The Relationship Between Ethnicity and Obesity in Asian and Pacific Islander Populations: A Literature Review

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The purpose of this literature review is to explore the potential relationship between ethnicity and obesity, and obesity-related risks, with a particular emphasis on disparities between Asian and Pacific Islander populations. We conducted a comprehensive search of available medical literature related to the rise of obesity in the United States, factors contributing to obesity, evidence-based clinical guidelines, and obesity and related risks as they occur in Hawaii. In conducting this search, we sought to illuminate obesity rates in Asians and Pacific Islanders in connection with various factors, such as diet and lifestyle, acculturation, and body image, as they occur in diverse cultural contexts. We found that the rates of obesity and related risks were highest in Native Hawaiians and Samoans. Based upon our review of the literature, we conclude that further research is necessary to address the relationship between ethnicity and obesity risk factors in Asian and Pacific Islander populations. (*Ethn Dis*. 2004;14:111–118)

Key Words: Asians and Pacific Islanders, Obesity, Related Risks, Ethnicity, Acculturation

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Introduction

This review seeks to explore the potential relationship between ethnicity and obesity, and obesity-related risks, with a particular emphasis on disparities between Asian and Pacific Islander populations. After providing an overview on the rise of obesity in the United States, this paper will review literature related to the disease's contributing factors, evidence-based clinical guidelines, and obesity as it occurs in Hawaii. We then seek to illuminate obesity rates in Asians and Pacific Islanders, in connection with various factors, such as diet and lifestyle, acculturation, and body image, as they occur in diverse cultural contexts.

We conclude that a relationship between ethnicity and obesity risk factors does, in fact, exist. We believe that further research is necessary, particularly among Asian and Pacific Islander populations, to better characterize the extent of obesity-related variations between these ethnic groups. Such research will be vital to the development and implementation of effective interventions designed to reduce obesity-related disparities, and to improve clinical outcomes in at-risk racial and ethnic minorities.

Obesity in the United States

With a reduction in the prevalence of other diseases due to an increase in smoking, obesity may soon become the leading cause of preventable disease and deaths in the United States. Consequently, the US Surgeon General recently issued a "call to action," advocating a national effort to identify the root causes of obesity, and to outline effective and culturally appropriate interventions.[1] The Surgeon General noted that causes of obesity may vary according to race, ethnicity, gender, and socioeconomic status. Many obesity-related risk factors are over-represented in minority populations, and research designed to explore obesity and its related risks could lead to interventions that would significantly reduce the burden of disease on minorities.

Innovative strategies to reduce obesity prevalence rates, particularly among minority populations who suffer a vast range of health risks leading to disparities in health outcomes, are sorely needed. In 2000, the US government spent an estimated $117 billion, nearly 10% of the US healthcare expenditure for that year, on obesity and weight problems.[2] People with a body mass index (BMI) of 30 or greater are considered clinically obese; those with BMIs between 25 and 29 are considered "overweight." Obesity is linked to numerous health risks, including coronary artery disease, hypertension, dyslipidemia, diabetes mellitus, stroke, gallbladder disease, osteoarthritis, sleep apnea, and respiratory problems, as well as endometrial, breast, prostate, and colon cancers.[3,4] Studies also correlate obesity with pregnancy complications, menstrual irregularities, hirsutism, stress, incontinence, and psychological disorders.[4] Among children, obesity heightens the risk of hyperlipidemia, hypertension, and impaired glucose tolerance.[5,6]

Chronic obesity requires greater cardiac expenditure to supply blood to pe-

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ripheral tissues. As a result, risk for stroke and heart rate increase, and the left ventricular mass becomes enlarged, heightening the risk of electrical abnormalities, heart failure, and sudden death.[7] In addition, obesity-associated insulin resistance predisposes those who exhibit it to diabetes.[8] Indeed, mortality rates increase sharply in people with BMIs greater than 30.[9,10]

The third National Health and Nutrition Examination Survey (NHANES III), conducted from 1988–1994, examined the rates of obesity among non-Hispanic Whites, non-Hispanic Blacks, and Mexican Americans, and reported that 50.7% of women, and 59.4% of men, were overweight or obese.[11] These percentages, which represent nearly 97 million adults, reveal a significant rise in overweight and obesity rates over the last three decades. Compared to a less than 1% increase between the 1971–1974 and 1976–1980 NHANES surveys, overweight and obesity rates rose by nearly 8% during the time between the 1976–1980 and the 1988–1994 surveys.[11–13] NHANES data from 1988–1994, and from 1999–2000, suggest a continuation of this alarming trend; overweight prevalence increased from 55.9% to 64.5%, respectively, and obesity rates rose from 22.9% to 30.5%, respectively.[13] During this same time period, the percentage of the population considered to be morbidly obese (BMI = 40) rose from 2.9% to 4.7%.

According to the NHANES surveys, escalation of overweight and obesity rates is occurring among men and women, across ethnicities (non-Hispanic Whites, non-Hispanic Blacks, and Mexican Americans), and in all age groups, including children and adolescents. Comparing data from the 1988–1994 and 1999–2000 NHANES surveys, percentages of overweight children increased from 7.2% to 10.4%, respectively, among those aged 2 through 5 years, from 11.3% to 15.3%, respectively, among 6- to 11-year-olds, and from 10.5% to 15.5%, respectively, among those aged 12 through 19 years.[14]

The prevalence of overweight and obesity rates in racial and ethnic groups not adequately represented in the NHANES surveys are estimated from smaller, less representative samples. For example, limited evidence suggests that it is less common for Asians to be overweight or obese.[15] On the other hand, native populations such as the Pima Indians and Pacific Islanders demonstrate high rates of obesity; in fact, in some settings, 40% to 70% are clinically obese.[16–19] To supplement the NHANES surveys, further studies are needed in disaggregated Asian and Pacific Islander populations to determine obesity prevalence rates, to ascertain the presence of co-morbid conditions, and to test the effectiveness of culturally appropriate interventions.

Factors that Contribute to Obesity

In 1998, more than half of Americans attempted to lose weight, spending over $33 billion on services and products.[20] Despite their efforts, however, 95% of individuals tend to regain lost weight within 7 years.[21] In spite of public and private expenditures, and existing treatment guidelines to promote appropriate interventions, various factors contribute to the steady rise in obesity rates in America, including dietary patterns, lack of exercise, lack of awareness of obesity and its related risks, and genetic susceptibility.

The per capita caloric intake in the United States increased from 3300 calories per day in 1970 to 3800 per day in the late 1990s.[22] In addition, fast food chains aggressively market foods that are high in fat and calories, and low in nutrients. Sixty percent of American adults are not regularly active; 25% are considered sedentary.[1] Children and adolescents also succumb to pressure to consume foods that lead to weight gain. Half the calories in children's diets stem from added fat and sugar,[23] frequently resulting in energy intake that exceeds expenditure. Most school vending machines sell highly caloric soft drinks, along with snacks with high fat and sugar content.[24] The total and saturated fat content of school meals commonly exceeds recommended limits.[25] For many children and adolescents, lack of dietary supervision at home can increase the difficulty of maintaining a healthy weight.[26] Moreover, many children do not engage in regular physical exercise, and, unfortunately, the prevalence of physical education classes in schools has declined from 42% in 1991 to 25% in 1995.[1]

Many overweight or obese persons fail to recognize health risks related to excess weight. In a recent US survey, where two thirds of participants were overweight, and one-third were obese, 78% were not seriously concerned about their weight.[27] Many physicians may also under-recognize or under-treat obesity, and minimal insurance reimbursement for obesity treatments can compound the problem.[21,28] A study of reimbursement for pediatric obesity reported that only 11% of treatments were reimbursed.[29] Patients and physicians often exhibit pessimistic attitudes about treatment outcomes, creating an additional barrier to achieving a healthy weight.[30,31]

In addition to the above factors, genetics may play a role in obesity and its related risks. Obesity is genetically complex. Multiple genes may be implicated, and contributing genes may interact with other genes and/or environmental factors such as diet and physical activity. Variance in obesity rates between racial

and ethnic groups may stem, in part, from genetic susceptibility. Evidence suggests that genetics may account for 25% to 70% of variations in BMI.[32,33]

The hormone leptin is the most researched genetic factor in obesity. Leptin is secreted by adipocytes. Circulating leptin levels correlate with the lipid content of a non-fasting person.[34,35] For some children, insufficient leptin levels result in severe obesity, and treatment with recombinant leptin can lead to dramatic weight loss.[36] Genes currently under investigation include those that regulate appetite,[37,38] determine the number of adipocytes available to store fat,[39] influence differences in resting energy exposure,[40] affect insulin resistance,[41] stimulate growth hormone release,[42,43] and regulate energy expenditure through protein uncoupling due to oxidative phosphorylation.[44] Further investigation of diet, lifestyle, genes, and other factors will be crucial to identifying and evaluating the role of ethnicity in obesity.

Evidence-Based Clinical Guidelines

The National Institutes of Health (NIH) recently formed an expert panel that issued evidence-based guidelines for treating obesity.[4] The NIH panel offered treatment recommendations based upon a review of more than 300 randomized clinical trials, concluding that caloric consumption between 1,000 to 1,200 kilocalories per day can lead to an 8% average reduction of total body weight over 3 to 12 months. Even short-term weight loss of 5%–10% improves glycemic control, blood pressure, and lipid profiles.[45] Nevertheless, obesity may best be viewed as a chronic disease, requiring long-term treatment strategies, and the panel noted that social and cultural factors should be taken into consideration in the development of effective research and weight management programs. For example, attitudes toward food and body mass vary across cultures.[46] The NIH panel noted the absence of systematic studies on obesity treatments in diverse populations.

Behavioral and nutritional therapies were reported to improve weight loss, while pharmacological or surgical approaches may be more effective for some patients. Medications approved in the United States either suppress appetite or decrease nutrient absorption,[45] and short-term benefits of these have been documented. In some cases, bariatric surgery, which enables the patient to experience early satiation, can be effective on a long-term basis. In spite of evidence-based clinical guidelines and effective available treatment, the rise in obesity rates persists on a national scale.

Obesity in Hawaii

Research efforts in Hawaii could provide exemplary models for national efforts to assess the relationship between ethnicity and obesity. Hawaii offers an ideal setting for obesity-related research, particularly given the high rates of obesity in Hawaii's diverse population. More than 75% of Pacific Islanders (including Native Hawaiians and Samoans) in Hawaii are overweight or obese, compared to 52% of Caucasians, 46% of Japanese, and 45% of Filipinos.[47] Asians and Pacific Islanders are growing segments of the US population, increasing from 1.5 million in 1970 to 3.7 million in 1980, and to 7.3 million in 1990.[8] According to the 2000 US. Census, Asians (alone, or in combination with other races) number 11.9 million, while Native Hawaiians and other Pacific Islanders number 800,000 (alone, or in combination with other races). These significant findings illustrate the need for further research in Asian and Pacific Islander populations.

OBESITY AND "WESTERNIZATION" IN ASIANS AND PACIFIC ISLANDERS

One interesting phenomenon is the acculturation process as it relates to obesity and related risk patterns in populations who have immigrated to Hawaii and adopted more "Western," or "modern," behaviors. For example, the BMIs of immigrants from South and East Asia, as well as from Polynesia, are generally higher than those of their counterparts in their countries of origin. In addition, immigrants from East Asia, at lower BMIs, are exhibiting an increasing incidence of obesity-related diseases.[15,48–50] These variances may be due, in large part, to dietary changes that occur as part of the acculturation process. In more Westernized settings, where processed foods high in sugar, fat, and calories are more available, and more commonly integrated into daily diet, consumption of such foods may lead to an increased risk of obesity and associated diseases.

Fast food, in particular, is often integrated into dietary patterns in modern settings such as Hawaii, and fast food chains even incorporate high caloric versions of regional foods. For example, in Hawaii, McDonald's features Portuguese sausage, along with the regular burgers and French fries. Convenience stores, such as 7-11, sell hot dogs and spam musubi (rice blocks topped with sliced spam and wrapped in seaweed), as well as pork and beef manapua (puffed dough balls stuffed with meat). Zippy's, a local fast food chain, offers meals such as spaghetti and meatballs, as well as local dishes like "loco moco" (two scoops of rice, a large burger, a fried egg, and brown beef gravy). The availability of a variety of local and national fast food, which is consumed by diverse ethnic groups in Hawaii, is a likely contributor to obesity-related risks.

The adverse effects of Westernization have been suggested by studies pertaining to Asian immigrants. Compared to those living in the country of origin, immigrants to the United States are at greater risk for coronary artery disease, diabetes, and breast and colon cancers.[51–54] Risk factors for, and incidence of, major chronic disease increase with

Westernization. Mean levels of serum cholesterol, serum triglyceride, and triglyceride are higher among Asians in the United States, and hypertension occurs more frequently.[55] Risk factors, however, can vary by Asian ethnicity. Filipinos, for example, may be especially prone to hypertension.[15]

As they become acculturated, Asian immigrants tend to be less physically active and consume more Westernized diets. A study of Japanese-American men in Seattle, for instance, showed their mean intake of fat (32.4 g) to be twice that of men in Japan (16.7 g).[8,56] A comparison of second and third generation Japanese Americans in Los Angeles revealed that the third generation dined out more often and consumed more takeout food and salty snacks, compared to the second generation.[57] Another study demonstrated that Japanese living in Hawaii ate more animal fat and simple carbohydrates, and fewer complex carbohydrates, compared to their counterparts in Japan.[58] Similarly, a comparison of Chinese in the United States and China found that those living in the United States engaged in less physical activity, got fewer calories from carbohydrates, and more calories from fat, and consumed more red meat and less fruit.[49]

The negative health consequences of increased BMIs for Asians may be greater than for Whites of European descent. One Hawaii study reported that BMIs were higher among Japanese in Hawaii than in Japan, even with similar total caloric intake.[48] At a given BMI, Asians may be more prone to central (visceral) adiposity, increasing their risk of obesity-related diseases beyond that expected, based on their BMIs.[59–61] Asians may also tend to accumulate subscapular fat more easily. For example, a study of young adult women in Hawaii reported that Asian women had greater subscapular skin-fold thickness than Whites at similar BMIs, as well as a greater percentage of body fat.[62] Subscapular skinfold thickness strongly correlated with diastolic blood pressure, suggesting further obesity-related risks.

As illustrated by several studies among Japanese Americans, increases in adiposity and BMI due to Westernization may be associated with a higher risk of diabetes among Asians living in the United States. The risk of diabetes in Japanese Americans is about twice that of Japanese living in Japan.[50,59] Incident studies of non-insulin-dependent diabetes mellitus show increased risks at BMIs of 25 to 29, below the clinical obesity definition set forth by the National Heart, Lung, and Blood Institute. In addition, risks for Japanese Americans with impaired glucose tolerance increase sharply at BMIs of 23 or higher.[50] Over one third of the Japanese participants in one study had impaired glucose tolerance, likely due to a high prevalence of insulin resistance.[63,64] Asians demonstrate a greater prevalence of insulin resistance compared to non-Hispanic Whites, despite having lower average BMIs and waist-to-hip ratios.[65] The above findings suggest that guidelines based upon studies conducted in other ethnic populations may not be suitable for Asians.

As with Asian migrant populations, there appears to be a connection between Westernization and obesity in Pacific Islanders. For example, comparisons between traditional Western Samoa and modern American Samoa demonstrate marked differences in dietary patterns that are linked to increased cardiovascular disease prevalence.[66] Increases in cardiovascular disease rates in Samoa appear to correlate with modernization of diet and lifestyle; high levels of social support, parental ties, and knowledge of Samoan culture are associated with low blood pressure, while factors related to modernization are associated with higher blood pressure levels.[67] Specifically, the percentage of overweight Samoan women dramatically appears to increase from 46%, for those living in Western Samoa, to 80%, for those who have migrated to Hawaii.

Body Image Among Pacific Islanders

Modernization has perhaps had less of an effect on body image than on diet and lifestyle. In many traditional Polynesian societies, even after Western contact, a very large body was a sign of wealth, royalty, status, and prestige.[68] For example, many Hawaiian monarchs demonstrated their noble stature through their robust physical image. Although the idealization of a large body frame with abundant energy stores may be shifting to a more modern context, particularly in Hawaii, traditional cultural images often still influence body self-image. This idealization may linger as a means of perpetuating Hawaiian culture.[69,70] A recent study found that Pacific Islanders in Hawaii view body image differently, according to whether they identify with a Western, or a non-Western, culture.[71] Acceptance of larger body types also seems to persist among Native Hawaiians when compared to Whites and Asian Americans living in rural Hawaii.[72]

Similarly, a study in Australia showed that although overweight Samoan women were concerned about body fatness, they were less preoccupied by their concerns than their Australian counterparts. Overweight Samoan women felt stronger and more fit and attractive than did Australian women of comparable weight.[69] Another study in New Zealand found that although the ideal body type was slim, overweight Samoans did not view themselves as overweight as often as their Western counterparts, and Samoan women did not share strong negative views of obesity.[70] In spite of modern influences on traditional preferences for a large body size, obesity rates tend to increase in Samoan men along with modernity of residence or occupation.[73] Ironically, as many modernized Pacific Islanders achieve the prized large body, this ideal is being discarded in favor of more slender body images. Study of the tensions between traditional and modern diet, lifestyle,

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and body image, as these tensions manifest in obesity and related risks, will be an important component of studies designed to address the relationship between ethnicity and obesity.

Obesity and Related Risks in Native Hawaiians and Samoans

Obesity and associated diseases occur in alarming rates among Pacific Islanders. The mean BMI of Native Hawaiians is 31.0. Interestingly, BMI increases in relation to percentage of Native Hawaiian ancestry, suggesting a genetic connection between ethnicity and body weight.[19,74] Samoans also demonstrate high obesity rates. The mean BMI for Samoans aged 25–54 years is 30–32 for males, and 32–36 for females.[17] While genetic factors may be significant, diet and lifestyle also play a prominent role in the development of obesity and its associated risks in Native Hawaiians and Samoans. For example, a recent comparison of diet among women of different ethnic groups demonstrated that Hawaiian women tended to follow a meat-based diet, which associated with higher BMI, while Japanese and Chinese women followed a bean- or soy-based diet, which correlated to lower BMI.[75]

Compared to other ethnic groups in Hawaii, Native Hawaiians suffer disproportionately from obesity-related diseases, particularly diabetes and cardiovascular disease. Among adult Hawaiians aged 30 and over, the prevalence of diabetes is about 20%, approximately 3 times the national rate.[76] Further, Native Hawaiians die of diabetes at a rate of 117 per 100,000, compared to the average rate of 53 per 100,000 for other ethnic groups.[77] Native Hawaiians may be genetically susceptible to diabetes, as well as to obesity; increased Hawaiian blood quantum is associated with higher fasting glucose levels.[78] Interestingly, though, the risk of diabetes has not been shown to diminish with a decreased percentage of Hawaiian ancestry. This finding may be due to inaccurate ethnic self-reporting, or to mixed ancestry that includes other ethnic groups with high diabetes rates.

Among part-Hawaiian children, the prevalence of Type 1 diabetes is 2.5 times higher than in White children, and ten times higher than in Japanese children.[79] Another consequence of childhood obesity for females is early menarche, which is associated with breast cancer later in life.[80] Native Hawaiian girls report menarche at a significantly lower age than non-Hawaiians.[81]

Cardiovascular risk factors also occur in high rates in Native Hawaiians. A study of Native Hawaiians living in an isolated community (Molokai Island) reported that 14% of those aged 20–39 years, and 36% of those aged 40–59 years, had either high blood pressure (systolic blood pressure greater than 140 mm Hg,and/or diastolic pressure greater than 90 mm Hg), or were taking antihypertensive medications.[74,82] Hypertension, the presence of which was usually known to the participant, was frequently uncontrolled. In the Molokai Island population, 8% of those aged 20–29 years, and 46% of those aged 50–59 years, experienced elevated serum cholesterol levels (6.2 mmol/L or greater).[82] The risk factors related to obesity that occur in Native Hawaiians and other Pacific Islanders contribute to significant health disparities.

Research indicates that risk factors identified based on standard clinical criteria in limited study sets for obesity are not appropriate for all ethnic groups, or study populations. This is particularly critical to obesity research in Hawaii, where most of the population represents an ethnic minority. Experts from Asia and the Pacific recently met to discuss definitions of overweight and obesity in diverse populations, and concluded that criteria for Asians and Pacific Islanders must reflect anthropometric trends in order to accurately assess risks associated with being overweight or obese.[83] In addition to population-specific criteria for determining overweight and obesity, Asian and Pacific Islander populations may require population-specific dietary and physical activity guidelines,[8] all of which could be explored through studies implemented in Hawaii.

Efforts to Address Obesity Among Native Hawaiians

A few programs have already been implemented in response to high rates of obesity and associated diseases in Native Hawaiian populations, in particular. The Waianae Diet Program, for example, is a community-based program that incorporates traditional Hawaiian diet and cultural teachings and has demonstrated positive effects.[84,85] Another effort, the Uli'eo Koa Program, consists of a pilot study to assess the effects of a traditional Hawaiian diet on moderately active, non-obese Native Hawaiian adults, focusing particularly on wellness and physical fitness related to the diet.[86] An innovative approach, the Uli'eo Koa Program seeks to reproduce the holistic practices of ancient Hawaiian warriors, including diet, traditional fighting arts, and massage, and has combined them to create a culturally rich health education program.[87] Population-specific research will lend further support to programs like these, which are designed to address the particular needs of Asian and Pacific Islander populations.

CONCLUSION

As demonstrated by the above studies, at least some correlation exists be-

tween ethnicity and obesity, particularly in connection with genetic variance and lifestyle factors. Based upon our review of the scientific literature, we conclude that sufficient evidence exists to justify further research among Native Hawaiians, Samoans, and other subpopulations, including other Pacific Islanders, Filipinos, and diverse Asian groups. Such research will be vital to illuminating the extent of obesity-related disparities between ethnic groups, and to developing effective, culturally appropriate prevention and intervention strategies for obesity and its associated diseases.

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