

# A Descriptive Study of Marshallese and Chuukese Patients with Diabetes in Hawai'i

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## Abstract

*Diabetes is a growing epidemic in the United States with significant racial and ethnic health disparities among minorities. In Pacific Islanders, diabetes ranks as the fifth leading cause of death, higher than the national average. Despite this, little is known about diabetes in this population, and even less so in subpopulations such as Micronesians. To target these high-risk individuals, a federally qualified health center on Hawai'i Island started a multi-disciplinary diabetes care program for two Micronesian populations. This manuscript describes the characteristics of the Marshallese and Chuukese patients with diabetes enrolled in this program. Program enrollees had low socioeconomic status and poor health literacy, as well as high prevalence of co-morbidities commonly linked with diabetes. These findings support the data available on Micronesian populations and highlight the need to develop approaches that will improve health outcomes and bridge health disparities for these individuals.*

## Keywords

*Diabetes, health disparities, Micronesians, Pacific Islanders, Chuukese, Marshallese*

## Introduction

More than 25 million people, 8.3% of the United States' population, have diabetes.<sup>1</sup> Diabetes is a major cause of both macrovascular and microvascular health complications, making it the seventh leading cause of death in the United States.<sup>1</sup> In the Asian American and Pacific Islander population, diabetes ranks even higher as the fifth leading cause of death.<sup>2</sup>

Racial and ethnic disparities in incidence, prevalence, and treatment of type 2 diabetes are a public health concern and challenge. Health disparities among Hispanics and African Americans have been well documented in the literature, but little information is known about Pacific Islanders, including Micronesians.<sup>3-6</sup>

Because of their small population size, Native Hawaiians and Pacific Islanders (NHPI) are typically grouped together for analysis; nevertheless, it is important to examine subpopulations independently as differences exist between rates of obesity, health status, and healthcare access.<sup>7</sup> According to the 2010 Census, 1.2 million people, 0.4% of the United States population, identified as NHPI alone or in combination with one or more races. Although the percentage may be small, the NHPI cohort grew more than three times faster than the total United States population, 35% compared to 9.7%, between 2000 and 2010.<sup>8</sup>

Micronesians specifically are the newest and fastest growing group of immigrants to Hawai'i, with the number of immigrants in Hawai'i rising from just 229 in 1986 to 3,355 by 1997, with 60.9% of them living in poverty.<sup>9</sup> As of 2006, it was estimated that 14,000 Micronesian immigrants lived in Hawai'i, with 15%

of them living on Hawai'i Island.<sup>10</sup> Despite rapid growth, there is limited knowledge of health care and health disparities in NHPI as a whole and even less in its constituent populations.

The information that is available regarding NHPI reflects multiple health disparities and poor health status. Risk factors contributing to metabolic syndrome, including low activity levels, poor diet, tobacco use, and obesity, are high.<sup>11-12</sup> This may contribute to a diabetes prevalence that is two to four times higher in NHPI than the general population, afflicting over 20,000 Native Hawaiians in the state.<sup>13-16</sup> In addition, there are also intra-state health disparities with Hawai'i Island having a higher diabetes incidence than the overall state average.<sup>17</sup> Micronesians suffer disproportionately from diabetes as well, partially due to high levels of obesity.<sup>18-21</sup> Finally, NHPI are less likely to be aware of their chronic diseases, as well as less likely to be treated.<sup>15</sup>

Some efforts have been made to bridge these health disparities and improve quality of care for NHPI. For example, the PILI 'Ohana Pilot Project promoted weight loss in a targeted, culturally adapted approach in five NHPI communities and showed a statistically significant weight reduction after program completion.<sup>22</sup>

Reducing disparities in this high-risk population may require focused programs and targeted interventions. There is little data on the socioeconomic and clinical characteristics of Micronesians with diabetes. Hence, the purpose of this study was to describe the characteristics of two Micronesian populations at a federally qualified health center (FQHC) on Hawai'i Island.

## Methods

### Study Population

Bay Clinic Inc. (BCI) nonprofit community health centers serve the health care needs of Hilo, Puna, and Ka'u on Hawai'i Island. BCI is the only FQHC and safety-net service provider for the communities located in East and South Hawai'i, serving a combined population of 86,156 people. Five clinics provide primary and preventive medical care for those who experience geographic, cultural, financial, and social barriers to healthcare services.

BCI provides healthcare to residents spanning 2,048 square miles of rural and remote geography. The entire area is federally designated as a Medically Underserved Area/Population (MUA/MUP), Dental Health Provider Shortage area, and Mental Health Provider Shortage area. Forty three percent of the service area's residents live below the federal poverty line with 1 in 3 receiving food stamps, and 2 in 5 on Temporary Assistance for Needy

Families (TANF). The regional unemployment rate is 12% with some areas reaching 16%, and the per capita income of \$13,265 is one of the lowest in the state. Within the patient population, 17% of adults and 12% of children are uninsured. The majority (58%) of BCI patients are Medicaid/QUEST beneficiaries; 10% are Medicare beneficiaries, 17% are uninsured and 15% are privately insured. The area hosts a large NHPI population, with 27% of the BCI patient population identifying with only NHPI ancestry.<sup>23</sup>

In 2006, in response to the diabetes epidemic, BCI piloted the Bay Clinic Diabetic Project at their Hilo facility based on national standards for diabetes self-management education and support. The program had open enrollment, regardless of level of diabetes control. The Hilo BCI facility hosted two Diabetes Self-Management Education (DSME) programs, one for Chuukese (n=21) and one for Marshallese (n=36) patients. At the end of the trial period, participants showed significant improvements in measured health indicators including glycosylated hemoglobin (A1c) and blood pressure.<sup>24</sup>

### Data Collection

For patients who participated in the program, Marshallese and Chuukese patient data was collected retrospectively from patient charts and the electronic medical record (BCI transitioned from paper charts to electronic medical records during the data collection period).

### Health Indicators

Baseline health information, such as number of chronic medication conditions, were collected through identification of all non-acute ICD-9 codes for the patient listed under their past medical history in the medical record.

Clinical health indicators included A1c, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), total cholesterol (TC), body mass index (BMI) and blood pressure (systolic and diastolic). Information was collected for the fourth quarter of 2010 prior to the integration of clinical pharmacist services. If no data was available during this period then the most recent data going backwards in time was considered baseline.

As this was a descriptive study, no statistical tests were performed. The study was approved as exempt by the University of Hawai'i Institutional Review Board.

### Results

Demographic information for Marshallese and Chuukese patients in the Hilo BCI DSME program is summarized in Table 1. The mean age of Micronesian patients with diabetes was 56 years. Overall, 24% of the population completed grade school and 37% completed high school as their highest level of education. Household size tended to be larger for Chuukese, with 21% of Chuukese and 7% of Marshallese having households of 5 to 6 members. Income for 94% of the overall population was less than \$20,000 annually with 79% receiving Medicaid benefits.

Patient health characteristics from the year 2010 for the two groups are summarized in Table 2. The majority (81%) of the Chuukese population were obese, compared to 43% for the Marshallese population. Also, 14% of Chuukese were current smokers, compared to 3% of Marshallese. The study group on average took 4.4 medications with most of these medications targeted for diabetes and chronic disease states including hypertension, dyslipidemia, and other cardiovascular disease.

Table 3 summarizes clinical health indicators for the Micronesian population. The overall BMI average was 32.6. The average A1c was 8.8% (goal <7% for most individuals with diabetes), LDL cholesterol was 105.5 mg/dL, HDL cholesterol was 37.5 mg/dL, and triglycerides were 159 mg/dL.

### Discussion

Programs specifically designed for populations with poor health and socioeconomic standing may improve health outcomes for these individuals. This study described the characteristics of participants enrolled in one such program developed for NHPI, specifically a Micronesian subpopulation with diabetes, and examined characteristics of those enrolled in the program. Current data on NHPI health status is limited, with even less information available for Micronesians. What information there is indicates that NHPI have poor health status disproportionate to national averages; data from this study supports this and

Table 1. Demographic Characteristics of Marshallese and Chuukese Patients with Diabetes.

	Overall (n=57)	Marshallese (n=36)	Chuukese (n=21)
Age [Mean (SD)]	56.8 (1.1)	56.0 (1.6)	58.1 (1.9)
Female (%)	44.6	42.9	47.6
<b>Highest Education level (%)</b>			
Some grade school	4.9	3.7	7.1
Grade school graduate	24.4	18.5	35.7
Some high school	14.6	22.2	0
High school graduate	36.6	33.3	42.9
Some college	4.9	7.4	0
College graduate	14.6	14.8	14.3
<b>Income level (%)</b>			
Less than \$20,000	93.8	93.6	94.4
\$20-39,000	4.2	3.2	5.6
\$40,000+	2.0	3.2	0
<b>Household size (%)</b>			
1-2	61.2	70.0	47.4
3-4	26.5	23.3	31.6
5-6	12.2	6.7	21.1
<b>Type of coverage (%)</b>			
Medicaid	78.6	65.7	100
Medicare	1.8	2.8	0
Medicaid and Medicare	5.3	8.3	0

	Overall (n=57)	Marshallese (n=36)	Chuukese (n=21)
Obese (BMI >30) (%)	57.1	42.9	81.0
Current smoker (%)	7.3	2.9	14.3
Former smoker (%)	21.8	20.6	23.8
Hypertension (%)	69.6	65.7	76.2
Dyslipidemia (%)	71.4	80.0	57.1
Coronary artery disease (%)	12.5	8.6	19.0
Stroke (%)	5.4	8.6	0
Condition count [Mean (SD)]	4.4 (0.3)	4.6 (0.3)	4.0 (0.6)
Number of medications (total)	4.4 (0.3)	4.5 (0.4)	4.3 (0.5)
Diabetes	1.5 (0.1)	1.5 (0.2)	1.4 (0.2)
Hypertension	1.0 (0.1)	0.9 (0.2)	1.1 (0.2)
Dyslipidemia	0.8 (0.1)	0.9 (0.1)	0.7 (0.1)
<b>Diabetes medications (%)</b>			
Metformin	69.1	65.7	75.0
Sulfonylurea	30.9	34.3	35.0
DPP4 Inhibitor	1.8	2.9	0
Insulin	30.9	31.4	30.0

	Overall (n=57)	Marshallese (n=36)	Chuukese (n=21)
Weight [Mean Kg (SD)]	83.1 (2.6)	77.9 (3.2)	92.0 (3.5)
Body Mass Index (BMI)	32.6 (0.96)	30.7(1.1)	35.8(1.6)
A1c	8.8 (0.3)	9.1 (0.4)	8.3 (0.3)
LDL	105.5 (.48)	105.2 (6.0)	106.0 (8.2)
HDL	37.5 (0.9)	37.8 (1.3)	37.0 (1.3)
Total Cholesterol	172.6 (5.7)	175.7 (7.6)	167.5 (8.7)
Triglycerides	159.4 (15.5)	173.5 (22.7)	135.9 (16.3)
Systolic Blood Pressure	127.3 (2.7)	126.8 (3.7)	128.3 (3.8)
Diastolic Blood Pressure	76.4 (1.3)	77.2 (1.5)	74.9 (2.7)

further emphasizes the need to target these high-risk groups to improve health and quality of life.

Education level and household income are two common indicators used to evaluate socioeconomic standing, which is closely associated with health status.<sup>25</sup> The overall socioeconomic characteristics of the Marshallese and Chuukese enrolled in the DSME program were very similar. About a quarter of the population only completed grade school and a little more than a third completed high school in their home country. Compared to most recent data available regarding completion of grade school in the Pacific Islands, the rate of grade school completion in the study sample was low but this may be compensated for by the

higher rate of high school completion than typically expected. Access to high school education is a particular challenge in the Pacific Islands, with a distinct disadvantage and imbalance in Micronesia and the Marshall Islands. The quality of education is a challenge as well, with regional tests reflecting low reading, writing and basic numeracy skill mastery.<sup>26</sup> Therefore in spite of a trend towards higher education levels in the study population, health literacy as observed by program providers remained poor. In addition, most individuals were not fluent in English, which posed a significant barrier to care and required translation services for even basic communication between providers and educators and the patients.

The great majority of patients had an annual income of less than \$20,000, meeting the Hawai'i poverty threshold for any household greater than three individuals.<sup>27</sup> Income disparities for those meeting the federal poverty line was even starker for the study population at 94%, compared to the general BCI patient population at 43%. National data (2005-2009) support that morbidity and mortality, unhealthy behaviors, poor access to health care as well as poor quality of care increase with poor socioeconomic status.<sup>25</sup> The study data support available information regarding socioeconomic disparities in Pacific Islanders, marking an increased need for better health care and education in this population.

Health insurance coverage is another factor strongly associated with improved health outcomes.<sup>25</sup> The majority of those enrolled in the DSME program were insured through Medicaid. Despite high rates of insurance coverage, challenges to quality care still remained. Multiple factors were involved, including coverage cancellation for individuals who travelled out-of-country back to the Marshall or Chuuk Islands for extended periods and poor follow-up rates for others. Poor follow-up rates could possibly be attributed to multiple factors as well, including lack of access to transportation services and long travel distances to the clinic itself in this rural community.

On average, inclusive of diabetes, the study population had 4.4 chronic medical conditions. The obesity rate was higher in this diabetic cohort (57%), compared to state prevalence rate of 23.6%.<sup>28</sup> Such high obesity rates may be attributable to multiple factors including poor socioeconomic status, poor health literacy, and diet choices. Obesity not only increases the risk for diabetes, but also hypertension and dyslipidemia, both of which were highly prevalent in the study populations.<sup>29</sup>

The two populations had similar A1c values with an average of 8.8%, indicating poor diabetes control. However the DSME program started in 2006; the data described reflected patient status in late 2010 and does not evaluate whether or not diabetes control improved since the initiation of the program.

Information from this study contributes to the limited available data on Micronesian populations, reflecting significant health and socioeconomic disparities compared to the general United States population. This high-risk population may receive the most benefit from targeted care programs like the BCI DSME program. Future directions include continued development of such programs and analyses of health indicator outcomes, includ-

ing morbidity and mortality among those receiving such care compared to those receiving standard diabetes care. Addressing health care challenges unique to this patient population, such as language barriers, physical access to care and differences in cultural perception of health and health care may improve outcomes as well.

### Disclosure Statement

Stacy Haumea and Charlotte Grimm were employed by Bay Clinic Inc. but this study was not funded or sponsored by the organization. No other authors reported any financial disclosures.

### Conflict of Interest

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

### Acknowledgements

The authors would like to acknowledge Joanne Kamei BSN, RN; Vita Angelov RD; Craig Nutter PharmD; Anthony Thai PharmD; and Megan Venegas PharmD for their contribution to the study.

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