

Does Obesity Contribute as Much to Morbidity as Poverty or Smoking?

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Does obesity contribute as much to morbidity as poverty or smoking?

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The prevalence of obesity is increasing in America, but its impact on morbidity relative to other health risks is unclear. This paper compares the effects of overweight, poverty, smoking and problem drinking on occurrence of chronic conditions and health-related quality of life. The data were collected from a nationally representative household telephone survey of 9585 adults fielded in 1998, using self-reported measures of height and weight, poverty, smoking status, problem drinking, chronic conditions and SF-12 global scales. Regression analyses were used to estimate effects of health risk factors on morbidity.

Thirty-six percent of adults are overweight but not obese ($25 \leq \text{BMI} < 30$) and another 23% are obese ($\text{BMI} \geq 30$). Controlling for demographics, obesity is associated with more chronic conditions and worse physical health-related quality of life ($P < 0.01$). Smoking history and poverty predict having chronic conditions, but their effect sizes are significantly smaller. Even after controlling for chronic conditions, obesity predicts physical health-related quality of life, in that case with an effect size similar to poverty. The effect of problem drinking is always smaller.

Obesity is highly prevalent and associated with at least as much morbidity as are poverty, smoking and problem drinking. Nevertheless, the latter have achieved more consistent attention in recent decades in clinical practice and public health policy. *Public Health* (2001) **115**, 229–235.

Keywords: health risk behaviors; smoking; obesity; poverty

Introduction

The US is experiencing an increasing prevalence of overweight and obesity among men and women and across age groups—the ‘obesity epidemic’.^{1,2} This development runs counter to a key objective of the nation’s public health effort, *Healthy People 2000*, to decrease overweight prevalence, and contrasts with declines in prevalence of other health risk behaviors, such as cigarette smoking or alcohol consumption.³ Far more people now are overweight or obese than are smokers or problem drinkers.

Obesity is associated with increased health care costs, increased all-cause mortality rates and increased risk for coronary heart disease, osteoarthritis, diabetes mellitus, hypertension, dyslipidemia and certain types of cancer.^{4–13} Even modest weight reductions can have substantial lifetime health and economic benefits.^{14–18}

However, different health risk factors compete for attention and time of physicians, patients and public education programs, making priority setting difficult. Recent federal efforts have focused on reducing disparities in health status and healthcare due to poverty and low socioeconomic status. Poverty or low socioeconomic status also strongly affect mortality rates and health status, indepen-

dent of health risk behaviors.^{19–25} Poverty, therefore, would be a reasonable parameter against which to evaluate the importance of behavior-associated health risks such as overweight and obesity, smoking, or heavy drinking.

Making a health risk behavior a public policy or clinical practice priority could have a substantial impact on reducing that risk in the population. For example, smoking quite possibly has received the most public attention among risk factors, in part due to annual reports by the Surgeon General for over 25 years and numerous primary care interventions. In 1992, 75% of internists asked about smoking among almost all their patients—a result that met the *Healthy People 2000* target—and 63% asked about alcohol use.³ Even a lower smoking assessment rate of 67% measured in a 1991 survey, which was deplored as falling short of national health objectives,²⁶ nonetheless exceeded the *Healthy People 2000* goals for physician advice about exercise (50%), as well as actual exercise counseling rates in 1992—there are no separate goals for weight counseling.^{3,27,28}

In this paper, we use data from a national household survey fielded in 1998 to compare the associations of poverty, weight and other risk factors (smoking, heavy drinking) with the occurrence of chronic medical conditions and with physical and mental health-related quality of life, as assessed by the SF-12 scales. We expect obesity to be associated with lower health-related quality of life through increased prevalence of chronic conditions. However, its effects could also occur through other mechanisms

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such as reduced functional lung capacity or decreased physical activity, which would result in persistent effects of overweight on morbidity after controlling for chronic conditions.

There are few empirical precedents for anticipating which health risks have the strongest impact on morbidity: obesity, poverty, smoking, or heavy drinking. One Dutch study found that poverty is a stronger predictor than behavioral risk factors in explaining mortality differences by educational status;²⁹ other studies were either more ambiguous or did not provide comparative data. Studies have found that obesity is associated with lower quality of life, and weight loss with increased quality of life, especially in the domains of vitality and physical functioning.^{30–33} However, these studies did not compare the effects of obesity and poverty or other health behaviors on health-related quality of life.

Methods

We analyze data from Healthcare for Communities (HCC), a national household phone survey fielded in 1997/1998.³⁴ HCC reinterviewed adult participants of the Community Tracking Study (CTS), on average 15 months after their CTS interview. The CTS sample is representative of the US civilian, non-institutionalized population.³⁵ The CTS included a sample clustered within 60 randomly selected US communities, as well as a geographically dispersed sample.

HCC selected 14 985 from a random sample of 30 375 CTS telephone respondents for follow-up. After discarding interviews that were conducted with respondents who may have been ineligible, HCC completed 9585 interviews out of 14 985 attempts, approximately a 64% response rate. This response rate is comparable to other recent general population surveys on related issues. The Behavioral Risk Factor Surveillance System (BRFSS) had a 63.5% response rate after determining household eligibility in 1998.^{1,36} The Americans' Changing Lives survey had a response rate of 68% of sampled individuals.²¹ (Of course, the design of the HCC study is not comparable since it is a follow-up on a prior study, which had a similar response rate.) The final sample includes between 70 and 250 respondents from each of the 60 communities that were part of the CTS, and approximately 1300 persons from the geographically dispersed national sample. In these analyses, the combined sample is used, and weights were derived based on the inverse of the probability of selection, non-response, and non-telephone households.

The central dependent variable measures an individual's health status. We use two different approaches. The first is a count of 17 chronic health conditions (asthma; diabetes; hypertension; arthritis; physical disability such as loss of arm, leg, eyesight, or hearing; trouble breathing; cancer; neurological condition; stroke or paralysis; angina/heart failure/coronary artery disease; chronic back problems;

stomach ulcer; chronic liver disease; migraine or chronic severe headaches; chronic bladder problems; chronic gynecologic problems; other chronic pain conditions). Some of those conditions are causally related to obesity, whereas others, such as physical disability, are unrelated to obesity, but may be causally related to poverty (for example, through high risk occupations).

The second approach evaluates health-related quality of life. Physical health status is measured by the physical health scale on the SF-12 (PCS12), a shorter version of the more commonly used SF-36, which was developed in the Medical Outcomes Study.³⁷ For mental health, additional items were available and we therefore use the Mental Health Inventory from the Medical Outcomes Study³⁸ instead of the mental health subscale based on the SF-12. Higher values on both scales indicate better health, which is the opposite scoring of a chronic condition count.

We present results for the following groups defined by the *body mass index* (BMI, calculated as weight in kilograms divided by height in meters squared): underweight (BMI < 18.5), normal (18.5–24.9), overweight (25–29.9), obese-1 (30–34.9), obese-2 (35+). *Poverty* is measured as family income under the federal poverty limit, near poverty is family income up to 200 percent of federal limit. Two variables indicate *smoking* status: a) whether or not the respondent ever smoked; b) whether the respondent is currently a daily smoker. *Alcohol use/abuse* was assessed using the Alcohol Use Disorders Identification Test (AUDIT).³⁹

We include age groups 18–34, 35–49, 50–64, 65–74, 75+ and race (black, hispanic, white, others) and stratify by sex. For sensitivity analyses (not shown), we also included education in years, and insurance status (no insurance, medicare, medicaid, with private/other insurance the omitted category).

We first provide weighted descriptive (unadjusted) statistics by weight group and sex. Because sociodemographic characteristics differ, the main analysis uses linear regression to adjust for sociodemographic differences. Regressions were weighted and standard errors nonparametrically adjusted using the Huber/White correction as implemented in the cluster option in Stata 6.0. This corrects for the possibility that individual observations are not independent within an area. Tests are based on the covariance matrix of the estimators (Wald test).

Results

According to the HCC survey, 36% of the population are overweight, but not obese ($25 \leq \text{BMI} < 30$), and 23% are obese ($\text{BMI} \geq 30$). These estimates are almost identical to the results from the Third National Health and Nutrition Examination Survey.⁴⁰ Tables 1 (for women) and 2 (for men) provide descriptive statistics of health status and sociodemographics by weight category. Individuals with BMI in the normal range have on average 1.1 chronic

conditions, overweight individuals 1.3, individuals in the obese-1 category 1.7, and individuals in the obese-2 category 2.0. The gradient is steeper for women than for men. Similarly, quality of life as measured by the SF-12 physical scale (PCS12) declines with BMI, although the changes appear less pronounced than for chronic conditions. Extremely overweight individuals tend to have worse mental health-related quality of life, but otherwise there is no significant relationship between BMI and that morbidity scale.

However, the groups also differ significantly in other demographic and health risk factors and these relationships differ for men and women. Among women, there is a strong inverse relationship of BMI and family income and positive association with poverty rates, which does not exist for men. Current smoking is negatively associated with BMI.

The regression models adjust for confounding factors. Tables 3 (for women) and 4 (for men) present the effect of specific health risks (BMI category, smoking status, heavy drinking, poverty) on the number of chronic conditions and the physical health scale of the SF-12 quality of life measure (PCS 12), controlling for age group and race. It shows the effect size relative to the reference group, which is the normal weight group for underweight, overweight, or

obese individuals; non-smokers for ever smokers or daily smokers; non-drinkers or light drinkers for heavy drinkers, and the non-poor for the poor and near poor group. For example, the first column in Table 3 shows underweight women have on average 0.41 fewer conditions and women with a BMI over 35 have on average 1.20 more conditions than otherwise similar women in the normal weight range. Women who ever smoked regularly have on average 0.18 more conditions and women who currently smoke daily have 0.40 (0.18+0.22) more chronic conditions than women who never smoked regularly. Two columns are shown for PCS-12. The first does not control for chronic conditions, which measures the total association of a risk factor with physical health. The second includes chronic conditions as covariates and the coefficients give the effect size beyond the effect of chronic conditions that may have been caused by this risk factor.

Obesity is consistently a highly significant predictor of poor physical health, but not of mental health (mental health results available from the authors). A BMI of 30–35 is associated with one half an additional chronic condition, a BMI of 35+ with one additional chronic condition with a slightly stronger effect for women than for men. In contrast, the effect of ever smoking has only an effect of

Table 1 Health status and sociodemographics by weight group among women

	Underweight BMI < 18.5 n = 162	Normal 18.5 ≤ BMI < 25 n = 2686	Overweight 25 ≤ BMI < 30 n = 1650	Obese 1 30 ≤ BMI < 35 n = 795	Obese 2 BMI ≥ 35 n = 522
Physical health (PCS12)	47.9 (6.24)	47.3 (6.32)	46.0 (6.24)	44.5 (6.71)	42.6 (7.1)
Number of chronic conditions	0.86 (1.14)	1.23 (1.52)	1.60 (1.70)	1.95 (1.93)	2.6 (2.07)
Mental health (MHI 5)	79.3 (18.5)	80.1 (16.4)	79.4 (18.2)	77.7 (19.7)	73.2 (22.4)
Screen positive for a mental health disorder	0.18 (0.39)	0.16 (0.36)	0.15 (0.36)	0.17 (0.37)	0.27 (0.44)
Ever smoker (includes daily smokers)	0.49 (0.50)	0.45 (0.50)	0.47 (0.50)	0.48 (0.50)	0.44 (0.50)
Daily smoker	0.29 (0.45)	0.20 (0.40)	0.17 (0.37)	0.20 (0.40)	0.17 (0.38)
Heavy drinker (AUDIT = 1)	0.02 (0.15)	0.02 (0.15)	0.02 (0.15)	0.02 (0.14)	0.00 (0.06)
Black	0.04 (0.19)	0.07 (0.25)	0.14 (0.34)	0.20 (0.40)	0.22 (0.41)
Hispanic	0.02 (0.13)	0.09 (0.30)	0.08 (0.27)	0.09 (0.28)	0.17 (0.37)
Age	47.4 (21.6)	46.3 (18.1)	50.9 (16.9)	49.6 (15.7)	50.0 (16.2)
Education (No of y)	13.3 (2.2)	13.4 (2.6)	12.8 (2.4)	12.6 (2.6)	12.2 (2.3)
Family income	48 522 (70 814)	48 389 (46 134)	42 789 (43 126)	38 197 (34 084)	35 121 (31 243)
Poor	0.23 (0.42)	0.15 (0.36)	0.11 (0.31)	0.20 (0.40)	0.24 (0.43)
Near poor	0.15 (0.36)	0.19 (0.39)	0.20 (0.40)	0.25 (0.43)	0.24 (0.43)
No insurance	0.13 (0.33)	0.11 (0.32)	0.11 (0.31)	0.11 (0.31)	0.13 (0.33)

Note: standard deviations in parentheses.

Table 2 Health status and sociodemographics by weight group among men

	Underweight BMI < 18.5 n = 17	Normal 18.5 ≤ BMI < 25 n = 1258	Overweight 25 ≤ BMI < 30 n = 1639	Obese 1 30 ≤ BMI < 35 n = 627	Obese 2 BMI ≥ 35 n = 227
PCS12	43.6 (8.1)	47.8 (5.5)	47.6 (6.57)	46.0 (6.21)	45.3 (6.4)
Number of chronic conditions	2.2 (1.5)	1.0 (1.4)	1.1 (1.5)	1.4 (1.7)	1.9 (1.9)
MHI 5	78.1 (16.1)	81.7 (15.2)	82.9 (15.9)	81.9 (16.7)	77.5 (17.1)
Screen positive for a mental health disorders	0.15 (0.36)	0.11 (0.32)	0.10 (0.30)	0.12 (0.33)	0.14 (0.34)
Ever smoker (includes daily smokers)	0.29 (0.47)	0.56 (0.50)	0.53 (0.50)	0.54 (0.50)	0.49 (0.50)
Daily smoker	0.16 (0.38)	0.23 (0.42)	0.18 (0.38)	0.17 (0.38)	0.15 (0.36)
Heavy drinker (AUDIT = 1)	0.01 (0.11)	0.13 (0.34)	0.09 (0.30)	0.11 (0.31)	0.10 (0.31)
Black	0.13 (0.35)	0.09 (0.29)	0.11 (0.32)	0.15 (0.36)	0.18 (0.39)
Hispanic	0 (0)	0.10 (0.30)	0.11 (0.31)	0.07 (0.25)	0.10 (0.31)
Age	59.2 (25.3)	44.1 (18.6)	46.5 (15.9)	45.4 (15.5)	45.7 (14.8)
Education (No of y)	14.2 (3.0)	13.3 (2.8)	13.4 (2.6)	13.2 (2.5)	12.9 (2.9)
Family income	36 854 (31 786)	51 223 (55 258)	58 964 (58 706)	57 273 (62 404)	46 890 (40 908)
Poor	0.23 (0.43)	0.13 (0.33)	0.10 (0.29)	0.08 (0.28)	0.11 (0.32)
Near poor	0.08 (0.28)	0.18 (0.39)	0.15 (0.36)	0.16 (0.36)	0.21 (0.41)
No insurance	0.04 (0.20)	0.17 (0.38)	0.11 (0.32)	0.09 (0.28)	0.22 (0.42)

Note: standard deviations in parentheses.

one quarter of an additional chronic condition and heavy drinking has no significant effect. Poverty tends to be a stronger predictor than smoking or drinking, but weaker than obesity, especially extreme obesity. The results are very similar for physical health-related quality of life. Controlling for chronic conditions reduces the effect of obesity by about half, but even so it has a similar effect as that for other risk factors, including poverty.

Testing for statistical differences in the effects sizes, a BMI of 35 or more, which affects 9% of women, has a significantly stronger adverse health effect than either poverty (affecting 18% of women), smoking (19% daily smokers), or heavy drinking (2%), among women ($P < 0.01$) in all columns of Table 3. A BMI of 30–35 (affecting an additional 14% of women) has about the same effect as poverty or daily smoking, but is significantly worse than ever smoking or heavy drinking ($P < 0.01$). Among men, obesity has no significantly different effect from poverty, although severe obesity (BMI > 35) has a significantly stronger adverse effect than near poverty in the first two columns of Table 4. Moderate and severe

obesity among men are associated with significantly more chronic conditions than heavy drinking or smoking ($P < 0.01$), but not with worse physical quality of life.

The results in Tables 3 and 4 do not control for other economic variables, such as insurance status or education, which are correlated with poverty. As a specification test, we re-estimated all models with education and insurance status as covariates, which reduced the relative effect of poverty and near poverty compared to obesity.

Discussion

A cross-sectional analysis of data from a household sample found that obesity has as strong, or even stronger, an association with both occurrence of chronic medical conditions, and physical health-related quality of life, as poverty, lifetime smoking history, or recent heavy drinking. Moreover, a larger proportion of the population is obese (BMI ≥ 30, 23%) than are poor (14%), heavy drinkers as identified by AUDIT (6%), or daily smokers (19%). These

Table 3 The association of body mass, heavy drinking, smoking and poverty with health status (women only)

Risk factor	Dependent variable		
	Count of chronic conditions	PCS12	PCS12 (controlling for chronic conditions)
Underweight	- 0.41 ^b	0.77	0.10
BMI < 18.5	(0.13)	(0.58)	(0.54)
Overweight	0.22 ^b	- 0.85 ^b	- 0.45
25 ≤ BMI < 30	(0.07)	(0.27)	(0.24)
Obese 1	0.58 ^b	- 2.28 ^b	- 1.26 ^b
30 ≤ BMI < 35	(0.10)	(0.37)	(0.35)
Obese 2	1.20 ^b	- 4.19 ^b	- 2.00 ^b
BMI ≥ 35	(0.13)	(0.45)	(0.43)
Ever smoking	0.18 ^a	- 0.51	- 0.16
	(0.07)	(0.27)	(0.25)
Current daily smoking (in addition to ever smoking)	0.22 ^a	- 1.06 ^b	- 0.68 ^a
	(0.10)	(0.34)	(0.30)
Heavy drinking	0.13	- 0.30	0.06
	(0.13)	(0.57)	(0.52)
Poor	0.57 ^b	- 2.29 ^b	- 1.31 ^b
	(0.10)	(0.34)	(0.31)
Near poor	0.41 ^b	- 1.83 ^b	- 1.15 ^b
	(0.08)	(0.32)	(0.28)

Note: Reference group is normal weight range, adjusted for age group, marital status, ethnicity (black, hispanic, white, other). Estimated standard error in parentheses. ^aSignificant at $P < 0.05$; ^bsignificant at $P < 0.01$.

Table 4 The association of body mass, heavy drinking, smoking and poverty with health status (men only)

Risk factor	Dependent variable		
	Count of chronic conditions	PCS12	PCS12 (controlling for chronic conditions)
Underweight	0.83	- 3.55	- 2.31
BMI < 18.5	(0.51)	(3.30)	(3.54)
Overweight	0.11	- 0.48	- 0.23
25 ≤ BMI < 30	(0.07)	(0.26)	(0.23)
Obese 1	0.50 ^b	- 2.14 ^b	- 1.25 ^b
30 ≤ BMI < 35	(0.09)	(0.43)	(0.24)
Obese 2	0.93 ^b	- 2.63 ^b	- 1.07
BMI ≥ 35	(0.18)	(0.67)	(0.63)
Ever smoking	0.25 ^b	- 0.94 ^b	- 0.55 ^a
	(0.07)	(0.29)	(0.27)
Current daily smoking (in addition to ever smoking)	0.03 (0.09)	- 0.95 ^b (0.37)	- 1.00 ^b (0.35)
Heavy drinking	0.16	- 0.57	- 0.38
	(0.10)	(0.34)	(0.32)
Poor	0.58 ^b	- 2.56 ^b	- 1.45 ^b
	(0.09)	(0.46)	(0.41)
Near poor	0.40 ^b	- 1.07 ^b	- 0.35 ^b
	(0.09)	(0.34)	(0.33)

Note: Reference group is normal weight range, adjusted for age group, marital status, ethnicity (black, hispanic, white, other). Estimated standard error in parentheses. ^aSignificant at $P < 0.05$; ^bsignificant at $P < 0.01$.

findings reinforce prior recommendations that weight control become a higher national priority,¹ especially given the dramatic increases in prevalence of overweight.

Is it likely that making weight control a higher national priority would lead to weight loss and improved health?

Achieving lasting individual health behavior change is difficult, but weight loss certainly shares this problem with smoking cessation and reducing alcohol consumption, where some progress has been achieved in recent decades. There is qualified evidence that specific interventions for

weight loss are efficacious⁴¹ and that persons advised by a physician to lose weight are more likely to do so.⁴² However, most people that try to lose weight do not use an optimal approach.⁴³ More targeted clinician counseling may be needed to substantially change that approach.

The targeted goal of *Healthy People 2000* was that 50% of overweight individuals use sound weight loss practice. Actual rates reported in 1995 were less than 20%, lower than reported 10 y earlier.³ Persons with lower socioeconomic status may benefit more from primary care clinician counseling for obesity, since they are less likely to receive it than persons with higher socioeconomic status,⁴⁴ suggesting that current clinical practice does not address this differential burden of morbidity.

A time lag may intervene between obesity and development of chronic health problems. Thus, given the rapid increase in obesity in all segments of the population, our cross-sectional analyses may underestimate effects on morbidity. Obesity is associated with elevated rates of health services use and costs¹² which would likely increase more rapidly after health complications occur. For these reasons, addressing the 'obesity epidemic' may qualify as an urgent public policy priority, especially as the baby-boom population ages.

The results need to be interpreted in the light of other study limitations. Some of the association of obesity with morbidity, other than chronic conditions, could be due to some unmeasured health effects, such as gallbladder disease (although the size of the effect suggests that it is not due to such relatively rare conditions), severity of medical conditions, or physical activity level. Overweight participants in self-reported studies tend to underestimate their weight, which may bias the true rates of obesity downward;⁴⁵⁻⁴⁶ however, our estimate of 23% obesity among adults is identical to the estimates of the Third National Health and Nutrition Examination Survey.^{3,40,47} A downward bias in weight reported by overweight respondents could lead to a lower correlation between obesity and health status than if height and weight were assessed independently, as in the NHANES III.⁴⁷ The reliance on self-report of chronic conditions is likely to result in underestimates of their prevalence. While telephone interviews may cause bias, recent research found that differences in health indicators between all households and those with telephones are minor, even among individuals below the poverty level.⁴⁸

A cross-sectional evaluation does not provide evidence for causality. The higher mortality of obese people may contribute to an underestimation of the impact of body mass on chronic conditions occurring later in life. Similarly, poor health may cause lower income and this reverse causality would lead to an overestimation of the effect of poverty on health. Economists have emphasized this effect, especially for earned income, but other researchers found no effect of illness episodes on economic hardship.²⁴ This study did not have an independent measure of physical activity.

Overall, our findings suggest that weight reduction should be given an increased priority for clinical practice and public health: The consistent and strong association of obesity with physical health-related quality of life suggests that targeting weight reduction may be a particularly useful clinical practice strategy for improving general health, in addition to the confirmed benefits of reducing mortality and mitigating the effects of overweight on occurrence of specific diseases. The association of obesity with chronic conditions and poorer quality of life is at least as high, if not higher, than the association of poverty, smoking, or drinking with chronic conditions and poorer quality of life. Moreover, the prevalence of obesity is higher than that of poverty, daily smoking, or heavy drinking. In addition, weight reduction is a potentially achievable mechanism for improving public health, which may also particularly benefit persons in poverty.

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