The Relationship Between Select Demographic Characteristics and Body Mass Index Among Native Hawaiian and Other Pacific Islander Caregiving Adults

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The Relationship Between Select Demographic Characteristics and Body Mass Index
Among Native Hawaiian and other Pacific Islander Caregiving Adults

Obesity was once an issue primarily affecting high-income countries; however, obesity is now a worldwide epidemic (World Health Organization [WHO], 2013b), recently referred to as “globesity” (WHO, 2013a). WHO estimates 1.4 billion adults are overweight, and more than 500 million adults are obese around the world (WHO, 2012).

Obesity burdens low- and middle-income countries already dealing with infectious diseases and under-nutrition (WHO, 2012). This burden is exemplified in the Pacific Island nations, where the leading causes of morbidity and mortality have shifted to obesity-related diseases. These island nations struggle with this escalating burden (Seniloli, 2005).

Native Hawaiian or other Pacific Islanders (NHOPIs) are people with genetic origins in Hawaii, Samoa, or other Pacific Islands (Hixson, Hepler, & Kim, 2012). NHOPI prevalence of overweight or obesity is among the highest in the world. Nauru, a Pacific Island nation, is considered the most obese country in the world with an overweight and obesity prevalence of 93% (WHO, 2011). Hawaii’s overall prevalence of overweight or obesity is 52.1%, but the prevalence for Native Hawaiian residents is 69.6% (Hawaii Department of Health, 2011). Inasmuch as NHOPIs are one of the fastest growing ethnic groups in the U.S. (Hixson et al., 2012) and their overweight and obesity prevalence is high, the U.S. as well as Pacific Island nations must be concerned with their obesity and related health care issues.

Traditionally, NHOPIs have been aggregated with Asians, so advocacy groups have called for NHOPI specific research to address their particular needs (Stafford, 2010). Recent studies examined NHOPI obesity’s relationship with health behaviors, but information on sample demographics was limited (Hughes & Marks, 2009; Moy, Sallis, Ice, & Thompson, 2010). The
Centers for Disease Control and Prevention (CDC; 2010) showed obesity prevalence varies substantially by race/ethnicity, location, gender, and education, but these data were not NHOPI specific and were self-reported. A systematic search of the literature from 2001 to 2012 revealed no studies directly exploring the relationship of NHOPI demographic characteristics and BMI.

In order to address the burden of NHOPI obesity, it is necessary to better understand the relationship between demographic characteristics and BMI calculated from accurately measured heights and weights within a sample of NHOPIs. Thus, the purposes of this study are to identify the proportion of the sample that is overweight or obese and explore the relationship between BMI and demographic characteristics in a sample of NHOPI caregiving adults.

**Background**

Statistics demonstrate NHOPIs generally have higher rates of overweight and obesity than much of the world’s population (WHO, 2011). Implications of these statistics are best understood by examining the associated risks of obesity and factors contributing to NHOPIs’ high prevalence of obesity, including lifestyle and perception of body size.

**Associated Risks**

As obesity increases, so does morbidity and mortality of related diseases. Individuals, communities, and nations are burdened with the associated costly healthcare. Obesity increases the risk for cardiovascular disease, stroke, hypertension, type 2 diabetes, and some cancers (CDC, 2010; Davis et al., 2004; WHO, 2012). Obesity also correlates with psychological disorders, osteoarthritis, sleep apnea, and respiratory problems (Davis et al., 2004).

NHOPIs experience these obesity-related disease patterns with increases in non-communicable, chronic diseases, and premature death (Seniloli, 2005). Among all ethnic groups
in Hawaii, Native Hawaiians have the highest prevalence of diabetes and a diabetes-related mortality, three times higher than Caucasians. Native Hawaiians also have a cardiovascular disease mortality that is more than twice that of Japanese inhabitants, who have the lowest cardiovascular disease rate in Hawaii (Mau, Sinclair, Saito, Baumhofer, & Kaholokula, 2009). As obesity prevalence grows, so does the prevalence and impact of obesity-related diseases.

**Lifestyle Contributors**

Shifting diets and changing physical activity contribute to overweight and obesity in NHOPIs. Their diets once consisted of traditional foods, such as breadfruit, banana, yam, and taro, but have transitioned to calorie-dense diets with increased fat, sugar, salt, and processed foods. This may be due to increased availability of calorie-dense foods, changes in taste, and increased incomes that allow such food purchases (Hughes & Marks, 2009; Lassetter, 2011). Increased obesity prevalence may be related to changes in employment opportunities. Rather than the highly physical labor of traditional farming and fishing, modern jobs are less active in office, retail, and tourism settings. Additionally, modern technology has reduced the physical activity and energy expenditure required in many jobs (Gill et al., 2002; Seniloli, 2005).

A similar transition has occurred in recreation, which historically included dancing, canoeing, and swimming (Siefken, Macniven, Schofield, Bauman, & Waqanivalu, 2011). Modern sedentary activities, such as television and video games, now dominate many NHOPIs’ lifestyles. Sedentary activity is also influenced by limited recreational facilities, high cost, and environmental factors (Moy et al., 2010). For instance, people who feel unsafe in their neighborhood are less likely to exercise outdoors (Gill et al., 2002). NHOPIs in the U.S. have a
greater risk than other Americans for conditions amenable to increased activity, such as obesity and diseases like type 2 diabetes, cardiovascular disease, and some cancers (Moy et al., 2010).

**Perception of Body Size**

When examining obesity among NHOPIs, the perception and value of body size should be considered. Some NHOPIs perceive a fuller, even obese, figure as desirable (Lassetter, 2011; Seniloli, 2005). Historically, large body size was considered beautiful and signified wealth, status, and prestige (Davis et al., 2004; Gill et al., 2002; Lassetter, 2011). However, this traditional large body size implied a musculature and strength that offered protection and stamina during hard physical labor, periods of starvation, and infectious diseases. The current large body size is more often due to fat from changing diets and lifestyles. Thus, large body size has become more harmful than protective (Gill et al., 2002; Lassetter, 2011).

NHOPIs’ high obesity prevalence places them at greater risk for obesity-related diseases. Lifestyle factors, such as changes in diet, employment opportunities, and recreation likely contribute to their high obesity prevalence. Additionally, some NHOPIs perceive large body size as desirable, which might also have a role. To better address this important health issue, one first needs to understand the BMI distribution among NHOPIs. Further, understanding risks among various demographic subgroups might lead to more efficient screening of high-risk groups and more targeted health promotion.

**Methods**

**Study Design**

This study is part of a larger research project investigating diet and activity patterns and health literacy in NHOPI caregiving adults. We used a descriptive, correlational design and
convenience, purposeful sampling. We developed the portion of the questionnaire related to this study, including the demographic questions.

**Research Setting**

Data collection occurred in Utah and Hawaii. In Utah, which has one of the largest NHOPI populations in the U.S. outside Hawaii (Hixson et al., 2012), recruitment and data collection occurred in Salt Lake and Tooele counties. NHOPI community leaders identified cultural events with high likelihood of successful recruitment and data collection and helped recruit participants. In Hawaii, local Native Hawaiian research assistants identified data collection settings, including a preschool and supermarkets in neighborhoods of varying socioeconomic levels around Oahu and the Big Island. Managers at each event or location gave signed permission before recruitment or data collection occurred.

**Procedure**

Researchers handed fliers briefly explaining the purpose and inclusion criteria to people who approached the research table. To be included, people had to self-identify as (1) an English–speaking adult at least 18 years of age, (2) a NHOPI, and (3) a primary caregiver (e.g. parent or grandparent) of a NHOPI child between 6 months and 18 years of age. The last criterion was included for the larger study’s purposes.

After the study was explained and questions were answered, people who met inclusion criteria and wanted to participate were asked to read and sign a consent form. Then research team members read the questions to participants and recorded their answers in writing. Finally, participants’ height and weight were measured and recorded. Participants were compensated for their time, and their children were entertained with coloring books during data collection.
Measures

Participants’ heights were measured with a Seca 213 Stadiometer, and their full-clothed weights were measured at least twice with a digital Seca 803 scale. If the two weights differed, the participant was weighed a third time, and the results were averaged for data analysis.

The CDC’s (2011a) on-line adult BMI calculator was used to determine BMI. The CDC’s BMI categories were used: underweight (BMI <18.5 kg/m$^2$), normal weight (BMI $\geq$18.5 kg/m$^2$ but <25 kg/m$^2$), overweight (BMI $\geq$25 kg/m$^2$ but <30 kg/m$^2$), and obese (BMI $\geq$30 kg/m$^2$). A subcategory of obesity, morbidly obese (BMI $\geq$40 kg/m$^2$), was also included (CDC, 2011b).

Data Analysis

We used IBM Statistical Package for the Social Sciences (SPSS) Version 19 to analyze data. A significance of $p < .05$ was established. We calculated descriptive statistics (means, standard deviations, medians, and ranges for continuous variables, and frequencies for dichotomous and nominal variables). To examine the relationship of age, income, and educational attainment with BMI, correlations were completed. Two-tailed t-tests were used to examine BMI differences by gender and location. Finally, a one-way analyses of variance (ANOVA) was done to explore BMI differences between ethnic subgroups.

Ethical Considerations

Institutional Review Boards at Brigham Young University, Brigham Young University-Hawaii, and the University of Utah approved this study. Questionnaires and body measurements were conducted as privately as circumstances allowed, and confidentiality was carefully guarded. For example, consent forms and questionnaires were stored separately to protect confidentiality.

Results
Sample

Our sample included 364 NHOPIs, 42.6% in Utah ($n = 155$) and 57.4% in Hawaii ($n = 209$). Participants’ ages ranged from 18 to 85 years ($M = 39.0, SD = 15.2$), and the sample was 64.0% female. See Table 1 for further demographic information.

BMI Categories

Participants’ weights ranged from 29.0 kg to 190.0 kg ($M = 93.0, SD = 25.9$). Participants’ heights ranged from 115.6 centimeters to 194.3 centimeters ($M = 168.1, SD = 9.7$). The low height and weight were outliers because we had one adult dwarf participant. Table 2 shows participants divided into BMI categories. Overall, 84.3% of our NHOPI sample was overweight or obese. Of those, 58.5% were obese, including 16.7% who were morbidly obese.

BMI Relationship with Demographics

Age, income, and educational attainment. Correlations of BMI between age ($r = .031; p = .560$) and income ($r = -.055; p = .299$) were not statistically significant. However, the correlation between BMI and educational attainment was significant ($r = -.123; p < .05$). This means that as participants’ education increased, their BMI decreased slightly. Education explained approximately 1% of the variance in BMI.
Location and gender. The relationship between BMI and location was statistically significant. These results are detailed in Table 3. The mean BMI of participants in Utah was significantly greater than the mean BMI of participants in Hawaii ($p = .017$).

Examining BMI distribution by gender yields further insight (see Table 2). Prevalence of overweight or obesity among males was 90.9%, of whom 69.5% were obese and 17.6% were morbidly obese. Females had a lower prevalence of overweight or obesity at 80.7% with an obesity prevalence alone of 52.4%, including 16.7% who were morbidly obese. Although males had a greater mean BMI ($M = 33.49$, $SD = 7.12$) than females ($M = 32.06$, $SD = 8.34$), this difference was not statistically significant ($p = .086$).

We also compared females and males by location (see Table 3). The BMI of males in Utah ($M = 34.77$, $SD = 7.18$) was significantly higher ($p = .039$) than males in Hawaii ($M = 32.20$, $SD = 6.93$). Females in Utah had higher BMI ($M = 32.96$, $SD = 8.0$) than females in Hawaii ($M = 31.50$, $SD = 8.28$), but the difference was not statistically significant ($p = .195$).

Ethnicity. Participants self-identified as Native Hawaiian, Samoan, Tongan, or other Pacific Islander. Using ANOVA to examine BMI between ethnic subgroups (see Table 4), we found a significant difference $F(3,36) = 9.5, p < .001$, partial Eta Squared = .07. Samoans had a significantly greater BMI than Hawaiians ($p = .00$) and other Pacific Islanders ($p = .00$) but not significantly greater than Tongans ($p = .09$). Using crosstabs analysis, there were fewer than
expected Samoans in the normal weight category \( (n = 2, \text{ expected } n = 10.8) \), and more than twice as many as expected were morbidly obese \( (n = 26, \text{ expected } n = 12.6) \).

Insert Table 4 from Appendix D about here

**Discussion**

Overweight and obesity of NHOPIs in our study is similar to the most recent WHO global estimates of Pacific Island nations. The highest prevalence for male overweight and obesity in the world are in six Pacific Island nations, ranging from 80.9% to 96.9%. For female overweight and obesity prevalence, the top seven nations are Pacific Islands, ranging from 84.1% to 93.1% (WHO, 2011). Thus, our sample is comparable to the heaviest Pacific Island nations.

The percentage of overweight and obesity in our sample (84.3%) is higher than overweight and obesity prevalence for Native Hawaiians (69.6%) in the 2009 Hawaiian Health Survey, which was based on self-reported height and weight (Hawaii Department of Health, 2011). This difference highlights the importance of carefully measured height and weight to accurately determine BMI. In self-reported data, weight is often under-reported and height over-reported, leading to under-estimated BMI (Elgar & Stewart, 2008).

**Food Costs and Location**

In a recent survey, 73% of respondents identified price as a consideration in their food-purchase decisions. Only taste was more frequently considered, with 87% using it in decision making. Merely 61% identified healthfulness as an important consideration (International Food Information Council Foundation, 2012). Over the last 30 years, the price of fruits and vegetables
increased, while the cost of processed, calorie-dense foods decreased (Finkelstein & Strombotne, 2010). As the cost of healthy food rose, people increased their daily calorie intake, trending with the obesity epidemic (Wright, Kennedy-Stephenson, Wang, McDowell, & Johnson, 2004).

Food prices vary by location, with prices increasing in remote areas. The remoteness of Hawaii and other Pacific Islands means much of the food (85-90%) must be imported over great distances, increasing the price (Hawaii Department of Agriculture, 2008). According to the U.S. Department of Agriculture (USDA; 2012b), cost of food on a thrifty plan for a family of four averaged $543.50 per month in the U.S. mainland. By comparison, this same plan costs almost twice as much in Hawaii at $1038.00 (USDA, 2012a). This difference in food costs may help explain the significantly higher BMI of NHOPIs in Utah than Hawaii, as lower food costs make food more accessible to families in Utah.

When NHOPIs move from Hawaii to the U.S. mainland, their food budget stretches further. In fact, Native Hawaiian migrants in Las Vegas explained they ate more food there than they had in Hawaii because groceries and restaurant meals were less expensive in Las Vegas. Participants connected less expensive food and their tendency to overeat with their self-reported weight gain since moving to Las Vegas (Lassetter, 2011). These dietary patterns then influence the migrants’ posterity because dietary patterns are learned within the context of families (Gruber & Haldeman, 2009). Thus, though our sample was not strictly first-generation migrants, the relatively lower cost of food likely contributed to a higher mean BMI in Utah than in Hawaii.

Physical Activity

Physical activity might also contribute to the significant difference between NHOPI BMI in Utah and Hawaii. Utah’s winters are cold and long, which might decrease outdoor physical
activity, especially for people more accustomed to warmer temperatures. Acculturation also influences activity. Some immigrants arrive to the U.S. with good physical activity and dietary patterns, but these patterns diminish over time in the U.S. (Lassetter & Callister, 2009). Future research could elucidate the relationship between BMI and location by comparing NHOPIs’ physical activity and dietary patterns in their native land and in the U.S. mainland.

Educational Attainment

As in our study, several researchers found a significant inverse relationship between BMI and educational attainment in many populations (Himes & Reynolds, 2005; Worthy, Lokken, Pilcher, & Boeka, 2010). One explanation for these results is that people with higher levels of education are more likely to have additional information about health risks associated with obesity and a greater understanding of the benefits of healthy eating and exercising. However, a multi-ethnic study in Hawaii showed a significant inverse relationship between educational attainment and BMI in women but not men (Brown, Hampson, Dubanoski, Stone Murai, & Hillier, 2009). In a retrospective review of data from the U.S.’s National Health Interview Survey identified a relationship between BMI and educational attainment, but the strength of the relationship declined over time. As the adult population became increasingly educated, obesity rates continued to climb rather than decline as expected (Himes & Reynolds, 2005). Although our findings were significant, education explained only 1% of BMI variance. More research is needed to clarify the relationship between educational level and BMI.

Income, Gender, and Age

Our findings suggest that income, gender, and age do not contribute significantly to the high prevalence of obesity among NHOPIs. Other research is conflicted over the relationship
between obesity and income in other populations. Jolliffe (2011) noted the media, policy briefings, and some academic writing tend to portray a significantly negative correlation between obesity and income, but Jolliffe analyzed the U.S.’s National Health and Nutrition Examination Survey (NHANES) and found no statistically significant difference in overweight or obesity prevalence between poor and non-poor people. However, significant, positive relationship between obesity and income have been found in research conducted in low- or middle-income countries (Neuman, Finlay, Smith, & Subramanian, 2011; Subramanian, Perkins, Ozaltin, & Smith, 2011). Further research on low- or middle-income Pacific Island nations would help identify if they demonstrate a significant, positive correlation between income and obesity.

Similar to the NHANES data Jolliffe analyzed, our sample consists of a range of incomes in a developed country; thus, we conclude that NHOPIs in Utah and Hawaii trend with their U.S. counterparts in the lack of a significant relationship between income and obesity.

Our NHOPI sample may be unique because there was no significant BMI difference based on gender, and there was no significant relationship between BMI and age. Researchers studying multi-ethnic samples in the U.S. and Australia found males were more likely to have greater BMIs than females (Kifle & Desta, 2012). Likewise, significant relationships between age and BMI have been found. In multi-ethnic samples, this relationship represented a concave curve. BMI increased with age initially, but then decreased later in life (Kifle & Desta, 2012). Because our study was not longitudinal, we cannot conclude whether our sample would follow a similar trend. Overall, research highlights the complexity of obesity. In our NHOPI sample, demographic characteristics explain a fractional part of the obesity issue.

Limitations of the Study
The sampling method was a limitation; we used convenience, purposeful sampling, which may introduce sampling bias by attracting those with a particular interest in nutrition and health. In an effort to minimize bias, we collected data at a variety of events and locations. These recruitment locations also reflected a variety of socio-economic statuses.

In order to qualify for participation, recruits only had to self-identify as NHOPI; our criteria did not explore with participants their NHOPI heredity or social belonging. As a result, we acknowledge that race- or ethnicity-based self-reports are limiting factors in all health research, including this study. Participants may have ethnic identities that are more or less aligned with their lineage or their culturally-based health behaviors. Thus, the results must be considered with the understanding that many participants were not solely of NHOPI descent. This is, however, reflective of NHOPIs in the U.S., who are the most likely among racial groups to report multiple races (Hixson et al., 2012). Also, the distribution of ethnic subgroups in our sample should be noted. Samoans represented 20.3% of our sample, but Tongans represented only 6%. This might have influenced our findings when comparing ethnic subgroups.

The inclusion criterion of being a primary caregiver of children limited those who could participate. Although this criterion was critical to the larger study, we might have had a broader sample without it.

Another limitation was that we did not exclude pregnant women. We did not ask about pregnancy, so we do not know how many participants may have been pregnant. Because of weight gain during pregnancy, pregnant participants may have affected women’s BMI results.

Using BMI as the only way to determine overweight and obesity was another limitation. Although BMI historically has been used to diagnose obesity, its use is criticized for an uncertain
ability to differentiate between fat mass and lean muscle mass and to assess fat distribution (Stevens, McClain, & Truesdale, 2008). This might be particularly applicable to NHOPIs because they tend to have a higher lean body mass than Europeans (Swinburn, Ley, Carmichael, & Plank, 1999), suggesting the BMI categories might need upward adjustment for use in NHOPIs. Adiposity measurements more precise than BMI calculations are advantageous but might not be as practical for large studies in settings where privacy is challenging. Therefore, BMI remains the most commonly used measurement in studying the health consequences of obesity (Stevens et al., 2008). Each of these limitations should be considered pertaining to the application of this study.

**Implications for Clinical Practice and Future Research**

Due to the prevalence of obesity in the NHOPI population, healthcare providers should properly screen NHOPIs for overweight and obesity and the associated risks. Individuals should also be assessed with other obesity indicators, such as waist and hip circumferences and skinfold measurements.

Healthcare providers should educate about risks of obesity while maintaining cultural sensitivity to NHOPIs’ values; strategies focused on good nutrition and “activity” might be more acceptable than a focus on weight loss and “exercise.” NHOPIs in their native lands, in the U.S., and around the world would benefit from education on healthy food options and activity. Because of the collectivist culture of NHOPIs (McLaughlin & Braun, 1998), a focus on the family or community groups might enhance the effectiveness of education efforts. In addition, NHOPIs may be more receptive to NHOPI instructors and facilitators, suggested by the crucial role of NHOPI research assistants and community leaders in recruitment of our participants.
Considering the significant findings pertaining to Samoans in our study, research is needed to verify and examine contributors to higher obesity prevalence among this group than other NHOPI subgroups. In addition, the effectiveness of interventions, such as nutrition education and activity, should be researched in the NHOPI population. This will help identify the best approach to decrease the obesity epidemic among this high-risk group.

**Conclusion**

Results of this study clarify understanding of obesity and facilitate efforts to improve the health of NHOPIs through patient education and clinical practice. NHOPIs are one of the most obese groups in the world and consequently are at high risk for associated morbidity and mortality. The obesity epidemic in NHOPIs is widespread, affecting people of all ages and income levels and both genders. Education offers a small advantage, as a higher educational attainment is correlated with lower BMI among NHOPIs, but this explains only a fractional part of the issue. NHOPI BMI is also influenced by location; those living in areas of low food prices might be at an increased risk for obesity. With this greater understanding of the contributors of obesity, nurses can better direct education, interventions, and clinical practice towards improving health of NHOPIs.
References


## Appendix A

### Table 1. Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>155 (42.6)</td>
</tr>
<tr>
<td>Hawaii</td>
<td>209 (57.4)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>131 (36.0)</td>
</tr>
<tr>
<td>Female</td>
<td>233 (64.0)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>39.0 (15.2)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 20,000</td>
<td>89 (24.4)</td>
</tr>
<tr>
<td>20,000 to 39,999</td>
<td>104 (28.5)</td>
</tr>
<tr>
<td>40,000 to 59,999</td>
<td>88 (24.1)</td>
</tr>
<tr>
<td>60,000 to 79,999</td>
<td>42 (11.5)</td>
</tr>
<tr>
<td>80,000 or more</td>
<td>38 (10.4)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>14 (3.8)</td>
</tr>
<tr>
<td>Graduated from high school</td>
<td>120 (33.0)</td>
</tr>
<tr>
<td>Some technical school or college</td>
<td>124 (34.1)</td>
</tr>
</tbody>
</table>
Graduated from college 74 (20.3)
Attended some graduate school 5 (1.4)
Have a graduate degree 26 (7.1)

Marital Status
Married 213 (58.5)
Never married 88 (24.2)
Separated or divorced 40 (11.0)
Living with partner 14 (3.8)
Widowed 9 (2.5)

Ethnicity
Hawaiian 222 (61.0)
Samoan 74 (20.3)
Tongan 22 (6.0)
Other Pacific Islander 46 (12.6)

Health Insurance
Yes 317 (87.1)
No 47 (12.9)

Regular source of health care
Yes 325 (89.3)
No 39 (10.7)
Appendix B

Table 2. Body Mass Index Categories of all Participants

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Overall (n (%))</th>
<th>Male (n (%))</th>
<th>Female (n (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt;18.5)</td>
<td>4 (1.1)</td>
<td>0 (0)</td>
<td>4 (1.7)</td>
</tr>
<tr>
<td>Healthy (BMI ≥18.5 but &lt;25)</td>
<td>53 (14.6)</td>
<td>12 (9.1)</td>
<td>41 (17.6)</td>
</tr>
<tr>
<td>Overweight (BMI ≥25 but &lt;30)</td>
<td>94 (25.8)</td>
<td>28 (21.4)</td>
<td>66 (28.3)</td>
</tr>
<tr>
<td>Obese (BMI ≥30)</td>
<td>213 (58.5)</td>
<td>91 (69.5)</td>
<td>122 (52.4)</td>
</tr>
<tr>
<td>*Morbidly Obese (BMI≥40)</td>
<td>61 (16.7)</td>
<td>23 (17.6)</td>
<td>39 (16.7)</td>
</tr>
</tbody>
</table>

*Morbidly Obese is subcategory of Obese
# Appendix C

## Table 3. BMI Differences by Location

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
<th>BMI Mean (SD)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td>2.403</td>
<td>.017*</td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>155 (42.6)</td>
<td>33.73 (7.97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td>209 (57.4)</td>
<td>31.72 (7.87)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.086</td>
<td>.039*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>65 (49.6)</td>
<td>34.77 (7.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td>66 (50.4)</td>
<td>32.20 (6.93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.289</td>
<td>.195</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>90 (38.6)</td>
<td>32.96 (8.50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaii</td>
<td>143 (61.4)</td>
<td>31.50 (8.28)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD = Standard Deviation

*Significance of p < .05
### Appendix D

Table 6. ANOVA Post-hoc of Ethnic Subgroups

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>n (%)</th>
<th>BMI Mean(SD)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaiian</td>
<td>222 (61.0)</td>
<td>31.72 (7.77)</td>
<td>.00*</td>
</tr>
<tr>
<td>Samoan</td>
<td>74 (20.3)</td>
<td>36.54 (7.59)</td>
<td>-</td>
</tr>
<tr>
<td>Tongan</td>
<td>22 (6.0)</td>
<td>31.77 (7.54)</td>
<td>.09</td>
</tr>
<tr>
<td>Other Pacific Islander</td>
<td>46 (12.6)</td>
<td>30.37 (7.44)</td>
<td>.00*</td>
</tr>
</tbody>
</table>

SD = Standard Deviation

*Significance of p < .05