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.
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 smooths 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) quan-
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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