

Health Indicators of Native Hawaiian and Pacific Islanders in the United States

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Abstract This study aimed to describe health indicators and behaviors of Native Hawaiian and Pacific Islander (NHPI) adults and to compare findings to previous reports on US NHPI and the US population. A sample of $N = 100$ (56 M, 44 F) NHPI adults aged 40–59 years completed an anonymous questionnaire addressing education and household income, tobacco use, physical activity, fruit and vegetable (F&V) consumption, cancer screening and health status. Objective measures of height and weight were taken to calculate body mass index (BMI). The study sample consisted of 49% current smokers and the majority was not meeting guidelines for physical activity (80%) or F&V consumption (99%). Cancer screening rates ranged from 0 to 57% and were higher among females. Mean BMI was 33.9 ± 7.5 kg/m² and 95% were overweight or obese. While 36.7% were hypertensive, only 11.1% were taking prescribed medication. Compared to both the general US population and available data for US NHPI, study participants reported higher prevalence of obesity and chronic conditions (hypertension, high cholesterol, diabetes, and angina/CHD) and lower levels of physical activity, F&V

consumption and cancer screening rates. Study findings contribute to the limited knowledge regarding health behaviors of US NHPI. Comparisons to US data increase evidence of NHPI health disparities, while comparisons to previous NHPI studies emphasize the magnitude of unhealthy lifestyle behaviors and subsequent adverse health conditions for this particular sample. Further improvements to community outreach and recruitment strategies could successfully encourage high-risk individuals to participate in health promotion and behavior intervention studies to improve NHPI health behaviors.

Keywords Native Hawaiian and Pacific Islanders · Physical activity · Tobacco · Cancer screening · Obesity

Introduction

Native Hawaiian and Pacific Islanders (NHPI) represent cultural groups having origins in any of the Pacific Islands in Polynesia, Micronesia or Melanesia [1]. Due to their relatively small numbers in the US, data for both Asian and Pacific Islander (API) populations, representing over forty diverse cultures, have historically been aggregated into one category [2–6]. As a group, API were associated with favorable health profiles [7, 8] and inadvertently acquired the “healthy minority” label. However, health-related studies, mostly conducted in Hawai’i and the South Pacific, highlight a multitude of health disparities for NHPI, providing evidence of a generally poor health status. Available literature reports typically low levels of physical activity [9–16], poor diets (high in fat, low in fruits and vegetables (F&V) [12, 17, 18] high tobacco use (30.9%) [19], high rates of overweight and obesity [12, 13, 15, 18, 20–23], and

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consistently high rates of chronic diseases such as cancer (breast 150%, ovarian 200%, cervical 500% compared to US 118, 13 and 8%, respectively) [24], diabetes and heart disease [25, 26]. Life expectancies at birth for Hawaiian, Samoan, and Guamanian males (71.5, 71.0 and 72.4 years, respectively) and females (77.2, 74.9 and 76.1 years, respectively) are lower than white men and women in the US [27–29]. NHPI are less likely to be aware of adverse health conditions and therefore less likely to seek medical care [26, 30]. For example, Native Hawaiians in Hawai'i display one of the worst health profiles, the highest mortality rates for most chronic diseases, and subsequently the shortest life expectancy [30].

The diversity and health disparities among NHPI in the US were acknowledged by Healthy People 2010, which established ten leading health indicators to serve as a set of measures to provide a snapshot of the nation's health [31]. Limited data indicated that, compared to the general population, NHPI typically experienced poorer health, displayed lower levels of educational attainment, and higher rates of poverty. However, for the top three leading health indicators (physical activity, overweight and obesity, and tobacco use), data for NHPI were either not collected, had not been analyzed, or did not meet the criteria for statistical reliability, data quality or confidentiality [31].

In 1997, the US Office of Management and Budget officially acknowledged the diversity of API and the importance of identifying health disparities within NHPI apart from the much larger Asian populations. Classification standards for collecting and reporting federal statistics on race and ethnicity were revised to disaggregate API into two separate groups: Asian Americans and Native Hawaiian and Pacific Islanders [32].

In the US, there was a 140% growth rate of NHPI between 1990 and 2000 [33], and by 2006, this number exceeded one million [1]. Although representing only 0.3% of the nation's population, the annual growth rate from 2005 to 2006 was 1.7% (or 17,000). The highest increase was seen in California (3,400), which accounts for >25% (260,000) of the NHPI living in the US (second only to Hawai'i) [34–36]. Compared to the general population with a median age of 36.4 years and 25% <18 years, NHPI are a relatively young group (median age of 28.6 years with 30% <18 years) [1, 35].

Additional information regarding ethnic-specific health behaviors for NHPI contributes to the limited data available for this high risk group. The primary aim of this study was to describe physical activity, F&V consumption, tobacco use and cancer screening behaviors in NHPI adults residing in San Diego County. Secondary aims were to compare findings to available data on US NHPI and the US population.

Methods

The San Diego State University Research Foundation Institutional Review Board approved this cross-sectional study. A community leader recruited individuals attending the San Diego Pacific Islander Festival and local church and community functions. Since cancer screening behaviors were variables of interest, the sample of NHPI adults was limited to 40–59 years. Participants were asked to complete an anonymous questionnaire and undergo measures of height and weight. Overall, 343 (219 M, 124 F) individuals were approached to reach the final sample of $N = 100$ (56 M, 44 F) (response rate = 29.2%). Questions from existing surveys that had evidence of validity and reliability were compiled to create the questionnaire administered in this study [37–40]. Socioeconomic indicators were educational background and annual household income. Physical activity was measured with the New Zealand Physical Activity Questionnaire—short form [41] which was modified from the International Physical Activity Questionnaire (IPAQ-short). Questions pertaining to tobacco use, F&V consumption, cancer screening behaviors and health status originated from the Behavioral Risk Factor Surveillance Surveys (BRFSS) [42, 43]. Aside from physical activity questions, the questionnaire was self-administered and the above variables consisted of 30–36 questions, depending on participant age and gender. A stadiometer (Ohaus ES 200L) was used to measure height to the nearest 0.1 cm and a digital scale (Conair WW33) measured weight to the nearest 0.1 kg. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2).

Data coding, scoring and categorizing followed established protocols from the respective questionnaires. Education levels were categorized as 'less than high school education' (<7th grade, junior high/middle school, some high school), 'at least high school education' (completed high school, some college or vocational training) and 'have bachelor's degree (completed college or university, completed graduate degree). Participants who were current smokers were categorized by frequency ('everyday' and 'some days'). Total duration (min/week) of walking, moderate- and vigorous-intensity physical activity was computed by multiplying the frequency (days/week) and average daily duration (min/day). MET values for walking (3.3 METs), moderate- (4.0 METs) and vigorous-intensity (8.0 METs) activity were multiplied by total duration to calculate total MET-min/week. Participants were classified into 'low', 'moderate' or 'high' activity categories according to the following standard scoring criteria, and those in 'moderate' and 'high' activity categories were further classified as 'meeting' current physical activity guidelines [44]:

- Low: individuals who do not meet criteria for ‘moderate’ or ‘high’
- Moderate: individuals who reported either of the following criteria:
 - Vigorous-intensity activity on ≥ 3 days/week for ≥ 20 min/day
 - Moderate-intensity activity on ≥ 5 days/week for ≥ 30 min/day
 - Walking, moderate- or vigorous-intensity activity on ≥ 5 days/week achieving ≥ 600 MET-min per week
- High: individuals who reported either of the following criteria:
 - Vigorous-intensity activity on ≥ 3 days/week achieving ≥ 1500 MET-min/week
 - Walking, moderate- or vigorous-intensity activity on > 7 days/week achieving ≥ 3000 MET-min/week

Responses to dietary questions were converted to average daily servings and total daily F&V consumption included fruit juice, fruit, green salad, potatoes, carrots and vegetables (as reported in BRFSS). Cancer screening questions asked women if they ever had a mammogram, clinical breast exam, or Pap test, asked men if they ever had a prostate-specific antigen (PSA) test or a digital rectal exam, and asked respondents ≥ 50 years if they ever had a blood stool test, sigmoidoscopy or colonoscopy. Standard BMI categories were used to classify participants as normal weight (< 25.0 kg/m²), overweight (25.0–29.9 kg/m²) or obese (≥ 30.0 kg/m²). Health status was assessed by asking if the respondent had ever been told by a doctor, nurse, or other health professional that they had high blood pressure, high blood cholesterol, diabetes or cardiovascular disease (in the form of a heart attack, angina or coronary heart disease, or stroke).

Statistical Analyses

A target sample size of $N = 100$ was set to detect small effect sizes (Cohen’s $d = 0.20$) at an alpha of 0.05 and power of 0.80. Statistical analyses were conducted using SPSS 15.0, and ‘Don’t know/Not sure’ and ‘Refused’ responses were set to ‘Missing’. One outlier was identified for self-reported total physical activity (750 min/week). Preliminary analysis of physical activity data conducted with and without one outlier’s data showed no differences, so this participant’s data remained in the analyses. Independent t -tests were conducted to examine differences in health behaviors between NHPI men and women.

Comparison Samples

Present study data are presented in comparison to available data for US NHPI and the general US population, and came from multiple resources. The National Health and Nutrition Examination Survey (NHANES) collects data through interviews and physical examinations to assess the prevalence of chronic conditions in the population. Height, weight and body mass index (BMI) calculations were compared to objective measures from NHANES (1999–2002) on Non-Hispanic White adults aged 40–59 years [45]. The BRFSS is a telephone-administered health survey designed to track health information related to leading causes of death in the US BRFSS data specific to level of education, household income, tobacco use, F&V consumption, cancer screening and the majority of health status variables (high cholesterol, heart attack, angina or coronary heart disease, and stroke) were reported for 45- to 54-year-olds from all 50 states and the District of Columbia for 2006 and 2007 [43, 46]. Comparative data on the prevalence of hypertension and medication were obtained for 2007 from the Centers for Disease Control and Prevention [47]. National physical activity data was obtained from an international study that surveyed $N = 4,671$ US adults with a similar instrument and scoring protocol (response rate 30.9%) [48].

Data pertaining to US NHPI were retrieved from several national resources, including the Asian Pacific Islander American Health Forum (APIAHF) [3, 34], the US Census [1, 49], the California Health Interview Survey (CHIS) [50], and a National Institutes of Health (NIH) report [51]. Ethnic-specific data for NHPI subgroups came from the US Census, APIAHF [25, 28], CHIS, BRFSS Hawai’i [52], the Hawai’i State Department of Health [11, 53], and three smaller research studies [30, 54, 55]. The smaller research studies used a variety of recruitment approaches, mainly conducted by community members that were somewhat similar to recruitment methods from the present study. Aluli [54] conducted clinical examinations on $N = 257$ Native Hawaiians, aged 20–59 years, living in rural areas of Molokai. Participants were recruited through mail solicitations, newspaper advertisements and house-to-house canvassing of the community by Native Hawaiian physicians and outreach workers. Mishra et al. [55–57] examined health behaviors, knowledge and attitudes in Samoan adults residing in American Samoa, Hawai’i and Los Angeles. A sample of $N = 1834$ Samoans aged ≥ 18 years were randomly sampled for a cross-sectional study that involved an interviewer-administered questionnaire in either English or Samoan language. Participation was encouraged through churches, community organizations and government officials, and results

specific to smoking and cancer screening behaviors were used for comparisons. Chiem et al. [30] assessed cardiovascular risk factors in $N = 228$ Chamorro men and women, aged 19–87 years, residing in San Diego, California. Study participants were randomly sampled from the Chamorro Directory International, a telephone directory of self-identified Chamorros. Word of mouth and community newspaper advertisements encouraged participation. Research staff members were bilingual community members and the overall response rate was 62.8%.

Results

A total of 100 (56 M, 44 F) NHPI adults (mean age = 46.9 ± 5.4 years) completed the anonymous questionnaire. The ethnic composition of this sample included Samoans (57%), Tongans (6%), Guamanian/Chamorros (11%), Marshallese (3%) and NHPI reporting ‘more than one race’ (24%). Participant characteristics, health behaviors, and comparable data for US NHPI and the general US population are reported in Table 1.

Education and Household Income

The proportion of the US population aged 45–54 years with less than a high school education was 6%, with 92% having at least a high school education [46]. Values for NHPI in the US were 21.0 and 55–84%, respectively [34, 49]. The present study’s sample consisted of 15% with less than a high school education, 85% with at least a high school education and 11% with a bachelor’s degree. Compared to the US, NHPI from the present sample and other studies reported more individuals with less than a high school education.

In 2000, median household income in the US was \$50,046 [49]. For NHPI, median incomes ranging from \$42,062 to \$50,922 have been reported [1, 25, 28, 34, 49] with ethnic specific data for Native Hawaiians (\$44,862) [25] and Samoans (\$40,058) [28]. Median household income for this sample was \$50,000–\$59,000, slightly higher than comparison samples.

Tobacco Use

In 2007, 22% of US adults aged 45–54 years were current smokers [46]. Available data report 17% of US NHPI as current smokers, with ethnic-specific data for Chamorros (15%) and Hawaiians (20–27%) [25, 30, 50, 58]. The proportion of current smokers in the present study was at least 2–3 times greater than comparison samples.

Frequency of Tobacco Use

In the US a higher proportion of adults aged 45–54 years reported smoking ‘every day’ (18%) compared to ‘some days’ (5%) [46]. No comparable data was available for US NHPI. About 5% of the sample from this study reported ‘every day’ smoking while 44% smoked ‘some days’.

In the US, more males (21%) than females (18%) reported being current smokers. The prevalence of males and females smoking ‘every day’ and ‘some days’ was 16 vs. 13 and 6 vs. 5%, respectively [46]. No comparable data was available for US NHPI. In the present study, more males (52%) than females (46%) were current smokers, although more females reported ‘every day’ smoking (5 vs. 11%) while more males reported ‘some day’ smoking (46 vs. 41%).

Physical Activity

The proportion of US adults classified into low, moderate and high physical activity categories was 16, 22, and 62%, respectively [48]. No comparable reports using the same measure of physical activity were found for US NHPI. The majority of the present study’s sample was classified as low active (80%), with 18 and 2% in the moderate and high active categories, respectively. Female study participants were significantly more active than males for walking, moderate- and vigorous-intensity activity ($P < 0.05$).

Fruit and Vegetable Consumption

For US adults aged 45–54 years, the median percentage of individuals consuming ≥ 5 daily F&V servings was 23%. Overall, more females (29%) met F&V recommendations compared to males (19%) [46]. Ethnic specific NHPI studies reported 17% of Native Hawaiians [53] and 42 and 40% of Chamorro males and females consumed ≥ 5 daily F&V servings [30]. Mean daily F&V intake for this study’s sample was 0.8 ± 1.3 servings. Females consumed more F&V servings than males (1.1 ± 1.7 vs. 0.6 ± 0.9 , respectively; $P = 0.06$), although only one female participant reported meeting current F&V recommendations.

Cancer Screening

Across all cancer screening tests, US rates of ‘ever’ screened ranged from 24% (home blood stool test) to 90% (clinical breast exam) [43, 46]. For US NHPI, cancer screening rates ranged from 23% (home blood stool test) to 92% (clinical breast exams and mammograms for Native Hawaiians) [43, 50, 52, 53, 55, 56]. By contrast, NHPI cancer screening rates from the present study were dramatically lower, ranging from 0% (home blood stool test)

Table 1 Demographics, health behaviors and conditions for study participants compared to other US NHPI and the US population

	Study Sample			US NHPI			US population		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
	(N = 100)	(N = 56)	(N = 44)						
Height (in)	68.9 ± 4.4	71.1 ± 3.7	66.5 ± 3.6				–	70.0 [45] 40–59 ^a	64.6 [45] 40–59 ^a
Weight (kg)	104.6 ± 25.8	110.4 ± 19.1	97.2 ± 31.0				–	90.8 [45] 40–59 ^a	76.3 [45] 40–59 ^a
Mean BMI (kg/m ²)	33.9 ± 7.5	34.0 ± 6.4	33.7 ± 8.8		30.0 [54]	30.9 [54]	–	28.7 [45] 40–59 ^a	28.3 [45] 40–59 ^a
Education and income (%)									
Less than high school education	15.0			21.0 [34] 2.6 Chamorro [30] 15.0 Hawaiian [25] 23.0 Samoan [28]				9.6 [45] 45–54 ^a	8.4 [45]
At least high school education	85	82.1	88.6	55.0 [34] 84.0 [1] 64.5 [49] 67.9 Hawaiian [49] 65.3 Samoan [49] 63.6 Chamorro [49]			91.9 [45] 45–54 ^a	90.0 [45]	89.1 [45]
Have bachelor's degree	11.0			11.0 [34] 10.0 [1] 13.8 [49] 15.2 Hawaiian [49] 10.5 Samoan [49] 14.3 Chamorro [49]			–	–	–
Have graduate degree	0.0			4.0 [1]			–	–	–
Median household income	\$50–59 K			\$42,062 [34] \$47,497 [1] \$45,915 [49] \$44,862 Hawaiian [25] \$40,058 Samoan [28]			\$50 K [49]		

Table 1 continued

	Study Sample			US NHPI			US population		
	Total (N = 100)	Males (N = 56)	Females (N = 44)	Total	Males	Females	Total	Males	Females
Tobacco use (%)									
Current smokers	49.0	51.8	45.5	17.4 [50]	42.0 [61]	34.0 [61]	22.3 [45]	21.2 [45]	18.4 [45]
				15.4 Chamorro [30]	9.0 [30]	13.0 [30]	45–54 ^a		
				20.1 Hawaiian [25]	31.4	22.5			
				27.1 Hawaiian [58]	Samoan [57]	Samoan [57]			
Current smokers— every day	5.0	5.4	11.4				17.9 [45]	15.5 [45]	13.4 [45]
							45–54 ^a		
Current smokers— some days	44.0	46.4	40.9				4.9 [45]	5.9 [45]	4.5 [45]
							45–54 ^a		
Physical activity (%)									
Low	80.0	92.9	63.6				15.9 [48]	13.6 [48]	18.2 [48]
Moderate	18.0	7.1	31.8				22.1 [48]	19.2 [48]	25.0 [48]
High	2.0	0.0	4.5				62.0 [48]	67.2 [48]	56.7 [48]
F&V consumption									
Mean ± SD	0.8 ± 1.3	0.6 ± 0.9	1.1 ± 1.7						
<5 Daily F&V servings (%)	99.0	100.0	97.7				76.9 [45]	80.6 [45]	71.2 [45]
							45–54 ^a		
≥5 Daily F&V servings (%)	1.0	0.0	2.3	17.2 Hawaiian [53]	42.4	40.4	23.1 [45]	19.4 [45]	28.8 [45]
							45–54 ^a		
Cancer screening (%)									
Clinical breast exam	–	–	54.5	55.6 Samoan [55]			–	–	90.1 [45]
				91.6 Hawaiian [52]			–	–	69.0 [43]
Mammogram	–	–	40.9	68.1 [50]			–	–	40–49 ^a
				32.9 Samoan [55]			–	–	79.1 [43]
				91.8 Hawaiian [52]			–	–	50–59 ^a
Pap smear	–	–	56.8	63.6 [50]			–	–	87.6 [43]
				46.0 Samoan [56]			–	–	45–54 ^a
PSA test	–	3.6	–	46.8 Hawaiian [53]			–	–	24.6 [45]
				46.1 Hawaiian [52]			–	–	40–49 ^a
							–	–	58.6 [45]
							–	–	50–59 ^a

Table 1 continued

	Study Sample			US NHPI			US population		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
	(N = 100)	(N = 56)	(N = 44)						
Digital rectal exam	-	8.9	-	39.1 [50]			-	70.8 [45]	-
				55.7 Hawaiian [53]					
				65.2 Hawaiian [52]					
Sigmoidoscopy/colonoscopy	3.3	-	-	39.1 [50]			57.1 [43]	56.8 [43]	57.8 [43]
				33.5 Hawaiian [53]			50+ ^a	50+ ^a	50+ ^a
				48.4 Hawaiian [52]					
Home blood stool test	0.0	0.0	0.0	23.0 [50]			24.2 [43]	24.7 [43]	23.6 [43]
				35.7 Hawaiian [53]			50+ ^a	50+ ^a	50+ ^a
				47.4 Hawaiian [52]					
Overweight/obesity (%)									
Overweight (BMI 25.0–29.9 kg/m ²)	30.0	25.0	36.4	31.1 Chamorro [30]	36.0 [30]	27.3 [30]	66.3 [62]	70.8 [62]	61.8 [62]
				43.4 Hawaiian [25]			20–74 ^a	20–74 ^a	20–74 ^a
				72.5 Hawaiian [59]					
				30.2 Hawaiian [58]					
				30.0 45–54 ^a [11]					
Obese (BMI ≥ 30.0 kg/m ²)	65.0	73.2	54.5	19.4 [50]	20.0 [30]	21.9 [30]	32.9 [62]	40.0 [62]	41.0 [62]
				64.0 [51]			20–74 ^a	40–59 ^a	40–59 ^a
				21.1 Chamorro [30]					
				33.0 Hawaiian [53]					
				43.5 Hawaiian [58]					
Ever been told (%)									
High blood pressure	36.7	42.9	28.6	25.0 [51]	35.0 [30]	48.0 [30]	15.9 [46]	16.1 [46]	15.5 [46]
				42.5 Chamorro [30]					
				31.8 Hawaiian [52]					
				16.0 Hawaiian [11]					
Taking medicine for high blood pressure	11.1	10.9	11.6	34.2 Chamorro [30]			26.7 [46]	26.9 [46]	26.2 [46]
				74.4 Hawaiian [52]					
High cholesterol	58.6	66.1	48.8	34.2 Hawaiian [52]	50.0 [51]	45.0 [51]	38.6 [45]	38.9 [45]	35.6 [45]
							45–54 ^a		
Diabetes	34.3	42.9	23.3	16.2 Chamorro [30]	12.0 [30]	20.0 [30]	7.9 [45]	8.1 [45]	8.1 [45]
				>15.0 40–49 ^a [54]			45–54 ^a		
				>20.0 50–59 ^a [54]			45–54 ^a		

Table 1 continued

	Study Sample			US NHPI			US population		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
	(<i>N</i> = 100)	(<i>N</i> = 56)	(<i>N</i> = 44)						
Heart attack	0.0	0.0	0.0	3.8 Hawaiian [52]			2.8 [45] 45–54 ^a	5.4 [45]	3.0 [45]
Angina/CHD	9.1	10.7	7.0	2.7 Hawaiian [52]			3.0 [45] 45–54 ^a	5.1 [45]	3.3 [45]
Stroke	0.0	0.0	0.0	2.5 Hawaiian [52]			1.9 [45] 45–54 ^a	2.5 [45]	2.6 [45]

^a Ages in years

to 57% (Pap smear). Females demonstrated higher cancer screenings rates (41–57%) than males (4–9%).

Body Mass Index Categories

Rates of US overweight and obesity are ~66 and 33%, respectively. The prevalence of overweight males (71%) was higher than females (62%) and obesity rates among 40- to 59-year-olds were 40 and 41%, respectively) [45]. Available literature on NHPI subgroups have reported 31% of Chamorros ($M = 36\%$, $F = 27\%$) [30] and 30 to 73% of Hawaiians to be overweight [25, 58, 59]. In 1993, 30% of Native Hawaiians aged 45–54 years were overweight [11]. The prevalence of obesity in US NHPI varies from 19% (in California) to 64%, based on multiple studies [30, 50, 51, 53, 58]. In the present study, only 5% of NHPI were classified as normal weight, while 30% ($M = 25\%$, $F = 36\%$) were overweight and 65% ($M = 73\%$, $F = 55\%$) were obese. The total sample was classified as obese with a mean BMI of $33.9 \pm 7.5 \text{ kg/m}^2$.

Health Status

About 16% of the US population had been told they had hypertension and 27% of those individuals were currently taking hypertensive medications [47]. Comparable data among US NHPI report a 25% prevalence of hypertension [51]. Prevalence of hypertension was higher in Native Hawaiians (16–32%) [11, 52] and Chamorros (43%) [30], which also reported a higher proportion of hypertensive Hawaiians and Chamorros taking medication (74 and 34%, respectively), compared to the US population. In the present study, 37% ($M = 43\%$, $F = 29\%$) were hypertensive, although only 11% ($M = 11\%$, $F = 12\%$) reported taking medication.

In 2007, 39% of US adults aged 45–54 years had been told by a health professional they had high cholesterol [46] compared to 34% of Native Hawaiians [52]. Another study reported 50% of NHPI males 45% of females had high cholesterol [51]. In this study's sample, high cholesterol was reported by 59% of participants, with a higher prevalence among males (66%) compared to females (49%).

Approximately 8% of the US population between 45 and 54 years of age reported being diagnosed with diabetes [46]. Previous studies reported diabetes in 15 and 20% of US NHPI aged 40–49 and 50–59 years, respectively [54] and 16% ($M = 12\%$, $F = 20\%$) of Chamorros [30]. One-third (34%) of the present study's sample were diabetic, with a higher prevalence observed in males (43%) compared to females (23%). These findings indicate that diabetes is 2–4 times more prevalent in NHPI compared to the general US population.

A small proportion of the US population between 45 and 54 years reported having a heart attack (3%), angina or coronary heart disease (3%), or a stroke (2%) [41], and similar data were reported for Native Hawaiians (4, 3, and 3%, respectively) [52]. Although none of the present study's participants reported a previous heart attack or stroke, 9% ($M = 11%$, $F = 7%$) had been told they had angina or coronary heart disease.

Discussion

Study Participants vs. US and NHPI Comparison Samples

Compared to the US population, health profiles of NHPI from the present study indicated poor lifestyle behaviors and high prevalence of chronic conditions. Study participants reported dramatically lower levels of physical activity, F&V consumption and cancer screening rates. About two-thirds of study participants were obese and prevalence of smoking and chronic diseases and conditions (with the exception of heart attack and stroke) were consistently higher than the general US population in the same age groups.

Compared to available literature on US NHPI, study participants reported similar education levels and a higher household income. Although comparable physical activity data were not found, study participants reported higher rates of smoking and lower levels of F&V consumption. Cancer screening rates were relatively similar for NHPI females, falling within the range of previously reported studies. However, cancer screening behaviors among NHPI males and individuals aged ≥ 50 years from the present study were extremely low. The proportion of overweight study participants was similar to previous NHPI reports, although obesity was much higher in this sample. Similar adverse health profiles were observed between study participants and US NHPI reports. However, this sample had a greater prevalence of high cholesterol, diabetes, angina or CHD, and was less likely to take hypertensive medication.

Participant Outreach and Recruitment in NHPI Populations

There is a possibility the extreme prevalence rates in this sample were related to recruitment methods. Since healthier individuals are more likely to participate in health-related research [60], further examination into participant outreach and recruitment strategies was carried out. A community representative from a local organization who was a well-known, long-time advocate for NHPI health was responsible for participant recruitment. The recruitment challenge was acknowledged since NHPI are a

relatively young population. Initial recruitment efforts took place at a health booth during a NHPI festival, which yielded only 22 completed surveys (response rate 18.3%). The entire recruitment effort lasted 8 months to achieve the target sample size of $N = 100$ NHPI aged 40–59 years. Feedback from the community leader indicated the low response rate was due to survey length, which had an approximate completion time of 35 min (the entire survey included additional variables outside the scope of this report). Additionally, timing plays an important factor in access to the community. Group occasions such as funerals and weddings typically involve the entire community and take precedence over individual commitments. The remaining study sample was recruited through repetitive, face-to-face approaches from the community leader at local churches, meetings, and social functions. The community leader had ongoing dialogue with potential study participants on several occasions, and ultimately participation was secured after the study received 'blessings' from key community leaders (i.e., elders, ministers) who encouraged participation by underscoring the benefits associated with additional research data for the NHPI community.

This approach demonstrates an intrinsic NHPI cultural attitude which places greater emphasis on the well-being of the collective unit (i.e., community, family) rather than the individual [26]. Insight from the community leader suggests that the low levels of compliance to hypertension medication is an example of NHPI sacrificing at the individual level to benefit the family (i.e. contributing finances collectively towards household expenses and financially assisting relatives). Additionally, doctors' verbal instructions on how and when to take medications are confusing or forgotten after a couple of days and there is a tendency to take home remedies (i.e. a mixture of Aloe and water) or over the counter medications (i.e. aspirin) that may have no effect on hypertension. Core cultural values among NHPI include family, community, spirituality, and a holistic view of life and health, and strongly influence health behaviors. The holistic worldview of NHPI emphasizes the interconnectedness of all things, including the belief that spiritual health contributes to physical health, that health outcomes are dictated by God's will and individual attempts to treat or control adverse health conditions are futile.

Study Limitations

This was a convenience sample obtained by intensive community outreach and recruitment strategies. While the sample may not accurately reflect the overall NHPI population, the findings emphasize NHPI health disparities in the US. During selection of comparison studies for the US population, attempts were made to find the most recent, comparable data. For example, NHANES data were used to

report US overweight and obesity rates because these data came from objective measures of height and weight. While several variables were measured in this study by BRFSS questions, not all BRFSS data are available for each year. The proportion of US adults meeting physical activity guidelines came from a study which used a similar questionnaire that measures duration and frequency of walking, moderate- and vigorous-intensity physical activity, although the methods of administration differed from this study (telephone- vs. interviewer-administered).

Study Implications

Findings from this study contribute to the limited knowledge regarding health behaviors of NHPI in the US comparisons to US data increase evidence of NHPI health disparities, while comparisons to other NHPI studies emphasize the magnitude of unhealthy lifestyle behaviors and subsequent adverse health conditions for this particular sample. Differences in prevalence rates across NHPI samples raise questions about the most appropriate recruitment strategies for these groups. It is unclear whether higher risk prevalence rates from the current study or lower rates from other NHPI samples are more representative. One difference was use of an anonymous survey in the present study. Evaluation of participant recruitment strategies and interpretation of results underscores the importance of how cultural beliefs may affect lifestyle behaviors and decisions. Further improvements to community outreach and recruitment strategies could provide a successful approach for including high-risk individuals in health promotion and behavior intervention studies to educate and improve NHPI health behaviors. Priorities for future research include NHPI population prevalence studies which utilize culturally appropriate recruitment and measurement methods, as well as an urgent need for behavioral interventions to reduce risk in these communities.

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