hannan P. Comparisons of self-reported and measured height and weight. *Am J Epidemiol*. 1982 1982;115(1):122-126.



# Closing The Gap “Disparity In Native Hawaiian Cardiac Care”

Ann Cook APRN; Coraleen T. Grothaus APRN; Carol E. Gutierrez APRN; Kimberly A. Kehoe APRN; and Mona R. Valentin PharmD

## Abstract

*Purpose:* Queen’s Heart, the cardiac service line at the Queens Medical Center (QMC), Honolulu, Hawai’i, recognizes the importance of closing the health disparity gap that affects the Native Hawaiian population. The purpose of this study was to examine the process and outcomes of health care among Native Hawaiians with heart disease, and to evaluate the impact of a multidisciplinary, culturally sensitive effort to improve quality of care.

An inpatient program was created by assembling a team of practitioners who have an affinity for Native Hawaiian culture to address the health care of the Native Hawaiian people.

*Methods:* All Native Hawaiian patients who were admitted to The Queen’s Medical Center from January 2007 to December 2008 became participants of the program. Baseline outcomes data for cardiac core measures, length of stay, 30 day readmission rates, and adverse events were reviewed by the team before the study was initiated. Educational materials were developed to provide culturally specific disease management information to patients and family members. The patient educators and discharge counselors provided patients with the education and tools they needed to engage in self care management. Heart failure disease management ensured that all Native Hawaiian patients receive appropriate quality care, individualized heart failure education, and a definitive plan for out patient follow up. The Integrative Care Program provided a holistic perspective of healing.

*Results:* All quality indicators for Native Hawaiian patients with cardiac disease have improved. Patient satisfaction rates have remained at the 99th percentile. There has been a marked improvement in adverse events following percutaneous coronary interventions (PCI) for Native Hawaiian patients. Readmissions that occurred in less than 30 days for patients admitted with myocardial infarctions and heart failure have improved and are now essentially the same as all other patient populations.

*Conclusions:* Culturally sensitive and patient centered care, delivered by the team of specialists from Queen’s Heart, has allowed patients to incorporate cultural preferences into their care and recovery. Readmission rates have decreased, mortality rates have improved, and patient and family satisfaction is enhanced.

## Introduction

There is an increasing burden of cardiometabolic disorders among minority populations in the United States.<sup>1</sup> Most of the studies evaluating health care disparities have focused on the differences between African American populations and those with a primarily European ancestry. The State of Hawai’i has the largest number of peoples who identify themselves as Native Hawaiian/Pacific Islanders in the United States. In 2007, Queen’s Heart developed a program to address the cardiometabolic health disparities of hospitalized Native Hawaiians. The Queen’s Heart Native Hawaiian Health Initiative (QHNHHI) was supported by the Board of Trustees and CEO of The Queen’s Health Systems.

Until recently the health care disparities of this population of people have been under studied.<sup>2</sup> The data for Native Hawaiians/Pacific Islanders with heart disease are scarce. The available data does indicate that these ethnic groups have a higher rate of risk factors for cardiovascular related conditions including hypertension, diabetes,

and obesity.<sup>2,3</sup> Asian and Pacific Islanders, with heart failure, were found to have extended hospitalizations and require more medical interventions than Caucasians.<sup>3</sup> The purpose of this study was to examine the process and outcomes of health care among Native Hawaiians with heart disease, and to evaluate the impact of a multidisciplinary and culturally sensitive effort to improve quality of care.

## Methods

The Queen’s Heart Native Hawaiian Health Initiative was based on The Queen’s Medical Center (QMC) philosophy of care, Lokomaika’i (Inner Health) and was guided by principles of patient and family centered care, culturally centered care, collaboration between all health care team members, and delivery of care with an emphasis on education. Building on an ongoing performance improvement infrastructure, QHNHHI was specifically tailored to address health care disparities among Native Hawaiians and also to provide high-quality care for *all* hospitalized patients.

A team of specialized practitioners, with an affinity for Native Hawaiian culture, developed educational materials that would provide culturally appropriate disease management information to patients and families. Patients were provided with scales for daily weights and blood pressure cuffs. Educators and discharge counselors presented patients with the education and tools needed to engage in self management.

All Native Hawaiian patients were seen by an Advance Practice Registered Nurse (APRN) for education, review of treatment plan, and a definitive plan for out patient follow up. A process for discharge medication reconciliation was developed and physician order sets were changed to insure accurate medication reconciliation, and include pharmacy oversight.

All Native Hawaiian patients that were admitted to QMC from January 2007 through December 2008 became participants in the program. Outcome data for quality core measures, length of stay, 30 day readmission rates, and adverse events following percutaneous coronary intervention (PCI) were reviewed prior to the initiation of the study and compared between the Native Hawaiian patient population and all others for the time period from 12-2006 to 12-2008. Data and technical support were provided by existing staff. The program concentrated on three areas of intervention: Education and self care management, disease management, and stress reduction and wellness.

## 1. Education and Self-Care Management

Education in cardiac disease management is a key component to promoting quality self care in patients. QHNHHI utilizes an APRN and a clinical pharmacist, both with expertise in cardiology, to educate patients and their families on disease process and self care management. The goal of the education and counseling intervention is to increase the patient’s and family’s knowledge, enhance their involvement in care, and promote improved compliance with

a self care treatment regimen.<sup>5,6</sup> The ability to self manage minimizes hospital readmissions, increases quality of life and provides patients with control over their disease process.<sup>3</sup> The APRN and clinical pharmacist partner in discharge education and consultation to ensure comprehensive life style education and to ensure accurate reconciliation of home and hospital medications that will promote a successful transition from hospital to home.

The Clinical Pharmacist provides medication information that promotes adherence and helps to prevent medication related adverse events after discharge. A medication schedule is generated for each patient prior to discharge. A pill box is provided for patients with complex medication schedules, significant amounts of medication, and perceived difficulties with medication compliance. The APRN's focus is on the patients understanding of their disease, life style changes required to promote wellness, and stressing the importance of ongoing out patient follow up. Studies have shown that Native Hawaiians do not trust traditional western medicine and are less likely to comply if a trusting relationship is not formed.<sup>7</sup> Since forming trust between care provider and patient is imperative to promoting effective communication patient educators use a technique called "talk story" this style of communication is informal and relaxed and allows the patient and care provider to get to know each other and build a therapeutic relationship.<sup>3</sup>

The QHNHHI team have adapted traditional education strategies to ensure that the material is culturally acceptable. For example, salt reduction is an essential part of dietary education for all cardiac patients. However Pa'akai (salt) traditionally has spiritual cleansing properties and is highly treasured in the Native Hawaiian culture. Therefore, dietary salt reduction presents a challenge for many Native Hawaiians. Educational material was developed to recognize and appreciate the cultural significance of salt, but also demonstrates the importance of a reduced sodium diet. Culturally sensitive, and disease specific printed materials, have been developed to ensure that the cultural aspects of disease management have been addressed.

Another important concept of culturally sensitive teaching is to include families in the educational process. "Ohana" or family is an integral part of the lives of the Native Hawaiian community and can often be a major component in successful disease management. Families are encouraged to be a part of patients' care and education.

## 2. Disease Management

Disease management is an integral part of QHNHHI. Heart failure (HF) is among the most common chronic diseases in the United States. It results in frequent hospitalizations with high readmission rates, and complex compliance issues. The literature suggests that heart failure affects minority communities in a disproportionate manner and treatment options that affect outcomes may be influenced by racial or ethnic differences.<sup>8</sup>

The heart failure population at QMC is made up of approximately 25% Native Hawaiians. Heart failure is a complex cardiometabolic syndrome that is frequently made more difficult to treat because of the high incidence of diabetes, obesity, hypertension, and lung disease. These co-morbidities can also be causative factors in the diagnosis and have a disproportionate incidence in Native Hawaiian/Pacific Islander peoples.<sup>1-8</sup> Heart failure patients often have frequent hospitalizations with high readmission rates, and complex

compliance issues.

The APRN follows the heart failure patients throughout their hospitalization and provides the patients with a scale for daily weights and blood pressure cuffs along with education on the importance of monitoring daily weights, for enhanced fluid management, and blood pressure control. Attending physicians are consulted to ensure that treatment plans are initiated early in the hospitalization, the treatment plan is updated, and quality measures of care are met.

Heart failure patients often have multiple co-morbid conditions such as diabetes and renal failure. These conditions require complex medication schedules, dietary restrictions, and are accompanied by functional impairment and poor adherence to follow up. These factors often contribute to exacerbation of symptoms of heart failure and contribute to frequent readmissions.<sup>9</sup> Readmission rates for heart failure that occur in less than 30 days of a previous admission exceed 20% nationwide.<sup>10</sup> That number has traditionally been higher for the Native Hawaiian patients than for non-Hawaiians at The Queen's Medical Center. One of the reasons for the higher percentage of Native Hawaiians being readmitted can be attributed to lack of out patient follow-up due to geographic location, transportation, insurance issues and a general mistrust of western medicine. QHNHHI has broken down some of these barriers. While in-patients a trust is developed between the patient and care provider. Part of the APRN's assessment is identifying known barriers to out patient follow-up and putting into place strategies to optimize the chances of follow up occurring. These could include providing services at The Queen Emma Clinic where the same APRN who followed the patient in the hospital, would follow the patient as an out-patient in collaboration with a physician, Social Worker, and Clinical Pharmacist. Heart failure symptoms can be managed, medications adjusted, education reinforced, and housing concerns or insurance issues can be promptly addressed. The multi-disciplinary team addresses the heart failure patients' needs on an on-going basis and readmissions can be prevented.

## 3. Stress Reduction and Wellness

In March 2008 an integrative care program was implemented that offers wellness education, stress management and complementary healing modalities to Native Hawaiian patients. Services are provided by two holistic APRN's and a licensed massage therapist. In order to promote a healing environment a Ti leaf (La'i) welcome is offered as well as poi being on the hospital menu. Both La'i and poi have special meaning for health and healing to Native Hawaiians. On admission to the hospital the holistic APRN conducts a wellness consult, assessing pre-admission levels of psychosocial stress, existing coping mechanisms, patient perception of illness, and life meaning. After the initial evaluation integrative therapies are offered to help manage stress, provide symptom control, relieve anxiety, and improve sleep. These therapies include massage, reflexology, guided imagery, guided meditation, aromatherapy, and Healing Touch.

Music is an essential part of Hawaiian culture. CD's with a variety of music are provided upon patient or family request. A hospital volunteer also visits patients, at their request, to play live ukulele music and sing Hawaiian songs. It has been demonstrated that music lifts the spirits, reduces pain, improves blood pressure, heart rate and calms the nervous system.<sup>11-13</sup>



Prior to discharge a “wellness prescription” is provided. It offers individualized recommendations which may include sleep hygiene and stress management tips, and other areas of focus for enhanced well being.

Research suggests that Native Hawaiians prefer traditional healing that provides a more holistic approach to care.<sup>10</sup> This “whole person” model of care has been shown to enhance patients’ overall satisfaction and their willingness to participate in self care management.<sup>15</sup> Further evidence suggests that the addition of a holistic approach may reduce readmissions as well as reduce the long term risks of heart disease.<sup>14-15</sup>

## Analysis

The authors used existing data sets to evaluate the process of care (quality of care) among Native Hawaiians (NH) compared with non-Native Hawaiians. Information on outcomes related to percutaneous coronary interventions (PCI), heart failure (HF), myocardial infarction (MI), and quality measures were obtained from clinical databases that are maintained by trained nurse coordinators. Utilization, including readmission rates and length of stay were obtained from hospital admission data. Data from 2006, prior to initiation of the QHNHHI were considered as baseline, with data from 2008 considered follow-up or post intervention. Data from 2007, during the planning and initiation of QHNHHI were not evaluated. Changes in measures between 2006 and 2008 were compared among NH and non-NH.

## Results

Table 1 displays performance measures (percentages based on the number of eligible patients), readmission rates, and length of stay for NH and non-NH discharged in 2006 and 2008. In general, adherence to performance measures for acute MI and HF were excellent at baseline and generally similar between NH and non-NH. For

example both AMI and HF generally ranked above 90% compliance for both groups. An exception is the provision of discharge instructions for HF patients, which was lower for both groups at ~ 82%. Consistent with published data, the readmission rate for MI was lower than for HF, with NH having a higher readmission rate than non-NH for HF (33% vs. 23%). Conversely, compared with non-NH, average length of stay for NH was longer for MI and shorter for HF. At follow up, adherence to performance measures improved for both NH and non- NH, achieving >99% for both MI and HF, except for the provision of discharge instructions which, nonetheless, improved to 88%-89%.

Quality Core Measures have shown improvement in both groups during the time of the study. There are several unrelated factors that have contributed to these outcomes. There have been changes made to physician order sets and discharge instructions that promote compliance with core measures. Adherence to core measure compliance is monitored by the staff of the Center for Outcomes and Research and the cardiac APRN’s diligently document contra indications to core measure quality indicators.

NH patients underwent 68 percutaneous coronary interventions (PCI) in 2006 and 69 in 2008. The number of periprocedural myocardial infarctions, renal failure, emergent/urgent coronary bypass surgery, and death substantially improved between baseline and follow-up (Figure 1).

## Discussion

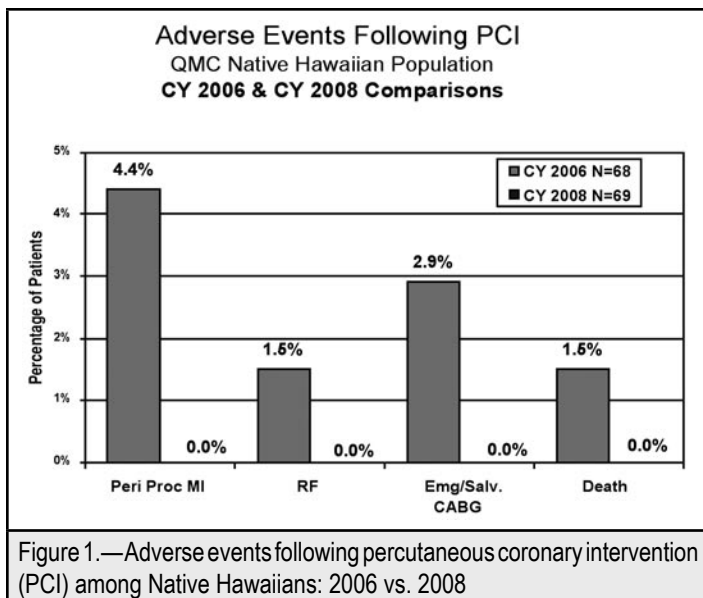
In general, we found that the quality of cardiovascular care of NH at QMC was excellent at baseline. The quality core measures have improved among the entire patient population following the implementation of a multi-disciplinary team. Some improvements in quality core measures were notable among the NH population. The less than 30 day readmission rates for NH with acute myocardial infarction have been reduced by 2% and NH heart failure patients

Table 1.— Performance Measures, 30-day Readmission Rates and Length of Stay: 2006 vs. 2008

	Baseline: 2006*		Follow-up: 2008*	
	NH	Non NH	NH	Non NH
<b>Acute MI</b>				
Aspirin at Arrival	92%	97%	99%	100%
Aspirin at discharge	98%	96%	100%	99%
Ace-Inhibitor for LVSD	94%	86%	100%	100%
Smoking Cessation	95%	95%	100%	100%
Beta blocker at discharge	100%	98%	99%	99%
Beta blocker at admission	100%	98%	100%	99%
30 Day Readmit Rate	12%	13%	10%	9%
Average LOS	9.10 days	7.81 days	7.41days	6.66 days
<b>Heart Failure</b>				
Discharge instructions	82%	83%	89%	88%
LV Function	95%	94%	99%	100%
Ace-Inhibitor	92%	88%	100%	100%
Smoking Cessation	94%	98%	100%	100%
30 Day Readmission Rate	33%	23%	17%	19%
Average LOS	6.8 days	7.6 days	7.8 days	7.7 days

NH = Native Hawaiian; MI: Myocardial infarction; LVSD: Left ventricular systolic dysfunction; LOS: Length of stay; LV: Left ventricular

\* Percentages are based on number of eligible patients.



with less than 30 day readmissions have decreased from 33% to 17%. The national average for HF readmissions in the United States is 19% to 21%.

The length of stay (LOS) for patients following an acute myocardial infarction has decreased slightly, and the LOS for heart failure patients remains unchanged. The length of stay continues to be of concern and the NH population has the largest room for improvement. The extended LOS in this patient population may be related to the severity of illness at the time of admission.

### Limitations

There are several limitations to this study. First, this study was observational and not randomized. The QHNHHI intervention was implemented in the setting of ongoing, long-standing performance improvement programs, and the impact of the intervention cannot be clearly determined. For example, the implementation of computer-based order sets and physician report cards likely improved adherence to performance measures and resource utilization. Second, the overall adherence to performance measures and resource utilization was high for both the NH and non NH. The difference between the two groups was less than expected, which may have limited the potential impact of the intervention (ceiling effect). Nonetheless, improvements between baseline and follow up indicate that the results may be clinically meaningful.

In summary, the authors have found that the quality of care among NH and non-NH hospitalized with MI and HF is excellent. The implementation of a multidisciplinary, patient centered intervention, focused on reducing disparities in cardiovascular disease, when added to an ongoing performance program, can have a positive impact on quality of care, patient satisfaction, and promotes the reduction of health care disparities for all Hawaiian People.

*No potential conflicts of interest relevant to this article were reported.*

### Acknowledgments

We wish to acknowledge Dr. Gerard Akaka, VP Medical Affairs, Cathy Young, VP Cardiac/Geriatric, and Diane Paloma, Director Native Hawaiian Health Program for administrative support. We would like to thank Suzanne Beauvallet, Clinical Data Base Coordinator, and Desiree Uehara, Clinical Data Analyst for taking the time to provide us with outcomes data. Finally we wish to express our deep appreciation to Dr. Todd Seto, Medical Director of the Center for Outcomes Research for his support, his invaluable input, and his precious time during this process.

Authors' Affiliation:  
The Queen's Medical Center, Honolulu, HI 96813

Correspondence to:  
Ann Cook APRN  
The Queen's Medical Center – Queen's Heart  
1301 Punchbowl Street  
Honolulu, HI 96813  
E-mail: [ancook@queens.org](mailto:ancook@queens.org)

### References

1. Yancy, Clyde W. the Prevention of heart failure in minority communities and discrepancies in health care delivery systems. *The Med Clin N Am.* 2004;88:1347-1368.
2. Mau MK, Sinclair K, Saito EP, Baumhofer KN, Kaholokula JK. Cardiometabolic health disparities in native Hawaiians and other pacific islanders. *Epidemiologic Reviews.* "in press"
3. Kaholokula JK, Saito E, Mau MK, Latimer R, Seto TB. Pacific islanders' perspective on heart failure management. *Patient Education and Counseling.* 2008;70:281-291.
4. Bodenheimer T, MacGregor K, Shafiri C. Helping patients manage chronic conditions. <http://www.chcf.org/topics/chronicdisease>. July 14, 2009.
5. Jerant AF, von Frederichs-Fitzwater MM, Moore, Monique. Patients' perceived barriers to active self-management of chronic conditions. *Patient Education and Counseling.* 2005;75:300-307.
6. Mau MK, West M, Sugihara J, Kamaka M, Mikami J, Cheng SF. Renal disease disparities in asian and pacific-based populations in Hawaii. *Journal of the National Medical Association.* 2003;95(10):955-963.
7. Brown DW, Haldeman GA, Croft JB, Giles WH, Mensah GA. Racial or ethnic differences in hospitalization for heart failure among elderly adults: medicare, 1990 to 2000. *American Heart Journal.* 2005;150:448-454.
8. Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. *JAGS.* 2004;52(675):676-685.
9. Hospital bedside technology solution results in 74 percent reduction in heart failure readmission rate. <http://www.medicalnewstoday.com/articles/> July 21, 2009.
10. Young N, Braun K, La'au lapa'au and western medicine in Hawaii: experiences and perspectives of patients who use both. *Hawaii Med J.* 2007;(66):176-180
11. Nilsson U. The Effects of music intervention in stress response to cardiac surgery in a randomized clinical trial. *Heart Lung.* 2009;38(3):201-207.
12. Ebneshahidi A, Moheeni M. the Effect of patient selected music on early postoperative pain, anxiety, and hemodynamic profile in cesarean section surgery. *Altern Complement Med.* 2008;14(7):827-831
13. Chan MF, Wong OC, Chan HL et al. Effects of music on patients undergoing a c-clamp procedure after percutaneous coronary intervention. *J Adv Nurs.* 2006;53(6):669-679.

# Effects of Perceived Racism and Acculturation on Hypertension in Native Hawaiians

Joseph Keawe'aimoku Kaholokula PhD; Marcus K. Iwane MD; and Andrea H. Nacapoy MA

## Abstract

**Objective:** To examine the effects of perceived racism and acculturation on the hypertension status of Native Hawaiians.

**Design:** Cross-sectional data from 94 Native Hawaiian adults were obtained which included the following: 1) socio-demographic variables and self-reported hypertension status; 2) a 5-item Hawaiian cultural identity subscale (HCSS) and a 5-item American cultural identity subscale (ACSS); and 3) perceived racism based on a 6-item modified version of the 32-item Oppression Questionnaire (OQ).

**Results:** Based on logistic regression analysis, the ACSS scores and OQ scores had significant ( $p < .05$ ) and independent effects on hypertension status, after considering the effects of age, sex, and education level, and HCSS scores. Of the variables examined, OQ scores had the greatest magnitude of effect on hypertension status.

**Conclusion:** More perceived racism and a greater identification with the American mainstream culture were both, independently, related to self-reported hypertension in Native Hawaiians. These findings have important clinical and public health implications.

## Introduction

Hypertension (high blood pressure) affects 26.7% of the US population and is a major risk factor for cardiovascular disease (CVD).<sup>1</sup> Native Hawaiians, the indigenous people of Hawai'i, have a higher prevalence of hypertension (31.8% to 39.6%) than many other US ethnic groups.<sup>2-4</sup> They also have the highest coronary heart disease mortality rates (135.4 per 100,000) and die due to CVD an average of 7.5 years younger than other ethnic groups.<sup>5</sup> Identifying important and modifiable risk factors of hypertension in Native Hawaiians can lead to effective interventions to ameliorate their CVD-related disparities as well as those of other Pacific Islanders and indigenous populations.

Studies established a strong link between various psychosocial stressors (e.g., work strain, social status, and emotional distress) and increased risk for hypertension.<sup>6</sup> In some US ethnic groups, unique stress-related psychosocial factors associated with hypertension have been identified. Vaeth and Willett found that Hispanic Americans with high- to mid-acculturation levels (e.g., higher interaction with people from the US mainstream) were nearly three times more likely to have hypertension than those with low-levels of acculturation, even after adjusting for socio-demographics, health care access and utilization, and health behaviors and status.<sup>7</sup> The Hispanic HANES and NHANES III studies found similar associations between acculturation levels and hypertension in Hispanic Americans despite employing different ways of measuring acculturation.<sup>8-9</sup> Vaeth and Willett suggest that higher levels of acculturation for Hispanic Americans may be associated with greater acculturative stressors, such as being marginalized from their Hispanic community and not benefiting fully from the purported advantages associated with the "American lifestyle."<sup>7</sup>

Racism, also referred to as racial/ethnic discrimination or oppression, is another stress-related psychosocial factor associated with hypertension. In African Americans, studies found an association between perceived ethnic discrimination and an increased risk for

hypertension.<sup>10</sup> Davis *et al.* found that degree of stress from perceived ethnic discrimination was a significant predictor of hypertension in a sample of 356 African American adults.<sup>11</sup> Steffen *et al.* found that perceived racism accounted for a significant proportion of the variance in waking systolic (7% of the variance) and diastolic blood pressure (4% of the variance) in 69 African American adults after adjusting for age, BMI, and income.<sup>12</sup>

In relation to hypertension, the effects of acculturation were examined exclusively in Hispanics while the same is true for African Americans concerning the effects of perceived racism. Native populations in the United States, such as American Indians, Alaska Natives, and Native Hawaiians, report ethnic discrimination and difficulties in acculturating toward the US mainstream.<sup>13,14</sup> The higher prevalence of hypertension among native US populations compared to other US ethnic groups and the general population is well documented.<sup>3,5</sup> However, no study to date examined the effects of acculturation factors and perceived racism on hypertension in native US populations.

As part of a first-year medical student research project at the John A. Burns School of Medicine (JABSOM), the effects of acculturation (based on both Native Hawaiian and American cultural identification) and perceived racism on self-reported hypertension in a convenience sample of Native Hawaiian adults were examined. Most studies examining the effects of acculturation on hypertension only measured the degree to which individuals identified with or had assimilated (i.e., adapted) toward the American mainstream. The team chose to also examine the degree to which individuals identify with their Native Hawaiian identity and affiliation as to avoid the assumption that a high American mainstream identity means a low ethnic identity.<sup>15</sup> The team also chose to focus on these two cultural identifications as surrogate factors of acculturation because other commonly measured acculturation factors, such as length of US residence, generational status, and language preference are not relevant to native populations.<sup>16</sup>

## Methods

### Study Design and Participants

Using a cross-sectional correlational study design, Native Hawaiians were recruited for participation in this study from various monthly gatherings of Native Hawaiian civic and cultural organizations over a two-month period on the island of O'ahu. All Native Hawaiian adults ( $\geq 18$  years of age) from these organizations were eligible to participate. In total, 94 adult Native Hawaiians (48 women and 46 men) participated in this study. A Native Hawaiian, as a distinct ethnic group, was defined as any descendent of the aboriginal people who resided in the islands now called Hawai'i prior to 1778.<sup>17</sup>

### Assessments

Socio-demographic information and hypertension status were collected using a questionnaire that asked for the participant's sex, age, marital status (i.e., 'never married'; 'currently married'; 'divorced or separated'; or 'widowed'), and highest formal educa-

tional attainment (i.e., 'no high school diploma'; 'H.S. diploma or GED/CBase'; 'some college, technical, or vocational training'; or 'college graduate').

Hypertension status was assessed based on the participant's self-report with either a "Yes" or "No" response to the question, "Have you ever been told by a doctor that you have high blood pressure (hypertension)?" Cross-sectional studies of hypertension rely on participants' self-reported diagnosis of hypertension because of its feasibility.<sup>18</sup> Studies found a high correlation between self-reported diagnosis of hypertension and confirmed hypertension diagnosis, with 72.1% sensitivity and 86.4% specificity.<sup>18,19</sup>

Perceived racism was assessed using a 6-item modified version of the 32-item Oppression Questionnaire (OQ).<sup>20</sup> The OQ measures a person's beliefs about discrimination and oppression toward his or her own social group by those of other social groups. The instructions asked the respondents to answer in the context of how other social groups perceive and treat them as Native Hawaiians. Example items include "They consider us to be inferior" and "They don't give us equal rights" with responses ranging from 1 (not at all) to 4 (a great deal). The total possible scores ranged from 6 to 36, with higher scores indicating greater perceived racism. Because the OQ was modified for the purpose of this study, the Cronbach's alpha was calculated to assess its internal reliability and yielded an alpha of .93, suggesting a high degree of internal consistency.

Degree of Native Hawaiian cultural and American mainstream cultural identifications were assessed using an acculturation questionnaire designed for use with Native Hawaiians.<sup>16</sup> The questionnaire consists of a 5-item Hawaiian cultural identity subscale (HCSS) and a 5-item American cultural identity subscale (ACSS). Each subscale separately assesses the participant's preference for their Native Hawaiian heritage and lifestyle and American heritage and lifestyle based on their reported degree of knowledge about; involvement in; association with; positive feelings toward; and the importance of these cultural groups to him or her. A 5-point response scale, ranging from 1 (very knowledgeable; very involved; very interested; very positive; or very important) to 5 (not knowledgeable; not involved or interested at all; very negative; not important at all) was used for each item. The responses to each item were reversed scored so that the total possible scores (ranging from 5 to 25) indicated a stronger identity. The HCSS and ACSS subscales have been used in a previous study of Native Hawaiians.<sup>16</sup>

### **Procedures**

During the data collection period, a researcher attended several monthly meetings/gatherings of various Hawaiian civic and cultural organizations to recruit participants for this study. Permission from the organizations' leaders was obtained in advance. Recruitment from Hawaiian civic and cultural organizations was done because most of their membership is Native Hawaiian with a diverse socio-demographic representation, such as in age and educational background. At each meeting, a researcher spent about five minutes providing a brief educational talk about the health disparities experienced by Native Hawaiians and introducing the study to its membership. The educational talk did not cover information about psychosocial factors and hypertension as not to influence their responses if they chose to participate. Informed consent was obtained from interested individuals based on a standard consent process approved by the

Institutional Review Board of the University of Hawai'i. Those who consented completed the packet of questionnaires by themselves, which took about 10 minutes. The survey packets were collected by the researcher as to ensure privacy. Upon completion, the participants were given a brief written explanation of the study.

### **Data Reduction and Analysis**

All statistical analyses were done using JMP statistical software, release 7.0 (SAS Institute Inc. 2007). A probability value of  $< .05$  was used to determine statistical significance. The separated, divorced, and widowed marital statuses were collapsed into a single category because of small sample size in each, and is referred to as 'disrupted marital status' from here on. For reporting sample characteristics, all study variables were examined by hypertension status (participants who reported hypertension versus those who did not).

Analysis of variance (ANOVA) was done to examine the statistical association of the continuous variables of age and OQ, HCSS, and ACSS scores with the dichotomous variable of hypertension status (1 = No; 2 = Yes). Chi-square analysis ( $\chi^2$ ) was done to examine the statistical association of the dichotomous variables of sex, educational attainment, and marital status with hypertension status. For all subsequent analyses, sex (1 = male and 2 = female) and educational attainment (1 = no H.S. diploma to 4 = college graduate) were dummy coded and Pearson Product Moment Correlation coefficients were calculated between all study variables (except marital status).

In predicting hypertension status (a dichotomous outcome variable), a 3-step logistic regression analysis was done to examine the independent effects of the socio-demographic variables (Step 1); the independent effects of HCSS scores and ACSS scores when entered into the analysis with the socio-demographic variables (Step 2); and the independent effects of OQ scores when entered into the analysis with the socio-demographic variables and HCSS and ACSS scores (Step 3). Wald test was done to confirm that an independent variable had a statistically significant relationship with hypertension status in the logistic regression analysis.

## **Results**

### **Participants' Characteristics and Bivariate Associations with Hypertension Status**

The characteristics of the participants are summarized in Table 1 by hypertension status and combined sample. The prevalence of self-reported hypertension was 39%. Participants who reported having hypertension were significantly older in age [ $F(1,92) = 24.68, p < .0001$ ]; lower in educational attainment [ $\chi^2(3, N=94) = 10.46, p < .05$ ]; and had higher mean scores on the OQ [ $F(1,92) = 22.53, p < .0001$ ], HCSS [ $F(1,92) = 4.24, p < .05$ ], and ACSS [ $F(1,92) = 7.66, p < .01$ ]. Participants who reported having hypertension were also more likely [ $\chi^2(3, N=94) = 18.22, p < .001$ ] to be currently married or have a disrupted marital status.

### **Intercorrelations between Study Variables**

The intercorrelations between study variables and their means and standard deviations (SD) are summarized in Table 2. HCSS scores had a significant positive correlation with age ( $r = -.24$ ) and OQ scores ( $r = .35$ ). ACSS scores OQ scores both had a significant positive correlation with age ( $r = .43$  and  $.26$ , respectively). Education level had a significant negative correlation with age ( $r = -.25$ ).

Characteristics	No Hypertension 61% (57)	Hypertension 39% (37)	Combined 100% (94)
Age (years)**	35.6 ± 17.0	55.2 ± 20.7	43 ± 20.7
Female (vs. male)	53% (30)	49% (18)	51% (48)
Educational attainment*			
No high school diploma	0	8% (3)	3% (3)
High school diploma/GED/CBase	9% (5)	19% (7)	13% (12)
Some college/technical/vocational	35% (20)	16% (6)	28% (26)
College graduate	56% (32)	57% (21)	56% (53)
Marital Status**			
Never married	60% (34)	22% (8)	45% (42)
Currently married	28% (16)	46% (17)	35% (33)
Divorced/separated/widowed	12% (7)	32% (12)	20% (19)
OQ scores**	11.2 ± 4.6	16.0 ± 4.9	13.1 ± 5.2
HCSS scores*	21.2 ± 2.2	22.1 ± 1.9	21.6 ± 2.1
ACSS scores**	19.5 ± 3.0	21.0 ± 1.9	20.1 ± 2.7

Data shown as % (n) or mean ± standard deviation. \* p < .05, \*\* p < .01

### Logistic Regression Analysis Predicting Hypertension Status

The 3-step logistic regression analysis described earlier was done to examine the independent effects of the socio-demographic variables, the acculturation variables (HCSS and ACSS), and OQ scores in predicting hypertension status. Marital status was not included in the analysis for parsimony and to avoid multicollinearity because of its significant positive linear relationship [ $F(3, 92) = 49.05, p < .0001$ ] with age (i.e., young adults more likely to be never married and older adults more likely to have a disrupted marital status). As summarized in Table 3, age was the only socio-demographic variable with a significant and independent effect on hypertension status (i.e., older participants were more likely to report having hypertension) in Step 1 of the logistic regression analysis [ $\chi^2(3, N=93) = 21.04, p < .0001$ ]. In Step 2, the effects of age remained significant while HCSS scores and ACSS scores had no significant effects on hypertension status [ $\chi^2(5, N=93) = 24.27, p < .001$ ]. When OQ scores were added to the analysis in Step 3, age no longer had a significant effect on hypertension status while ACSS scores and OQ scores had significant and independent effects on hypertension status (higher scores on both were associated with self-reported hypertension) [ $\chi^2(6, N=92) = 38.49, p < .0001$ ].

### Discussion

The authors examined the effects of perceived racism and acculturation (based on both Native Hawaiian and American cultural identifications) on self-reported hypertension status in a sample of Native Hawaiian adults, after considering the effects of socio-demographic variables. The bidirectional approach to understanding acculturation (i.e., measuring both ethnic and mainstream identifications) the authors employed here helps to account for their possible independent effects, given that people can simultaneously identify with both to varying degrees.<sup>21</sup> To date, this is the first study to examine the effects of both acculturation and perceived racism on hypertension in an indigenous US population. However, these findings should be

Variables	1	2	3	4	5	6
1. Age	1.0					
2. Sex	-.03	1.0				
3. Education	-.25*	-.05	1.0			
4. HCSS scores	.24*	.06	.08	1.0		
5. ACSS scores	.43***	-.05	-.02	.05	1.0	
6. OQ scores	.26*	-.11	-.04	.35**	-.13	1.0
N	93	94	94	94	94	93
M	43.2	-	3.4	21.6	20.1	13.1
SD	20.7	-	0.8	2.1	2.7	5.2

\*p < .05, \*\*p < .001, \*\*\*p < .0001

considered preliminary since hypertension was based on self-report only and based on a non-random convenience sample.

The findings suggested that Native Hawaiians who strongly identified with the American mainstream culture and lifestyle (i.e., higher ACSS scores) as well as those who perceived greater racism were more likely to report having hypertension. Their effects on self-reported hypertension status were independent of each other, but perceived racism had a greater magnitude of effect on hypertension status. The finding regarding American identity is consistent with similar studies among Hispanics<sup>7</sup> while the finding regarding perceived racism is consistent with similar studies among African Americans.<sup>10</sup> Perceptions of racism as a unique psychosocial stressor for other ethnic groups is well-documented. Mays *et al.*, in their review of ethnic/racial discrimination in African Americans, noted that such discrimination can lead to physiological wear-and-tear on a person (e.g., chronic activation of the hypothalamic-pituitary-adrenal axis stress-response) as to place them at risk for heart disease, diabetes, obesity, and infection.<sup>22</sup>

Table 3.— Summary of Logistic Regression Analysis Predicting Hypertension Status					
Variables	B	SE	Odds ratio (95% CI)	R2	Wald statistic
Step 1				.17	
Age	0.05	0.01	1.05 (1.03, 1.08)		15.38***
Sex (male)	0.04	0.24	0.92 (0.36, 2.41)		0.02
Education level	-0.14	0.31	0.87 (0.47, 1.59)		0.20
Step 2				.20	
Age	0.04	0.01	1.04 (1.01, 1.07)		6.54**
Sex (male)	0.05	0.25	0.90 (0.34, 2.38)		0.04
Education level	-0.23	0.32	0.79 (0.41, 1.47)		0.54
HCSS scores	0.19	0.13	1.21 (0.95, 1.58)		2.19
ACSS scores	0.11	0.10	1.12 (0.92, 1.38)		1.17
Step 3				.31	
Age	0.03	0.02	1.03 (0.99, 1.06)		3.38
Sex (male)	-0.14	0.28	1.32 (0.44, 1.19)		0.25
Education level	-0.25	0.38	0.78 (0.37, 1.64)		0.43
HCSS scores	0.03	0.14	1.03 (0.78, 1.38)		0.05
ACSS scores	0.26	0.13	1.30 (1.02, 1.70)		4.36*
OQ scores	0.22	0.06	1.25 (1.11, 1.43)		12.43***

Unit odds ratios (i.e., per unit change in regressor) are reported for continuous variables.  
\* p < .05, \*\* p < .01, \*\*\* p < .001

The finding that a high American identity, as measured in this study, was associated with having hypertension in Native Hawaiians suggests that it may be a marker of other psychosocial stressors not examined in this study. As Vaeth and Willett explained in their report on Hispanic Americans, a higher level of acculturation for Hispanics and its association with hypertension could be due to being marginalized from their Hispanic community while not fully being accepted by the American mainstream.<sup>7</sup> A similar situation could be occurring with Native Hawaiians in which those with a higher American identity are being disenfranchised from their Hawaiian community while having difficulty "fitting into" the American mainstream. Another possible explanation is that a greater American identity in Native Hawaiians could be associated with psychosocial stressors unique to the adoption of an American lifestyle. Studies found that many people at risk for CVD report having high job and family demands and inadequate social and economic resources.<sup>23</sup> Future studies are needed to examine whether such factors mediate the relationship between American mainstream identity and hypertension status in Native Hawaiians.

The finding that perceived racism was strongly related to having hypertension in Native Hawaiians has both clinical and public health policy implications. Researchers have postulated that many Native Hawaiians are devalued and marginalized by other social groups in Hawai'i.<sup>13,24</sup> Other researchers have described how a lower social status can negatively impact a person's health and well-being.<sup>23,25</sup> Knowing that perceived ethnic discrimination may lead to increased hypertension risk in Native Hawaiians can inform the development

of psychological interventions targeting how they manage or deal (e.g. coping strategy) with such discrimination as to not wear on their physiological stress-response system over time. These findings can also inform public health policies and initiatives to effectively address their risk for CVD by addressing psychosocial stressors imposed on them by larger societal factors (e.g., lower assigned social status and negative stereotypes).

Some methodological limitations of this study are worth noting. Again, it is important to recognize the preliminary nature of these findings. First, the participants' hypertension status was based on their self-report. Studies have found that self-report can be a reasonably valid measure of hypertension status.<sup>18</sup> Notwithstanding, future studies should base hypertension status on a confirmed diagnosis rather than self-report as to ensure validity in the outcome measure. Second, a convenience sample of Native Hawaiians was used, which might limit the generalizability of the findings to the larger Native Hawaiian population. However, evidence suggests that the sample used in this study was somewhat representative. Specifically, the hypertension prevalence in this study (39%) was comparable to that found in large survey studies of Native Hawaiians, which range between 32% and 40%.<sup>24</sup> Finally, the sample size was small but large enough to detect differences suggesting adequate statistical power.

In conclusion, a high degree of perceived racism and a high American mainstream identification appear to be independently associated with having hypertension in adult Native Hawaiians. The association of these two psychosocial factors with hypertension was not explained away by socio-demographic factors, such as age, sex, and education level. However, more studies that improve on the methodology used are needed to lend support for the findings and conclusions drawn here.

*No potential conflicts of interest relevant to this article were reported.*

### Acknowledgements

The authors thank Toni Garma for her assistance in this study. JKK's contribution was in part supported by a research supplement grant to promote diversity in health-related research from the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health (NIH; Grant U01HL079163). The JMP statistical software used in this study was made possible by a grant from the National Center for Research Resources (NCRR) of NIH (Grant P20RR016467). The content in this paper is solely the responsibility of the authors and does not necessarily represent the official views of the NHLBI, the NCRR, or the NIH.

### Authors' Affiliations:

- Department of Native Hawaiian Health, John A. Burns School of Medicine, University of Hawai'i at Manoa, Honolulu, HI 96813 (J.K.K., A.H.N.)
- John A. Burns School of Medicine, University of Hawai'i at Manoa, Honolulu, HI 96813 (M.K.I.)
- Department of Psychology, University of Hawai'i at Manoa, Honolulu, HI 96826 (A.H.N.)

### Correspondence to:

Joseph Keawe'aimoku Kaholokula PhD  
Department of Native Hawaiian Health  
651 Ilalo Street, MEB 307L  
Honolulu, HI 96813  
Ph: (808) 692-1047  
Fax: (808) 692-1255  
E-mail: kaholoku@hawaii.edu

## References

1. National Center of Health Statistics. Health, United States, 2007, with chartbook on trends in the health of Americans. Hattysville, MD: US Government Printing Office; 2007.
2. Grandinetti A, Chen R, Kaholokula JK, et al. Relationship of blood pressure with degree of Hawaiian ancestry. *Ethn Dis*. 2002,12(2):221-228.
3. Center for Disease Control. Health status of American Indians compared with other racial/ethnic minority populations—selected states, 2001-2002. *MMWR Morb Mortal Wkly Rep*. 2003,52(47):1148-1152.
4. Salvai FR, Nguyen D. 2007. Told by a doctor, nurse, or other health professional that you had high blood pressure [online]. State of Hawaii BRFSS. Available from: <http://hawaii.gov/health/statistics/brfss/brfss2007/2007/demo07/bphigh4.html> [Accessed 2 September 2008].
5. Balabis J, Pobutsky A, Kromer Baker K, et al. The burden of cardiovascular disease in Hawaii 2007. Honolulu, HI: Hawaii State Department of Health; 2007.
6. Kulkarni S, O'Farrell I, Erasi M, et al. Stress and hypertension. *WMJ*. 1998,97(11): 34-38.
7. Vaeth PA, Willett DL. Level of acculturation and hypertension among Dallas County Hispanics: Findings from the Dallas Heart Study. *Ann Epidemiol*. 2005,15(5):373-380.
8. Espino DV, Maldonado D. Hypertension and acculturation in elderly Mexican Americans: Results from 1982-84 Hispanic HANES. *J Gerontol*. 1990,45(6):M209-M213.
9. Sunquist K, Winkleby M. Cardiovascular risk factors in Mexican American adults: A transcultural analysis of NHANES III, 1988-1994. *Am J Public Health*. 1999,89(5):723-730.
10. Brondolo E, Rieppi R, Kelly KP, et al. Perceived racism and blood pressure: A review of the literature and conceptual and methodological critique. *Ann Behav Med*. 2003,25(1):55-65.
11. Davis SK, Liu Y, Quarells RC, et al. Stress-related racial discrimination and hypertension likelihood in a population-based sample of African Americans: The Metro Atlanta Heart Disease Study. *Ethn Dis*. 2005,15(4):585-593.
12. Steffen PR, McNeilly M, Anderson N, et al. Effects of perceived racism and anger inhibition on ambulatory blood pressure in African Americans. *Psychosom Med*. 2003,65(5):746-750.
13. Rezendes WC. Ka lama kukui: Hawaiian psychology: An introduction. Honolulu, HI: 'A'ali'i Books. 1996.
14. Warner J.C. Group therapy with Native Americans: Understanding essential differences. *Group*. 2003,27 (4):191-202.
15. Berry JW. Conceptual approaches to acculturation. In: K.M. Chun, P.B. Organista and G.M. Marin, eds. *Acculturation: Advances in theory, measurement, and applied research*. Washington, DC: American Psychological Association; 2003:17 – 37.
16. Kaholokula JK, Nacapoy AH, Grandinetti A, et al. Association between acculturation modes and type 2 diabetes among Native Hawaiians. *Diabetes Care*. 2008,31(4):698-700.
17. Office of Hawaiian Affairs. Native Hawaiian data book. Honolulu, HI: Office of Hawaiian Affairs. 2002.
18. Alonso A, Beunza JJ, Delgado-Rodríguez M, et al. Validation of self reported diagnosis of hypertension in a cohort of university graduates in Spain. *BMC Public Health*. 2005,5:94.
19. Lima-Costa MF, Peixoto SV, Firmo JO. Validity of self-reported hypertension and its determinants (the Bambui study). *Rev Saude Publica*. 2004,38(5):637-642.
20. Victoroff J. 2005. The Oppression Questionnaire [online]. Available from: <http://www.humiliationstudies.org/documents/VictoroffOppressionQuestionnaire.pdf> [Accessed August 5, 2008].
21. Matsudaira T. Measures of psychological acculturation: A review. *Transcult Psychiatry*. 2006,43(3): 462-487.
22. Mays VM, Cochran SD, Barnes NW. Race, race-based discrimination, and health outcomes among African Americans. *Annu Rev Psychol*. 2007,58:201-225.
23. Suchday S, Tucker DL, Krantz DS. Diseases of the circulatory system. In: Boll JJ, Johnson SB, Perry, Jr. NW, et al., eds. *Handbook of clinical health psychology: Medical disorders and behavioral applications*. Washington DC: American Psychological Association; 2002:203-238.
24. Okamura J. Ethnicity and inequality in Hawai'i. Philadelphia: Temple University Press. 2008.
25. Mendelson T, Thurston RC, Kubzansky LD. Affective and cardiovascular effects of experimentally-induced social status. *Health Psychol*. 2008,27(4):482-489.



# Diet, Psychosocial Factors Related to Diet and Exercise, and Cardiometabolic Conditions in Southern Californian Native Hawaiians

Archana Jaiswal McEligot PhD; Juliet McMullin PhD; Ka'ala Pang RN; Momi Bone BS; Shauna Winston BS; Rebekah Ngewa MPH; and Sora Park Tanjasiri DrPH

## Abstract

**Objective:** Native Hawaiians are at higher risk for cardiometabolic disease, including diabetes and cardiovascular disease compared with other ethnic groups. Diet, body mass index (BMI) and psychosocial, as well as cultural issues may influence risk for cardiometabolic disease. Our team conducted a community-based participatory research study and examined diet, height/weight, psychosocial factors, and community health concerns in Native Hawaiians living in Southern California.

**Design and Methods:** Cross-section of 55 participants,  $\geq 18$  years old. Dietary data were collected via three 24-hr dietary recalls, anthropometrics were measured, and psychosocial factors and cardiometabolic conditions were self-reported. Talk story related to diet and health was completed in a sub-sample. Means and frequencies were calculated on dietary intakes, cardiometabolic disease and BMI. Independent t-test and chi square analyses, as appropriate, were performed to assess differences in dietary intakes, obesity and psychosocial factors between those with and without a pre-existing cardiometabolic condition.

**Results:** Of those with pre-existing health conditions ( $n=28$ ), 72% reported being diagnosed with a cardiometabolic condition. For those with pre-existing cardiometabolic conditions, the daily vegetable consumption was 2.57 servings ( $\pm 1.66$ ) and the mean fruit consumption was 1.43 servings ( $\pm 0.1.99$ ). The mean fiber intake was 16.24 grams ( $\pm 6.92$ ), the mean percentage energy from fat was 34.82% ( $\pm 6.40$ ) and the mean % energy from carbohydrate was 47.15 ( $\pm 6.77$ ). The psychosocial data showed significantly ( $p \leq 0.05$ ) lower social support, social interaction, self-monitoring and cognitive-behavioral strategies related to exercise for those with cardiometabolic disease compared with those without disease. All the talk story discussion groups expressed concern over diabetes and weight management, both as an individual and community issue.

**Conclusions:** The dietary data indicate that Native Hawaiians residing in Southern California should aim to increase their vegetable, fiber, and reduce % energy from fat and saturated fat. Additionally, the psychosocial data suggests that implementing physical activity programs based on socio-cultural values such as *ohana*, community gatherings, as well as individual self-monitoring and cognitive-behavioral strategies may improve cardiometabolic outcomes. In efforts to reduce cardiometabolic disease disparity, these data suggest that Native Hawaiians in Southern California are aware and concerned about cardiometabolic disease in the community, and that implementation of an effective energetic (diet plus physical activity) intervention that is socially, and culturally specific for Native Hawaiians in Southern California is critical.

## Introduction

Health disparities related to cardiometabolic disorders, including cardiovascular disease, diabetes and obesity, are pervasive in the United States, particularly affecting African American, Hispanic, Asian American and Pacific Islander minority groups.<sup>1-10</sup> Mau and colleagues' recent review of studies assessing cardiometabolic disease risk reported that Native Hawaiians have the highest prevalence of diabetes compared with other ethnic groups in Hawai'i, ranging from 19 – 22% for type 2 diabetes and 16 – 35% for impaired glucose

tolerance.<sup>6,11-13</sup> Studies on cardiovascular risk factors report increased obesity and blood pressure in those with Native Hawaiian ancestry compared with other ethnic groups in the United States.<sup>1,14-16</sup>

Diet and physical activity are inextricably linked with diabetes and cardiovascular disease risk, and therefore several prevention programs have been implemented to reduce cardiometabolic risk in Native Hawaiians residing in Hawai'i.<sup>17-19</sup> Studies assessing dietary intakes in Native Hawaiians show high energy intake, low legume consumption, and moderate soy intake for this population.<sup>20-22</sup> Intervention programs aimed at preventing diabetes in Native Hawaiians on Hawai'i applied culturally-appropriate concepts such as *ohana* (family) and community-based efforts to improve dietary intakes in order to reduce risk.<sup>17,19</sup> The Native Hawaiian Diabetes Intervention Program showed that those who received a personalized family support intervention transitioned from the pre-action to the action/maintenance stage for reduced fat intake and increased physical activity.<sup>17</sup>

Outside of Hawai'i, California has the largest Native Hawaiian population in the continental United States. Dietary intakes, accessibility to traditional Hawaiian foods and possibly psychosocial factors related to diet/exercise may differ for Native Hawaiians residing in California. However, studies on dietary intakes and diet/exercise psychosocial factors in relation to cardiometabolic disease in Southern Californian Native Hawaiians have yet to be conducted. Partnering with Native Hawaiian organizations in Southern California, our team conducted a pilot community-based participatory research (CBPR) study to investigate dietary intakes, diet/exercise psychosocial factors and talk story discussions related to cardiometabolic disease in Native Hawaiians residing in Southern California. Exploring diet and community perspectives may provide insight into developing culturally-appropriate interventions for reducing cardiometabolic disease in this population.

## Methods

### Study Overview and Sample

The present study used a cross-sectional design among a non-probability sample of Native Hawaiians in Southern California. The study team convened a community advisory board (CAB), comprising of key partners, from two organizations [‘Āinahau O Kaleponi Civic Club and the Pacific Islander Health Partnership (PIHP)], and university research members. The CAB was central to developing study protocol, reviewing questionnaires and assisting in recruitment. Recruitment methods included building partnerships with Native Hawaiian community-based groups, developing and disseminating culturally-appropriate fliers, and soliciting via telephone and in-person at cultural gatherings. Eligibility included  $\geq 21$  years of age, having some Native Hawaiian ancestry (self-reported) and currently residing in Southern California. After obtaining written consent, community leaders and study staff collected demographic,



socio-cultural questionnaires and pre-existing health condition information via questionnaire. Also at the initial meeting, in-person height and weight measurement were conducted. Following the initial assessment, three 24-hr dietary recalls via telephone were scheduled and collected. At subsequent assessment meetings self-reported psychosocial data related to diet/exercise were collected, and talk story sessions were completed. Sixty-two consented individuals completed the sociodemographic and pre-existing health conditions questionnaire and of the 62, 55 completed the 24-hr dietary recall and psychosocial questionnaire. Of the 55 participants, 8 had pre-existing health conditions other than cardiometabolic disease and were excluded from the present study. A total of 47 participants, 26 with no pre-existing health conditions and 21 with cardiometabolic related health conditions, are included in the present analysis assessing cardiometabolic conditions. Of the 47, 4 (9%) completed 24-hr dietary recalls through e-mail (using similar queries as on the telephone), and 9 (19%) provided self-reported height and weight. Of the total sample, 37 (15 males and 22 females) completed the talk story sessions and are included in the talk story data. There were a total of eight talk story sessions lasting approximately one hour. Each talk story had between 6-8 participants in each group. A full study protocol review was conducted and approved by the Internal Review Board (IRB) of the California State University, Fullerton (HSR#: 09-0159).

### Dietary Assessments

The study involved using 24-hr dietary recall methodology to collect dietary data. Twenty-four hour dietary recall methodology uses computer-assisted technology to collect dietary data for the previous 24-hour period from participants/patients. For the present study, three 24-hour dietary recalls were collected over the telephone (and 9% through email), two of which were collected over the weekday and one was collected over the weekend during a two week period.

The Nutrition Data System (NDS) software was used to collect dietary data (NDS, University of Minnesota, 2007). The nutrient database used by NDS to obtain the nutrients from foods is derived from the USDA Nutrient Data Laboratory. The NDS includes values for nutrients, nutrient ratios and food components and encompasses over 18,000 foods, including ethnic foods and over 8,000 brand products. Supplement use was also collected via 24-hour dietary recalls.

### Psychosocial Questionnaire

The psychosocial instrument and psychometric evaluations of the scales utilized in the present study have been validated previously in diverse groups.<sup>23-25</sup> In previous studies, intra-class correlation for the psychometric evaluations of the scales ranged from 0.62–0.85, suggesting good to excellent reliability. Factor analysis revealed a good to reasonable loading of the data to each of the scales modeled (0.91–1.0) and Cronbach alpha values ranged between 0.69–0.93.

The scales in the questionnaire measured predisposing (social support) and self-regulation factors (cognitive and behavioral) related to diet and physical activity, both concepts intrinsic to social cognitive theory.<sup>23-25</sup> Management and behaviors related to diet were also assessed. Fifteen scales were measured in the psychosocial questionnaire: social support for diet, social support for exercise,

self-monitoring diet, self-monitoring exercise, self-efficacy related to diet, self-efficacy related to maintaining diet, outcome expectations for diet and for exercise, diet planning, preparing/buying foods, portion control, social interaction related to diet, social interaction related to exercise, cognitive-behavioral strategies related to diet and cognitive-behavioral strategies related to exercise. Participants were asked to report on experiences over the past month.

### Talk Story

Talk story is an informal conversation where individuals may talk about their day or what happens to be on their mind at the time.<sup>26,27</sup> In the Hawaiian culture, it is considered a matter a respect to engage in talk story prior to engaging in direct conversation and it is one way that people get to know each other. As Sing (1999) has noted ““talking-story”... is how we as Hawaiians best approach an issue. It includes all our voices and the nuance of “group energy, group mana.” Through this type of conversation about dietary knowledge, health and practices, the research group and participants had an opportunity to better understand the concerns of the community in Southern California and acquire more in depth insights into the data.

### Other Measures

Using a standard protocol, height and weight were measured in-person using stadiometers and step-up scales.<sup>31</sup> For measuring height, participants were asked to remove hats, socks and shoes. Measurement of height was conducted by moving the participant’s head down (tucking the chin) so the Frankfort plane was in a horizontal position (i.e. the bottom of eyes lined up with the middle of ear-flap of the skin). We used an electronic step-up scale to measure weight. Partitions were used while measuring weight to increase privacy.

### Statistical Analysis

Descriptive data on the total sample (n=47) were conducted on gender and age. Height and weight data were used to calculate frequencies of normal (<25 kg/m<sup>2</sup>), overweight (25-29.99 kg/m<sup>2</sup>) and obese (>30 kg/m<sup>2</sup>) BMI. An independent samples *t*-test was conducted to compare differences in age and dietary intakes previously shown to be related to cardiometabolic disease between those with pre-existing cardiometabolic conditions/syndromes (Type 2 diabetes, cardiovascular disease, high blood pressure and high cholesterol) and those without any health conditions. Similarly a chi square analysis was conducted to measure gender and BMI (normal, overweight, obese) differences between the two groups. Each psychosocial scale was summed and an independent *t*-test was conducted to measure differences for each scale between those with pre-existing cardiometabolic conditions and those without any health conditions. The level used to specify significance for each test was  $p \leq 0.05$ .

### Talk Story Qualitative Analysis

The talk story conversations were audio recorded and transcribed. A content analysis was performed on each conversation (n=37). The content analysis coded themes that were of particular issue to the research group such as foods that were said to have cultural value, issues that made eating healthy or eating Hawaiian foods difficult, and ideas that would motivate change. The data was also coded for themes that frequently emerged in the conversations

such as memories of growing up in Hawai'i and its impact on their thoughts about food.

## Results

The mean age for the total sample (n=47) was 59 ( $\pm 15$ ), and 18 (38%) were males and 29 (62%) were females. BMI was as follows: 13% normal, 30% overweight and 57% obese. Of those reporting health conditions, 72% reported having a pre-existing cardiometabolic condition, and of those with pre-existing cardiometabolic health conditions, 13 (62%) reported having diabetes and the remaining included coronary artery disease, hypertension and high cholesterol.

Table 1 shows frequencies of BMI and mean dietary intakes for those with pre-existing cardiometabolic conditions. No significant differences were observed for BMI or dietary intakes between the two groups. For those with pre-existing cardiometabolic conditions, the daily vegetable consumption was 2.57 servings ( $\pm 1.66$ ) and the mean fruit consumption was 1.43 servings ( $\pm 0.1.99$ ). The mean fiber intake was 16.24 grams ( $\pm 6.92$ ), the mean percentage energy from fat was 34.82% ( $\pm 6.40$ ) and the mean % energy from carbohydrate was 47.15 ( $\pm 6.77$ ).

Table 1.— BMI and Dietary Intakes for Native Hawaiians with (n = 21) and without (n = 27) Pre-existing Cardiometabolic Conditions and without Disease		
Variable	Cardiometabolic Conditions (Yes)	Cardiometabolic Conditions (No)
Body Mass Index, n (%)		
Normal (< 25 kg/m <sup>2</sup> )	2 (9.52%)	4 (15.38)
Overweight (25 – 29.9 kg/m <sup>2</sup> )	6 (28.57)	8 (30.77)
Obese (> 30 kg/m <sup>2</sup> )	13 (61.90)	14 (53.85)
Dietary variables, (mean $\pm$ SD)		
Vegetable (servings)	2.75 $\pm$ 1.66	2.41 $\pm$ 1.45
Fruit (servings)	1.43 $\pm$ 1.99	1.79 $\pm$ 1.37
Fiber (servings)	16.24 $\pm$ 6.92	17.11 $\pm$ 6.94
Whole grain (servings)	1.79 $\pm$ 1.59	1.49 $\pm$ 1.74
Refined grain (servings)	3.29 $\pm$ 1.59	3.95 $\pm$ 2.28
% energy from fat	34.82 $\pm$ 6.40	34.68 $\pm$ 8.20
% energy from saturated fats	11.68 $\pm$ 3.10	10.78 $\pm$ 3.17
Trans fats, g	3.58 $\pm$ 2.02	3.96 $\pm$ 2.36
Cholesterol, mg	178.21 $\pm$ 83.48	194.52 $\pm$ 70.67
% energy from carbohydrates	47.15 $\pm$ 6.77	48.49 $\pm$ 8.81
Sodium, mg	2796.8 $\pm$ 1328.2	3122.1 $\pm$ 1983.4

Psychosocial factors related to diet/exercise for those with pre-existing cardiometabolic conditions and those without are shown in Table 2. Mean scores for self-monitoring of exercise, social interactions related to exercise and “how often did you prepare healthy foods with your family and friends” were significantly ( $p \leq 0.05$ ) lower for those with pre-existing cardiometabolic conditions compared with those without cardiometabolic conditions. Mean scores for social support for exercise and cognitive behavioral strategies related to exercise were borderline significantly different ( $p=0.07$ , 0.06, respectively) between the two groups.

Table 3 shows three talk story themes that are of particular relevance for the present paper. These themes included concerns over diseases associated with weight, diet and exercise, and the tension between individual change and community change. All eight of the talk story groups mentioned concern about diabetes and obesity among the Hawaiian population. Four groups mentioned concerns regarding heart disease and cancer as well. The conversations in the groups always began with discussions of obesity. Because of their concern over diabetes and obesity, the conversation would then turn to talk about their ability, or lack thereof, to exercise on a regular basis or to the food portions consumed. Discussions regarding exercise focused on many of the difficulties of living in Southern California where commuting long distances (an hour or more) to work or locations of leisure are a standard expectation. Three of the groups mentioned the stressfulness of working and living in California as a hindrance to exercise and safety concerns when exercising. Other themes related to potential intervention strategies included cooking classes, walking groups, and informational brochures that provided locations of stores that sold Hawaiian food.

## Discussion

The team determined that of those Native Hawaiians in Southern California with a health condition, nearly 75% reported having a cardiometabolic-related condition. Further, 87% were either overweight or obese, and were not meeting the American Diabetic Association's dietary guidelines for vegetable, fiber, whole grains, % energy from fat, % energy from saturated fat and % energy from carbohydrates, specifically for diabetes and cardiovascular disease prevention.<sup>29</sup> Individuals with pre-existing cardiometabolic conditions reported lower scores, compared with those without a pre-existing health condition, for several psychosocial scaled related to exercise.

Previous findings reveal higher glucose intolerance, type 2 diabetes, obesity and cardiovascular disease in Native Hawaiians compared with other ethnic groups in Hawai'i.<sup>6,10,11,21,30,31</sup> A study of glucose intolerance among Native Hawaiians in rural Hawai'i showed that the crude prevalence of impaired glucose tolerance was between 15% - 20%.<sup>6</sup> Analysis of existing Hawai'i state-wide data demonstrated that 11.5% of Native Hawaiians had been told by their doctors that they had diabetes.<sup>30</sup> A study on overweight and obesity in the Native Hawaiian population showed that 63.6% were overweight (based on BMI  $\geq 27.8$ ) and 44.6% were severely overweight.<sup>31</sup> Most studies on weight report overweight to obese BMI frequencies for Native Hawaiians.<sup>15,21,31,32</sup> Our findings, based on the total sample of n = 55, reveal that 24% were diabetic, and of those with pre-existing cardiometabolic conditions, 91% were either overweight or obese. The primary pre-existing health condition that was reported for Native Hawaiians in Southern California was cardio-metabolic related. The slightly higher crude prevalence of diabetes in our study may be due to a higher mean age for participants enrolled.

Native Hawaiian dietary patterns have been studied,<sup>15,20-22,32</sup> however few studies report on dietary intakes in Native Hawaiians with cardiometabolic disease.<sup>15,21,32</sup> A recent study in rural Hawai'i compared dietary patterns, including vegetable and fruit, local ethnic dishes and a Western diet dominated by fast-food, among various ethnic groups.<sup>21</sup> The findings suggested that Caucasians showed higher scores for consuming fruits and vegetables compared with the other ethnic groups, while the Filipino and Hawaiians in rural

Variable/Scales	Value range	Cardiometabolic conditions (Yes)		Cardiometabolic conditions (No)	
		N	Mean (SD)	N	Mean (SD)
Social Support for Diet <sup>a</sup>	3 - 12	18	7.28 (1.94)	24	6.5 (2.60)
Social Support for Exercise <sup>a,e</sup>	7 - 28	18	11.83 (3.00)	24	14.5 (6.11)
Self-Monitoring for Diet <sup>a</sup>	6 - 24	17	16.71 (5.69)	25	16.32 (4.56)
Self-Monitoring for Exercise <sup>a,d</sup>	4 - 16	18	7.83 (2.90)	25	9.8 (3.16)
Self-efficacy for diet skills <sup>b</sup>	3 - 12	19	8.10 (2.60)	26	9.38 (2.40)
Self-efficacy for sticking with diet <sup>b</sup>	5 - 20	19	11.84 (4.34)	25	13.92 (4.55)
Outcome Expectations for Diet <sup>c</sup>	9 - 45	19	37.16 (6.73)	26	36.77 (8.40)
Outcome Expectations for Exercise <sup>c</sup>	9 - 45	19	38 (4.64)	25	38.56 (8.12)
Planning for diet <sup>a</sup>	5 - 20	19	11.26 (3.03)	26	12.08 (3.14)
Preparation/Buying for diet <sup>a</sup>	6 - 28	18	15 (4.04)	25	15.44 (5.47)
Portion Control <sup>a</sup>	5 - 20	19	13.58 (3.31)	26	13.81 (3.90)
Social Interaction for diet <sup>a</sup>	3 - 12	19	7.26 (1.76)	26	7.19 (2.33)
Social interaction for exercise <sup>a,d</sup>	4 - 16	18	5.56 (2.28)	25	7.2 (2.84)
Cognitive-behavioral strategies for exercise <sup>a,e</sup>	5 - 20	18	9.94 (3.65)	25	12.4 (4.66)
Cognitive-behavioral strategies for diet <sup>a</sup>	5 - 20	19	9.29 (3.88)	25	12.16 (4.84)
How often did you prepare healthy foods with your family and friends? <sup>a,d</sup>	1 - 4	19	2.11 (0.81)	25	2.64 (0.95)

a: response options "almost never, sometimes, often and almost always"; b: response options "not at all sure, a little sure, somewhat sure, very sure"; c: response options "strongly disagree, disagree, neutral, agree, strongly agree"; d: p < 0.05 between males and females; e: p = 0.06 – 0.07

Hawai'i consumed more of the ethnic foods. However no differences in dietary patterns were reported between diabetic and non-diabetic Hawaiians.<sup>21</sup> Our team found no differences in dietary intakes of foods related to cardiometabolic disease between those with and without pre-existing metabolic conditions. These observations may be due to collection of "prevalent" pre-existing conditions, and by not assessing dietary intakes prior to or at diagnosis of disease. Also, it is possible that dietary intakes may have changed after diagnosis. However, our findings show that the present study population should be encouraged to reach the dietary guidelines endorsed by the American Dietetic Association (and the United States Department of Agriculture), specifically related to 5 servings of vegetables, 25 – 30 g fiber, < 30% energy from fat, 0 g trans fat, < 10% energy from saturated fat and 2300 mg sodium.<sup>29</sup>

Our findings on psychosocial factors and talk story discussions provide potential avenues for developing interventions to reduce and/or control cardiometabolic disease in Native Hawaiians. Participants with pre-existing cardiometabolic conditions, compared with those without any health conditions, scored lower on several psychosocial scales related to exercise. Specifically, improving social support for exercise, such as having other individuals provide encouragement, offer to exercise and provide helpful reminders to exercise may increase exercise levels in Native Hawaiians with cardiometabolic conditions. Other strategies include improving social interactions related to exercise such as asking friends or relatives to engage in physical activity. Further, participants with pre-existing cardiometabolic disease were less likely to self-monitor their exercise behavior, including keeping record of their physical activity, increasing their physical activity based on reduced activity and finding ways to fit in small amounts of activity during the

Table 3.— Pressing Health Problems and Concerns Related to Diet and Exercise in Native Hawaiians (n = 37) Residing in Southern California

Summary of Talk Story points
<p><b>Pressing health problems:</b>            Diabetes            Obesity            Heart Disease            Cancer</p>
<p><b>Concerns related to diet and exercise:</b></p> <p><b>Dietary concerns ~</b>            Expectations of large amounts of food at social events            Expectations of large food portions            Respecting the food by eating everything that is on the plate            Eating too much white rice            Inability to find healthy Hawaiian foods in California</p> <p><b>Exercise concerns ~</b>            Stress of living in California ~ fast paced life does not allow time for exercise            Longer work hours            Large distances between home, work, and locations where family can engage in health activities            Concern over safety of local environment prevents people from exercising in local areas</p> <p><b>Community solutions ~</b>            Create opportunities for family gatherings by focusing on youth            Distribute information on locations where Hawaiian food can be purchased            Hawaiian cooking courses            Community walks</p>

day. Additionally, cognitive-behavioral scores related to exercise, such as rewarding and praising oneself for being physically active, and thinking about the positive aspects of physical activity were lower for those with cardiometabolic disease compared with those

without disease. Therefore, as reported in one previous study,<sup>17</sup> strategies focusing on improving group/social activities, as well as self-monitoring and cognitive-behavioral modifications related to exercise could increase physical activity and potentially improve cardiometabolic outcomes in Native Hawaiians residing in Southern California.

The talk story sessions revealed that the participants are profoundly aware of the high rates of diabetes and obesity among Native Hawaiians. Their concerns over diet and exercise also show that they understand that these are practices in which they must engage if the disease rates are to decrease. Their awareness is layered in the complexities of living as Native Hawaiians in California. On the one hand they understand that the cultural expectation of large food portions and eating everything on one's plate must be changed at the individual and social level. On the other hand, however, they also critiqued the long commuting distances and the difficulty of finding spaces for community exercise associated with life in California. Coinciding with the psychosocial data, the talk story discussions revealed that supporting individuals in dietary and exercise efforts can be primarily achieved through the support of community activities.

Limitations must be acknowledged when interpreting the data. We conducted a CBPR study of Native Hawaiians living in Southern California and therefore, the results are only generalizable to Native Hawaiians in Southern California. Also, the cross-sectional study design limits establishing temporal sequence between risk factors, psychosocial factors and disease. Further, detecting differences between groups may be limited by the small sample size; however even with the small sample size, we observed differences related to the psychosocial factors.

Our team established that Native Hawaiians in Southern California reported relatively high levels of cardiometabolic disease and that nearly 90% were either overweight or obese. Intervention programs should focus on improving dietary intakes for vegetable, fiber, % energy from fat and other cardiometabolic-related dietary variables. Because *ohana* values, and community and group interactions are central to the Hawaiian culture, our results on improving social interaction/behaviors related to exercise could be readily applied to a diet and physical activity intervention program for Native Hawaiians with cardiometabolic disease in Southern California. Future studies, with larger sample sizes, should be conducted to further decipher effective diet and exercise strategies for Native Hawaiians residing in Southern California.

*This study was funded by the National Institutes of Health (grant number, 3 U01 CA114591-03S4).*

*No potential conflicts of interest relevant to this article were reported.*

**Authors' Affiliation:**

- California State University Fullerton, Fullerton, CA (A.J.M., S.W., R.N., S.P.T.)
- University of California, Riverside, Riverside, CA (J.M.)
- Pacific Islander Health Partnership, Honolulu, HI (K.P.)
- 'Ainahau O Kaleponi Civic Club (M.B.)

**Correspondence to:**

Archana Jaiswal McEligot PhD; Department of Health Science, California State University Fullerton, 800 N. State College Blvd., Room KHS-121, Fullerton, CA 92834  
Ph: (714) 278-3822; Fax: (714) 278-5317; E-mail: amceligot@fullerton.edu

**References**

1. Acton KJ, Burrows NR, Moore K, et al. Trends in diabetes prevalence among American Indian and Alaska Native children, adolescents, and young adults. *Am J Public Health*. 2002; 92:1485-1490.
2. Allison MA, Budoff MJ, Wong ND, et al. Prevalence of and risk factors for subclinical cardiovascular disease in selected US Hispanic ethnic groups: the Multi-Ethnic Study of Atherosclerosis. *Am J Epidemiol*. 2008; 167:962-969.
3. Aluli NE, Jones KL, Reyes PW, Brady SK, Tsark JU, Howard BV. Diabetes and cardiovascular risk factors in Native Hawaiians. *Hawaii Med J*. 2009;68:152-7.
4. Burrows NR, Geiss LS, Engelgau MM, et al. Prevalence of diabetes among Native Americans and Alaska Natives, 1990-1997: an increasing burden. *Diabetes Care*. 2000;23:1786-1790.
5. Eggede LE, Dagogo-Jack S. Epidemiology of type 2 diabetes: focus on ethnic minorities. *Med Clin North Am*. 2005; 89:949-975. viii.
6. Grandinetti A, Chang HK, Mau MK, et al. Prevalence of glucose intolerance among Native Hawaiians in two rural communities. Native Hawaiian Health Research (NHR) Project. *Diabetes Care*. 1998; 21:549-554.
7. Johnson DB, Oyama N, LeMarchand L, et al. Native Hawaiians mortality, morbidity, and lifestyle: comparing data from 1982, 1990, and 2000. *Pac Health Dialog*. 2004;11:120-130.
8. Furubayashi JK, Look MA. Type 2 diabetes in native Hawaiians and Pacific Islanders in Hawaii. *Pac Health Dialog*. 2005;12:103-10.
9. Mau, MK, Sinclair, K, Saito, EP, Baumhofer, KN, Kaholokula JK. Cardiometabolic Health Disparities in Native Hawaiians and Other Pacific Islanders. *Epidemiol Rev*. 2009; Jun 16. [Epub ahead of print].
10. Mau MK, Grandinetti A, Arakaki RF, et al. The insulin resistance syndrome in native Hawaiians. Native Hawaiian Health Research (NHR) Project. *Diabetes Care*. 1997;20:1376-1380.
11. Grandinetti A, Kaholokula JK, Theriault AG, Mor JM, Chang HK, Waslien C. Prevalence of diabetes and glucose intolerance in an ethnically diverse rural community of Hawaii. *Ethn Dis*. 2007;17:250-5..
12. Salvail FR, Nguyen D. Have you ever been told by doctor that you have diabetes? State of Hawaii BRFSS 2006. In: 2006 State of Hawaii—By Demographic Characteristics. Behavioral Risk Factor Surveillance System (2006) Honolulu, HI: Hawaii State Department of Health.
13. Grandinetti A, Chang HK, Theriault A, et al. Metabolic syndrome in a multiethnic population in rural Hawaii. *Ethn Dis*. 2005;15:233-237.
14. Novotny R, Davis J, Ross P, et al. Adiposity and blood pressure in a multiethnic population of women in Hawaii. *Ethn Health*. 1998;3:167-173.
15. Grandinetti A, Chen R, Kaholokula JK, et al. Relationship of blood pressure with degree of Hawaiian ancestry. *Ethn Dis*. 2002;12:221-228.
16. Taira DA, Seto TB, Marciel C. Ethnic disparities in care following acute coronary syndromes among Asian Americans and Pacific Islanders during the initial hospitalization. *Cell Mol Biol*. 2001;47:1209-1215.
17. Mau MK, Glanz K, Severino R, Grove JS, Johnson B, Curb JD. Mediators of lifestyle behavior change in Native Hawaiians: initial findings from the Native Hawaiians Diabetes Intervention Program. *Diabetes Care*. 2001; 24: 1770-5.
18. Boyd JK, Braun KL. Supports for and barriers to healthy living for Native Hawaiian young adults enrolled in community colleges [electronic article]. *Prev Chronic Dis*. 2007;4:A88.
19. Look MA, Baumhofer NK, Ng-Osorio J, Furubayashi JK, Kimata C. Diabetes training of community health workers serving native Hawaiians and Pacific people. *Diabetes Educ*. 2008; 34: 834-40.
20. Park SY, Murphy SP, Wilkens LR, et al. Dietary patterns using the Food Guide Pyramid groups are associated with sociodemographic and lifestyle factors: the multiethnic cohort study. *J Nutr*. 2005;135:843-9.
21. Kim HS, Park SY, Grandinetti A, Holck PS, Waslien C. Major dietary patterns, ethnicity, and prevalence of type 2 diabetes in rural Hawaii. *Nutrition*. 2008;24:1065-72.
22. Kolonel LN, Henderson BE, Hankin JH, Nomura AM, Wilkens LR, Pike MC, Stram DO, Monroe KR, Earle ME, Nagamine FS. A multiethnic cohort in Hawaii and Los Angeles: baseline characteristics. *Am J Epidemiol*. 2000;151:346-57.
23. Nothwehr F. Attitudes and behaviors related to weight control in two diverse populations. *Prev Med*. 2004; 39:674-80.
24. Nothwehr F, Peterson NA. Healthy eating and exercise: strategies for weight management in the rural midwest. *Health Educ Behav*. 2005;32:253-63.
25. Nothwehr F, Snetselaar L, Yang J, Wu H. Stage of change for healthful eating and use of behavioral strategies. *J Am Diet Assoc*. 2006;106:1035-41.
26. Mayeda, DT. Talking Story with Hawaii's Youth: Confronting Violent and Sexualized Perceptions of Ethnicity and Gender. *Youth & society*. 2001; 33, 99-128.
27. Sing D Kekaulike, Hunter A, Meyer AM. Native Hawaiian education: Talking story with three Hawaiian educators. *J Amer Indian Edu*. 1999;39:4-13.
28. U. S. Department of Health and Human Services, National Center for Health Statistics, NHANES III Reference Manuals and Reports. Hyattsville, MD: Centers for Disease Control and Prevention; 1996.
29. Nutrition and diabetes. URL available at: <http://www.diabetes.org>.
30. Aluli NE, Reyes PW, Tsark J. Cardiovascular disease disparities in native Hawaiians. *J Cardiometab Syndr*. 2007;2:250-3.
31. Aluli NE. Prevalence of obesity in a Native Hawaiian population. *Am J Clin Nutr*. 1991;53:1556S-1560S.
32. Maskarinec G, Grandinetti A, Matsuura G, Sharma S, Mau M, Henderson BE, Kolonel LN. Diabetes prevalence and body mass index differ by ethnicity: the Multiethnic Cohort. *Ethn Dis*. 2009;19:49-55.

# Culturally-specific Physical Activity Measures for Native Hawaiian and Pacific Islanders

Karen L. Moy PhD; James F. Sallis PhD; and Sora Park Tanjasiri DrPH

## Abstract

**Introduction:** Physical activity is an important contributor to the health disparities experienced by Native Hawaiian and Pacific Islander (NHPI) populations. A culturally-specific measurement instrument that minimizes interpretation bias is necessary to obtain accurate assessments of this lifestyle behavior. The purpose of this study was to 1) create two versions of the Pacific Islander Physical Activity Questionnaire (PIPAQ-short and PIPAQ-long) for United States NHPI, and 2) pilot test the PIPAQ instruments and two objective physical activity monitors to evaluate cultural-appropriateness and acceptability.

**Methods:** Forty NHPI adults (20M, 20F) aged 21-65 years attended focus group discussions addressing cultural perspectives related to physical activity. Feedback from participants, community leaders and physical activity experts guided cultural modifications to existing questionnaires to create PIPAQ-short and PIPAQ-long with accompanying showcards. Pilot testing of both PIPAQs and two objective physical activity monitors, the Actiheart and ActiTrainer, was carried out in another sample of 32 NHPI adults (17M, 15F) aged 18-63 years. Participants were instructed to wear one monitor for  $\geq 10$  hours/day for 7 consecutive days. At the follow-up visit, participants completed PIPAQ-short and PIPAQ-long, and a written and verbal exit interview to provide feedback on both subjective and objective instruments.

**Results:** The majority of participants felt PIPAQ-long provided a more accurate reflection of activity levels, compared to PIPAQ-short. The Actiheart was the preferred monitor due to higher comfort and lower participant burden. Self-reported duration of physical activities was most difficult to recall, compared to activity type, frequency and intensity.

**Conclusion:** Both PIPAQ instruments and the Actiheart monitor have demonstrated cultural acceptability and appropriateness for NHPI adults. Future studies will investigate the validity and reliability of both PIPAQ instruments in larger samples of NHPI adults.

## Introduction

Physical activity is an important protective factor for many of the health disparities experienced by Native Hawaiians and Pacific Islander (NHPI). However, there is currently no culturally-specific instrument that produces valid and reliable estimates of this important lifestyle behavior. The development of such an instrument is the first step towards improving health and reducing obesity-related disparities for this under-studied, high-risk population.

### Physical Activity Questionnaires

Physical activity is a complex behavior and accurate assessments obtained from subjective instruments rely on the respondent's comprehension of the multiple dimensions (i.e. duration, frequency, intensity and type) and contexts (sport and recreation, transport, occupation and household) associated with performing activities. Terminology such as "leisure-time" or "moderate-intensity" can be ambiguous and result in misinterpretation and subsequent misclassification of activity levels.<sup>1</sup> Since ethnicity influences activity recall,<sup>2,5</sup> the potential for misclassification is further exacerbated within and between different cultures and populations.

Culturally-tailored physical activity questionnaires include appropriate language and terminology, as well as culturally-relevant examples of activities that are familiar to the target audience. Therefore, the intent of each question is more clearly conveyed, which facilitates respondents' comprehension, and potentially increases recall accuracy.<sup>2,4,6,7</sup> The International Physical Activity Questionnaires (IPAQs) have been used extensively to estimate the prevalence of activity and sedentary behaviors in over 70 developed and developing countries.<sup>8-10</sup> Pacific Islander nations, however, have not been included, and researchers have issued cautions about their use in rural or low literacy populations in developing countries.<sup>11</sup> The long form of the New Zealand Physical Activity Questionnaire (NZPAQ-LF) utilizes accompanying showcards that provide examples of activities performed in different contexts. Validity testing in a multiethnic New Zealand population reported the lowest recall accuracy for Pacific Islanders ( $r=0.02$ ), compared to Maori ( $r=0.21$ ) and New Zealand Europeans ( $r=0.41$ ),<sup>12</sup> indicating the need for further cultural refinements.

### Physical Activity Monitoring Devices

Although not always possible, objective measurement techniques are preferred when assessing physical activity levels and patterns. While accelerometers and heart rate monitors have been widely used to assess free-living activity, combined measures of simultaneous heart rate and motion (HR+M) improve accuracy of estimates and correlate strongly with gold standard measures of doubly labelled water and indirect calorimetry.<sup>13-16</sup> Two novel devices that record synchronized measures of HR+M are the Actiheart (Mini Mitter/Respironics (now Philips), Bend, Oregon) and ActiTrainer (Actigraph, Pensacola, Florida). Both monitors are shown in Figure 1 and specifications are presented in Table 1. Neither monitor has been previously used or validated in the NHPI population, so critical pilot testing is required to determine cultural appropriateness and acceptability.

Without a culturally-specific, valid and reliable physical activity questionnaire, it is impossible to obtain accurate assessments, monitor trends, or determine the effectiveness of interventions aimed at promoting the adoption and maintenance of regular physical activity to address NHPI health disparities. This study's primary objective was to develop two versions of the Pacific Islander Physical Activity Questionnaire (PIPAQ-short and PIPAQ-long) for United States NHPIs. Secondary objectives were to pilot test both PIPAQ instruments, the Actiheart and ActiTrainer for cultural appropriateness and acceptability.

## Methods

Ethics approval for this pilot study was granted by the San Diego State University Institutional Review Board. The community-based participatory research approach was a partnership with NHPI leaders from two community-based organizations that assisted in planning,

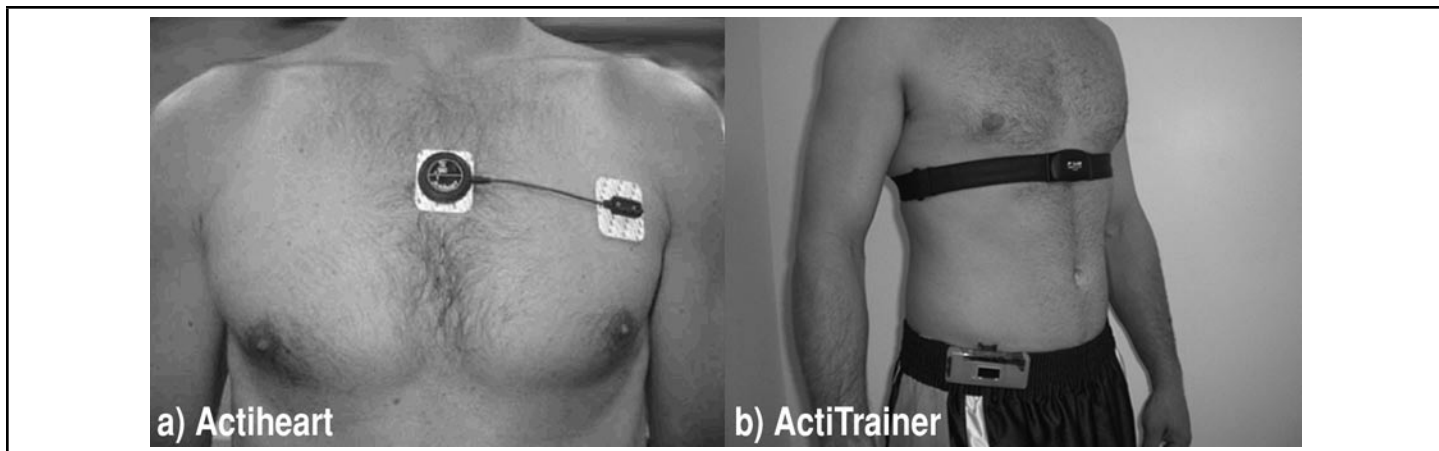


Figure 1.— Placement and Wear of the a) Actiheart and b) ActiTrainer Physical Activity Monitors

Table 1.— Comparison of Actiheart and ActiTrainer Monitors

	Actiheart	ActiTrainer
Components	Single-unit that includes a main sensor and left lead connected by a 100mm. wire	Polar T31 adjustable heart rate transmitter strap; accelerometer unit
Size	Main sensor — Thickness: 0.7 cm., Diameter: 3.3 cm. Left lead — 0.5 x 1.1 x 2.2 cm.	Accelerometer — Thickness: 1.52 cm., Width: 8.56 cm., Height: 3.81 cm. Heart rate transmitter strap — 25-33 in. (+25% stretch capability)
Weight	10 g.	Accelerometer unit: 48 g. Heart rate transmitter strap: 2.3 oz.
Storage Capacity	128kb (15 days with 60s epochs)	1MB (~59 days with 60s epochs)
Rechargeable Battery	17 mAh Lithium; 3.0 volt Life: ~14 days continuous wear Recharge Time: 11 hrs	400 mAh Lithium; 4.18 volt Life: ~7-10 days for daytime only wear (depends on LED setting) Recharge Time: 2.5 hrs
Accelerometer frequency range	1-7 Hz	0.25-2.5 Hz
ECG sampling frequency	128 Hz	NA
Measurable heart rate range	31-250 bpm	40-220 bpm

implementing and reporting back to the community: the Union of Pan Asian Communities (San Diego) and the Samoan National Nurses Association (Los Angeles). NHPI adults between 21-65 years who spoke English “very well” were invited to participate in focus group discussions and pilot testing of subjective and objective physical activity measurement instruments. Community leaders screened and recruited participants through flyers and word-of-mouth at local churches and community organization meetings.

### Focus Groups

Four gender-stratified focus group discussions (~75 min each), facilitated by a NHPI community leader, were attended by N=40 (20 men, 20 women) NHPI adults. Discussions addressed cultural perspectives related to physical activity, and language interpretation was provided when necessary. Specific discussion topics included personal definitions of common terminology from physical activity questionnaires, culturally-relevant examples of activities and perceived intensities, and self-reporting of the type, duration, and frequency of activities that participants currently perform.

A combination of the IPAQ and NZPAQ-LF instruments provided the foundation for developing the PIPAQ-short and PIPAQ-long instruments. Feedback from focus group participants, NHPI community leaders and physical activity experts guided cultural modifications

to the format, terminology, and physical activity examples included in each questionnaire. The primary goal was to ensure that content validity of the PIPAQ instruments was optimized by emphasizing their ability to assess all physical activity dimensions and contexts, and produce useful estimates related to public health guidelines while maintaining interpretation of the original instruments.

### Pilot Testing

Pilot testing of both PIPAQs, the Actiheart, and ActiTrainer was conducted on N=32 NHPI adults who attended two visits at local community sites. During Visit 1, participants completed a signed consent form, received one activity monitor, and verbal and written instructions on proper application and wear. Participants were instructed to wear their respective monitors for at least 10 hours/day for 7 consecutive days, and practiced applying the monitor themselves while research staff were present. At Visit 2, data from the monitors were downloaded and scanned with the Actiheart (version 2.0) and ActiTrainer (version 3.6.0) software to determine daily wear time. Participants’ chest diameters were measured, followed by interviewer-administration of PIPAQ-short and PIPAQ-long. Written and verbal exit interviews were conducted to obtain participant feedback on both questionnaires, as well as their overall experience with their respective monitors.

Table 2.— Actiheart vs. ActiTrainer: Participant Characteristics and Mean Wear Time

	Actiheart			ActiTrainer		
	Total	Males	Females	Total	Males	Females
	N=17	N=10	N=7	N=15	N=7	N=8
Age (years)	36.3 ± 12.7	36.8 ± 12.1	35.6 ± 14.4	44.3 ± 13.1	47.9 ± 13.1	40.6 ± 12.8
BMI (kg/m <sup>2</sup> )	31.0 ± 7.5	30.0 ± 6.3	32.5 ± 9.5	31.2 ± 7.2	33.5 ± 7.0	28.5 ± 6.9
Chest circumference (in)	41.7 ± 6.4	41.6 ± 6.4	41.9 ± 7.1	43.0 ± 8.7	47.0 ± 5.0	38.5 ± 10.0
Mean wear days (out of 7)	6.5 ± 0.9	6.3 ± 1.1	6.8 ± 0.4	6.0 ± 1.7	6.0 ± 1.8	6.0 ± 1.8
Mean daily wear (hrs/day)	12.6 ± 3.2	11.2 ± 2.6	14.3 ± 3.1	10.9 ± 3.5	11.1 ± 3.9	10.8 ± 3.4
Comfort level (1-10 scale)	7.3 ± 2.4	7.2 ± 2.4	7.4 ± 2.3	6.3 ± 3.0	4.3 ± 3.4	8.0 ± 1.5

**Results**

*Creation of the Pacific Islander Physical Activity Questionnaires*

The sample of N = 40 focus group participants represented a wide age range (21-61 years) of men (35.8 ± 11.1 years) and women (33.9 ± 11.8 years) from the four largest United States NHPI subgroups: 12.5% Tongan, 52.5% Samoan, 25.0% Guamanian/Chamorro, 5.0% Native Hawaiian, and 5.0% reporting more than one race.

Similar to the IPAQ-short, PIPAQ-short asks about time spent in the moderate- and vigorous-intensity physical activity, and walking (in all contexts) over the last 7 days. However, the question ordering was changed to first address walking in order to reduce over-reporting of moderate- and vigorous-intensity physical activity.<sup>17</sup> Several key terms typically found on activity questionnaires were misinterpreted by focus group participants. For example, “resistance training”, which refers to activities purposefully performed to improve muscular strength or endurance, was mistakenly associated with a mental feeling of disapproval or opposition (i.e., “not wanting to do something”), so this term was replaced with “muscle strengthening activities”. Additionally, the terms “moderate” and “vigorous” intensity were changed to “medium” and “hard” intensity, and definitions were enhanced to include a 1-10 scale and associated physiological effects. The inclusion of physical activities performed in all contexts was elaborated upon, and culturally-relevant examples of activities were inserted. The final version of PIPAQ-short consists of 5-8 questions.

PIPAQ-long was developed by combining the IPAQ-long (10-23 questions, depending on activity level) with showcards that accompanied the NZPAQ-LF to assist with respondent comprehension and recall. These showcards were modified to represent common physical activities performed by United States NHPI, categorized by intensity and context (sport and recreation, occupation, household, transportation), as well as muscle-strengthening and sedentary behaviors (e.g., watching television, working a desk job, computer use, reading, lying down, etc.). Based upon focus group discussions, a total of 30 sport and recreational activities were omitted from the original showcards since less than 25% of focus group participants reported participation in their lifetime. Three activities were added: dodgeball, racquetball, and kickball.

**Pilot Testing**

A sample of N = 32 (17 men, 15 women) NHPI adults, aged 18-63 years (40.3 ± 13.3) participated in pilot testing of both PIPAQs, the

Actiheart, and ActiTrainer monitors. The sample represented the diversity of United States NHPI subgroups (9.3% Tongan, 53.0% Samoan, 21.9% Guamanian/Chamorro, 9.4% Native Hawaiian, and 6.3% reporting more than one race), and was classified as obese with a mean body mass index (BMI) of 31.1 ± 7.2 kg/m<sup>2</sup>.

Equal numbers of men and women wore the Actiheart (10 men, 7 women) or ActiTrainer (7 men, 8 women) monitor, and no significant differences in participant characteristics were observed between groups that were assigned different monitors. Table 2 presents participant characteristics, average wear time, and comfort levels according to assigned monitors. Overall, Actiheart was worn longer (6.5 ± 0.9 days for 12.6 ± 3.2 hrs/day) than ActiTrainer (6.0 ± 1.7 days for 10.9 ± 3.5 hrs/day). No significant gender differences were observed for either monitor.

Based on a 1-10 scale, participants reported overall comfort levels that were slightly higher for Actiheart (7.3 ± 2.4) compared to ActiTrainer (6.3 ± 3.0) (Table 2). Interestingly, men who were required to shave their chests for Actiheart wear reported higher comfort levels (7.2 ± 2.4) compared to men who wore ActiTrainer (4.3 ± 3.4), and the highest overall comfort levels were reported by women wearing the ActiTrainer (8.0 ± 1.5). During exit interviews, the majority of ActiTrainer wearers reported the heart rate transmitter strap was “too small” (mean chest circumference of men and women wearing the ActiTrainer were 47.0 ± 5.0 and 38.5 ± 10.0 inches, respectively). Adverse skin reactions were reported by 4 ActiTrainer wearers (1 man, 3 women). These were minor skin rashes that occurred after 4-5 days of consecutive wear, although 1 participant developed a rash on her second day of wear. Two Actiheart wearers (1 man, 1 woman) also reported minor skin irritation due to adhesive electrodes, which occurred during the last 2 days of wear.

Feedback on self-report instruments was obtained after participants completed both PIPAQ instruments. Using a scale of 1-10, participants rated the difficulty of accurately recalling activity type, frequency, intensity, and duration. While no significant gender differences were observed, recall of activity duration ranked highest in level of difficulty (4.7 ± 3.1) among men and women. Activity type, frequency, and intensity were all ranked similarly (3.3 ± 2.7). In regard to cultural acceptability of the PIPAQ instruments, the overall consensus was that the additional detail and accompanying showcards of PIPAQ-long allowed participants to provide a more accurate reflection of their activity levels, compared to PIPAQ-short.

## Discussion

Physical activity represents a critical lifestyle behavior that is linked to most chronic diseases that disproportionately affect ethnic minority populations, notably NHPIs. This is the first published study to develop and test the comprehension and acceptability of subjective physical activity questionnaires (PIPAQ-short and PIPAQ-long), as well as the feasibility of two objective measurement devices (Actiheart and ActiTrainer) in NHPI populations. While the IPAQ instruments have been widely used and validated for many countries and cultural groups, this is not true for NHPIs. Based upon focus groups conducted in this study, many changes need to be made to the IPAQ to improve comprehension and potential validity for NHPIs. Thus, the PIPAQs were created with extensive community input, and initial pilot testing indicated that both were feasible with participants favoring the PIPAQ-long over the PIPAQ-short. Future studies will investigate the validity and reliability of both PIPAQ instruments in larger samples of NHPI adults. Once validated, baseline activity data for United States NHPIs can be used to monitor physical activity and sedentary behaviors, determine trends, and measure the effectiveness of interventions in this high-risk population.

Data on participant adherence to, and feedback from wearing the Actiheart and ActiTrainer monitors, indicated that while both were acceptable to NHPI adults, comfort levels and mean days of wear were higher for the Actiheart. Although both objective activity monitors record simultaneous HR+M data, their designs were different. The Actiheart, a small single-unit device that is worn on the chest and secured by adhesive electrodes, was preferred over the ActiTrainer, which consisted of a separate heart rate monitor strap worn around the chest, and an accelerometer unit worn at the hip. The identification of a culturally-accepted monitor will serve as the criterion measure of physical activity to validate self-reported measures. If PIPAQ-short and PIPAQ-long show acceptable validity and reliability, these culturally-specific instruments could be used to provide valuable physical activity assessments for baseline and evaluation purposes. Indeed, the results from this pilot study set the stage for a full-scale PIPAQ validity and reliability study, a necessary 'next step' for providing NHPIs with a culturally-specific instrument to improve the accuracy of this important lifestyle behavior.

Lastly, this study could not have been conducted without involvement of community leaders in the development and implementation of study activities. NHPI community leaders from trusted community-based organizations provided valuable input into the cultural modifications to the IPAQ and NZPAQ-LF instruments, recruited eligible adults to participate in focus group discussions and pilot testing, and provided the space to carry out data collection activities. In formative research such as this, where no immediate community benefit is provided, we believe NHPI adults participated solely based upon the reputations of the leaders and organizations. We hope future studies will build upon this research to understand the psychosocial and environmental determinants of physical activity, the correlations of physical activity with other factors (e.g., diet and nutritional intake), and the effectiveness of culturally-tailored physical activity interventions for NHPI adults in the United States. Such efforts are being undertaken by other partners in the WINCART network, with the overall goal of reducing and eliminating enduring chronic disease disparities for NHPI communities.

*K.L. Moy was funded through a UC, San Diego Integrated Cardiovascular Epidemiology Fellowship (T32HL079891), sponsored by NHLBI. This project was supported in part by the National Institutes of Health, National Cancer Institute, Center to Reduce Cancer Health Disparities, grant U01CA114591-S5. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NCI CRCHD.*

*No potential conflicts of interest relevant to this article were reported.*

## Acknowledgements

This study was supported by Grant #3U01 CA114591-03S5. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the funders. Special thanks to WINCART (Weaving and Islander Network for Cancer Awareness, Research and Training), the Samoan National Nurses Association and the Union of Pan Asian Communities for their valued partnerships, and the study participants for their time and cooperation. The authors would also like to acknowledge Kimberly Lutu-Fuga and Kelley Thompson for their contributions to the study.

### Authors' Affiliation:

- San Diego State University, Department of Psychology, San Diego, CA 92103 (K.L.M., J.F.S.)  
- California State University, Fullerton; Department of Health Science, Fullerton, CA 92831 (S.P.T.)

### Correspondence to:

Karen L. Moy PhD  
San Diego State University  
Physical Activity Research Collaborative  
6475 Alvarado Road, Suite 238  
San Diego, CA 92120  
Email: kmoy@projects.sdsu.edu

## References

1. Sallis JF, Saelens BE. Assessment of physical activity by self-report: status, limitations, and future directions. *Res Q Exerc Sport*. 2000;72:1-14.
2. Ainsworth BE, Irwin ML, Addy CL, Whitt MC, Stolarczyk LM. Moderate physical activity patterns of minority women: the cross-cultural activity participation study. *J Womens Health Gend Based Med*. 1999;8:805-813.
3. Tudor-Locke C, Henderson KA, Wilcox S, Cooper RS, Durstine JL, Ainsworth BE. In their own voices: Definitions and interpretations of physical activity. *Women's Health Issues*. 2003;13:194-199.
4. Warnecke RB, Johnson TP, Chavez N, et al. Improving question wording in surveys of culturally diverse populations. *Ann Epidemiol*. 1997;7:334-342.
5. Kriska A. Ethnic and cultural issues in assessing physical activity. *Res Q Exerc Sport*. 2000;71:S47-53.
6. Blair SN. Physical inactivity and cardiovascular disease risk in women. *Med Sci Sports Exerc*. 1996;28:9-10.
7. Strath SJ, Swartz AM, Bassett DRJ, O'Brien WL, King GA, Ainsworth BE. Evaluation of heart rate as a method for assessing moderate intensity physical activity. *Med Sci Sports Exerc*. 2000;32:S465-470.
8. Guthold R, Ono T, Strong K, Chatterji S, Morabia A. Worldwide variability in physical inactivity a 51-country survey. *Am J Prev Med*. 2008;34:544-555.
9. Bauman AE, Bull FC, Chey T et al. The International prevalence study on physical activity: Results from 20 countries. *Med Sci Sports Exerc*. In press.
10. Rosenberg DE, Bull FC, Marshall AL, Sallis JF, Bauman AE. Assessment of sedentary behavior with the International Physical Activity Questionnaire. *J Phys Act Health*. 2008;5:S30-44.
11. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003;35:1381-1395.
12. Moy KL, Scragg RK, McLean G, Carr H. The New Zealand Physical Activity Questionnaires: Validation by heart-rate monitoring in a multiethnic population. *J Phys Act Health*. 2008;5:S45-S61.
13. Haskell WL, Yee MC, Evans A, Irby PJ. Simultaneous measurement of heart rate and body motion to quantitate physical activity. *Med Sci Sports Exerc*. 1993;25:109-115.
14. Strath SJ, Brage S, Ekelund U. Integration of physiological and accelerometer data to improve physical activity assessment. *Med Sci Sports Exerc*. 2005;37:S563-571.
15. Rennie K, Rowsell T, Jebb SA, Holburn D, Wareham NJ. A combined heart rate and movement sensor: proof of concept and preliminary testing study. *Eur J Clin Nutr*. 2000;54:409-414.
16. Strath SJ, Bassett DRJ, Thompson DL, Swartz AM. Validity of the simultaneous heart rate motion sensor technique for measuring energy expenditure. *Med Sci Sports Exerc*. 2002;34:888-894.
17. Barnett J, Nigg C, De Bourdeaudhuij I, Maglione C, Maddock J. The effect of item order on physical activity estimates using the IPAQ. *California J Health Promot*. 2007;5:23-29.



# Perspectives on the Crisis and Challenge of Cardiovascular Disease in the Diverse Asian Populations of California

Colman Ryan MD and Richard E. Shaw PhD

## Abstract

Recent data demonstrate alarming increases in mortality from cardiovascular disease and increase in risk factors that are pushing this disease to epidemic proportions in Asians living in the Bay Area of Northern California. Although genetics may have an important role, environmental factors including diet, stress and lack of exercise are contributing to the incidence of hypertension, diabetes and obesity in this population. Research at the San Francisco Heart and Vascular Institute in Daly City, California shows that this trend is continuing, and combined with a delay in seeking treatment in this diverse ethnic group, leads to poorer outcomes in revascularization therapies used to treat these patients. More intensive community education that includes patients and his/her family and more aggressive preventive treatment programs are needed to slow the progress of this growing health problem.

## Introduction

In developing nations of the world, cardiovascular disease is the most common cause of death.<sup>1-3</sup> It appears that genetics are important, but much of the increase of cardiovascular disease to near epidemic proportions is the result of environmental factors such as diet, stress, and lack of exercise. Diet is undoubtedly one of the most important factors. In the United States, the availability of fast food, larger portion sizes, the liberal use of trans-fatty acids in many processed food and the hurried lifestyle of most Americans around mealtime has decreased the consumption of more healthy foods that can be prepared at home.

This increase in the prevalence of cardiovascular disease is also having a major impact on the United States economy. More than 17% of the gross national product is spent on health care, which is more than almost every other country in the world. While there has been a decline in incidence of coronary events, which is most likely due to the impact of statin therapy in stabilizing coronary plaques making them less likely to rupture and result in acute myocardial infarctions,<sup>4</sup> the yield from the US healthcare expenditure is far from satisfying. Table 1 and Table 2 show how poorly the United State ranks worldwide in infant and maternal mortality and life expectancy for both men and women. As a country we lag far behind many nations in these statistical outcomes.

Health Status Measure	USA	US Rank in OECD (30)	Best Rank of OECD
Infant Mortality (deaths in first year of life/1000 live births/2002)			
All Races	6.8	25	Iceland (2.7)
Whites Only	5.7	22	
Maternal Mortality 2001 (deaths per 100,000 births)			
All Races	9.9	22	Iceland (0)
Whites only	7.2	19	

Health Status Measure	USA	US Rank in OECD (30)	Best Rank of OECD
Life Expectancy from birth (y)			
All Women	80.1	22	Japan (85.3)
White Women	80.5	19	
All Men	74.8	22	Sweden (78.4)
White Men	75.3	19	
Life Expectancy from age 65/ -2004*			
All women, years	19.8	10	Japan (23)
White women, years	19.8	10	
All men, years	16.8	9	Iceland (18.1)
White men, years	16.9	9	

\* Data missing for six (6) countries

## Ethnicity and Cardiovascular Disease

Towards the latter part of the twentieth century, studies and government surveys showed that the Asian population appeared to have fewer risk factors for cardiovascular disease, with the possible exception of smoking. However, recent studies have found that there has been a progressive increase in cardiovascular risk factors and a decrease in the cardiovascular health in this population.<sup>5</sup> A recent study showed that the major causes of death for Asian/Pacific Islanders were heart disease and stroke, which accounted for 32.9% of deaths in men and 33.5% of deaths in women. Diabetes accounted for 3.4% of all deaths. Even more striking was the 7.5% prevalence of diabetes in Asian/Pacific Island population, which is twice that of Caucasians.<sup>6</sup> Compared to other ethnic groups, Asian/Pacific Islanders have had higher increases in smoking, alcohol consumption and obesity over the last several years. There has been a dramatic increase worldwide in cardiovascular disease and the risk factors that contribute to it,<sup>7,8</sup> and this increase is even more pronounced for many of those who have moved to the west coast of the United States. It is expected that by 2050 less than half of the US population will be Caucasian, with the majority being either Hispanic or Asian by that time, bringing into sharp focus the acuity of this rise in cardiovascular disease and uncontrolled risk factors.

In Daly City, which is part of San Mateo County in California, Asian/Pacific Islanders make up a substantial portion of the population with coronary artery disease. There has been progressive increase in risk factors from 1994 to 2004, which has continued to increase through 2009. Almost all of these individuals have hypertension and/or dyslipidemia, and nearly 53% have diabetes mellitus. The problem is also apparent from the explosion of obesity that is occurring among school-age children in these families. Between 1994 and 2007, there had been a tremendous increase in the number of Asians, particularly Filipinos, in this area (see Table 3). The Filipinos are the majority of Asians by far to populate San Mateo County. Diets of families in the Philippines were evaluated by nutritionists. The

**Table 3.— Demographic Change, San Mateo County (as indicated by 1990 and 2007 census data)**

Race/Ethnicity	Population (% total)		Total Change 1990-2007	% Change 1990-2007
	1990	2007		
White	383,088 (60.5)	477,214 (67.5)	84,126	21.4
Hispanic	114,627 (17.6)	162,606 (23)	47,979	41.9
Asian/PI	105,559 (16.2)	180,281 (25.5)	74,722	70.8
Black	34,000 (5.2)	23,330 (3.3)	-10,670	-31.4
Native Am	2,349 (0.4)	3,535 (0.5)	1,186	50.5
Other	NA	NA	NA	NA
>= 2 Races	NA	22,623	NA	NA
Total	649,623	706,983	197,343	153.2

**Table 4.— Changes in Risk Factors Over Ten Years in Patients with Known Coronary Artery Disease by Ethnic Background**

Risk Factors	Year	Filipino	Hispanic	Caucasian
Obesity	1994	6.9	29.2	21.8
	2004	18.8	42.9	38.6
Hypertension	1994	78.7	65.3	61.9
	2004	84.4	81.0	81.1
Diabetes	1994	35.9	29.6	26.9
	2004	53.1	40.2	28.0
Smoking	1994	52.3	59.6	72.4
	2004	43.8	33.3	55.8
Hyperlipidemia	1994	72.8	60.2	74.5
	2004	90.6	69.1	70.2

diets were considered poor due to the use of lard and other oils for cooking.<sup>9</sup>

### Revascularization Therapies at the San Francisco Heart and Vascular Institute

The San Francisco Heart and Vascular Institute is located at Seton Medical Center in Daly City. The demographics of inhabitants in the area are shown in Table 4. Cardiovascular disease is rampant. Between 1994 and 2004, there is a huge increase in obesity, hypertension, diabetes, and hyperlipidemia in the area population with known coronary disease (Table 4). The inescapable consequence of poor diet and weight gain is diabetes. It was astonishing to find that diabetes mellitus in Filipinos was even greater than that in Hispanics. Even more compelling now is the prevalence of coronary artery disease and stroke in Filipino women. In 13 years, the requirement for coronary artery bypass graft or percutaneous coronary intervention (PCI) in women increased from 3% to 51%. Whether this is due to the recognition that symptoms are vague and atypical in women or disease progression in women is not understood.

An equally disturbing trend is the general attitude of Asian/Pacific Island population towards symptoms that may indicate a cardiovascular issue. It is part of Asian culture that patients do not seek attention until things are drastic (i.e., “something is falling off”). The symptoms are frequently ignored until they become extreme. This often leaves the health care professional with a situation where coronary artery disease is very advanced. When Asians appear for care, their arteries are difficult to treat by either PCI or coronary artery bypass. Outcomes in Asians are worse than for any other ethnic group.<sup>10</sup> Perhaps treatment by medical therapy in view of recent studies such as the COURAGE study should be considered,<sup>11</sup> as partial revascularization may not be optimal.

### Solutions

Shakespeare said, “diseases drastic grown by drastic pliance are relieved or not at all.” The greatest solution to this problem worldwide is prevention. But where is the best place to start? The children of as many as 30% of adults in this county are overweight and cannot be held responsible for their own behavior. Parents are reluctant to recognize that an obese 9-year-old does not benefit from being labeled as having “puppy fat”. Children do not want the lecture, and

parents do not want the responsibility. Loving your own child and keeping them healthy seem to be two different elements of modern society that are difficult to attain.

Education at our schools and churches, and the presentation of heart-healthy diets in our cafeterias, are essential. The hard facts are hard for people to heed. Repetition is a strong advocate for good behavior, but it is difficult to achieve.

Solutions are difficult, but possible. Emphasis on diet from birth with strict dietary home habits, school habits, and the recognition of fast-food industry contributions to this epidemic must be made. More emphasis should be on heart-healthy food and smaller portions. It appears that there has been a certain complacency about being conscious of the type of food that is consumed since a magic pill (the broad use of “statins”) can provide an easy solution. However, this only addresses one small aspect of the risk profile, and other risk factors are not treated.

### Summary

The Asians in San Mateo County demonstrate a large, disappointing deterioration in risk factors and deadly outcomes. Obesity, hypertension, hyperlipidemia, and consequently diabetes, are rampant. Treatment with preventive measures such as statins to control cholesterol, good control of blood pressure, better diet, and more physical activity could far exceed the outcomes achieved by intervention with angioplasties, stents, or coronary artery bypass after the disease is established and has progressed. Even these procedures have had less than optimal outcomes in patients with continued risk factors and no aggressive attempt to control them. We must strive to continue to educate our younger population and their parents in the necessity of avoiding even further disasters.

*No potential conflicts of interest relevant to this article were reported.*

#### Authors' Affiliation:

- San Francisco Heart & Vascular Institute at Seton Medical Center, Daly City, CA (C.R.)  
- Division of Cardiology, California Pacific Medical Center, San Francisco, CA (R.E.S)

#### Correspondence to:

Colman Ryan MD; San Francisco Heart & Vascular Institute at Seton Medical Center, 1900 Sullivan Avenue, Daly City, CA 94015; Ph: (650) 991-6712; Fax: (650) 755-7315

## References

1. World Health Report 2002: Reducing risks, promoting healthy life. Geneva, World Health Organization, 2002.
2. Murray CJL, Lopez AD: The Global Burden of Disease, Cambridge, MA, Harvard School of Public Health, 1996.
3. Pearson TA: Global perspectives on cardiovascular disease, *Evidence Based Cardiovasc Med* 1:4, 1997.
4. Sheth T, Nair C, Nargundjar M, et al: Cardiovascular and cancer mortality among Canadians of European, south Asian, and Chinese origin from 1979 to 1993: An analysis of 1.2 million deaths. *Can Med Assoc J* 161:132, 1999.
5. Pleis JR, Lethbridge-Cejkum. Summary of health statistics for U.S. Adults National Health Interview Survey, 2005. National Center for Health Statistics. 2006 Vital Health Stat 10 (232).
6. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). "Diabetes in Asian and Pacific Islander Americans." Available from <http://diabetes.niddk.nih.gov> 2002.
7. Chan JCN, Malik V, Jia W, Kadowaki T, Yajnik C, Yoon K-H, Hu FB: Diabetes in Asia: Epidemiology, risk factors, and Pathophysiology. *JAMA* 2009;301(20):2129-140.
8. Klatsky AL, Tekawa IS, Armstrong MA: Cardiovascular risk factors among Asian Americans. *Public Health Reports* 1996;Vol 3 (supplement 2):62-64.
9. Ryan C, Shaw R, Pliam M, Zapolanski AJ, Murphy M, Valle HV, Myler R: Coronary heart disease in Filipino and Filipino-American patients: prevalence of risk factors and outcomes of treatment. *J Invasive Cardiol* 2000; 12:134-139.
10. Ryan C, Shaw RE, Millhouse F, Zapolanski A, Yap A, Lee L, Khoury L, Cavanaugh M, Pliam M: The role of ethnicity in outcomes after coronary artery intervention: How important are clusters of risk factors?. *J Am Col Angiology*, 2003;Vol 1:283-291.
11. BodenWE, O'Rourke RA, Teo KK, Hatrigan PM, Maron DJ, Kostuk WH, Knudtson M, Dad M, Casperson P, Harris CL, Chaitman BR, Shaw L, Gosselin G, Nawaz S, Title LM, Gau G, Blaustein AS, Booth DC, Bates ER, Spertus JA, Berman DS, Mancini GB, Weintraub WS: COURAGE Trial Research Group: Optimal medical therapy with or without PCI for stable coronary disease. *N Engl J Med*, 2007 Apr 12;356(15):1503-16.



# Diabetes Care in a Predominantly Native Hawaiian and Pacific Islander Outpatient Population

Rachel Lee MD; Janet Onopa MD; Marjorie K. Mau MD; and Todd B. Seto MD, MPH

## Abstract

**Purpose:** Racial differences in diabetes care and outcomes, particularly among African Americans and Hispanics, have been well-recognized. The goal of this study was to evaluate the quality of diabetes care, using nationally recognized standards of care, in a multispecialty, hospital-based clinic that cares for a predominantly Native Hawaiian and Pacific Islander population.

**Methods:** We identified patients with a new primary or secondary diagnosis of diabetes during a visit (baseline visit) between January 2005 and June 2006 at the Queen Emma Clinics. Each patient's medical record was reviewed to obtain demographic and clinical information related to diabetes, including laboratory and test results and medications, from the baseline visit through 12 months follow-up. Performance indicators were selected from those recommended by the National Diabetes Quality Improvement Alliance and included selected 8 measures: 1) Hemoglobin A1c  $\geq 9.0\%$ ; 2) Annual lipid panel checked; 3) Systolic blood pressure  $< 140$  mmHg; 4) LDL cholesterol  $< 130$  mg/dL; 5) Annual fundoscopic examination; 6) Foot examination; 7) Aspirin use; 8) Annual evaluation for urine protein.

**Results:** We identified 364 patients, the majority Pacific Islanders (58%), with Asians (15%) and Native Hawaiians (17%) more frequent than Caucasians (10%). Compared with Caucasians, Native Hawaiians and Pacific Islanders were significantly more likely to have poor glucose control. There were no significant differences between groups for the other measures. Patients compared favorably when compared with national benchmarks. For 2 indicators, adherence was significantly higher for the total study population compared with the US average (systolic blood pressure  $< 140$  mmHg, aspirin therapy). For 2 indicators, there were no significant difference (LDL cholesterol  $< 130$  mg/dL, annual foot exam) and for 2 indicators, adherence was significantly lower for the study population (hemoglobin A1c  $> 9\%$ , annual fundoscopic examination).

**Conclusions:** Native Hawaiians and Pacific Islanders with diabetes have poorer blood glucose control compared with Caucasians and Asians, but the overall care is otherwise generally similar. The diabetes care received by patients in this clinic that treats a generally underserved population compares favorably with national benchmarks.

## Introduction

Over 20 million people in the United States are diagnosed with diabetes, with estimates that, in the near future, 1 in 3 Americans will develop diabetes in his or her lifetime and that diabetics will lose, on average, up to 15 years life-years.<sup>1</sup> Fortunately, an array of interventions to prevent or delay diabetes and its complications have emerged, including aggressive control of blood glucose, hyperlipidemia and hypertension, screening and early treatment of diabetic retinopathy and nephropathy, regular foot exams, and influenza and pneumococcal vaccinations.

However, there are data that diabetes care has been suboptimal and varied despite widespread quality improvement efforts. Indeed, in a recently published national population-based survey, 40% of diabetes had poorly controlled LDL cholesterol, 33% had poorly controlled blood pressure, and 20% had poor glycemic control.<sup>1</sup> Racial differences in diabetes care and outcomes, particularly among African Americans and Hispanics, suggest that the barriers

to improving the quality of care may be more substantial for some than for others.

Less is known about the care of Native Hawaiians and Pacific Islanders with diabetes. Although NHPI have a higher prevalence of diabetes and its complications than do Caucasians and Asians, how this disproportionate burden of diabetes relates to disparities in the assessment of care is uncertain. The goal of this study was to evaluate the quality of diabetes care, using nationally recognized standards of care, in a multispecialty, hospital-based clinic that cares for a predominantly underserved population.

## Methods

### Patient Population

We identified patients with a new primary or secondary diagnosis of diabetes during a visit (baseline visit) between January 2005 and June 2006 at the Queen Emma Clinics, a multispecialty, hospital-based outpatient clinic located at The Queen's Medical Center. Patients could be new to the clinic or have had ongoing care, but all were required to have a first-time diagnosis of diabetes. Adult medicine care is provided by primary care physicians, who are responsible for patient care and internal medicine and medical student education. Patients who attended at least one follow-up visit to the adult medicine clinic within 6 months of the baseline visit were included in the study cohort. For patients with more than one visit during the study period, the first visit was defined to be the baseline visit. Race and ethnicity information were obtained from administrative records and the medical chart and were classified as Caucasian, Asian, Native Hawaiian and Pacific Islanders. All others were classified as Other and excluded from the data analysis.

### Data Collection

Each patient's medical record was reviewed to obtain demographic and clinical information related to diabetes, including laboratory and test results and medications, from the baseline visit through 12 months follow-up. Performance indicators were selected from those recommended by the National Diabetes Quality Improvement Alliance,<sup>2</sup> an alliance between 13 private and public national organizations to develop and maintain a national performance measurement set for diabetes. Intended to retrospectively assess the level of care, the measures have a firm evidence base, feasibility and reliability and are consistent with national standards promoted by the American Diabetes Association, American Medical Association, and others. To be consistent with the National Diabetes Quality Improvement Alliance and published benchmarks,<sup>1,2</sup> we selected 8 performance measures: 1) Hemoglobin A1c  $\geq 9.0\%$  (poor control); 2) Annual lipid panel checked; 3) Systolic blood pressure less than 140 mmHg; 4) LDL cholesterol  $< 130$  mg/dL; 5) Annual fundoscopic examination; 6) Foot examination; 7) Aspirin use; 8) Annual evaluation for urine protein.

## Data Analysis

We used descriptive statistics to summarize the study population and compare Native Hawaiians, Pacific Islanders, and Asians with Caucasians (referent group), using parametric and non-parametric tests as appropriate. We assessed the adherence to the diabetes performance measures at the baseline visit, and at 6 and 12 months follow-up. We also compared our results to results from a recent study<sup>1</sup> that examined data from the National Health and Nutrition Examination Study (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS), two large, US population-based epidemiological studies. All analyses were performed using Stata 8.0 (College Station, TX).

This study was reviewed and approved by The Queen's Medical Center's Research and Investigational Review Committee.

## Results

We identified 364 patients who received their first diagnosis of diabetes during the study period and had at least 1 follow-up appointment within the subsequent 6 months. Of these patients, 309 (85%) were new to the clinic and the remaining 15% of patients had established care. The majority of patients were Pacific Islanders (58%), with Asians (15%) and Native Hawaiians (17%) more frequent than Caucasians (10%). Compared with other patients, Caucasians were more likely to be male and were less likely to have hypertension, hyperlipidemia, and heart failure (Table 1). Significantly more Native Hawaiians had heart failure compared to Caucasians, despite their younger age. Nearly 90% of all patients were cared for by medical residents at their baseline visit. In general, Caucasians were less likely to be on ACE inhibitors or angiotensin receptor blockers, statins and oral hypoglycemic agents, compared with other groups (Table 1).

At 6 months follow-up, the blood pressures of Native Hawaiians (131±18 mmHg), Asians (132±17 mmHg) and Pacific Islanders (138±21 mmHg) were similar to Caucasians (133±17 mmHg). Compared with Caucasians (7.9±2.3), Native Hawaiians (9.2±2.6,  $p<0.05$ ) and Pacific Islanders (8.6±2.2,  $p<0.05$ ) had a significantly higher hemoglobin A1c, with Asians having a similar level (7.8±2.3). Compared with Caucasians (137±96 mg/dL), Asians (151±138 mg/dL) and Native Hawaiians (149±110 mg/dL) had a slightly higher LDL level, and Pacific Islanders (123±54 mg/dL) had a slightly lower level, although the differences were not statistically significant. The results were similar at 12 month follow-up (Table 2).

Table 2 displays the 8 performance measures as assessed at 12 month follow-up, with results from data from NHANES and BFRSS<sup>1</sup> included for comparison. Compared with Caucasians (23%), Native Hawaiians (47%,  $p=0.004$ ) and Pacific Islanders (30%,  $p=0.05$ ) were significantly more likely to have poor glucose control, defined as hemoglobin A1c > 9.0%. In contrast, there were no statistically significant differences between groups for the other measures, although the level of performance varied between measures. For example, nearly 80% of patients had a systolic blood pressure less than 140 mmHg, but only 48% of patients had evidence of testing to detect urine protein and only 66% of patients were taking daily aspirin. Notably, only 35% of patients had documentation that an ophthalmologic exam was performed in the prior year.

	Caucasian (n=35)	Asian (n=57)	NH (n=62)	PI (n=210)
Age, years	54±13	51±15	50±13	53±12
Female	23%	51%**	47%*	55%#
Insurer				
Self-pay	11%	19%	11%	11%
Quest/Medicaid	52%	48%	58%	78%#
Medicare	23%	21%	16%	7%**
Medical History				
Hypertension	60%	75%	68%	78%*
Hyperlipidemia	57%	72%	76%	74%
Renal Insufficiency	17%	16%	19%	23%
Heart failure	3%	4%	18%*	6%
Coronary artery disease	11%	13%	4%	10%
Medications				
ACEI/ARB	57%	68%	73%	72%
Insulin	31%	7%	22%	14%*
Oral hypoglycemic agent	40%	65%*	61%	48%
Statin	31%	63%**	65%**	63%#
Systolic blood pressure, mmHg	136±16	137±20	135±18	138±21
HbA1c, %	8.0±2.0	8.7±2.7	9.9±2.7*	9.3±2.4*

All comparisons relative to Caucasians; \*\* $p<0.01$ ; \* $p<0.05$ ; # $p<0.001$ ; NH = Native Hawaiian; PI = Pacific Islander; ± values represent standard deviation

	Caucasian (n=35)	Asian (n=57)	NH (n=62)	PI (n=210)
Systolic Blood Pressure, mmHg				
6 months	133±17	132±17	131±18	138±21
12 months	128±32	136±20	124±36	132±28
HbA1c, %				
6 months	7.9±2.3	7.8±2.3	9.2±2.6*	8.6±2.2*
12 months	7.7±1.9	8.2±2.4	9.5±2.7*	8.9±2.2*
LDL, mg/dL				
6 months	137±96	151±138	149±110	123±54
12 months	152±156	166±181	171±163	140±124

Patients in this study compared favorably with US benchmark data (Table 3). For 2 indicators, adherence was significantly higher for the total study population compared with the US average (systolic blood pressure < 140 mmHg: 79% vs. 68%,  $p<0.001$ ; aspirin therapy: 61% vs. 45%,  $p<0.001$ ). For 2 indicators, there were no significant difference (LDL cholesterol < 130 mg/dL: 58% vs. 64%,  $p=0.10$ ; annual foot exam: 72% vs. 68%,  $p=0.17$ ) and for 2 indicators, adherence was significantly lower for the total study population (hemoglobin A1c > 9%: 29% vs. 21%,  $p<0.004$ ; fundoscopic examination: 35% vs. 68%,  $p<0.001$ ).

	Caucasian (n=35)	Asian (n=57)	NH (n=62)	PI (n=210)	Total (n=364)	US Average
Hemoglobin A1c >9.0% (poor control)	23%	22%	47%**	30%*	29%	21%
Annual lipid profile	80%	89%	85%	89%	88%	85%
LDL cholesterol <130 mg/dL	50%	63%	51%	59%	58%	64%
Systolic blood pressure <140 mmHg	86%	82%	81%	77%	79%	68%
Annual fundoscopic examination	37%	34%	26%	37%	35%	68%
Foot examination	71%	68%	63%	76%	72%	68%
Aspirin therapy	60%	61%	66%	69%	66%	45%
Annual test for urine protein	57%	44%	50%	47%	48%	--

All comparisons relative to Caucasians; \*p<0.05; \*\*p=.004; NH = Native Hawaiian; PI = Pacific Islander

## Discussion

In this study, which examined diabetes processes and outcomes of care in a hospital-based, outpatient clinic, we found that diabetes care is generally similar between Caucasians, Asians, Native Hawaiians and Pacific Islanders, and, overall, is similar to national benchmarks. To our knowledge, this is the first study to examine diabetes care in a predominantly Native Hawaiian and Pacific Islander population, and builds on previously published epidemiological studies that examined the prevalence of diabetes, risk behaviors, and diabetes-related conditions.<sup>3</sup>

Racial differences in diabetes care have been reported, with evidence that African Americans<sup>4,5</sup> and Hispanics,<sup>4,6</sup> but not Asians,<sup>4</sup> have higher hemoglobin A1c levels when compared with Caucasians. However, the magnitude and significance of these differences vary,<sup>6,7</sup> and when a broader number of performance indicators are assessed, racial differences in diabetes care are less distinct. For example, in a study evaluating data from NHANES, Mexican-Americans were significantly more likely to have poorly controlled blood glucose and elevated blood pressure, and less likely to receive annual cholesterol testing when compared with Caucasians. However, the rate of annual fundoscopic examinations, LDL cholesterol < 130 mg/dL and microalbuminuria were similar between the two groups.<sup>6</sup> In our study, Native Hawaiians and Pacific Islanders were more likely to have poor blood glucose control when compared with Caucasians, but there were no significant differences in other performance indicators.

There is, however, substantial room for improvement. Developed by the Diabetes Quality Improvement Alliance, the performance indicators used in this study define a minimal level of quality – measures of accountability and minimum standards, rather than measures of optimal care.<sup>2</sup> Thus, while it is notable that the care for the patients in our study is similar to national benchmarks, despite being a generally underserved population with broad cultural diversity, blood glucose control, blood pressure management and other clinical measures need to be optimized. For example, if an optimal LDL cholesterol and hemoglobin A1c levels are defined as < 100 mg/dL and ≤ 7.0% respectively, then only 34% and 41% of study subjects would be at target levels – rates that are nearly identical to national benchmarks (34% and 42% respectively).<sup>1</sup>

There are several limitations to our study. First, our sample size is small and limited to a single outpatient clinic, which may affect the power of our analyses and generalizability of our findings. Second, low adherence to performance may not reflect poor quality care. Patient preferences, adherence to therapy, comorbidities and medical record documentation may all impact assessments of care. Indeed, the low rate of annual fundoscopic examinations noted in our study likely reflects difficulties documenting results from external consulting ophthalmologists, based on the number of referral requests processed by clinic staff. Third, our assessment of

performance indicators focused on data 12 months after the baseline visit, although it is arguable that an earlier assessment would be more appropriate. However, we felt that a shorter follow-up period would potentially penalize physicians for indicators that are recommended annually (e.g., fundoscopic examination, lipid profile, urine protein). Moreover, for the other 5 indicators, there was no substantial difference between the 6- and 12-month assessments. In summary, Native Hawaiians and Pacific Islanders with diabetes have poorer blood glucose control compared with Caucasians and Asians, but the overall care is otherwise generally similar. The diabetes care received by patients in this clinic that treats a generally underserved population compares favorably with national benchmarks.

*No potential conflicts of interest relevant to this article were reported.*

## Acknowledgement

This work was supported, in part, by the National Heart, Lung, and Blood Institute (grant U01HL 079152) and the National Center on Minority Health and Health Disparities (P20MD 000173).

### Authors' Affiliations:

- Center for Outcomes Research and Evaluation (T.B.S.) and the Queen Emma Clinics (T.B.S., J.O.), The Queen's Medical Center, Honolulu, HI 96813  
 - Departments of Medicine (T.B.S., J.O., R.L.) and Native Hawaiian Health (M.K.M.), John A. Burns School of Medicine, University of Hawai'i, Honolulu, HI 96813

### Correspondence to:

Todd B. Seto, MD MPH  
 The Queen's Medical Center  
 1301 Punchbowl Street  
 Honolulu, HI 96813  
 Ph: (808) 585-5439  
 Email: tseto@queens.org

## References

1. Saaddine JB, Cadwell B, Gregg EW, et al. Improvements in diabetes processes of care and intermediate outcomes: United States, 1988-2002. *Ann Intern Med.* 2006;144:465-474.
2. Fleming BB, Greenfield S, Engelgau MM, Pogach LM, Clauser SB, Parrott MA. The Diabetes Quality Improvement Project. *Diabetes Care.* 2001;24(10):1815-1820.
3. Mau MK, Sinclair Ki, Saito EP, Baumhofer KN, Kaholokula JK. Cardiometabolic health disparities in Native Hawaiians and other Pacific Islanders. *Epidemiol Rev.* June 16, 2009;(Epub ahead of print).
4. McBean AM, Huang Z, Virnig BA, Lurie N, Musgrave D. Racial variation in the control of diabetes among elderly Medicare managed care beneficiaries. *Diabetes Care.* 2003;26:3250-3256.
5. De Rekeneire N, Rooks RN, Simonsick EM, et al. Racial differences in glycemic control in a well-functioning older diabetic population. *Diabetes Care.* 2003;26:1986-1992.
6. Harris MI. Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. *Diabetes Care.* 2001;24:454-459.
7. Lanting LC, Joung IM, Mackenbach JP, Lamberts SW, Bootsma AH. Ethnic differences in mortality, end-stage complications, and quality of care among diabetic patients. *Diabetes Care.* 2005;28:2280-2288.

# Serving Hawaii's patients and community since 1856

While health care has changed a lot since 1856, Hawaii's physicians still have the same priority – the health of their patients.

As the largest organization in the state to represent Hawaii physicians of all specialty and practice types, **it is Hawaii Medical Association's mission to help physicians help patients.**

From the time King Kamehameha IV granted our charter, HMA has been a true advocate for physicians, patients, and the community . . . advocacy that's needed now more than ever during the national health care reforms.

Mahalo to Hawaii physicians for providing care to our community, and mahalo to all Hawaii citizens for supporting **HMA's goal of access to quality health care in our state.**



**To learn more about our efforts, visit [www.hmaonline.net](http://www.hmaonline.net)**

Physicians – interested in joining the cause to help your patients? Call HMA for details on becoming a member:  
(808) 536-7702, toll-free (888) 536-2792



Artist: Dietrich Varez