

Trends in Bariatric Surgery for Morbid Obesity in Wisconsin

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ABSTRACT

Background: Obesity is a national epidemic with rates in Wisconsin and the United States doubling over the past decade. Research of available treatments for morbid obesity (body mass index ≥ 40 kg/m²) suggests that bariatric surgery may be the only modality that provides any significant long term weight loss.

Methods: Using the data from Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System, we analyzed self-reported information on body weight and height among adults in Wisconsin. We used the WITHIN database for inpatient hospitalization and surgeries in Wisconsin to evaluate trends in gastric bypass surgery. Finally, we surveyed bariatric surgeons in Wisconsin to assess trends in bariatric surgery in the state.

Results: In Wisconsin, the percentage of the adults considered to be obese increased from 11% in 1990 to 22% in 2001. In 1999-2001, approximately 80,000 adults (2% of the population) were morbidly obese. The number of gastric bypass surgeries performed in Wisconsin more than doubled in 1 year, from 182 in 2001 to 426 in 2002. According to bariatric surgeons, gastric bypass accounts for approximately 90% of bariatric surgeries performed in Wisconsin. Thus, in 2002, there was roughly 1 bariatric surgery for every 200 morbidly obese Wisconsin adults. Most (84%) bariatric surgeons are planning to increase the number of procedures they perform, and 24% plan on adding an additional bariatric surgeon to their group.

At the time of this study, Ms Erickson was a fourth year medical student at the University of Wisconsin Medical School. Doctor Remington is a professor in the Department of Population Health Sciences at the University of Wisconsin-Madison. Dr Peppard is a senior epidemiologist with the Wisconsin Public Health and Health Policy Institute, University of Wisconsin Medical School. This work was conducted as part of a fourth year medical school elective in population health.

Summary: Bariatric surgery rates are increasing in Wisconsin, yet the demand for surgery far exceeds current capacity of surgeons in the state.

INTRODUCTION

The headlines are no longer new—obesity is now considered a national epidemic. Furthermore, the percentage of overweight or obese adults continues to climb each year. In 1990, 36% of Wisconsin adults were overweight and an additional 11% were obese.¹ In sharp contrast, the data from 2001 shows that the percentage of overweight adults had risen to 37%, with the prevalence of obesity doubling to 22%.

Each year in the United States approximately 300,000 persons die from obesity-related complications.² It is estimated that the cost of treating obesity is between 5% and 9% of all national health care expenditures, making the dollar cost of treating obesity approximately \$77 billion to \$98 billion per year.²⁻⁴ Wisconsin's portion of the treatment is approximately \$1.4 billion per year.¹ One study, published in 2001, found the cost for providing health care to an overweight individual was 10% higher than those of normal body mass index (BMI = weight in kg/ height² in m²) and 36% higher for an obese individual.⁴ Surely reducing obesity prevalence will help decrease the state's health care burden. Health problems are even more severe in the morbidly obese, defined as a BMI ≥ 40 .⁵ For a woman whose height is 5'6", a weight of 250 pounds would yield a BMI of 40; a 5'11" man with that same BMI would weigh about 290 pounds. In addition to suffering from myriad health conditions and psychosocial problems, a morbidly obese person has only a 1 in 7 chance of reaching life expectancy.⁶

There are many programs available to aid obese people in losing weight. It is estimated that \$30 billion is spent yearly on weight reduction methods.⁷ However, a systematic review of literature regarding the treatment of obesity found that conservative methods—including

diet, exercise, medications, and behavioral therapy—do not reliably yield long-term weight loss, defined as weight loss maintained longer than 12 months.^{7,8}

Conservative treatment is especially ineffective in morbidly obese persons.⁹ However, recently evolving evidence suggests that gastric surgery is quite effective in both short- and long-term weight loss for the morbidly obese patient.¹⁰ A Swedish study involved a prospective matched cohort study of 2000 morbidly obese patients treated with medications with 2000 morbidly obese patients treated with surgery. The study found that bariatric surgery was better at weight reduction and improvement in the co-morbidities associated with obesity.⁶ In addition to the success bariatric surgery offers in terms of weight loss, an analysis of adult men and women with a BMI of 40-50 found gastric bypass to be cost-effective compared to no treatment.¹¹ Furthermore, obesity-related co-morbid medical conditions may remit following bariatric surgery. In a study by Balsiger et al,¹⁰ in addition to weight loss due to bariatric surgery, there was a decrease from 36% to 18% in usage of antihypertensive medications, a decrease from 12% to 1% for insulin, and a decrease from 33% to 9% in the need of anti-inflammatory medicine.

METHODS

Data for this report were gathered from 3 sources. First, Wisconsin-specific prevalences of obesity and morbid obesity were assessed using publicly available data from the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) at www.cdc.gov/brfss.¹² Second, the Wisconsin Department of Health and Family Service's WITHIN database, (available at www.dhfs.state.wi.us/healthcare-info/qsmain.htm) was used to examine recent trends in bariatric surgery. Third, we developed and administered a survey to Wisconsin bariatric surgeons to assess current bariatric surgery practices as well as to attempt to estimate future trends. These sources and associated analyses are detailed below.

To determine the prevalence of morbid obesity in Wisconsin we analyzed BRFSS data for the 3-year period from 1999 to 2001, since rates are unlikely to change considerably over this time period, and the estimates are more stable because of the larger sample sizes.¹² (Figure 1.) The BRFSS is a monthly telephone questionnaire developed by the CDC to gather data on behaviors that affect health. For our study, we used self-reported heights and weights from the Wisconsin BRFSS data to calculate a BMI. These calculated BMIs were divided into groups and analyzed by age and gen-

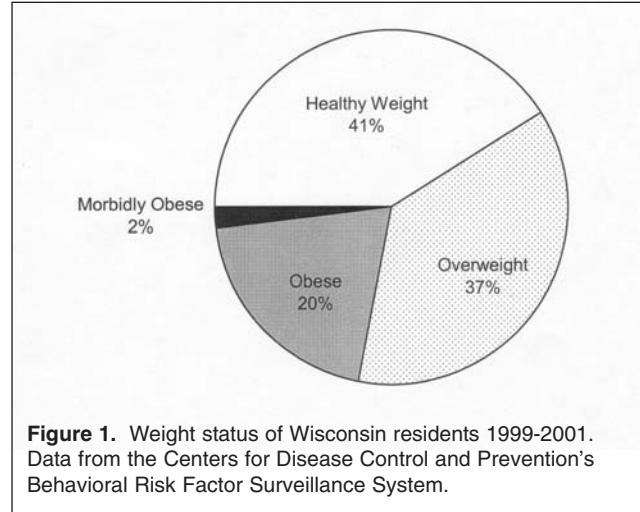


Figure 1. Weight status of Wisconsin residents 1999-2001. Data from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System.

der. The International Federation for the Surgery of Obesity has set selection criteria for obesity surgery. The criteria state that bariatric surgery is indicated if a patient has either a BMI ≥ 40 or a BMI between 35 and 40 and is presenting with a serious comorbid condition.⁶ We chose to focus on those adults with a BMI ≥ 40 , since this is a sufficient indication for bariatric surgery. We multiplied prevalence data from 1999-2001 by census estimates for age and gender to estimate the number of adults with morbid obesity.

Next we analyzed the WITHIN database for the years 2001 and 2002. The WITHIN database is a comprehensive data set cataloging all the hospitalizations and outpatient surgeries taking place in Wisconsin hospitals. All Wisconsin hospitals are required to submit data on a quarterly basis and the database is driven by the patient's discharge date. The data we looked at contained all records from all hospitals that discharged patients in 2001 and 2002. Veterans' hospitals are excluded from the reporting requirement. Principal diagnostic and procedure codes (ICD-9 criteria) can be analyzed by sex, age, county of residence, primary payer, year of discharge, total charges, and mean charges. Bariatric surgeries are recorded under 2 separate ICD-9 codes: gastric bypass (code 44.3 1) and insertion of a gastric bubble (code 44.93). Both open and laparoscopic gastric bypass are coded under 44.31 and thus we could not analyze them separately from this data set.

An additional limitation of the WITHIN data set is that all of the other forms of bariatric surgery, such as vertical banded gastroplasty, duodenal switch, and adjustable gastric banding, are lumped with other stomach and intestinal surgeries and coded under a variety of "other" ICD-9 codes. For example, vertical banded gastroplasty is coded under 44.69 for "other repair of

Table 1. Gastric Bypass Surgeries in Wisconsin, 2002

		BRFSS 1999-2001		WITHIN Hospital Discharge Data		
	Number of People Surveyed	% Surveyed with BMI >40*	Estimated Population BMI >40*	Number of Surgeries	Rate 1= Procedures/ Total Pop†	Rate 2= Procedures/ Pop BMI>40†
Males						
Age 18-34	1037	1.2% (0.5%-1.8%)	7000 (3100-11,000)	12	2.0	17
Age 35-54	1706	1.7% (1.1%-2.3%)	13,000 (8400-17,700)	36	4.8	28
Age 55+	985	1.2% (0.5%-1.8%)	6100 (2600-9600)	8	1.5	13
Females						
Age 18-34	1185	1.9% (1.1%-2.6%)	10,6000 (6200-15,000)	128	22	120
Age 35-54	1879	3.0% (2.2%-3.7%)	21,6000 (16,000-27,200)	201	28	93
Age 55+	1408	2.9% (2.0%-3.8%)	18,400 (12,900-24,000)	41	6.5	22

* 95% confidence interval
† per 10,000

the stomach.” However, this code is used for “other repair of stomach, inversion of gastric diverticulum, and repair of stomach not otherwise specified,” and thus it is impossible to separate out those procedures coded 44.69 done as a treatment for obesity. Similar problems were encountered with other types of bariatric surgery. Based on these restrictions, the WITHIN database could only accurately classify gastric bypass. We calculated rates of surgery in 2 ways: rates relative to the entire state population and rates relative to the population of morbidly obese persons in the state.

The final element of our research involved a 9-question survey mailed to 34 bariatric surgeons practicing in Wisconsin in late summer 2003. Surgeons were identified through a list compiled by the Association for Morbid Obesity Support Group. This list was their most current and complete list of practicing bariatric surgeons in Wisconsin. The survey was returned by 25 (74%) of the surgeons.

For the analyses of all the data sources (BRFSS, WITHIN, mailed survey), descriptive statistics were calculated with SAS and Microsoft Excel software. The protocol was approved by the UW Medical School Institutional Review Board.

RESULTS

Prevalence of morbid obesity in Wisconsin 1999-2001

The rates of morbid obesity during 1999-2001 are presented in Table 1. During this time period, approximately

2% (95% confidence interval: 1.7 % to 2.3%) of Wisconsin adults were morbidly obese. This percentage represents approximately 79,000 adults (95% confidence interval: 67,000 to 91,000 adults). Rates of morbid obesity are higher among women (2.6%, 95% confidence interval: 2.2%, 3.1%) compared with 1.4% of men (95% confidence interval: 1.0%, 1.8%). Rates of morbid obesity also increase with age, from 1.9% in females 18-34 to 2.9% in females 55+. Among men, a different trend is seen, with a peak prevalence of obesity in the age range 35-54 (1.7%) (Figure 2).

Trends in gastric bypass surgery in Wisconsin

Based on the WITHIN database, there were 182 gastric bypass surgeries performed in 2001 and 426 in 2002. The number of gastric bubble surgeries was 0 in 2001 and 2 in 2002. Due to the very low number of gastric bubble procedures, no further analysis was done on this procedure. Patients aged 25-54 accounted for 86% of the gastric bypass surgeries in 2001 and 85% of the cases in 2002. Individual age group breakdowns are shown in Figure 3. Women were more likely to have gastric bypass surgery, with over 85% of surgeries in 2001 and 87% of those in 2002 being performed on women.

Rates of gastric bypass surgery per 10,000 population and rates of gastric bypass surgery per 10,000 morbidly obese were greater among females in all age categories. For males 35-54, there were 28 bariatric surgeries per 10,000 morbidly obese. However, for females 35-54, 93 bariatric surgeries were performed per 10,000 morbidly

obese (Table 2). A morbidly obese female is more likely to have bariatric surgery than a morbidly obese male. Females age 18-34 are 7 times more likely, females age 35-54 are 3 times more likely, and those 55+ are 1.3 times more likely to undergo bariatric surgery than their age-matched, morbidly obese male counterparts. Rates for age and year are shown in Figure 4.

Survey results

A total of 25 surveys out of 34 were returned for a yield of 74%. The average number of years the surgeon had been practicing bariatric surgery in Wisconsin was 7.6, with a median of 3, (range: 1 to 31 years). Comparing 2001 to 2002, 84% of surgeons practicing bariatric surgery during this time period increased the number of bariatric surgeries they performed, with 50% of surgeons at least doubling the number of bariatric surgeries they performed in this 1 year time frame. Most (83%) surgeons predicted that the number of bariatric surgeries they perform will increase in 2003, and 53% predict they will at least double the number of bariatric surgeries they perform. If the surgeon's practice was solely bariatric surgery, the median number of estimated surgeries he or she could perform in the next 12 months was 620. With regards to types of bariatric surgeries, 44% of surgeons state that almost all (90% or more) of their bariatric cases are open gastric bypass and 36% state that almost all (90% or more) of their bariatric cases are laparoscopic gastric bypass.

In 2002, a total of 1239 bariatric surgeries were reported by surgeons returning the survey. The breakdown of specific types of surgery was 563 laparoscopic gastric bypass (45%), 596 open gastric bypass (51%), 11 vertical banded gastroplasty (<1%), and 68 other surgeries (5%).

In the next 12 months, 24% of the surgeons plan to add another surgeon who practices bariatric surgery to their groups; 20% were unsure. Factors that motivated surgeons to perform bariatric surgeries (more than 1 answer was allowed) included personal interest (88%), consumer need (68%), practice/group need (20%), desire to use advanced technology (40%), and financial reasons (16%). Circumstances under which surgeons received training in bariatric surgery varied (more than 1 answer was allowed): during residency (60%), apprenticeship (16%), fellowship (8%), and courses (56%).

The bariatric surgeons surveyed estimated the demand for bariatric surgery in their communities in the next 12 months ranged from 50 patients to unlimited. Major barriers to performing bariatric surgery included difficulty obtaining insurance approval (36%), competing professional obligations (36%), and limited operating room time (16%).

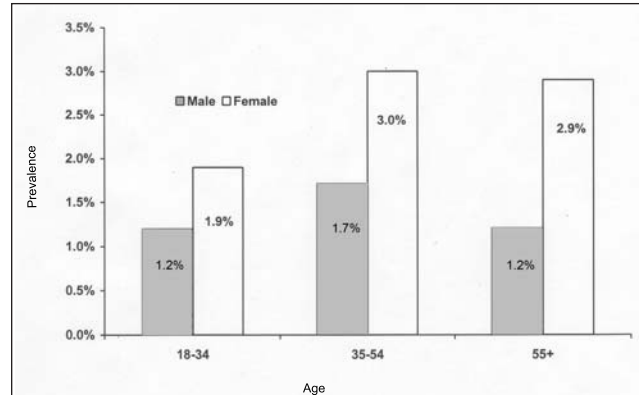


Figure 2. Prevalence of BMI ≥ 40 kg/m² by age and sex, Wisconsin 1999-2001. Data from the CDC BRFSS.

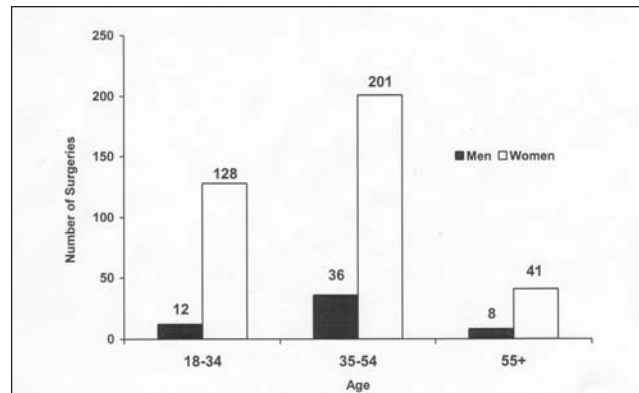


Figure 3. Gastric Bypass Surgeries in Wisconsin by Age and Gender 2002. Data from the CDC BRFSS.

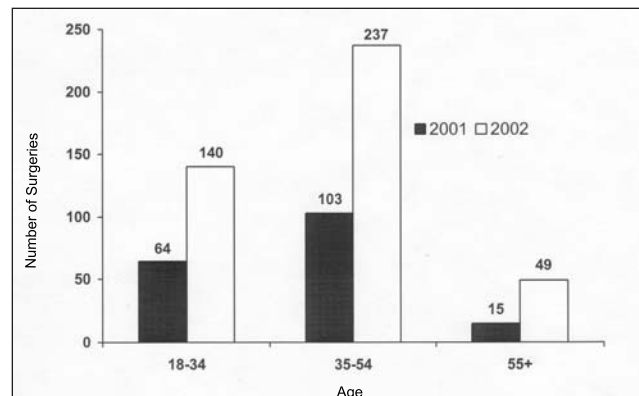


Figure 4. Gastric Bypass in Wisconsin by Age and Year. Data from the WITHIN Database.

DISCUSSION

There are approximately 79,000 Wisconsin adults who, based on BMI-criteria (BMI ≥ 40) alone, might be candidates for bariatric surgery. There is an additional unknown number who may qualify based on having a BMI of 35-40 with the presence of a serious comorbid condition. Currently, we know of 34 surgeons in

Table 2. Results from a Survey of Wisconsin Bariatric Surgeons (N=25)

Years Practicing Bariatric Surgery in Wisconsin	
Average	7.6
Median	3
Range	1-31
Number of Bariatric Surgeries 2001-2002	
Increased	84%
Increase by more than double	50%
Number of Bariatric Surgeries 2002 Compared to 2003 Estimates	
Predict increase	83%
Predict increase by more than double	53%
Maximum Number of Bariatric Surgeries that Could Be Performed per Year	
Median	620
Type of Bariatric Surgery Performed	
Laparoscopic gastric bypass	45% (n=563)
Open gastric bypass	48% (n=596)
Vertical Banded Gastroplasty	<1 % (n=11)
Other	7% (n=68)
Plan to Add Another Surgeon to their Group in the Next 12 Months	
Yes	24%
Not sure	18%
Motivating Factors to Provide Bariatric Surgery (Multiple Responses Allowed)	
Personal Interest	88%
Consumer Need	68%
Practice/group need	20%
Desire to use advanced technology	40%
Financial Reasons	16%
Where Bariatric Surgeons Received their Training (Multiple Responses Allowed)	
Residency	60%
Fellowship	8%
Apprenticeship	16%
Course	56%
Biggest Barrier to Performing Bariatric Surgery	
Insurance approval	36%
Competing professional obligations	36%
Limited operating room time	16%
Other	12%
Barrier to Performing Bariatric Surgery (Multiple Responses Allowed)	
Insurance approval	56%
Competing professional obligations	60%
Limited operating room time	28%

Wisconsin providing bariatric surgery procedures. Based on the results of our survey, over 80% of surgeons are planning to increase the number of bariatric surgeries they perform in the next year and 53% are planning to more than double the number of surgeries. However, each surgeon would need to perform over 2000 bariatric surgeries to surgically treat the current level of morbid obesity in Wisconsin. It is unlikely that this potential demand can be met given that fewer than 1 in 4 bariatric surgeons plan to add another surgeon to their group.

Utilizing the WITHIN database for Wisconsin hospitalizations, there were 426 gastric bypass surgeries done in 2002. There is some discrepancy regarding the number of gastric bypass surgeries between the WITHIN databases (426) and the survey-reported gastric bypass surgery numbers (1159) for 2002. Considering the return rate of the surveys (74%), the difference between the sources may even be larger. Possible reasons for the disparity include surgeries performed at Wisconsin Veterans hospitals, which are not reported to WITHIN, or error in reporting on the behalf of the surgeons. Additionally, the publicly available WITHIN data can only be analyzed by primary procedure code and thus does not include gastric bypass surgeries done as a secondary procedure for that hospitalization. Another limitation of the WITHIN database for hospital procedures is that it can only provide data specific to gastric bypass surgeries. Based on our surgeon survey, gastric bypass accounts for over 90% of all bariatric surgeries, which can provide a rough estimate for the total number of bariatric surgeries in 2002. In 2002, there were approximately 450-1300 total bariatric surgeries performed in Wisconsin, representing 1 surgery for every 80-180 adults with morbid obesity in the state.

Morbid obesity is more prevalent among females in all age groups. Overall, there are nearly twice as many morbidly obese females than males (Table 1). In 2002, 7 out of 8 gastric bypass surgeries were performed on females. The rates of procedures per population with a BMI ≥ 40 were higher for females of all age groups (Table 2). One possible reason for the increased rate of surgery for eligible females (BMI ≥ 40) could include greater demand from females. Additionally it may be that, among persons who are morbidly obese, women tend to have even more extreme BMIs than men, and this could influence position on the surgery priority list. This study only analyzed BMI ≥ 40 and does not provide any information regarding the estimated populations with a BMI ≥ 50 or 60.

Surgery for morbid obesity is increasing dramatically in Wisconsin. Confronting the public health problem of morbid obesity requires a comprehensive approach, from preventing obesity to treating those already afflicted. At present, bariatric surgery may be the only modality we can offer that provides any significant long term weight loss to the morbidly obese. The potential demand for surgery far exceeds the current capacity of surgeons in the state.

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REFERENCES

1. Austin D, Stone-Newsom R. An Ounce of Prevention: What Can Policymakers Do About the Obesity Epidemic? Wisconsin Public Health and Health Policy Institute, Wisconsin Health Policy Forums. 2003;1(2).
2. Mokdad A, Bowman B, Ford E, Vinicor F, Marks J, Koplan J. The continuing epidemics of obesity and diabetes in the United States. *JAMA*. 2001;286(10):1195-1200.
3. Thompson D, Wolf AM. The medical-care cost burden of obesity. *Obes Rev*. 2001;2(3):189-197.
4. Thompson D, et al. Body mass index and future health care costs: a retrospective cohort study. *Obes Res*. 2001;9(3):210-212.
5. National Institute of Health. Medline Plus Health Information. Available at www.nlm.nih.gov/medlineplus. Accessed March 19, 2004.
6. Baxter J. Obesity surgery—another unmet need: it is effective but prejudice is preventing its use. *BMJ*. 2000;321(7260):523-524.
7. Sugerman H. The epidemic of severe obesity: the value of surgical treatment. *Mayo Clin Proc*. 2000;75(7):669-672.
8. Glennly AM, O'Meara S, Melville A, Sheldon TA, Wilson C. The treatment and prevention of obesity: a systematic review of the literature. *Int J Obes*. 1997;21:715-737.
9. NIH Technology Assessment Conference Panel. Methods for voluntary weight loss and control: Consensus Development Conference. *Ann of Intern Med*. 1993;119:764-770.
10. Balsiger B et al. Prospective evaluation of Roux-en-Y gastric bypass as primary operation for medically complicated obesity. *Mayo Clin Proc*. 2000;75:673-680.
11. Craig B, Tseng D. Cost-effectiveness of gastric bypass for severe obesity. *Am J Med*. 2002;113(6):491-498.
12. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. Data Available at www.cdc.gov/brfss. Accessed March 19, 2004.

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