Increases in Clinically Severe Obesity in the United States, 1986-2000

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**Background:** We know that Americans are increasingly becoming overweight, but we do not know whether this trend applies to clinically severe obesity (≥100 lbs [45 kg] overweight), which is believed to have different causes than typical weight gain. Severe obesity is more serious for an individual’s health and creates different challenges for the health care system. This study estimates trends for extreme weight categories between the years 1986 and 2000.

**Methods:** The data come from the Behavioral Risk Factor Surveillance System. The dependent variable is weight category according to the body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) based on self-reported weight and height. Regression models adjust for changes in population characteristics and state participation.

**Results:** Between 1986 and 2000, the prevalence of a BMI (self-reported) of 40 or greater (about 100 lbs [45 kg] overweight) quadrupled from about 1 in 200 adult Americans to 1 in 50; the prevalence of a BMI of 50 or greater increased by a factor of 5, from about 1 in 2000 to 1 in 400. In contrast, obesity based on a BMI of 30 or greater roughly doubled during the same period, from about 1 in 10 to 1 in 5.

**Conclusions:** The prevalence of clinically severe obesity is increasing much faster than obesity. The widely published trends for overweight/obesity underestimate the consequences for physician practices, hospitals, and health plans because comorbidities and resulting service use are much higher among severely obese individuals. Accommodating severely obese patients will no longer be a rare event, and providers have to prepare to treat such patients on a regular basis.

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**IN THE United States, different studies have documented that most Americans are overweight (a body mass index [BMI; calculated as weight in kilograms divided by the square of height in meters] ≥25) or obese (BMI ≥30). About 1 in 5 adult Americans would be classified as obese based on self-reported weight and more than 1 in 4 based on objectively measured weight.** The typical definition of obesity, a BMI of 30 or greater, obscures the heterogeneity of this group. Severely obese individuals who are 100 to 200 lbs (45-90 kg) or more overweight encounter different challenges in the health care system than most obese individuals. Many physician offices and hospitals are not equipped for severely obese patients, who may not fit standard imaging equipment, operating tables, or wheelchairs. Even seemingly minor problems, such as the lack of a scale to weigh patients over 300 lbs (135 kg) in ambulatory settings, could conceivably affect quality of care and invite lawsuits. Recent high-profile newspaper articles have also reported anecdotes of injuries among health care personnel caused by severely obese patients and the lack of equipment to move those patients.5,6

Are these reports simply indicative of the increased prominence that obesity now has in the public debate? Does severe obesity simply parallel the general trend in obesity? Or is there something fundamentally different about clinically severe obesity? While trends for lower weight categories have been published repeatedly, there does not appear to be published data on trends in severe obesity. This article compares the trends for different categories of obesity between the years 1986 and 2000.

There are 2 conflicting opinions about trends in clinically severe obesity. Clinicians tend to consider clinically severe obesity a rare pathological condition that is not affected by behavioral changes in the general population. This view would suggest that severe obesity changes little over
time. Epidemiologists tend to lean toward the opposite view, namely, that severe obesity is part of the general population distribution and small increases in the population BMI would have proportionally larger effects in the extreme tail. Which of these views better describes reality is an empirical question, but the answer has major ramification for health care systems.

**METHODS**

This study analyzes data from the Behavioral Risk Factor Surveillance System (BRFSS), a cross-sectional telephone survey of noninstitutionalized adults, between the years 1986 and 2000. The BRFSS has been used for tracking health behaviors over time, and study details are documented elsewhere.

Individuals are classified into weight categories based on BMI calculated from self-reported weight and height. In addition to the standard “obese” category, defined as a BMI of 30 or greater, the main groups of interest are more extreme categories: BMI of 35 or greater; BMI of 40 or greater (often referred to as morbid obesity and roughly corresponding to 100 lbs [45 kg] overweight); BMI of 45 or greater; and BMI of 50 or greater (sometimes referred to as super obesity). There is a well-known tendency toward underreporting of weight and overreporting of height. The underreporting of weight increases with weight and absolute levels of prevalence are therefore substantially lower than if BMI were calculated by independent measurement. The effect on trends is probably less dramatic, but the bias will underestimate the increase among the heaviest groups. A partially offsetting bias could be caused by the decline in response rates to the BRFSS over time (from about 80%-65%). The potential for nonresponse bias arises if heavier people stay at home, answer the phone, and respond to surveys in relatively higher numbers, which is indeed the case.

The statistical analysis uses individual level logistic regression with an indicator of a specific weight category as the dependent variable. Time trend is measured as a linear spline with knots at 1991 and 1996 (ie, linear trends within each 5-year period, but trends can differ between 1986-1990, 1991-1995, and 1996-2000). The spline function smoothes estimates compared with year indicators and is mainly needed because of the small sample sizes in the early years and the heaviest BMI groups. The results are adjusted for sociodemographic changes to isolate the unique trend in obesity rates. Regressors include age (in 5-year intervals), educational achievement (less than high school, high school, some college, or college degree), racial group (white, black, Hispanic, or other), and sex. States differ in obesity rates at a point in time and state participation in the BRFSS has changed over time, which could bias trend estimates. There are 2 possible approaches to avoid biased trend estimates. One approach is to subset the analysis to states participating in every survey, but this would substantially reduce the number of observations and the resulting estimates would not necessarily be nationally representative. The alternative approach used here is to include state indicators to control for the changing survey participation by states over time. The state indicator captures state factors leading to differences in the absolute levels of obesity. Tests are based on the regression model and all results are statistically significant at P<.01 unless indicated otherwise. The adjusted results are based on the sociodemographic characteristics in the 2000 survey.

**RESULTS**

The Figure shows the growth rates for different weight categories. Between 1986 and 2000, the prevalence of BMI of 40 or greater (about 100 lbs [45 kg] overweight) quadrupled from about 1 in 200 adult Americans to 1 in 50; the prevalence of BMI of 50 or greater increased by a factor of 5, from about 1 in 2000 to 1 in 400. In contrast, obesity defined as a BMI of 30 or greater roughly doubled during the same time period, from about 1 in 10 to 1 in 5. The time trends for the 30 or greater BMI group is significantly lower than for the 40 or greater BMI group, which in turn is significantly lower than for the 50 or greater BMI group. Although the null hypothesis of a steady linear trend for all years and weight categories is rejected, the time trend is close to linear in the log odds and the Figure would look similar if based on a linear model. The results shown adjust for changes in population characteristics, but the demographic changes are too small to affect any qualitative results. Neither the aging of the US population nor the increasing percentage of minority groups plays a major role relative to the obesity trends shown in the Figure.

**COMMENT**

Reports that most Americans are overweight or obese and events such as the Surgeon General’s call to action have raised the public profile of the obesity debate. Nevertheless, the most dramatic part of the “obesity epidemic” has remained hidden, namely, that the prevalence of clinically severe obesity (BMI≥40) is increasing twice as fast as the prevalence of obesity. Because weight underreporting increases with a respondent’s actual weight, these estimates (based on respondent self-reported weight) are most likely to underestimate this trend.

Clinically severe obesity, far from being a pathological condition that only affects a fixed percentage of genetically vulnerable individuals, appears to be an integral part of the US population’s weight distribution. As the whole population shifts to the right, the extreme categories grow the fastest. The traditional clinical approach of targeting high-risk cases is only temporary and palliative in this situation, but cannot stem the trend. This offers new business opportunities for providers specializing in treating severe obesity, but the social costs are large.
An effective approach will depend on population-based approaches to maintain—or even shift backwards—the weight distribution in the full population. However, achieving lasting health behavior change is difficult and rarely achieved by exhorting individuals to exercise more, eat healthier, stop smoking, or drink responsibly. Car-friendly (and bike/pedestrian-hostile) urban developments, desk jobs, television, and relatively inexpensive calorie-dense foods are some of the recent environmental changes that have changed relative prices of caloric intake and physical activity. Arguably, environmental interventions to counter the obesity epidemic, similar to tobacco and alcohol policy, would be needed. As yet, this appears to be politically less feasible than expanding bariatric surgery programs or treating the ensuing complications of obesity.

For physicians, the disproportional increase in the heaviest weight categories entails changes in practice patterns and possible adverse financial consequences. Practices that have not encountered severely obese patients in the past will have to adjust to a regular stream of such patients in the future and invest in equipment to accommodate them. Obesity advocates are complaining that these changes are happening too slowly, raising the possibility of discrimination lawsuits against providers. Reorganizing practices to take care of severely obese patients can be expensive, but patients or health insurance plans are unlikely to pay for these changes.

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