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Diabetes and Hypertension in Marshallese Adults: Results from Faith-Based Health Screenings

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COMPLIANCE WITH ETHICAL STANDARDS

The authors have no conflicts of interest to disclose. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Abstract

Background—The Pacific Islander population in the United States is growing rapidly. However, research on Pacific Islanders in the US is limited, or sometimes misleading due to aggregation with Asian Americans. This project seeks to add to the dearth of health literature by conducting a health assessment of Marshallese in northwest Arkansas.

Methods—Using a community-based participatory research approach, nine health screening events were conducted at local Marshallese churches. Participants completed the Behavioral Risk Factors Surveillance Survey core questionnaire and diabetes module if applicable. Biometric data, including Hemoglobin A1c, blood pressure, and body mass index, was gathered by an interprofessional team.

Results—401 participants completed health screenings. High proportions of diabetes, obesity, and hypertension were found. A high percentage of participants were uninsured, and multiple barriers to health care were found within the sample.

Discussion—This project represents one of the first broad health assessments of Pacific Islanders in the US. Proportions of diabetes, hypertension, obesity, and uninsured found in the sample are much higher than national proportions.

Keywords

Diabetes; Faith-based; Health Disparities; Hypertension; Migrant; Pacific Islander

BACKGROUND

Between 2000 and 2010, the population of Pacific Islanders in the United States (US) grew by 40% [1]. Much of the growth is from the US Affiliated Pacific Islands (USAPI), which includes three US territories: Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands; and three freely associated, independent nations: the Federated States of Micronesia, the Republic of Palau, and the Republic of the Marshall Islands (RMI) [2]. The fastest population growth occurred in the South (66%), especially in the state of Arkansas (252%), which now has the largest population of Marshallese living in the continental US [1]. Marshallese migrants began coming to Arkansas after the RMI signed a Compact of Free Association (COFA) with the US in 1986 [3]. Arkansas is now home to approximately 12,000 Marshallese residents [1, 4–6].

Pacific Islander populations are underrepresented in all types of health research, and their data are often aggregated with Asian Americans', obscuring much of the available information [7–13]. While there are a limited number of studies that document the health status of Marshallese in the RMI and in Hawaii [14–19], there are no health status data published on Marshallese living in Arkansas. From 2013 to 2016, the research team has engaged a community-based participatory research (CBPR) collaborative to identify and

address the most pressing health issues in the Marshallese community in Arkansas [20–31]. The CBPR approach was essential because of historical context. Between 1946 and 1958, the US military detonated 67 fission and thermonuclear devices – equivalent to 7,200 Hiroshima-sized bombs – in the RMI [32, 33]. After the nuclear testing, in order to study the effects of radiation exposure, the US interned Marshallese who had been exposed to fallout [32, 34–37]. The research was conducted without the informed consent of the interned Marshallese and without translation of information into their native language [35, 38–41]. Similar to other cultures marked by historical trauma, the Marshallese community exhibits a distrust in health professionals and research [42–45].

The Marshallese community’s COFA migrant status affects their ability to obtain health insurance even after the Affordable Care Act (ACA). At the time of the signing of the COFA in 1986, Marshallese migrants were eligible for government subsidized insurances, such as Medicaid [21, 46]. However, after the passage of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, Marshallese migrants became ineligible for Medicaid [21, 28, 46–49]. Their exclusion was due to the re-categorization of COFA migrants as “non-qualifying immigrants” [21, 28, 46–49]. This status means they are required to purchase private health insurance or enroll in an employer-sponsored insurance plan. If they are not able to obtain health insurance, they must pay tax penalties set forth in the ACA. This also means they risk the inability to obtain and/or afford necessary medical services.

The CBPR collaborative in northwest Arkansas began with a series of qualitative studies that indicated diabetes, obesity, and other cardiometabolic diseases were the primary health concern of the Marshallese [20, 23–27, 30], but there was a lack of data on the prevalence and severity of non-communicable diseases within the northwest Arkansas Marshallese community. As the CBPR team sought to fill this gap in information, community collaborators explained Pacific Islanders’ health beliefs and behaviors reflect a collectivistic orientation in which church plays a crucial role [50, 51]. The CBPR collaborative recommended undertaking a church health screening study to better understand the health status of the community.

Development of the Marshallese Church Health Screening (MCHS) study and lessons learned from the study are described in a separate article [52]. In the current article, the results of the primary MCHS study are presented. The MCHS study procedures were reviewed and approved by the University of Arkansas for Medical Sciences (UAMS) Institutional Review Board (IRB protocol #202720).

METHODS

Recruitment of churches

In order to recruit churches, a bilingual (English/Marshallese) research manager met with church leaders to describe the purpose and process of the MCHS study. Both group and individual meetings were held. Screening dates were set for each church, and pastors informed their church members about the opportunity to participate in the MCHS study. Some churches invited bilingual study staff to attend a service prior to the screening and

explain the study to congregation members. At each church, the MCHS study event took place immediately following church services. All congregation members over the age of 18 were invited to participate.

Participant consent and data collection

During the screening event, participants received study information in Marshallese and/or English and were then provided the opportunity to give written consent. Data were collected only from those who consented to the study. Biometric data were collected by an interprofessional team from the UAMS Colleges of Medicine, Nursing, Physical Therapy, and Pharmacy, and the Office of Community Health and Research [52]. All team members engaged in biometric data collection were trained on proper blood pressure, weight, height, body mass index (BMI), and Hemoglobin A1c (HbA1c) measurement techniques prior to screening events. Systolic and diastolic blood pressure were measured manually via auscultation with the participant seated using a sphygmomanometer and stethoscope. HbA1c was determined via finger prick blood collection and a Rapid A1c test kit (A1CNow+).

Participants' weight (without shoes) was measured to the nearest 0.1 lb (0.045 kg) using a calibrated digital scale. Height (without shoes) was measured to the nearest inch using an adhesive-backed wall growth chart (0 to 78 inches) placed at floor level. Weight and height were used to compute a continuous measure of BMI using the Quetelet Index (kg/m^2) [53]. Participants also completed a survey instrument that included questions from the Behavioral Risk Factor Surveillance Study's (BRFSS) core questionnaire and diabetes module [54]. The surveys were conducted by bilingual research staff. Participants were allowed to refuse any data collection measure or survey question and continue participation in the study. Those who provided consent and completed at least some study activities were offered a \$15 gift card. All participants were provided a copy of their biometric screening results, and those who had results outside a normal/healthy range were provided private, participant-specific health counseling and referral information to a local health care provider.

Analytical methods

Descriptive statistics are provided for demographic data, biometric data, and survey responses. Proportions of diagnosed and undiagnosed diabetes and hypertension are calculated. The American Diabetes Association's Standards of Medical Care guidelines [55] and the American Heart Association's blood pressure categories [56] are used to determine whether or not biometric data is indicative of diabetes and hypertension. The Centers for Disease Control and Prevention's BMI ranges are used to categorize BMI [57]. Using chi-square analyses, the associations among health care access, health care coverage status, and HbA1c and blood pressure measurements are reported.

RESULTS

Between September 2014 and February 2016, nine screening events were held at eight Marshallese churches (one church hosted two separate screening events to accommodate its large number of members) with 401 total participants. Between 31 and 72 participants were

recruited at each screening ($M = 44.6$, $SD = 11.7$). All participants self-reported as being Marshallese. Participant demographics and biometric results are summarized in Table 1.

Demographics

The majority (55.9%) of participants were female. The mean age of all participants was 39.3 years ($SD = 12.9$). Approximately half (50.4%) of all participants had not completed high school, and only 1.7% reported they have graduated from college or graduate/professional school. When participants were asked if they would like to be contacted about opportunities to participate in future research, almost all (96.7%) answered “Yes” and provided contact information.

Biometric data

Using HbA1c levels to screen for diabetes, 29.0% had normoglycemic levels (5.6%), 32.6% had levels indicative of pre-diabetes (5.7–6.4%), and 38.4% had levels indicative of diabetes (6.5%). Of those with HbA1c levels indicative of diabetes ($n = 152$), over half (54.6%) had an HbA1c over 9%, which is considered poor glycemic control [58]. With respect to participants' BMI, only 10.4% had a normal/healthy weight (18.5–24.9), 28.0% of participants were overweight (25.0 – 29.9), and 61.7% were obese (30.0). Similarly, only 19.7% of participants had normotensive (< 120/80) blood pressure measurements, while 39.1% had blood pressure measures in the pre-hypertension range (120-139/80-89) and 41.2% had measures indicating hypertension (140/90). Moreover, almost one in five participants (19.2%) were found to have measures indicating the presence of both diabetes and hypertension.

Health care access

Response frequencies to BRFSS items related to health care access, health care coverage, and health care experiences are presented in Table 2. Just over half (53.6%) of participants reported they have some kind of health care coverage. More than three-quarters (79.6%) reported they did not have one person they consider their personal doctor or health care provider. Approximately half of all participants (52.8%) reported they have seen a doctor for a routine checkup in the past 12 months; however, 28.1% of participants reported they have not seen a doctor for a checkup within the past 5 years or have never seen a doctor for a checkup. Additionally, almost half of participants (49.6%) reported at some point in the past 12 months they needed to see a doctor but could not due to cost.

When asked whether they have been told by a health care professional they have diabetes, 20.8% responded affirmatively. Similarly, 22.2% reported they have been told they have high blood pressure. (Those who answered “Yes, but female told only during pregnancy” to either question were counted as “No” in the analyses.)

Bivariate analyses

Table 3 presents the chi-square analysis of HbA1c categories (Normoglycemic; Pre-diabetes; Diabetes) by self-reported diabetes, health care coverage status, and having a primary care doctor. Screening results showed many participants likely have undiagnosed chronic diseases. As the table illustrates, among those with HbA1c levels indicative of diabetes ($n =$

133), over half (51.9%) have never been told by a health professional they have diabetes. No significant relationships were found between HbA1c categories and health care coverage, ($\chi^2 (2) = .85; p = .66$), or HbA1c categories and having a primary care doctor, ($\chi^2 (4) = 6.88; p = .14$).

Similar results were also found with respect to blood pressure. Table 4 presents the chi-square analysis of blood pressure categories (Normotensive; Pre-hypertension; Hypertension) by self-reported hypertension, health care coverage status, and having a primary care doctor. As shown in the table, among those with blood pressure measurements indicative of hypertension ($n = 153$), approximately two-thirds (66.0%) have never been told by a health professional they have hypertension. No significant relationships were found between blood pressure categories and health care coverage, ($\chi^2 (2) = 3.37; p = .19$), or blood pressure categories and having a primary care doctor, ($\chi^2 (4) = 2.24; p = .69$).

Table 5 presents the chi-square analysis of the relationship between health care coverage (No; Yes) and time since last checkup, inability to see doctor due to cost, and having a primary care doctor. The table shows the significant association between health care coverage status and the amount of time since the last routine checkup, ($\chi^2 (4) = 10.29; p < .05$). A greater proportion of those with health care coverage had a checkup within the past 12 months or within the past two years than did those without health care coverage (57.9% vs. 48.0% and 14.8% vs. 12.1%, respectively).

There was also a significant association between health care coverage status and inability to see a doctor due to cost, ($\chi^2 (1) = 7.07; p < .01$). Among those with no health care coverage, 57.2% reported there was a time in the past 12 months they needed to see a doctor but could not due to cost, compared to 43.6% of those with health care coverage.

Likewise, there was a significant association between health care coverage status and having a primary care doctor, ($\chi^2 (2) = 25.97; p < .001$). A greater proportion of those with health care coverage had a primary care doctor (26.2%) than those without health care coverage (7.2%). Furthermore, among those without health care coverage, 90.6% reported they do not have a primary care doctor, compared to 69.9% of those with health care coverage.

DISCUSSION

The results show the Marshallese experience significant cardiometabolic health disparities. Although the sample described in this study is not a random, representative sample of the US Marshallese adult population, the observed proportions of cardiometabolic diseases within the sample are much higher than those found in the general US adult population. Specifically, among the general US adult population, 9.3% have diabetes [59], 29.1% have hypertension [60], and 34.9% are obese [61] (compared to 38.4%, 41.2%, and 61.7% of the sample, respectively). Notably, the proportion of diabetes observed among participants are 4.1 times as high as the proportion of diabetes found in the general US adult population. Furthermore, the proportions of hypertension and obesity among participants are 1.4 times as high and 1.8 times as high, respectively, as the proportions of hypertension and obesity in the general US adult population.

Of those with HbA1c levels indicative of diabetes, more than half had levels suggesting poorly controlled diabetes (HbA1c > 9%), which puts participants at increased risk of complications [58]. Moreover, 51.9% of those with HbA1c levels indicative of diabetes, and 66.0% of those with blood pressures indicative of hypertension, had never been told they had a chronic disease and therefore were not receiving treatment from a health care professional. These results are a concern, as long-term uncontrolled diabetes and hypertension can lead to significant health complications such as cardiovascular, cerebrovascular, and renovascular diseases [62, 63].

In addition, the results point toward several access barriers that may be contributing to the significant health disparities observed in this study. Although these data were collected after the passage of the ACA and Medicaid expansion, results indicate approximately half of participants do not have health insurance. The proportion of uninsured in the sample is more than four times as high as proportions found at the national and state levels (11.7% and 11.8% uninsured, respectively) [64]. This finding is likely due to the lack of Medicaid eligibility for COFA migrants [21, 28].

The results also point toward additional barriers beyond a lack of health care coverage. Health care coverage status was associated with having a personal doctor or health care provider, having a check-up within the past 12 months, and ability to afford to see the doctor. However, even many of those who reported having insurance were not accessing health care services, and having insurance was not significantly related to the diabetes or hypertension status. This suggests the need to identify the effects of other social-ecological barriers to health care access and disease prevention and management.

The findings of this study make a significant contribution to the existing literature regarding Pacific Islanders in the US. Pacific Islanders are underrepresented in all types of health research [7–11]. Furthermore, much of the existing research aggregates data on Pacific Islanders and Asian Americans, obscuring the substantial differences between these subgroups [9–12]. This lack of research has resulted in Pacific Islanders becoming a virtually invisible population. The limited and potentially misleading research literature on Pacific Islanders represents a critical barrier to addressing Pacific Islanders' health disparities, because it has slowed the accumulation of scientific knowledge, masked health disparities, and negatively affected resource allocation for research and programs [9–13].

Many minority populations who have experienced disenfranchisement or historical trauma are cited as being difficult to recruit into research studies [65, 66]. This study demonstrates the feasibility of recruitment through partnerships with faith-based organizations. The findings show 96.7% of participants agreed to be contacted for future studies, indicating the lack of research on this at-risk population may be due to a lack of opportunity to participate in research, rather than a lack of desire to participate in research.

Limitations

The primary limitation of the present study is the sampling method. The non-random sample limits the ability to generalize the results to broader Marshallese and Pacific Islander communities. Due to a lack of reliable community-level data, no direct comparisons of the

study sample can be made to the general population of Marshallese in Arkansas. This method also limits comparisons to other studies that employ BRFSS or health status data. Additionally, the proportions of diabetes and hypertension reported have not been age-adjusted. Attempts were made to mitigate sampling concerns by recruiting participants from across the adult lifespan and by including as many different congregations and denominations of churches as possible. Sampling limitations notwithstanding, this study represents one of the first broad assessments of Pacific Islander health in the continental US [67], and provides important information for future work with the Marshallese and other Pacific Islander communities living in the continental US.

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Table 1

Participant demographics and biometrics

Response Category	N (or Mean ± SD)	Percent of Sample (%)
Sex		
Female	221	55.9
Male	174	44.1
Age	39.3 ± 12.9	
Education		
Elementary school	43	10.7
Some high school	159	39.7
High school graduate	139	34.7
Some college/tech school	53	13.2
College graduate	5	1.2
Graduate degree	2	0.5
HbA1c		
Normoglycemic (< 5.6)	115	29.0
Pre-diabetes (5.7 – 6.4)	129	32.6
Diabetes (≥ 6.5)	152	38.4
BMI		
Underweight (< 18.5)	0	0.0
Normal/Healthy (18.5–24.9)	40	10.4
Overweight (25.0–29.9)	108	28.0
Obese (≥ 30.0)	238	61.7
Blood pressure		
Normotensive (< 120/80)	78	19.7
Pre-hypertension (120–139/80–89)	155	39.1
Hypertension (≥ 140/90)	163	41.2
Would like to be contacted about opportunities to participate in additional research projects		
Yes	263	96.7
No	9	3.3

Note: Only valid percentages shown. Percentages may not total 100 due to rounding. HbA1c = Hemoglobin A1c. BMI = Body Mass Index.

Table 2

Participant BRFSS results

BRFSS Questions	N	Percent of Sample (%)
Do you have any kind of health care coverage?		
Yes	211	53.6
No	183	46.4
Do you have one person you think of as your personal doctor or health care provider?		
Yes, only one	68	17.3
No	312	79.6
More than one	12	3.1
About how long has it been since you last visited a doctor for a routine checkup?		
Never	70	18.0
Within past 12 months	205	52.8
Within past 2 years	52	13.4
Within past 5 years	22	5.7
5 or more years	39	10.1
Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?		
Yes	193	49.6
No	196	50.4
Has a doctor, nurse, or other health professional EVER told you that you have diabetes?		
Yes	76	20.8
No	290	79.2
Have you EVER been told by a doctor, nurse, or other health professional that you have high blood pressure?		
Yes	82	22.2
No	287	77.8

Note: Only valid percentages shown. Health care coverage includes any form of insurance (private insurance, Medicaid, Medicare, etc.).

Table 3

Chi-square analysis of BRFSS responses by HbA1c categories

BRFSS Question	HbA1c Categories			χ^2	p
	Normoglycemic	Pre-diabetes	Diabetes		
Has a doctor, nurse, or other health professional EVER told you that you have diabetes?				96.65	< .001
No	108 (100%)	109 (90.1%)	69 (51.9%)		
Yes	0 (0%)	12 (9.9%)	64 (48.1%)		
Do you have any kind of health care coverage?				.85	.66
No	57 (49.6%)	55 (43.7%)	69 (46.6%)		
Yes	58 (50.4%)	71 (56.3%)	79 (53.5%)		
Do you have one person you think of as your personal doctor or health care provider?				6.88	.14
No	95 (84.8%)	105 (82.0%)	107 (72.8%)		
Yes, only one	14 (12.5%)	19 (14.8%)	35 (23.8%)		
More than one	3 (2.7%)	4 (3.1%)	5 (3.4%)		

Note: Only valid percentages shown. Percent within column presented in parentheses. HbA1c = Hemoglobin A1c. Normoglycemic includes HbA1c measurements less than or equal to 5.6%. Pre-diabetes includes HbA1c measurements between 5.7% and 6.4%. Diabetes includes HbA1c measurements greater than or equal to 6.5%. Health care coverage includes any form of insurance (private insurance, Medicaid, Medicare, etc.).

Table 4

Chi-square analysis of BRFSS responses by blood pressure categories

BRFSS Question	Blood Pressure Categories			χ^2	P
	Normotensive	Pre-hypertension	Hypertension		
Have you EVER been told by a doctor, nurse, or other health professional that you have high blood pressure?				24.62	< .001
No	66 (93.0%)	117 (83.6%)	101 (66.0%)		
Yes	5 (7.0%)	23 (16.4%)	52 (34.0%)		
Do you have any kind of health care coverage?				3.37	.19
No	42 (54.5%)	64 (41.8%)	75 (47.2%)		
Yes	35 (45.5%)	89 (58.2%)	84 (52.8%)		
Do you have one person you think of as your personal doctor or health care provider?				2.24	.69
No	66 (84.6%)	116 (76.8%)	126 (79.7%)		
Yes, only one	11 (14.1%)	30 (19.9%)	27 (17.1%)		
More than one	1 (1.3%)	5 (3.3%)	5 (3.2%)		

Note: Only valid percentages shown. Percent within column presented in parentheses. Normotensive includes blood pressure measurements less than 120/80. Pre-hypertension includes blood pressure measurements between 120-139/80-89. Hypertension includes blood pressure measurements greater than or equal to 140/90. Health care coverage includes any form of insurance (private insurance, Medicaid, Medicare, etc.).

Table 5

Chi-square analysis of BRFSS responses by health care coverage

BRFSS Question	Do you have any kind of health care coverage?		χ^2	<i>p</i>
	No	Yes		
About how long has it been since you last visited a doctor for a routine checkup?			10.29	.04
Within past 12 months	83 (48.0%)	121 (57.9%)		
Within past 2 years	21 (12.1%)	31 (14.8%)		
Within past 5 years	16 (9.2%)	6 (2.9%)		
5 or more years	19 (11.0%)	18 (8.6%)		
Never	34 (19.7%)	33 (15.8%)		
Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?			7.07	.01
No	77 (42.8%)	115 (56.4%)		
Yes	103 (57.2%)	89 (43.6%)		
Do you have one person you think of as your personal doctor or health care provider?			25.97	< .001
No	163 (90.6%)	144 (69.9%)		
Yes, only one	13 (7.2%)	54 (26.2%)		
More than one	4 (2.2%)	8 (3.9%)		

Note: Only valid percentages shown. Percent within column presented in parentheses. Health care coverage includes any form of insurance (private insurance, Medicaid, Medicare, etc.).

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