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Relationship of Demographic Characteristics and BMI with Health Literacy in Pacific Islander Care-Giving Adults

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ABSTRACT

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Purpose: Health literacy and obesity are major global issues. Vulnerable populations, such as those with low health literacy, have the highest rates of obesity. Native Hawaiian and other Pacific Islander (NHOPI) nations have the highest prevalence of obesity in the world. This study describes the relationship between health literacy and demographic variables in a sample of NHOPI caregiving adults.
Methods: We conducted a correlational study of 364 NHOPI adults. Each was a caregiver of at least one NHOPI child. Data were collected at grocery stores and a preschool in two Hawaiian Islands (n=209) and at NHOPI events in Utah (n=155). Our questionnaire included demographics, the Newest Vital Sign, and questions about caregivers' food-serving and activity promotion.
Results: 45% of the sample had limited health literacy. There was no significant difference between participants' health literacy in Hawaii and Utah. Other demographic variables (gender, age, income, BMI, and education) had a significant relationship with health literacy.
Conclusions: Many NHOPIs have limited health literacy. This is concerning as limited health literacy can reduce an adults' ability to use health-related materials including nutrition facts labels.
Implications for Practice: Health care providers should not assume NHOPIs understand nutrition facts labels. Instruction on nutrition facts labels should be available in schools and communities. Future research should examine effective interventions for this population.

Keywords: health literacy, Pacific Islander, BMI, obesity, demographics, gender, age, ethnicity, income, newest vital sign, nutrition label, prevention

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Relationship of Demographic Characteristics and BMI with Health Literacy in Pacific Islander Care-Giving Adults

Health literacy is a major global issue that has captured increasing attention. Health literacy has been defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions (U.S. Department of Health and Human Services, 2000). In 2007, the World Health Organization (WHO) Commission on the Social Determinants of Health identified health literacy as having a central role in health inequalities in both rich and poor countries. In the United States (U.S.), as many as 90 million adults have inadequate literacy skills, and limited health literacy costs as much as $238 billion (Kutner et al., 2007; Rothman et al., 2009; Yin et al., 2009).

Poor health literacy may contribute to chronic conditions, such as obesity and obesity-related diseases. Obesity and obesity-related diseases are major global issues with more than 1.4 billion adults worldwide classified as overweight (body mass index [BMI] $\geq$ 25), and of those over 200 million men and nearly 300 million women were obese (BMI $\geq$ 30; WHO, 2012). In the U.S., obesity costs an estimated $75 billion annually (Kennen et al., 2005).

Vulnerable populations, such as those with low health literacy, low incomes, minorities, the elderly, and the uninsured, have the highest rates of obesity (Kennen et al., 2005). One population with an especially alarming rate of overweight and obesity is Native Hawaiian and other Pacific Islander (NHOPI) adults (WHO, 2011). However, little is known about health literacy in the NHOPI population. The purpose of this study was to describe health literacy, as determined by interpretation of a nutrition fact label, in a sample of NHOPI adults. To accomplish this, we examined the relationship of demographic characteristics and BMI with health literacy. Additionally, we will describe aspects of interpreting nutrition fact labels most

difficult to understand. Our findings will inform health care providers about health literacy in NHOPIs and help them more effectively provide patient education to promote NHOPI health.

Background

Health literacy is a modifiable risk factor for reducing health disparities, including obesity and obesity-related diseases (Sanders, Shaw, Guez, Baur, & Rudd, 2009). Interpreting nutrition fact labels is one facet of health literacy that can also have an important role in the treatment and prevention of obesity and obesity-related diseases. High prevalence of obesity combined with limited health literacy may lead to greater health disparities and increasing health-related consequences in NHOPIs.

Prevalence. The six nations with the highest prevalence of overweight men and the seven nations with the highest prevalence of overweight women in the world are Pacific Island nations (Nauru, Tonga, Federal States of Micronesia, Cook Islands, Niue, Samoa, and Palau). The prevalence of overweight people in these countries ranges from 80.5% to 96.9% (WHO, 2011). In the U.S., the situation is much the same. NHOPIs are defined as people with ancestry that includes any of the original inhabitants of Hawaii, Guam, Samoa, Tonga, or other Pacific Islands (U.S. Census Bureau, 2010). When NHOPIs live in the U.S., their prevalence of overweight and obesity combined or obesity alone remains high. For example, the total prevalence of overweight and obesity combined in Hawaii in 2008 was 52.1% with Native Hawaiians, a Pacific Islander subgroup, having the highest prevalence (69.6%) of included ethnic groups (Hawaii Department of Health, 2009). Even in states with relatively low prevalence of obesity alone, such as Utah at 21.3%, NHOPIs have a significantly higher rate of obesity alone at 49.2% (Utah Department of Health, 2009).

Health related consequences. The health consequences from overweight and obesity include serious diet-related, non-communicable diseases, such as type 2 diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer (Carmona, 2005; Seniloli, 2005; WHO, 2011). Coinciding with NHOPIs' high prevalence of obesity and overweight, they are at much greater risk than other U.S. residents for obesity-related diseases (Moy, Sallis, Ice, & Thompson, 2010). In addition, there has been a shift in mortality and disease patterns in the Pacific Islands from pandemics of infectious disease to higher prevalence of non-communicable diseases (Seniloli, 2005). About 40% of NHOPIs have been diagnosed with a non-communicable disease, which now account for three-quarters of all deaths in the region, and 40-60% of total health-care expenditure (WHO, 2010).

Type 2 diabetes, an obesity-related illness, is often associated with costly long-term complications, which substantially burden the healthcare system and community (Rothman et al., 2009; Seniloli, 2005). Diabetes prevalence among adults in the Pacific region is among the highest in the world, ranging from 14% to 47% compared with an overall diabetes prevalence of 13% in mainland U.S. (WHO, 2010). Nauru, a Pacific Island nation with one of the highest rates of obesity, has the highest diabetes rate in the world (Seniloli, 2005).

In addition, growing evidence has linked inadequate health literacy to decreased levels of knowledge about chronic disease, poor health status, suboptimal health outcomes, inappropriate utilization of health services, and climbing health care costs (Rothman et al., 2009; Weiss et al., 2005; Yin, Forbis, & Dreyer, 2007). In a study of 200 caregivers of children with type 1 diabetes, Hassan and Heptulla (2010) found caregivers' literacy and numerical skills significantly influence their children's glycemic control. Specifically, mean hemoglobin A1c in children of caregivers with inadequate literacy was significantly higher than it was in children of caregivers

with adequate literacy. Likewise, Rothman et al. (2009) reported that in type 2 diabetes, lower health literacy has been independently associated with poorer knowledge of diabetes, lower quality of self-management, and unstable glycemic control.

Additionally, numeracy, defined as the ability to read and interpret numbers in daily life, is a key component of overall health literacy (Rothman et al., 2006). Limited numeracy is common in patients with diabetes and has been associated with greater difficulty understanding nutrition fact labels. Poor numeracy is also significantly associated with worse diabetes self-management, decreased self-efficacy, and elevated hemoglobin A1c levels (Rothman et al., 2009).

Health literacy and weight loss. Multiple researchers have shown a relationship among health literacy, nutrition fact labels, and obesity. For example, Rothman et al. (2006) stated understanding nutrition fact labels is foundational to being able to follow dietary recommendations, which is crucial for those with chronic health conditions, including obesity-related diseases. Additionally, Sanders et al. (2009) found adults with low basic literacy skills are less able to understand nutrition fact labels and identify appropriate portion sizes. Lack of understanding nutrition fact labels may lead to consuming either excessive or inadequate calories or nutrients to meet daily nutritional needs.

Once an individual is overweight, researchers found basic literacy and health literacy were associated with his/her ability to lose weight. Kennen et al. (2005) stated participants with low basic literacy were less likely to report being ready to lose weight and were less likely to understand the benefits of losing weight. Nearly half of overweight and obese participants at the lowest literacy level did not know that their weight affected their health, and those with low literacy lacked understanding of the importance of weight loss and skills to monitor and measure

weight loss (Kennen et al., 2005). Their findings suggest basic literacy may affect a person's health literacy as it relates to weight loss. Researchers concluded participants who were unable to read the words "calorie" and "obesity" may not be able to understand nutrition fact labels or obesity-related educational materials (Kennen et al., 2005).

Similarly, in a study of 349 youth and their adult caregivers, there was also a lack of understanding calories. For example, 51% of adolescents and 25% of caregivers did not understand why people need calories, and 20% of adolescents did not understand that the most effective way to maintain a healthy weight is to balance calories consumed with calorie needs (Nelson, Lytle & Pasch, 2009). Because so little is known about NHOPIs health literacy, we conducted our study to learn more about it.

Methods

We conducted a correlational study to describe and compare relationships between demographic variables and health literacy in a sample of NHOPI adults in Hawaii and Utah. Prior to data collection, Institutional Review Board approvals were obtained from Brigham Young University, Brigham Young University-Hawaii, and the University of Utah.

Research Setting and Recruitment

Inclusion criteria to participate in the study included: (1) self-identification as NHOPI or a member of a NHOPI subgroup, such as Native Hawaiian, Tongan, Samoan, Fijian, Tahitian, Maori, or Cook Islander, (2) the ability to speak English, and (3) being a primary caregiver (e.g. parent, aunt, uncle, or grandparent) of a NHOPI child between 6 months and 18 years of age. The final inclusion criterion of caregiver was needed for a larger study using the same data.

Hawaii and Utah were chosen as research locations because they are two of seven states considered to have a significant NHOPI population (U.S. Department of Health & Human

Services, 2011). According to the 2010 U.S. Census, 37,000 NHOPIs (alone or in combination with another race) lived in Utah. In Hawaii, there were 356,000 NHOPIs residing in the state, comprising 10% of the total population (U.S. Census Bureau, 2012; U.S. Census Bureau, 2010). The islands of Hawaii and Oahu were chosen because Honolulu County and Hawaii County are the two counties with the highest population of NHOPIs (U.S. Census Bureau, 2012; Hawaii Department of Business, Economic Development, and Tourism, 2010).

In Hawaii, participants were recruited by word of mouth and distribution of fliers containing a short description of the study at grocery stores and a preschool. With written consent of site managers, a table was set up at each location for recruitment and data collection. The research team included an associate professor/primary investigator, graduate and undergraduate nursing students/research assistants (RAs) from Brigham Young University, and two NHOPI students/RAs from Brigham Young University-Hawaii. The NHOPI RAs helped select optimal locations in Hawaii for data collection and served as culture brokers, assisting other research team members in understanding cultural nuances. The NHOPI RAs also seemed to help recruits feel comfortable approaching the research team and participating in the study. We felt the NHOPI RAs were crucial to the success of data collection in Hawaii.

In Utah, we recruited participants at the annual Pacific Islander Memorial Day celebration at Iosepa in Tooele County and two NHOPI events in Salt Lake County: the Pacific Islander Health Summit and Samoan Flag Day. With written consent of each event sponsor, a table was set up for recruitment and data collection. In Utah, local NHOPI community leaders helped with recruitment by informing attendees about our study and encouraging them to talk to us to learn more about the study. As with our NHOPI RAs in Hawaii, the NHOPI community

leaders in Utah were critical in identification of appropriate events for data collection and recruitment of participants.

Measures

Newest Vital Sign. Weiss et al. (2005) developed the Newest Vital Sign (NVS) in English and Spanish to measure health literacy; it is a series of six questions about a nutrition fact label on a container of ice cream. The NVS is used to assess an individual's abstract reasoning, ability to understand written information, and numeracy skills. Weiss et al. (2005) reported the questionnaire requires an average of three minutes for administration. Scores range from 0-6: A score of 0 to 1 suggests high likelihood of limited literacy, 2-3 indicates the possibility of limited literacy, and 4-6 almost always indicates adequate literacy. In the initial study of 250 English-speaking and 250 Spanish-speaking primary care participants, the questionnaire was shown to have good reliability (Cronbach $\alpha > 0.76$ in English and 0.69 in Spanish) and criterion validity ($r = 0.59$, $p<0.001$ in English; $r = 0.49$, $p<0.001$ in Spanish; Weiss et al., 2005).

Our questionnaire. In addition to NVS, our questionnaire included questions about: (1) demographic variables including age, gender, household income, and educational level, and (2) caregivers' self-reported food serving practices and promotion of exercise behaviors in children. Food serving questions were derived from a number of sources, including food surveys by the Australasian Child and Adolescent Obesity Research Network (ACAORN, 2010)

Procedures

After explaining the purpose of the research, answering questions, and obtaining a signed consent, a member of the research team read each question aloud and recorded in writing the participant's response. At completion of the survey, each participant's weight and height were

measured. Research activities required an estimated 15 minutes of participants' time. As compensation for their time, participants each received $10.

Participants' confidentiality was carefully guarded. The questionnaire did not contain any identifying information, and questionnaires were stored separately from informed consents.

Data Analyses

Data were entered and cleaned using IBM SPSS Statistics 19. To describe levels of health literacy in the sample and aspects of health literacy most and least understandable, descriptive statistics (frequencies, means, and standard deviations) were performed. To determine the differences in health literacy between groups, t-tests were performed. Correlations were calculated to investigate the relationship between some demographic characteristics and levels of health literacy. Finally, ANOVA was used to determine health literacy differences between ethnic subgroups.

Results

We described levels of health literacy and aspects of health literacy most and least understood, according to NVS scores, in a sample of 364 NHOPI adults. We also studied the relationship between demographic variables and health literacy in our sample.

Sample Description

Our sample included a purposeful, convenience sample of 209 NHOPI adults in Hawaii and 155 NHOPI adults in Utah (See Table 1). 64% of participants were female, and the mean age was 39 years (SD=15.2). A majority of participants (78%) reported an annual household income of less than $60k. 28.8% had received a college degree or higher education. Over half of participants (58.4%) were married. Most participants had health insurance (87.1%) and a regular source of health care (89.3%).

Levels of Health Literacy

To describe levels of health literacy in this sample, we used the NVS. Over half the participants (54.7%) demonstrated adequate literacy by correctly responding to at least four questions, with approximately 25% of them correctly answering all six questions. A quarter of participants (26.1%) showed a possibility of limited literacy by correctly responding to two or three questions, and 19.2% demonstrated a high likelihood of limited literacy by correctly responding to one question or none of them. Thus, according to their NVS scores, more than half our sample had adequate health literacy. However, it is concerning that nearly half (45.3%) had evidence of limited health literacy (see Table 2).

Aspects of Health Literacy

The question most participants answered correctly was a yes or no question about the safety of eating food with presumed allergies to penicillin, peanuts, latex gloves, and bee stings. As seen in Table 3, 78.9% reviewed the ingredient list on the ice cream label, which included peanut oil, and correctly determined the ice cream was not safe to eat. Participants had a 50% chance of responding correctly to this question because it required either a yes or no response. Participants who correctly answered this question were then asked to explain why the ice cream was not safe. Of the 78.9% who responded correctly to the yes/no food safety question, two-thirds (67.1%) correctly explained the ice cream would not be safe to eat because it contained peanut oil, leaving nearly one-third were unable to correctly explain why the ice cream was not safe. Several admitted that they did not know, but some of their more memorable explanations included: “because it will make me fat” or “because ice cream has lactose in it, and you said to assume I’m allergic to latex” or “I’m going to get acne and then have a heart attack.” Thus, a substantial portion of our sample could not correctly determine the ice cream was unsafe due to

the assumed peanut allergy either because they responded incorrectly to the yes/no question or in the follow-up question were unable to explain why the ice cream was unsafe.

The questions involving numeracy seemed difficult. The numeracy question best understood required participants to calculate the amount of ice cream they could have if allowed 60 grams of carbohydrates; approximately two-thirds (65.8%) responded correctly. The next best understood question involved calculating the total number of calories in the container of ice cream; 55.5% correctly calculated this. More participants struggled when asked to calculate the percentage one serving of ice cream would be of a given daily value of calories; 50.4% responded correctly.

The NVS question least understood involved a scenario in which a doctor advised reduction of saturated fat. Participants were required to calculate the amount of saturated fat they would be eating after eliminating one serving of ice cream per day. Less than half (46.0%) of participants answered correctly. This question was the most lengthy and seemed to be the one participants asked most often to have repeated.

Demographics and Health Literacy

We looked at demographic characteristics (gender, age, household income, educational level, BMI, regional location, ethnicity) and levels of health literacy in the sample as a whole and in both Hawaiian and Utahan subsets (see Table 4). To do this, we used t-tests for gender, and correlations to describe age, income, educational level, and regional location. Finally, we used ANOVA to determine differences between ethnic subgroups.

Only one finding (regional location) was non-significant. There was no significant difference (p=0.795) in participants' levels of health literacy between the locations of Hawaii and

Utah. This suggests that regional location within the United States may not affect level of health literacy in NHOPIs.

Gender was a significant finding with females scoring higher than males (p=0.046). Also, the correlation between NVS score and age showed a weak negative relationship (r=-0.26, p<0.001), showing that younger participants scored higher than older participants. As age increased, NVS score decreased, which explained about 4% of the variance in NVS scores.

There was a weak positive relationship between income and NVS scores (r=0.213, p=0.001). As income increased, so did participants' NVS scores. Income explained about 4% of the variance in NVS scores.

There was also a weak positive relationship between education and NVS scores (r=0.27, p<0.001). As participants' highest level of education increased, so did their NVS scores. Education explained approximately 4% of the variance in NVS scores. Additionally, participants who had attended a nutrition class scored slightly higher than participants who had not (p=0.051).

Finally, there was a significant negative relationship between BMI and NVS score (r= -0.116, p=0.027). As participants' BMI increased, their NVS scores decreased.

ANOVA was used to determine differences between ethnic subgroups (see Table 5). Tongans (n=22) had the highest mean NVS score at 4.364 (s.d.=1.59). Hawaiians (n=222) had a mean NVS score of 3.90 (s.d.=1.86), and other Pacific Islanders (n=46) had a mean score of 3.413 (s.d.=2.22). Samoans (n=74) had the lowest mean score, 2.74 (s.d.=1.97). Samoans scores were significantly lower than Hawaiians (p=0.000) and Tongans (p=0.008), but not significantly lower than other Pacific Islanders (p=0.324).

Discussion

Assessing Health Literacy with NVS

After a thorough search of the literature, no studies were found using NVS with NHOPIs. Further, Weiss (personal communication, Fall 2010) reported the NVS had not been used previously with NHOPIs. We found a sizeable portion of our NHOPI sample (45.3%) had a possibility of limited literacy. Likewise, NVS has been used to predict the possibility of limited health literacy in several other populations. Comparable to our results, 46.1% of participants (n=289) had low or possibly low health literacy skills in a randomized study that took place in 20 private and public medical practices. There were more participants with adequate literacy skills in the private practice setting than in public health clinics (62.7% versus 46.2%), and participants who spoke English scored higher on NVS than those who spoke Spanish (61.9% versus 42.3%; (Ryan et al., 2008). In a study of 54 Caucasian, Black, and Latino participants with type 2 diabetes receiving care at a free primary care clinic, nearly two thirds (65%) had NVS scores indicating a possibility of low health literacy (Heinrich, 2012). Similarly, in a study of 62 elderly African-American patients, 58% had NVS scores indicating a possibility of limited health literacy (Patel et al., 2011). Finally, a study of teenage athletes (n=206) and adults (n=778), 51.9% of adults and 40.3% of teenage athletes had NVS scores indicating inadequate health literacy (Shah, West, Bremmeyr, & Savoy-Moore, 2010). Similar to our findings, positive predictors of adequate health literacy among adults in this study included higher educational level, younger age, and health class participation (Shah et al., 2010).

Role of Health Literacy in Treatment and Prevention of Obesity-Related Illnesses

Reading and understanding nutrition fact labels, such as the ice cream label used in the NVS, are facets of health literacy that also have important roles in treatment and prevention of

obesity and obesity-related diseases. We found many NHOPIs have limited health literacy. This is concerning because limited health literacy can reduce adults' ability to comprehend and use basic health-related materials, including nutrition fact labels (White, Chen, & Atchison, 2008). Many Americans may not even be reading nutrition fact labels. The International Food Information Council Foundation (2012) conducted a large web-based survey of American adults and found 66% looked at nutrition fact labels, and half specified they looked at the calories per container, serving size, and the ingredient list. However, 54% reported they would rather enjoy their food without worrying about what is in it. We are unable to compare these findings with our participants because we did not ask about habits related to reading nutrition fact labels. Thus, failure to read these labels and/or not worrying about nutritional characteristics of food may be areas for concern when caring for NHOPIs. Further investigation is warranted.

Healthcare providers often recommend dietary guidelines, especially to patients with chronic health conditions. When doing so, they assume patients can read and understand nutrition fact labels (Rothman et al., 2006). Our results suggest many NHOPIs may not be able to correctly follow a specific dietary plan due to difficulty interpreting nutrition fact labels. Further, our results identify which aspects of nutrition fact labels are most difficult to understand; this information can assist health care providers in creating interventions and targeting educational tools for NHOPIs.

Demographics, NVS Scores, and Associated Risks

Ethnicity. Ethnic subgroups played a role in our findings with Samoans having a significantly lower mean NVS score than Hawaiians and Tongans but not the "other Pacific Islander" subgroup (see Table 5). Diabetes prevalence in American Samoa (47%) is among the highest in the world, and obesity prevalence is 80% among women in American Samoa (WHO,

2010). Further research is needed to investigate the relationships among ethnic subgroups, obesity, obesity-related illness, and health literacy.

Age. We anticipated younger participants would have higher NVS scores because they are likely to have taken math classes more recently than older participants. Our findings were consistent with this hypothesis. In our sample, NVS scores decreased as participants aged. Similarly, in a study of 1,014 participants, a higher percentage of young athletes correctly answered NVS questions than adults on nearly every question (Shah et al., 2010). Also, in a study of 200 primary care patients using a nutrition fact label survey, Rothman and associates (2006) found numeracy had a strong relationship with the ability to interpret nutritional information and that younger participants scored significantly higher than participants 65 years and older (p=0.04).

BMI and Health Literacy

In our study, as participants' BMIs increased, their health literacy decreased. This means the people perhaps most in need of being able to interpret and apply information on nutrition fact labels may be less likely to be able to complete this task. Health care providers should be mindful of this and incorporate teaching on interpretation of nutrition fact labels in weight loss interventions.

Feasibility of NVS

Feasibility of NVS as a health literacy tool was discussed in the literature. Time required to complete the tool was a concern. Patel and associates (2011) found health literacy could be assessed with NVS, but they concluded it was not practical as a quick screening tool. Their participants took an average of 11 minutes to complete the NVS (Patel et al., 2011). By comparison, Shah and associates' (2010) participants averaged 2.63 minutes to complete NVS.

This completion time is closer to the 3 minutes Weiss et al. (2005) reported their participants needed to complete the NVS. Although we did not measure the time it took participants to complete the NVS, we estimate that a completion time as short as 3 minutes would be an exception. We observed that participants who scored high seemed to complete the NVS fairly quickly, but those who missed questions took longer thinking about what the answer might be. Also, consistent with NHOPI cultural norms, many participants liked to talk and provided examples and stories as they responded. This took longer than simply replying to the NVS questions.

Another concern about the NVS was its acceptability by patients in the clinical setting. Vangeest, Welch, and Weiner (2010) conducted a study of 179 participants in primary care clinics. Their sample was 98% African American and 73% female. 46.4% of participants in this sample were found to have a possibility of limited literacy. Nearly all participants were comfortable with the screening and did not find such screening to be embarrassing. Many participants welcomed the health literacy screening, and even those with the lowest levels of literacy were strongly supportive of clinical screening (Vangeest et al., 2010). Further, in the study of 289 participants using NVS, Ryan et al. (2008) found participants were willing to undergo health literacy assessments, and satisfaction with care was not decreased by completing assessments. Similarly, our participants did not seem to mind answering NVS questions. Many commented they enjoyed answering the questions or thought the experience was interesting.

Limitations

This study has several strengths, including a large sample size. However, there were limitations to the study. First, participants were allowed to self-identify as NHOPI, and it was not possible for researchers to verify this information. Also, surveys were conducted orally, and it is

possible that some participants may have misheard the questions despite efforts to avoid this issue. Additionally, because the survey was oral, some participants may have told researchers what they perceived the researchers would want to hear rather than completely truthful answers.

The distribution of ethnic subgroups among our sample should also be noted. Tongans represented only 6% of our sample while Samoans represented 20.3%. If the ethnic subgroups had been more equivalent in size, the findings may have been different or may have strengthened the findings.

Another potential limitation was one question in the NVS may have been a leading question. A yes or no response was all that was required when participants were told to assume they had various allergies and then were asked if the ice cream was safe to eat. Several seemed to guess the correct answer of "no," but were then unable to explain why the ice cream was unsafe.

Some participants asked for a calculator or pen and paper to calculate responses. These items were not allowed, but their scores may have been affected if participants had been able to use them. Not allowing participants to use pen and paper or a calculator likely reflects real-life situations in which people quickly review nutrition fact labels to make food-purchase choices.

Conclusion

There are many implications from this study that could benefit NHOPIs and increase their health literacy. First, health care providers should not assume NHOPI patients and families understand health information and nutrition fact labels. When teaching about dietary needs and restrictions, health care providers need to review critical information on nutrition fact labels with patients in addition to explaining how to use this information when making food choices. Extra care should be taken with individuals whose demographic characteristics place them at increased risk for inadequate health literacy such as the elderly, those with lower household incomes, and

lower educational levels. Also, nurses and health care providers can advocate for instruction about nutrition fact labels in elementary and high schools as well as in community settings. Instruction on nutrition fact labels and numeracy skills would be a helpful addition to social marketing and community classes and workshops. Finally, on the state and national level, nurses and other health care providers can lobby for simpler, more uniform nutrition fact labels that would be more user-friendly and easier to apply to decision-making.

The Institute of Medicine maintains that individuals need to be more responsible for management of their own health care. The tasks of information gathering, measuring, and monitoring health increasingly rest on patients who may lack the health literacy skills needed to appropriately manage their diseases (Kennen et al., 2005). It is vital for health care providers to empower individuals with the knowledge required to obtain, process, and understand health information and utilize the information needed to make appropriate health decisions. According to former Surgeon General Carmona (2005), “promoting health literacy is perhaps the most important role of any health professional” (p. S9). In order to more effectively target patient education and health interventions, healthcare providers need information about those aspects of health literacy particularly difficult to understand as well as which populations are most at risk to have limited health literacy.

Further research should explore nutrition fact label instruction, nutrition education, and interventions that would be most effective in the NHOPI population. Additionally, research could be focused on NHOPI subgroups most at risk of limited health literacy, such as the Samoan subgroup in our sample. Many of the care-givers in our sample (42.5%; see Table 1) were not parents of the children they were caring for but were grandparents or other relation; thus, we suggest a multi-generational approach to teaching that would focus on all members of

the family. In our sample we found NHOPI participants seemed more receptive to recruitment from NHOPI research assistants and community leaders. We recommend future research on the effectiveness of interventions involving NHOPI instructors rather than instructors from another culture or race.

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Table 1. Demographic Characteristics of Participants [*n* (%)]

Characteristic	Overall	Male	Female
Region			
Utah	155 (42.6)	65 (49.6)	90 (38.6)
Hawaii	209 (57.4)	66 (50.4)	143 (61.4)
Gender			
Male	131 (36.0)	-	-
Female	233 (64.0)	-	-
Age			
Mean (SD)	39.0 (15.2)	40.4 (15.6)	38.2 (14.9)
Income			
Less than 20,000	89 (24.4)	27 (20.6)	62 (26.6)
20,000 to 39,999	104 (28.5)	29 (22.1)	75 (32.2)
40,000 to 59,999	88 (24.1)	39 (29.8)	48 (20.6)
60,000 to 79,999	42 (11.5)	20 (15.3)	22 (9.4)
80,000 or more	38 (10.4)	15 (11.5)	23 (9.9)
Education			
Some high school	14 (3.8)	6 (4.6)	8 (3.4)
Graduated from high school	120 (33.0)	45 (34.4)	75 (32.3)
Some technical school or	124 (34.1)	34 (26.0)	90 (38.8)

college			
Graduated from college	74 (20.3)	29 (22.1)	45 (19.4)
Attended some graduate school	5 (1.4)	3 (2.3)	2 (0.9)
Have a graduate degree	26 (7.1)	14 (10.7)	12 (5.2)
Marital Status			
Married	213 (58.5)	82 (62.6)	131 (56.2)
Never married	88 (24.2)	24 (18.3)	64 (27.5)
Separated or divorced	40 (11.0)	16 (12.2)	24 (10.3)
Living with partner	14 (3.8)	6 (4.6)	8 (3.4)
Widowed	9 (2.5)	3 (2.3)	6 (2.6)
Ethnicity			
Hawaiian	222 (61.0)	70 (53.4)	152 (65.2)
Samoan	74 (20.3)	32 (24.4)	42 (18.0)
Tongan	22 (6.0)	11 (8.4)	11 (4.7)
Other Pacific Islander	46 (12.6)	18 (13.7)	28 (12.0)
Relationship to Children			
Father	84 (23.1)	-	-
Mother	125 (34.4)	-	-
Grandfather	27 (7.4)	-	-
Grandmother	42 (11.5)	-	-
Other	86 (23.6)	-	-
Health Insurance			
Yes	317 (87.1)	109 (83.2)	208 (89.3)

No	47 (12.9)	22 (16.8)	25 (10.7)
Regular source of health care			
Yes	325 (89.3)	113 (86.3)	212 (91.0)
No	39 (10.7)	18 (13.7)	21 (9.0)

Table 2. Levels of health literacy

Likelihood of literacy	Questions correct	Participant response [n(%)]	Utah	Hawaii
High likelihood of limited literacy	0-1	70 (19.2)	33	37
Possibility of limited literacy	2-3	95 (26.1)	37	58
Adequate literacy	4-6	199 (54.7)	85	114

Table 3. Most to least understandable question on the Newest Vital Sign

	NVS Question	Correct response [n (%)]
5	Pretend you are allergic to penicillin, peanuts, latex gloves, and bee stings. Is it safe for you to eat this ice cream?	287 (78.8)
6	(If participant responded no to 5) Why not?	244 (67.0)
2	If you are allowed 60 grams of carbohydrates as a snack, how much ice cream could you have?	239 (65.7)
1	If you eat the entire container, how many calories would you eat?	202 (55.5)
4	If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?	183 (50.3)
3	Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?	168 (46.2)

Table 4. Demographic characteristics and NVS

Demographic Variable	Finding	*p*-value	Pearson Correlation	Spearman's rho
Gender	Females scored higher than males	*0.046		
Age	NVS scores decreased as age increased	*<0.001	-0.26	
Income	NVS scores increased as income increased	*0.001	0.213	0.210
Education	NVS scores increased as highest level of education increased	*<0.001	0.27	0.333
BMI	NVS scores decreased as BMI increased	*0.027	-0.116	
Location	No significant difference between Hawaii and Utah	0.795		

Table 5. NVS Score and Ethnic Subgroup

Ethnicity	Number (n)	Mean Score	Standard Deviation
Hawaiian	222	3.900	1.86
Samoan	74	2.74	1.97
Tongan	22	4.364	1.59
Other Pacific Islander	46	3.413	2.22