

# ACCULTURATION AND CANCER RISK BEHAVIORS AMONG PACIFIC ISLANDERS IN HAWAII

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**Background:** To communicate research to the public, the National Cancer Institute developed the Health Information National Trends Survey (HINTS). However, as with most national health surveillance, including the Behavioral Risk Factor Surveillance System, HINTS data are not sufficient to address unique demographic subpopulations such as US Pacific Islanders (PIs). National sampling methods do not adequately reach participants from small, medically underserved populations.

**Aim:** This study aims to document the cancer-relevant knowledge, attitudes, behaviors, and information-seeking practices of PIs in Hawaii (HI).

**Methods:** We conducted a cross-sectional survey during 2017-2018 of Native Hawaiians, Chuukese, and Marshallese in HI using Respondent Driven Sampling (RDS) to recruit these geographically diffuse groups. The modified HINTS survey included questions about cancer knowledge, attitudes and behaviors, health communications, and cultural practices.

**Results:** A total of 515 Native Hawaiians, 305 Chuukese, and 180 Marshallese completed the survey. Differences were found across a variety of cancer-related attitudes, knowledge, and behaviors. These groups also differed regarding acculturation, health locus of control, and trust in medical professionals. Native Hawaiians were significantly more acculturated ( $P=.0001$ ) than Chuukese or Marshallese and more likely to smoke cigarettes ( $P=.0001$ ). Among participants aged >50 years, we found no significant differences across ethnic groups ( $P=.30$ ) for those completing a colon cancer screening (37%). However, only 27% were referred to screening by a physician.

## INTRODUCTION

Pacific Islanders are one of the fastest-growing US populations, growing three times faster than the total US population.<sup>1</sup> According to the 2010 US Census, 1.2 million people identified themselves as Pacific Islanders.<sup>1</sup> The term Pacific Islanders consists of a broad category of ethnically and culturally diverse groups. These include Native Hawaiians and Samoans, who combined comprise 58% of the total US Pacific Islander population.<sup>1</sup> Micronesians, which include Marshallese (indigenous migrants from the US Associated Republic of the Marshall Islands), Chuukese (indigenous migrants from the islands of Chuuk that are part of the US Associated

Federated State of Micronesia) and Chamorro (US citizens, who are the indigenous people from the US territory of Guam), represent the third-largest group (15% combined) of Pacific Islanders in the United States.<sup>1,2</sup>

Limited data are available on the health of US Associated Pacific Islanders (USAPI), including Micronesians in Hawaii, because of their inadequate representation in health care assessments.<sup>3</sup> The CDC's Behavioral Risk Factor Surveillance System (BRFSS) captures generalizable data on Native Hawaiians in Hawaii but is insufficient in the ability to reach Micronesian residents.<sup>3</sup> Sampling strategies used by the BRFSS include the use of landline telephones to administer the survey. However,

**Conclusions:** Cancer prevention programs are greatly needed for PIs in HI. This study provides knowledge concerning the efficiency of RDS to recruit participants, and the role of culture in communications influencing cancer risk behaviors, which may be generalizable to migrant PIs in the United States. *Ethn Dis.* 2020;30(4):593-602; doi:10.18865/ed.30.4.593

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Micronesians do not commonly possess landline phones and are likely missed using telephone-based random sampling.<sup>3</sup> Therefore, additional survey administration methods are needed to accurately assess the health status, health information seeking, and the health care utilization patterns of Micronesians in Hawaii.

Unfortunately, indications are that Micronesian migrants in Hawaii represent a medically under-served population.<sup>3,4</sup> Anecdotal evidence from organizations that provide health care for Micronesians, including Tripler Army Medical Center and

of Micronesians are best understood in the context of the socio-political history of colonization, militarization and the destruction of subsistence economies within the region beginning with Spain, Japan, and Germany through WWII.<sup>5</sup> After WWII, the US was awarded military oversight within Micronesian islands, as a Strategic Trust by the United Nations.<sup>6</sup> Through the US Compacts of Free Association (COFA), citizens of these jurisdictions expected economic development support and had unrestrained travel to Hawaii, Guam, and the continental United States without the need for visas.<sup>5</sup> However, the US failed to develop infrastructure within the region in return for military jurisdiction.<sup>6</sup> As a result, many COFA citizens left their jurisdictions seeking higher education in the United States.<sup>5</sup> These US-educated COFA migrants returned to their homelands and garnered the few jobs in their jurisdictions, driving an increasing need for others to migrate to the United States to find work.<sup>5</sup> Inadequate employment and educational opportunities, combined with deficient health care systems within USAPI jurisdictions, continue to drive the current migration to the United States, specifically to Hawaii.<sup>5</sup>

In Hawaii, there are an estimated 355,816 people from the USAPI, of whom an estimated 17,380 or 2% are Micronesian.<sup>1</sup> The political and economic disparities that fuel the current migration of Micronesians have now, unfortunately, become rooted in Hawaii. Inadequate housing, reduced vocational, and educational opportunities are compounded by lifestyle changes, including obesity

and tobacco use initiated by the transitions from subsistence economies within their home jurisdictions.<sup>3,4</sup> Poor indicators of health, including lower life expectancies and high rates of chronic and infectious diseases, can be found in these migrant communities in Hawaii.<sup>5</sup> The adoption of unhealthy Western behaviors, such as tobacco, alcohol and drug use, and poor diets, are also seen in increasing rates among migrant youth.<sup>5,7</sup>

The National Cancer Institute (NCI) leads the nation's cancer control efforts.<sup>8</sup> The NCI developed the Health Information National Trends Survey (HINTS) in 2002 to measure how people access and utilize information, communications, and technology to manage health.<sup>8,9</sup> HINTS data provide insights concerning communication constructs and cancer-relevant knowledge, attitudes, and behaviors as a means to develop effective population-based interventions.<sup>9</sup> However, HINTS data are not sufficient to address minority populations in the United States, as sample sizes are too small for meaningful analyses. Additionally, HINTS does not assess the unique health behaviors of US ethnic subpopulations, including Pacific Islanders.<sup>10</sup>

Our study adapted the HINTS questionnaire to assess Micronesians in Hawaii to determine their health promotion behaviors. We also aimed to understand how other factors, including acculturation and health locus of control, contribute to the health of Micronesians and may interact with their health promotion behaviors, as compared with Native Hawaiians.<sup>10-12</sup> Specifically, we sought to expand the HINTS assessment to

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Hawaii's community-based health centers, suggests high rates of cancer, diabetes, and cardiovascular diseases.<sup>3</sup> Better assessment of the health behaviors and health care needs of this emergent population can support appropriate health promotion and the cost-effective allocation of health resources for Micronesians. These efforts can reduce health disparities, including the implicit and disproportionate cancer incidence and mortality found in Micronesians.<sup>5</sup>

The current poor health indicators

Native Hawaiians (N=500) and recent migrant Marshallese and Chuukese populations in Hawaii (N=500) to compare/contrast HINTS responses according to acculturation status. Our study examined whether these Pacific Islander populations have unique health communication patterns and whether acculturation influences how health information is sought, communicated, and utilized.

HINTS uses random digit dialing to administer this survey.<sup>8</sup> However, an innovative sampling method, respondent-driven sampling (RDS) developed by Heckathorn (2002), has been used to recruit geographically diffuse populations connected through social networks.<sup>13</sup> Pacific Islanders, including Native Hawaiians, Marshallese and Chuukese are dispersed throughout the islands of Hawaii. However, these collectivist cultures maintain connected social networks.<sup>3</sup> RDS uses constrained chain-referrals that progress through a series of recruitment waves until equilibrium (when the composition of the ultimate sample is independent) is reached.<sup>13,14</sup> Our study employed RDS to create a cost-efficient non-probability sampling frame.<sup>15</sup>

## METHODS

Our study was approved in January 2017 by the University of Hawaii Office of Research Compliance Human Studies Program, and procedures followed were in accordance with the ethical standards of the institutional review board and the Helsinki Declaration of 1975, as revised in 2000. Recruitment began

in May 2017 and ended in April 2018. Informed consent was obtained from all participants included in the study through a detailed explanation of the study and signed consent forms from each participant.

### Data Sources and Instruments

This study utilized core items from the HINTS national survey to allow for the integration of our data with similar nationally obtained datasets. These core items included key demographic measures of age, sex, race, marital status, ethnicity, education, employment, income, health insurance, and place of birth.<sup>9</sup> Core questions included in our survey were from the HINTS questionnaire pertaining to health information seeking, health care access, tobacco use, awareness of cancer risks, and colon cancer screening knowledge.<sup>9</sup> Additional items were added in Hawaii to address health communications issues pertinent to our Pacific Islanders and to address our research questions, including items on acculturation and health locus of control.

### Acculturation

Acculturation refers to an individual's ability to adjust or "fit" with their own cultural identity as well as the identity of the majority group.<sup>16</sup> Ethnic identity is one crucial aspect of acculturation because identity concerns the scope of which an individual endorses cultural traditions.<sup>16</sup> To measure acculturation, we utilized the Vancouver Index of Acculturation (VIA).<sup>17,18</sup> The VIA consists of 20 items reflecting various behaviors; respondents report how strongly they engage in behaviors

or identify with either their ethnic/heritage culture or American culture. The VIA has been found to offer high internal consistency and a reliable index for measuring acculturation within groups.<sup>17</sup> This study utilized 12 VIA items to measure acculturation. Sample items included, "I often participate in my ethnic, cultural traditions," and "I often participate in American cultural traditions." Sample items were rated using a four-point Likert Scale with 4=strongly agree, and 1=strongly disagree.

### Health Locus of Control

We used 12 items from the Multidimensional Health Locus of Control (MHLC) scales.<sup>15</sup> The MHLC measures an individual's perceived self-efficacy in seeking health information and operationalizing health behaviors, as well as beliefs about control over health outcomes.<sup>15,19</sup> This measure has shown good internal consistency ( $\alpha=.70$ ) and good content validity.<sup>15,19</sup> Questions included, "If I get sick, it is my own behavior which determines how soon I get well again." Responses are provided using a four-point Likert scale with choices ranging from extremely agree to extremely disagree. Our prior studies indicated differences in this measure among Pacific Islanders relative to health information seeking.<sup>10</sup>

### Trust in Health Information Sources

Survey questions assessing trust in health information sources were derived from the standard HINTS instrument.<sup>20</sup> Respondents were queried how much do they trust information from different sources on a four-

point Likert scale ranging from, 1=not at all, to 4=a lot. Selection options for health sources included a health care provider, family or friends, newspapers or magazines, the radio, the internet, television, government health agencies, charitable organizations, or religious organizations and leaders.

#### *Internet and Cell Phone Use*

Questions on the internet and cell phone usage were also obtained from the HINTS national instrument.<sup>20</sup> Items included, "Do you ever go online to access the internet or world wide web or to send and receive email?" with a yes or no response. Participants were asked if they had access to the internet through various means, including broadband, wireless, or dial-up. Participants were also queried about their use of the internet to obtain information on various health topics. Telephone and cell phone use questions included, "Does anyone in your family have a working cell phone?" and "Is there at least one telephone inside your home that is currently working and is not a cell phone."

#### *Colorectal Cancer Screening*

Questions from the Hawaii BRFSS were used to assess colorectal cancer screening.<sup>21</sup> Since colorectal cancer screening is recommended for individuals age  $\geq 50$  years, responses to these questions were limited to participants' self-reporting as aged  $\geq 50$  years. These questions included: "A blood stool test is a test that may use a special kit at home to determine whether the stool contains blood." And "Sigmoidoscopy and colonoscopy are exams in which a tube is

inserted in the rectum to view the colon for signs of cancer or other health problems. Have you ever had either of these exams?" Additional questions assessing the time since the respondent had these exams and whether the exams were recommended by a provider were also included.

#### *Cigarette and E-cigarette Use*

There are few comparative studies published since 2004 examining the reliability of tobacco product use, making comparisons between national surveys measuring tobacco use difficult to compare.<sup>22</sup> Therefore, our study used standard cigarette and e-cigarette use items from the Hawaii BRFSS questionnaires.<sup>21</sup> Our standard measures to assess e-cigarette use were developed by Pearson.<sup>23</sup> These measures included two core items, ever used (yes, no, don't know) and frequency of use (daily, less than daily, but at least once a week, less than weekly, but at least once a month, less than monthly, not at all). Measuring cigarette and e-cigarette use among migrant Pacific Islanders can provide insights on the need for tailored intervention and prevention measures.

#### **Respondent Driven Sampling, Procedures and Items**

We utilized respondent-driven sampling (RDS) to obtain reasonable samples of Micronesians living in Hawaii. RDS has several features to overcome the bias concerns of simple chain-referral sampling (snowball sampling): 1) each recruiter is limited in the number of respondents they can recruit, minimizing the influence of the initial recruit or 'seed'; 2) the relationship

between the recruiter and recruits is collected allowing adjustment for recruitment bias; and 3) personal network size of respondents is obtained to compensate for oversampling of respondents with larger networks.<sup>13,14</sup>

#### **Recruitment and Survey Administration Procedures**

The research team worked with organizations from Hawaii's Micronesian community to recruit participants. Unfortunately, in Hawaii, large numbers of Micronesian migrants are found in public housing. The research team, with the help of the Hawaii Public Housing Authority, identified three housing complexes in HI with a predominant number of Micronesian residents. These settings served as the primary recruitment venues. Research staff established regular days and times each week to survey and compensate referred participants at these locations. Surveys were administered in a paper and pencil format. Team members assisted with survey completion and checked responses.

Initial participants served as RDS seeds and were instructed on how to recruit three other participants using the study's prepared coupons. The coupons included recruitment details such as survey location, expiration date, and contact information for the study. Subsequently, recruited participants were requested to recruit three others, resulting in waves of recruitment and referrals that were tracked by each seed and recruiter. These procedures supported our use of RDS networking analysis software. Upon completion of the survey, participants were compensated with a \$15 gift card and also offered

a \$10 gift card for each person (up to three) they successfully recruited.

**Data Analysis**

The demographics collected included ethnicity, age, sex, income, marital status, education, employment status, place of birth, religion, insurance coverage, and insurance type. Participants’ demographics were summarized using descriptive statistics: mean, standard deviation, and range for continuous variables, eg, age, and frequency and percentage for categorical variables. Chi-square tests were used to assess differences by ethnicity in cell phone, internet usage, first sought source of health information, ever referred or ever had a colonoscopy, and acculturation. Logistic regression analyses were conducted to test the effects of ethnicity, age, and acculturation relative to key health behaviors, including cigarette and e-cigarette, health locus of control, and trust in health information sources. Odds ratio (OR) and its associated 95% CIs were calculated using the following reference groups: for ethnicity, Native Hawaiian; for age, age ≥50 years and, for acculturation, negative or ethnic acculturation. Quantitative analyses were conducted in SAS version 9.4 (Cary, NC), and P-values <.05 were considered statistically significant.

**RESULTS**

**Study Sample and Demographics**

The current analysis included 1010 participants from Hawaii. Our goal was to recruit 500 Native

**Table 1. Participant demographics**

|                          | Hawaii. n = 1,010 |
|--------------------------|-------------------|
| Age, mean (range)        | 43.5 (18 - 92)    |
|                          | n (%)             |
| 18 – 19                  | 61 (6.1)          |
| 20s                      | 164 (16.5)        |
| 30s                      | 205 (20.6)        |
| 40s                      | 199 (20.0)        |
| 50s                      | 187 (18.8)        |
| 60s                      | 126 (12.7)        |
| 70s                      | 41 (4.1)          |
| 80 - 90s                 | 12 (1.2)          |
| Sex                      |                   |
| Male                     | 390 (38.7)        |
| Female                   | 616 (61.1)        |
| Marital Status           |                   |
| Married                  | 370 (37.2)        |
| Single                   | 393 (39.5)        |
| Other                    | 232 (23.2)        |
| Ethnicity                |                   |
| Chuukese                 | 305 (30.2)        |
| Marshallse               | 180 (17.8)        |
| Native Hawaiian          | 515 (51.0)        |
| Education                |                   |
| <High school             | 243 (24.9)        |
| High school graduate     | 474 (48.7)        |
| Some college             | 134 (13.8)        |
| College or grad school   | 86 (8.9)          |
| Employment               |                   |
| Employed                 | 378 (38.9)        |
| Unemployed/retired       | 366 (37.6)        |
| Disabled                 | 85 (8.7)          |
| Student                  | 47 (4.8)          |
| Insurance                |                   |
| Yes                      | 538 (54.0)        |
| Income                   |                   |
| <\$35,000                | 709 (84.6)        |
| \$35,000 - \$75,000      | 101 (12.0)        |
| >\$75,000                | 26 (3.1)          |
| Health care provider     |                   |
| Yes                      | 883 (89.6)        |
| No                       | 103 (10.4)        |
| Type of provider         |                   |
| Hospital                 | 140 (18.8)        |
| Clinic                   | 400 (53.5)        |
| Physician                | 168 (22.5)        |
| Health care satisfaction |                   |
| Poor – Fair              | 97 (13.4)         |

Hawaiians, 250 Chuukese and 250 Marshallse (Table 1). Despite not reaching our intended distribution of participants by ethnic group, our

use of RDS was effective in reaching the total expected ethnic sample with <1% (10/1010) of participants who were not Native Hawaiian, Chuuke-

se or Marshallese. Participants were young and mostly female (61%) with a mean age of 44 years. Most participants had a high school education or higher (75%); however employment levels were low (39%) with low-income levels reported, with 85% of the sample reporting annual incomes <\$35,000. Finally, a little more than half of the sample reported having some type of health insurance (54%).

**Cell Phone and Internet Use**

Across all ethnic groups, participants were significantly more likely to have a working cell phone than not (chi-square P=.021). More than 81% of Marshallese, 78% of Native Hawaiians, and 70% of Chuukese reported having active use of cell phones. In contrast, most participants were significantly likely not to

have access or have used the internet (chi-square P=.001). Only 46% of Marshallese, 42% of Native Hawaiians, and 27% of Chuukese reported having access to or using the internet for health information seeking.

**Acculturation Results**

As anticipated, Native Hawaiians were found to be significantly more acculturated to American cultural norms than Chuukese or Marshallese (chi-square P=.0001). In our sample, 76% of Native Hawaiians compared with 58% of Marshallese and 52% of Chuukese identified with American customs.

**Sources of Health Information**

When asked where participants would go first for health information, there were no significant differences

by ethnicity (chi-square P=.394). For Native Hawaiians, primary sources included medical providers (37%), the internet (37%), and family and friends (25%). Chuukese first sought health information from their medical providers (48%), then family and friends (34%), and finally, the internet (17%). (Figure 1)

**Colon Cancer Screening**

Among participants aged ≥50 yrs, Native Hawaiians (29%) and Marshallese (32%) were more likely to be referred to a colon cancer screening test by a physician than Chuukese (20%) (chi-square P=.04). There were no differences in the reported utilization of colon cancer screening in these participants across all three ethnic groups (chi-square P=.304). However, only 27% (n=142) of all individuals aged

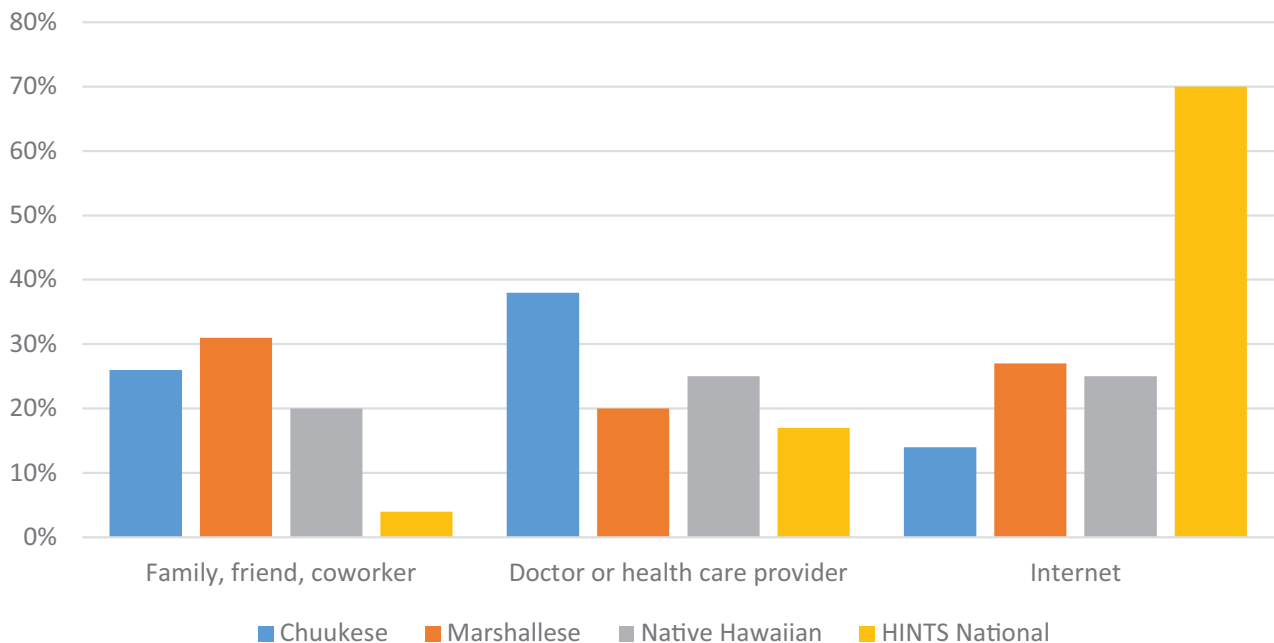


Figure 1. Sources for health or medical information by ethnicity

**Table 2. Ethnicity and trust in doctors and religious organizations for health concerns**

| Contrast    | Trust doctor                  | OR   | LCL  | UCL  | P                |
|-------------|-------------------------------|------|------|------|------------------|
| Chuukese    | Not at all                    | 1.00 |      |      |                  |
|             | A little                      | .87  | .46  | 1.65 | .67              |
|             | Some                          | .70  | .38  | 1.27 | .24              |
|             | A lot                         | .56  | .32  | .98  | .04 <sup>a</sup> |
| Marshallese | Not at all                    | 1.00 |      |      |                  |
|             | A little                      | .68  | .27  | 1.71 | .42              |
|             | Some                          | 1.03 | .46  | 2.33 | .94              |
|             | A lot                         | 1.20 | .56  | 2.55 | .64              |
| Contrast    | Trust religious organizations | OR   | LCL  | UCL  | P                |
| Chuukese    | Not at all                    | 1.00 |      |      |                  |
|             | A little                      | .89  | .52  | 1.52 | .68              |
|             | Some                          | 1.08 | .65  | 1.77 | .77              |
|             | A lot                         | 2.03 | 1.15 | 3.58 | .01 <sup>a</sup> |
| Marshallese | Not at all                    | 1.00 |      |      |                  |
|             | A little                      | .83  | .41  | 1.66 | .59              |
|             | Some                          | 1.19 | .64  | 2.22 | .59              |
|             | A lot                         | 2.17 | 1.09 | 4.35 | .03 <sup>a</sup> |

OR, odds ratio; LCL, lower confidence limit; UCL, upper confidence limit.  
 a. statistically significant at P<.05.

>50 years in all ethnic groups combined, were referred to a colon cancer screening test, and more than 63% of participants reporting never having a screening test for colon cancer.

**Trust in Medical Information**

We assessed participants’ trust in their respective sources of health information relative to their acculturation status. Controlling for age, we found that Chuukese and Marshallese were more than twice as likely to trust health information from their religious leaders rather than from their own physicians. (Table 2) Although physicians were among the first to be consulted regarding health information, doctors did not garner trust among these Micronesians.

**Poor Health Locus of Control**

Poor health locus of control or fatalism about cancer was found to

be related to levels of acculturation, controlling for age and ethnicity in participants. Those who reported with positive acculturation seemed to be protected against a fatalistic ideology toward cancer (P=.02, OR=.53, CI .03 -.92). Conversely, those with a more culturally focused perspective were found to more likely be fatalistic toward cancer (P=.04, OR=1.6, CI 1.02 - 2.67). These data have an implication in providing cancer control information to Micronesians.

**Cigarette and E-cigarette Use**

Finally, in examining health risk behavior in Pacific Islanders, we tested the effects of age ethnicity and acculturation on cigarettes and e-cigarette use. (Table 3) We found that Chuukese and Marshallese were more likely not to use tobacco products. Native Hawaiians were found to

be more likely to smoke (chi-square P<.0001), with nearly 27% of Hawaiians reporting as everyday smokers vs 4.8% Chuukese and 4.7% Marshallese. Additionally, among all participants, those who were more acculturated to American customs were more likely to smoke. Finally, younger participants, aged 18-29 years, and middle-aged adults aged 40-49 years, were also more likely to smoke cigarettes or use e-cigarettes.

**DISCUSSION**

Unlike populations in the continental United States, we found that internet access was limited among our sample, with access to cell phones as the preferred technology. The identification of this preferred communication resource helps inform the development of interventions based

**Table 3. Ethnicity and currently smoking, controlling for age and acculturation**

|             | Smoke now  | OR   | LCL  | UCL  | P                 |
|-------------|------------|------|------|------|-------------------|
| Chuukese    | Everyday   | .27  | .16  | .45  | .000 <sup>a</sup> |
|             | Some days  | 1.37 | .76  | 2.48 | .29               |
|             | Not at all | 1.00 |      |      |                   |
| Marshallese | Everyday   | .35  | .21  | .60  | .001 <sup>a</sup> |
|             | Some days  | .75  | .36  | 1.59 | .46               |
|             | Not at all | 1.00 |      |      |                   |
| Neutral     | Everyday   | 1.23 | .76  | 1.98 | .40               |
|             | Some days  | .92  | .50  | 1.68 | .79               |
|             | Not at all | 1.00 |      |      |                   |
| Positive    | Everyday   | 1.78 | 1.04 | 3.05 | .04               |
|             | Some days  | .77  | .35  | 1.70 | .53               |
|             | Not at all | 1.00 |      |      |                   |

OR, odds ratio; LCL, lower confidence limit; UCL, upper confidence limit.

a. statistically significant at P<.05.

upon cell phone technologies, including the possible use of momentary ecological assessment methods.<sup>24</sup> There were no significant differences by ethnicity in regard to where participants went first for health information. (Figure 1) These data were in contrast with the HINTS 2014 national sample data, where internet use was the most likely source for participants to first seek health information followed by health care providers and family and friends.<sup>20</sup>

As expected, Native Hawaiians were more likely to be acculturated to American norms, than Micronesian migrants. Although there is evidence of American acculturation among our Micronesian participants, the data indicate that they also continue their cultural practices while in Hawaii, with a little more than half of Marshallese and Chuukese identifying with American customs.<sup>12</sup> Additionally, this diminished acculturation in Micronesians affected their health communications and behaviors. Remarkably, Micronesian participants were likely to trust reli-

gious leaders rather than physicians. This finding supports the potential use of faith-based settings in the future to deliver health promotional interventions for this group. Further exploration of the possible role of discrimination of Micronesians in health care settings may identify approaches to train health care professionals about Micronesian cultures.<sup>5</sup>

Another finding was that acculturation was highly associated with a fatalistic attitude toward cancer. This finding has implications in providing cancer control information to Micronesians and may inform interventions that build assurance in this group about the value of cancer prevention behaviors, including screening, to reduce mortality.<sup>25</sup> In our sample, participants, regardless of ethnicity, were likely not to have been referred for colon screening, despite being at risk. The colon cancer screening rates among Native Hawaiians and Micronesians in this study are remarkably lower than the current overall screening rates in Hawaii, where according to BRFSS data of individuals aged 50

to 75 years, 67% reported having had a colon cancer screening.<sup>21</sup> Within this study, more than 60% of all participants did not have a screening test for colon cancer. Early and regular screening for precancerous colon lesions can prevent nearly 90% of colon cancers.<sup>25</sup> Therefore, implementation of a colon cancer screening intervention is needed and may reduce deaths in Pacific Islanders. Our data suggest that interventions providing Micronesians with detailed information about the ability of cancer screening to reduce deaths may be more effective than messages focused on finding and treating these cancers early.

American acculturation was found to be positively associated with cigarette and e-cigarette use in our sample. Smoking rates in our sample were lower among Micronesians compared with BRFSS data, aggregated for Pacific Islanders in HI (22.2%).<sup>21</sup> Given the role of acculturation, with Micronesians being less-acculturated, this knowledge can be leveraged to support a culturally based intervention to prevent tobacco use in Micronesian adolescents and young adults who are at-risk.

Finally, our study was able to use RDS to rapidly recruit participants in approximately seven months from our target ethnic groups, with only 10 participants who were not Pacific Islanders. This success can be attributed to our use of a “survey store model,” as described in previous studies using RDS.<sup>13,14</sup> Employing a consistent location, time and day for survey administration, and redemption of incentives provided convenience, consistency for potential participants and minimized the need for a promo-



tional resource to inform the overall community about the study. Additionally, this finding may support the ability of RDS to recruit large samples and recruit potentially generalizable data. Our future studies to correlate RDS-obtained data samples with those from randomly collected data samples will explore this possibility.

## CONCLUSION

Our study found that RDS may be an effective recruitment and sampling tool for collectivist cultures.

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Differences in health care utilization by acculturation status were found for recent Micronesian migrants, which may extend to other migrant groups. Finally, HINTS can be modified to assess the health-seeking and communication strategies of ethnic minority populations in the United States.

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## CONFLICT OF INTEREST

No conflicts of interest to report.

## AUTHOR CONTRIBUTIONS

Research concept and design: Willingham, Lee, Somera, Badowski, Pagano; Acquisition of data: Cassel, Willingham, Somera, Badowski; Data analysis and interpretation: Cassel, Willingham, Lee, Somera, Badowski, Pagano; Manuscript draft: Cassel, Willingham, Lee; Statistical expertise: Cassel, Willingham, Badowski, Pagano; Acquisition of funding: Cassel, Somera, Badowski; Administrative: Cassel, Willingham, Lee, Badowski; Supervision: Cassel

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