

Patient Characteristics, Health Status, and Health-related Behaviors Associated with Obesity

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Abstract

The objective of this study was to identify factors associated with obesity and to examine the health habits of the obese and non-obese. In this study of over 44,000 insured individuals, obesity rates increased with age until age 65 and were highest among members of Samoan ancestry. Because the causes of obesity are multi-faceted, treatment approaches may need to address diet, exercise, pharmacotherapy, and management of comorbid conditions.

Introduction

Obesity, a complex, multi-faceted condition involving environmental, genetic, behavioral and psychological components, has been increasing in every state in the United States. According to self-reported height and weight information, in 2001, 20.9 percent of U.S. adults were obese (body mass index (BMI) ≥ 30), compared to 11.6 percent in 1990.¹ Although obesity rates were somewhat lower in Hawaii, a similar trend was observed, with prevalence climbing from 9.1 percent in 1990 to 17.6 percent in 2001.²

Obesity is the second leading cause of preventable death in the United States, resulting in approximately 300,000 excess deaths each year.³ Obesity is also significantly associated with a number of co-morbid conditions. Adults with a BMI > 40 (class 2 obesity) had an odds ratio of 7.4 for diagnosed diabetes, 6.4 for high blood pressure, 1.9 for high cholesterol, 2.7 for asthma, 4.4 for arthritis, and 4.2 for fair or poor health.^{2,4}

Obesity and its associated health conditions contributed approximately \$117 billion in healthcare costs in 2000 for American adults, compared to \$99 billion in 1995, with a majority of the costs stemming from type 2 diabetes, coronary heart disease, and hypertension.^{5,6}

Ethnic, gender, and age disparities in the prevalence of obesity have been observed at the national level, with obesity being more common among African American and Mexican American women than among Caucasian women.⁷ The goals of this study were to identify disparities in the prevalence of obesity associated with age, gender, education level, and ethnicity in an insured population in Hawaii and to examine

the association between obesity, health status, and health-related behaviors.

Methodology

Study population

The study population was comprised of 44,528 members enrolled in a Health Maintenance Organization (HMO (n=6,746)), a Fee-For-Service Organization (FFS (n=31,532)) or a Medicare cost contract (n=6,250) of a single health insurer, who responded to a 2002 member satisfaction survey. Of the 54,669 members who responded to the survey, 10,141 were excluded because they did not supply height and weight information. The survey was administered between May and July of 2002 and had an overall response rate of 45.3 percent. Females were more likely to respond than males (47% vs. 43%, respectively, $p < 0.001$) and the mean age of respondents was older than that of non-respondents [59.6 vs. 50.7, respectively, $p < 0.001$].

Measurement

Body mass index was calculated from the self-reported height and weight data. An individual with a body mass index of greater than 29.9 was categorized as obese. This cut-off point is consistent with the National Heart Lung and Blood Institute's Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults.⁴

The survey also asked members to self-report ethnicity, education, health-related behaviors, and health status. For ethnicity, members were asked to check all that apply from a list of 19 ethnic groups (Table 1). These categories were chosen to be consistent with the Hawaii Department of Health's Hawaii Health Surveillance Program. In most cases, members who marked more than one race or ethnicity were categorized as 'mixed.' The exceptions were that any member who marked Hawaiian was classified as Hawaiian and any members who marked both Portuguese and white or Puerto Rican and white were considered Portuguese and Puerto Rican, respectively. Hence, the 'mixed' category is actually 'mixed, non-Hawaiian'. Data were displayed for the 10 largest categories: Japanese

(n=16,705), white (n=7846), Part Hawaiian (n=5466), Filipino (n=4271), mixed (n=3900), Chinese (n=2966), Portuguese (n=1138), Korean (n=417), Puerto Rican (n=214), and Samoan (n=82).

Additional survey items asked about fruit and vegetable consumption and exercise (Table 1), and the impact of physician counseling. Health status was assessed using the Medical Outcome Study Short-Form 12 (SF-12).⁸ Physical and mental health status summary scores were calculated from the SF-12 items.

Statistical analyses

For categorical variables, Pearson's χ^2 tests were used to compare the relation between demographic characteristics and obesity. For continuous variables, including physical and mental health scores, analysis of variance was used to determine whether there were significant differences related to obesity. Logistic regression was used to estimate the odds ratios of obesity for Japanese, Chinese, Filipino, Portuguese, Puerto Rican, Samoan, Korean, Hawaiian members, and members of mixed race or ethnicity, compared to whites. These analyses adjusted for age, gender, type of health plan, and education. T-tests were used to determine whether fruit and vegetable consumption and exercise differed for obese and non-obese members across all sub-groups defined by patient characteristics. All analyses were conducted in Stata V.7 (College Station, TX).

Results

Characteristics of the Study Population

Two percent of respondents were aged 18 to 24, 6.4 percent were aged 25 to 34, 12.1 percent were aged 35 to 44, 19.5 percent were aged 45 to 54, 20.3 percent were aged 55 to 64, and 39.6 percent were aged 65 and older. A total of 63 percent were female, and 86 percent had at least a high school education. The majority of members (70.8 percent) were enrolled in the FFS plan, 15.2 were enrolled in the Medicare cost contract, and 14.0 percent were enrolled in the

HMO. Overall, 17.6 percent were white, 2.6 percent were Portuguese, 0.5 percent were Puerto Rican, 6.7 percent were Chinese, 9.6 percent were Filipino, 37.5 percent were Japanese, 1.6 percent were Korean, 12.3 percent were Hawaiian, 0.2 percent were Samoan, and 8.8 percent were mixed. In response to the overall health status item, 2.4 percent reported poor health, 14.6 percent reported fair health, 40.2 percent reported good health, 33.1 percent reported very good health, and 9.7 percent reported excellent health.

Patient Characteristics and Obesity

The overall obesity rate was 15.9 percent. Obesity varied by ethnic group (Figure 1). Compared to whites, Samoans, Hawaiians, Puerto Ricans, Portuguese, and individuals of mixed ethnicity were significantly more likely to be obese, while Asians (Koreans, Japanese, Filipinos, and Chinese) were significantly less likely. These ethnic disparities were consistent across gender.

After adjustment for other patient characteristics, obesity increased with age until age 64, after which the likelihood of obesity decreased (Table 2). Similarly, the likelihood of obesity was highest for members with mid-level education and some college relative to members with less than an 8th grade education. Females were significantly less likely to be obese than males. Type of coverage was not significantly associated with obesity.

Health-Related Behaviors

Rates of exercise (mean=2.6 times per week, SD 1.7) and fruit and vegetable consumption (mean=2.5 servings per day, SD 1.3) were below recommended levels (Table 3). Across all of the sub-groups defined by patient characteristics, non-obese members consumed more fruits and vegetables (0.1-0.4 more servings per day) and exercised more (0.4-0.7 more times per week) than obese members. Age was significantly associated with increased consumption of fruits and vegetables and increased exercise. Men tended to eat fewer fruits and vegetables than women, but exercised

Table 1.— Survey item content

Item	Response set
Member ethnicity (Please select ALL that apply to you)	Caucasian, African American, Mexican, Puerto Rican, Cuban, American Indian, Portuguese, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander, Other
How many servings of fruits or vegetables do you eat in a day?	0; 1; 2; 3; 4; 5 or more
How many times a week do you exercise for at least 30 minutes?	0; 1; 2; 3; 4; 5 or more
Which of the following has your doctor ever talked to you about?	Diet; exercise; smoking
Which of the following have you ever done because of your doctor's advice?	Changed your diet in any way; done more exercise; tried to cut down or quit smoking
Your height	___ Feet ___ inches
Your weight	___ lbs

Figure 1.— Odds ratio of obesity among adult health plan members in 2002 related to ethnicity, adjusted. All odds ratios are relative to non-Portuguese, non-Puerto Rican whites (n=7846) and adjusted for age, gender, education level, and type of coverage. All differences are statistically significant at the 0.05 level. The category 'Hawaiian' includes part-Hawaiian. Members that marked both Portuguese and white or Puerto Rican and white were considered Portuguese or Puerto Rican, respectively. All others who marked more than one group were categorized as 'mixed'.

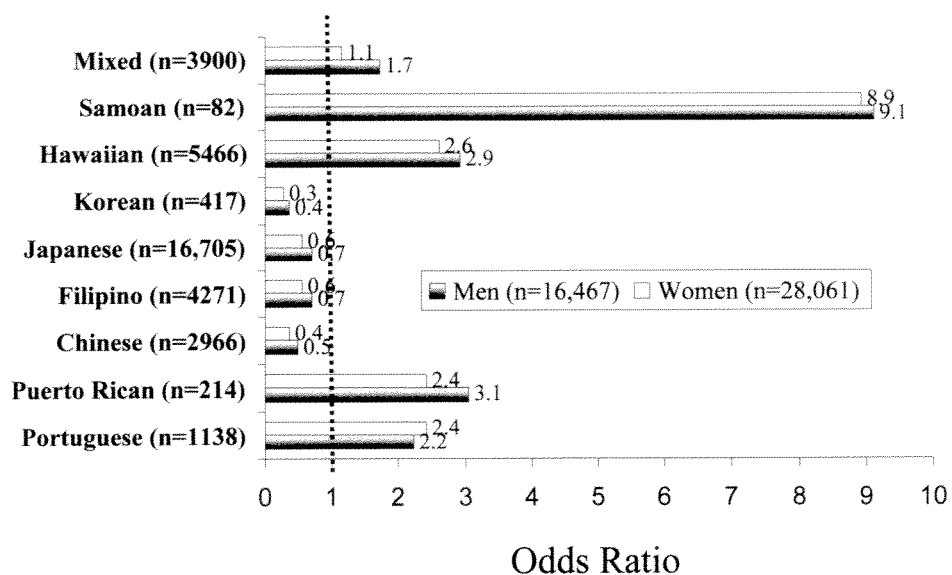


Table 2.— Likelihood of Obesity related to patient characteristics, adjusted*.

	Odds ratio of obesity	95% CI
Age		
18 to 24 (n=932)	1.0	
25 to 34 (n=2845)	2.0	1.6-2.6
35 to 44 (n=5393)	2.6	2.1-3.3
45 to 54 (n=8691)	2.8	2.3-3.5
55 to 64 (n=9019)	3.0	2.4-3.7
65 and older (n=17,648)	1.4	1.1-1.7
Gender		
Male (n=16,467)	1.0	
Female (n=28,061)	0.77	0.71-0.82
Education		
Less than 8th grade (n=2530)	1.0	
Some high school (n=2367)	1.1	0.95-1.3
High school graduate (n=11,429)	1.3	1.1-1.4
Some college (n=12,338)	1.2	1.1-1.4
College graduate (n=8464)	0.86	0.75-0.99
Post graduate education (n=6280)	0.82	0.71-0.94
Type of coverage		
Fee-for-Service (n=31,532)	1.0	
Health Maintenance Organization (n=6250)	1.1	0.96-1.23
Medicare cost contract (n=6746)	1.1	0.98-1.21

Adjusted for the factors listed above and member ethnicity (shown in Figure 1).

Table 3.— Mean consumption of fruits and vegetables per day and mean number of times of exercise per week related to patient characteristics and obesity.*

	Mean number of fruit and vegetables consumed per day			Mean number of times exercise ≥30 minutes per week		
	Non-Obese	Obese	t-test p-value	Non-Obese	Obese	t-test p-value
Age						
18 to 24 (n=932)	2.0	1.8	0.02	2.4	1.7	<0.001
25 to 34 (n=2845)	2.1	2.0	0.007	2.3	2.0	<0.001
35 to 44 (n=5393)	2.3	2.0	<0.001	2.4	2.0	<0.001
45 to 54 (n=8691)	2.5	2.2	<0.001	2.6	2.0	<0.001
55 to 64 (n=9019)	2.6	2.4	<0.001	2.7	2.2	<0.001
65 and older (n=17,648)	2.8	2.7	<0.001	2.9	2.4	<0.001
Gender						
Male (n=16,467)	2.4	2.1	<0.001	2.8	2.3	<0.001
Female (n=28,061)	2.7	2.4	<0.001	2.6	2.0	<0.001
Education						
Less than 8th grade (n=2530)	2.7	2.6	0.25	2.4	2.1	0.02
Some high school (n=2367)	2.7	2.4	<0.001	2.7	2.0	<0.001
High school graduate (n=11,429)	2.5	2.2	<0.001	2.6	2.1	<0.001
Some college (n=12,338)	2.4	2.2	<0.001	2.6	2.1	<0.001
College graduate (n=8464)	2.6	2.4	<0.001	2.7	2.2	<0.001
Post graduate education (n=6280)	3.0	2.7	<0.001	3.0	2.4	<0.001
Type of coverage						
Fee-for-Service (n=31,532)	2.6	2.3	<0.001	2.7	2.1	<0.001
Health Maintenance Organization (n=6,250)	2.4	2.2	<0.001	2.4	2.0	<0.001
Medicare cost contract (n=6,746)	2.8	2.7	0.07	2.8	2.4	<0.001
Ethnicity						
White (n=8547)	2.8	2.5	<0.001	2.9	2.2	<0.001
Portuguese (n=1138)	2.3	2.2	0.07	2.4	2.0	<0.001
Puerto Rican (n=214)	2.2	2.1	0.48	2.6	2.0	<0.001
Chinese (n=2966)	2.5	2.1	<0.001	2.6	2.0	<0.001
Filipino (n=4271)	2.4	2.2	<0.001	2.4	2.1	<0.001
Japanese (n=16,705)	2.5	2.2	<0.001	2.6	2.1	<0.001
Korean (n=47)	2.3	2.1	0.01	2.5	2.0	0.004
Hawaiian (n=5466)	2.3	2.2	0.001	2.6	2.1	<0.001
Samoan (n=82)	2.3	2.1	0.28	2.5	2.2	0.26
Mixed (n=3900)	2.3	2.2	<0.001	2.5	2.1	<0.001

*The mean number of fruit and vegetables was truncated at 5.

more. There wasn't a consistent trend relating education to fruit and vegetable consumption and exercise; however, individuals with post graduate education tended to have the healthiest behaviors. Exercise and fruit and vegetable consumption was highest for individuals covered by Medicare and lowest for HMO members. Obese or not, whites tended to exercise more and consume more fruits and vegetables than all other racial or ethnic groups.

When asked about physician impact on behavior change, obese members appeared to be more likely

than non-obese members to change their behavior based on physician advice (data not shown in tables). Approximately 11.4% of obese members reported smoking less based on physician advice, compared to 8.2% of non-obese members. Similarly, 55.7% of obese members said they exercised more based on physician advice, compared to 43.6% of non-obese members, while 63.5% of obese members said they changed their diet based on physician advice, compared to 38.2% of non-obese members.

Impact of Obesity on Health Status

Overall, the physical health status score of respondents was slightly below the national norm (49 vs. 50), while the mental health status was above the national norm (52 vs. 50, data not shown in tables). Obese members had lower physical health status scores (47.4 and 49.3, respectively) and mental health status scores (49.3 and 52.4, respectively) than non-obese members. After adjustment for patient characteristics, physical health scores of obese members were, on average, 2.6 points lower ($p < 0.001$) than the scores of non-obese and mental health scores were 0.28 points lower ($p = 0.002$).

Discussion

Healthy People 2010 identified obesity as one of ten high priority public health issues in the United States.⁹ Also recognizing the need to attenuate the growing trend, the Surgeon General recently issued a call to action to combat the rising trend in obesity, stating that "Health problems resulting from overweight and obesity could reverse many of the health gains achieved in the U.S. in recent decades".¹⁰ The goal of this manuscript was to examine the association between patient characteristics and obesity and to examine the health-related behaviors of the obese and non-obese in order to shed light on potential areas to target interventions.

In this study of over 44,000 insured individuals, we found that, after adjustment for other factors, the prevalence of obesity was significantly associated with age, gender, ethnicity, and education. After adjustment for other patient characteristics, obesity rates increased with age up until the age of 65 were highest for members of Samoan, Hawaiian, Puerto Rican, and Portuguese ancestry. Samoans stood out as having the highest obesity rates, with an odds ratio of obesity of 8.97 ($p < 0.001$) compared to whites. The negative impact of obesity on health was documented in our finding that the physical functioning and mental health of obese members were significantly lower than that of non-obese members.

There are several limitations to this study. First, we know that respondents to the survey differed from non-respondents in that they were more likely to be female and older. This may bias our findings. For instance, we know that compared to women, men were less likely to respond to the survey yet more likely to be obese. This suggests that our overall estimate of obesity (15.9 percent) may be too low. Second, this study relied on patient reports of height and weight. Previous studies have documented a tendency among patients to under-report weight and over-report height.¹¹ One study suggested that this under-reporting was most common among individuals over age 70, who tend to underestimate their weight.¹² This, too, would result in our underestimating the prevalence of obesity, particularly among the oldest members.

Despite these limitations, this study provides useful information to support interventions to reduce obesity rates in Hawaii. Examining health habits, we found that females were less likely to exercise than males but more likely to consume fruits and vegetables. This suggests that an appropriate intervention for obese women might focus on exercise, while one for men might emphasize the need to consume more fruits and vegetables. Moreover, among obese members, all ethnic groups tended to consume fewer fruits and vegetables than whites and exercise less. For Samoans, the group most likely to be obese, their exercise rates were similar to those of whites, but their fruit and vegetable consumption was considerably

less. Among all groups, obese individuals aged 18 to 24 had the least healthy behaviors. Given that their lifetime risk of an adverse event is highest, they represent a potential population to target for interventions.

While obese members were less likely to report exercising regularly and eating the recommended amount of fruit and vegetables, they were more likely than non-obese members to report changing their behavior (changing their diet, exercising more, smoking less) based on physician advice. This suggests that physicians may play an important role in informing patients of the health consequences of obesity and in recommending lifestyle changes. Moreover, the fact that the magnitude of the differences in exercise (< 1 time per week) and fruit and vegetable consumption (< 1 serving per day) between obese and non-obese members suggests that small, persistent changes in diet and exercise may have an effect.

Because the causes of obesity are multi-faceted, treatment approaches may need to address diet, exercise, pharmacotherapy, and the treatment of comorbid conditions. The Task Force on Community Preventive Services strongly recommends: 1) large scale, visible community-wide campaigns to promote physical activity; 2) individually tailored programs to integrate physical activity in daily routines; 3) school-based physical education programs; 4) increased access to recreational areas.¹³ The Department of Health, health plans, employers, hospitals, physicians, community health centers, and legislators need to work together to address this high priority public health issue.

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