More Than Black and White: Differences in Predictors of Obesity Among Native Hawaiian/ Pacific Islanders and European Americans

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Although Native Hawaiians and Pacific Islanders exhibit the highest rates of obesity and associated chronic diseases of any racial/ethnic group, they remain vastly underrepresented in health research. In a cross-sectional survey of college students (N = 402) we examined BMI and health outcomes in an ethno-racially diverse rural sample of Native Hawaiian/Pacific Islanders (25.1%), Asian Americans (39.8%), and European Americans (35.1%). Measures assessed BMI, health status, health behaviors, frequency of exercise, and symptoms of psychiatric disorders (i.e., depression, anxiety, posttraumatic stress, and substance abuse and dependence). Regression analyses revealed that an overall model of five predictors (gender, race, regular exercise, difficulty sleeping, and anxiety) was significantly associated with obesity (P < 0.001) and correctly classified 84.2% of cases. A 30.7% of Native Hawaiians/Pacific Islanders were obese as compared with 9.2% of European Americans and 10.6% of Asian Americans. These findings suggest that Native Hawaiian/ Pacific Islanders are at high risk for obesity and associated medical comorbidities, but that regular physical activity may ameliorate this risk. Further, these results support the consideration of Native Hawaiians/Pacific Islanders as a distinct racial/ethnic subgroup separate from other Asian populations.

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Significant research has examined obesity and its correlates among European Americans and African Americans. Few investigations have studied obesity among other racial/ethnic groups, especially Native Hawaiian/Other Pacific Islander (NHOPIs) and Asians. Though NHOPIs represent <1% of the US population (1), they exhibit the highest prevalence rates of obesity of any racial/ethnic group. Nationwide 2009 Behavior Risk Factor Surveillance Survey estimates suggest that 26.1% of European Americans, 38.7% of African Americans, and 29.2% of Hispanics are obese (2). In contrast, the State of Hawaii Behavior Risk Factor Surveillance Survey data from 2009 indicate that 49.3% of Native Hawaiians are obese, as compared with 21.4% of European Americans, 18.5% of Filipinos, and 12.8% of Japanese (3). Additionally, NHOPIs exhibit higher rates of chronic diseases associated with obesity compared with European Americans (4).

Young adults represent another high-risk subgroup that has traditionally been ignored in obesity research. Many young adults are focused on work or schooling and at higher risk for sedentary behavior. Adults between the ages of 18 and 25 gain 1–2 pounds annually and being overweight/obese during this time is associated with the development of later health problems (5). Among adults between the ages of 18 and 24 residing in Hawaii, 45.7% are classified as either overweight or obese (3). However, young adults are rarely targeted in obesity research and have proven difficult to engage in traditional weight-loss programs (6).

Although they exhibit the highest prevalence rates of obesity of any racial/ethnic group, to date little research attention has been paid to young adults of NHOPI descent. One limitation to this area of research is that NHOPIs are typically included as part of Asian-American racial/ethnic groups. Further, to our knowledge no studies have examined the correlates of obesity in this population, including the potential impact of psychiatric symptoms (e.g., depression, anxiety). Therefore, the aims of this study were to (i) describe the prevalence of obesity among NHOPIs separate from Asian Americans and European Americans, and (ii) examine the association of health status, health behaviors, psychiatric symptoms, as well as substance misuse and obesity among an ethno-racially diverse, rural population of young adults in Hawaii.

METHODS

Participants

Participants were 614 undergraduate students enrolled in introductory psychology classes. For a detailed description of the total sample, see
Anxiety symptoms were assessed using three stem questions: Anxiety. bach's defined as an affirmative answer to any 6 of the 10 questions. Cronbach's α for this sample was 0.88.

Substance abuse and dependence. Substance abuse was assessed using five questions based on the Diagnostic and Statistical Manual of Mental Disorders-IV-TR criteria for alcohol/substance abuse. Probable alcohol/substance abuse was defined as an affirmative response to any one of the five questions.

Data analysis
Summary statistics were calculated in terms of means and standard deviations for continuous variables and in terms of frequencies and proportions for categorical variables. Summary statistics were presented to describe the study sample's weight/BMI/obesity status, health status, and psychiatric status. Stepwise logistic regression was performed to determine which variables were significantly associated with obesity and to determine odds ratios. Potential predictors included demographics (age, gender, race/ethnicity, family income), health status, and probable mental health diagnoses (depression, PTSD, anxiety, and substance abuse).

RESULTS
Overall, 30.7% of NHOPIs were obese as compared with 10.6% of Asian Americans and 9.2% of European Americans (see Table 1 for details). Forward logistic regression results indicate that the overall model of five predictors (gender, race/ethnicity, regular exercise, difficulty sleeping, and anxiety) was significantly associated with obesity (−2 log likelihood = 246.159 \( \chi^2 \) (6) = 90.91, \( P < 0.001 \)). Having lived on the Big Island of Hawaii for most of their lives (0 = no, 1 = yes) was included as a covariate in the full model. Because of the known independent associations between race/ethnicity as well as psychiatric comorbidity and obesity, interactions between race/ethnicity and psychiatric comorbidity were also examined. Statistical significance was set at \( P = 0.05 \).

Table 1 Descriptive findings by race/ethnicity (M ± SD)

| Race/Ethnicity | Men (M ± SD) | Women (M ± SD) | Total (M ± SD) |
|----------------|-------------|----------------|---------------|
| Asian American (n = 160) | 69.34 (12.09) | 56.19 (11.00) | 60.88 (13.00) |
| European American (n = 141) | 76.50 (12.73) | 61.33 (10.41) | 66.81 (13.43) |
| Native Hawaiian/Pacific Islander (n = 101) | 80.68 (19.16) | 68.30 (21.28) | 71.39 (21.36) |
| Weight (kg) | 23.45 (3.94) | 22.65 (3.85) | 22.94 (3.89) |
| BMI | 23.64 (3.78) | 22.38 (3.63) | 22.84 (3.72) |
| Obese (%) | 10.5 (21.51) | 10.7 (7.79) | 10.6 (7.74) |
| Exercising regularly (%) | 70.2 (21.1) | 44.7 (34.3) | 53.8 (29.6) |
| Difficulty sleeping (%) | 51.0 (21.1) | 70.0 (34.3) | 63.1 (29.6) |
| Anxiety concerns (%) | 48.2 (10.5) | 58.0 (10.7) | 54.5 (10.6) |
| Depression. Depression was assessed by the Center of Epidemiological Studies Depression Scale (11). Participants with a score ≥16 were classified as having probable depression. Cronbach’s α for this sample was 0.88.

Procedures
Participants were recruited through the human subjects’ pool in the Psychology Department of the University of Hawaii at Hilo for course credit and asked to fill out a questionnaire packet that took ~15-30 min to complete. The University of Hawaii institutional review board approved all study procedures.

Measures
Obesity. Based on self-reported weight and height, BMI (pounds/height in inches² × 703) was calculated for each participant. Obesity (yes = 1, no = 0) was defined as BMI ≥30.

Health status questions. Participants were asked about their medical history and presence of chronic health conditions. Dichotomous responses (yes or no) were asked of participants regarding whether they (i) exercised on a regular basis, (ii) frequently had difficulty sleeping at night, (iii) used any tobacco product on a regular basis, (iv) visited a doctor in the past 12 months.

PTSD. Posttraumatic stress disorder (PTSD) was assessed by a 10-item Trauma Screening Questionnaire, a screening instrument with a yes/no response format based on Diagnostic and Statistical Manual of Mental Disorders-IV diagnostic criteria of PTSD symptoms experienced at least twice in the past week (9). The presence of PTSD was defined as an affirmative answer to any 6 of the 10 questions. Cronbach’s α for this sample was 0.85.

Anxiety. Anxiety symptoms were assessed using three stem questions from the MINI International Neuropsychiatric Interview (10) corresponding to generalized anxiety disorder, panic or social anxiety, respectively. Participants who endorsed symptoms consistent with any of the three anxiety disorders were classified as having a probable anxiety disorder.

Anxiety concerns (%) 48.2 58.0 54.5 62.2 60.8

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Substance abuse and dependence. Substance abuse was assessed using five questions based on the Diagnostic and Statistical Manual of Mental Disorders-IV-TR criteria for alcohol/substance abuse. Probable alcohol/substance abuse was defined as an affirmative response to any one of the five questions (12).
The model correctly classified 84.2% of cases. Male gender (odds ratio (OR) = 2.7 vs. female) and NHOPI (OR = 5.88 vs. European American) was associated with higher likelihood of being obese. Anxiety (OR = 2.03 vs. none, \( P = 0.052 \)) was marginally associated with being obese. Participants who reported having difficulty sleeping at night were more likely to be obese (OR = 3.52 vs. no sleep problems) while those who reported exercising on a regular basis were significantly less likely to be obese (OR = 0.34 vs. no exercise).

**DISCUSSION**

To our knowledge, this study is among the first to investigate the prevalence and correlates of obesity among an ethno-racially diverse sample of young adults in rural Hawaii, who represent a medically underserved and understudied group. Overall, 30.7% of NHOPIs were obese as compared with 10.6% of Asian Americans and 9.2% of European Americans. Results revealed that males, individuals of NHOPI descent, and sleep difficulties were associated with increased risk of obesity. However, exercise emerged as a protective factor: participants who reported exercising in regular exercise were at decreased risk.

One of this study's most significant findings is that although NHOPIs exhibited higher rates of obesity compared with European Americans, obesity was not associated with psychiatric comorbidity (i.e., depression, anxiety, PTSD, and substance use/dependence) either independently for the sample as a whole or uniquely by race/ethnicity. In contrast, research using predominantly European-American samples has demonstrated a link between depressive symptoms and being overweight/obese (13). Cultural influences may help to explain this apparent disparity. Pacific Islanders report greater acceptance and idealization of larger body types (which are associated with strength, attractiveness, and fitness) and lower levels of body image dissatisfaction (14,15). For example, among obese Samoan men, a significant number actually report wanting to be larger (14). Research also suggests that the strong cultural emphasis on food and social relationships in NHOPI communities may prevail over weight concerns (14).

Although a multitude of factors likely contribute to the higher rates of obesity observed among NHOPIs, it is important to consider the Hawaiian culture and environment. The traditional Hawaiian diet is calorically dense, placing high emphasis on starchy vegetables (e.g., yam, taro, banana), and many NHOPIs have embraced the American mainland diet of processed foods and meals high in refined grains. NHOPIs residing in rural areas also face unique challenges. Rural communities have fewer economic resources and may lack access to preventive health-care programs and safe spaces for recreation and physical activity. Genetic predisposition may place NHOPIs at further increased risk for obesity and central adiposity (16).

The observed relationship between sleep and obesity in this ethno-racially diverse, young adult sample is consistent with longitudinal, epidemiologic studies of the general population that have found sleep duration of <7 h to be associated with obesity (17). Additionally, results from State of Hawaii Behavior Risk Factor Surveillance data (18) are also consistent with the general US population in noting that poor sleep increases the odds of experiencing myriad chronic medical conditions and poor health behaviors (e.g., heart attack, stroke, asthma, arthritis, cancer, hypertension, high cholesterol, and smoking). Though causality cannot be determined, future efforts directed at identifying and treating sleep disturbance may help to reduce the risk of obesity and other chronic medical conditions.

The major limitation of this study is its cross-sectional design, which does not allow for examination of causal relationships. A second limitation is the self-report nature of the questionnaires and consequent susceptibility to recall bias. Additionally, the predominantly female, relatively young, college-enrolled study sample may not generalize to the larger Hawaiian population as a whole. However, identifying the characteristics of this unique subsample of an at-risk population could inform primary and secondary prevention efforts, e.g., college-based weight-management resources, health screening fairs, and culturally informed/gender-specific interventions. The study's considerable strengths include use of a large sample and examination of NHOPIs as a unique subgroup within an ethno-racially diverse sample.

Reducing health disparities among racial/ethnic minority populations remains an important treatment priority. To this end, future studies might investigate the impact of acculturation on dietary and physical activity patterns among young adults of NHOPI descent.

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**DISCLOSURE**

The authors declared no conflict of interest.

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