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Inpatient Bariatric Surgery Among Eligible Black and White Men and Women in the United States, 1999–2010

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OBJECTIVES: **We examined national trends in bariatric surgery for adults, focusing on differences in utilization by race and access to health care.**

METHODS: **We analyzed subjects eligible for bariatric surgery in the National Hospital Discharge Survey and the National Health and Nutrition Examination Survey for 1999–2010. Primary outcome measures included population-based estimates and comparison of blacks and whites eligible for surgery with those who actually received it.**

RESULTS: **A higher percentage of black than white women and of black than white men were eligible for bariatric surgery. But a higher proportion of eligible white women and men than black women and men received bariatric surgery. 69.8% of eligible white women and 72.9% of white women who received bariatric surgery had private health insurance, compared with 49.9% and 71.1% of black women. 71.4% of eligible white men and 75.9% of white men who received bariatric surgery had private health insurance, compared with 52.4% and 74.7% of black men. Among men eligibility and surgery rates were lower than for women of the same race, and significant differences were found by race in the same directions as for women.**

CONCLUSIONS: **Eligible whites received bariatric surgery at higher levels than eligible blacks, apparently partly because of differences in insurance coverage.**

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Introduction

Obesity is a significant public-health problem associated with an increased risk of development of a variety of chronic diseases, as well as an increased risk of mortality (1,2). Unfortunately, the prevalence of obesity defined by body mass index in adults in the United States continues to exceed 30%, affecting more than 130 million adults (3). Obesity is found throughout the United States population and is particularly prevalent among blacks, with recent national estimates indicating that 39% of black men and 59% of black women are obese (3).

Although it is not advocated as a first-line treatment for obesity, bariatric surgery has recently been shown to be an effective treatment for moderate to clinically severe obesity (4–6). Moreover, it has the benefit of successfully resolving or improving the obesity-associated chronic conditions of diabetes, hyperlipidemia, hypertension, and obstructive sleep apnea in the majority of cases (4,7,8). Further, bariatric surgery can improve quality of life, decrease the risk of premature death, and lower disability and health-care costs (9). Between 1998 and 2006, the trends in inpatient bariatric surgery in the United States indicated that bariatric surgical procedures increased substantially from 1998 to 2003 and then leveled off while rates of in-hospital complications were stable and length of stay decreased (10,11).

A variety of health disparities exist where there is underutilization of effective therapies by minority populations (12,13). Although blacks have a higher prevalence of obesity, it is unclear whether bariatric surgery has been appropriately utilized among this vulnerable population. In fact, racial comparisons were not presented in the most recent studies examining national trends in bariatric surgery (10,11). Thus, the purpose of this study was to examine national trends in bariatric surgery for eligible adults with a focus on potential differences by race and access to health care.

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Methods

We used two nationally representative surveys for this study, both of which were conducted by the National Center for Health Statistics. We conducted an analysis of the National Hospital Discharge Survey (NHDS; http://www.cdc.gov/nchs/nhds.htm) in the 12-year period of 1999–2010 for black and white patients aged 20–64 years to provide population estimates of the use of bariatric surgery (we did not include other races/ethnicities because of small sample sizes). We used the National Health and Nutrition Examination Survey (NHANES; http://www.cdc.gov/nchs/nhanes.htm), 1999–2010, to provide population estimates of the number of non-Hispanic black and non-Hispanic white people aged 20–64 who were eligible for bariatric surgery during the same time period. Because the NHDS did not include Hispanic ethnicity in its data collection but the NHANES did, we used a more comprehensive racial/ethnic category in the NHANES. For streamlining of language we label people as black or white. We limited this study to non-elderly adults because of the increase in risk of complications from abdominal surgery with increasing age (14).

We attempted to include national estimates of outpatient bariatric procedure usage from analysis of the National Hospital Ambulatory Medical Care Survey (NHAMCS). This data set would be a comparable ambulatory surgery data set to the NHDS. Unfortunately, data for ambulatory surgery are only available in the NHAMCS for 2009. In our analyses only a very small number of outpatient bariatric surgeries were reported, with an unweighted total of 7 bariatric surgeries out of 16,190 procedures for adults aged 20–64. Thus, the small sample size would not allow us to make reliable population estimates.

Inpatients who received bariatric surgery. The NHDS covered 151,551 to 376,328 patients per year in 203 to 458 short-stay hospitals by using a stratified, multistage survey to create a nationally representative annual sample of discharge records. The NHDS suffered a recent budget cut, which led to a 50% reduction in sample sizes in 2008–2010 relative to the 1999–2007 surveys. Noninstitutional short-stay and general hospitals are included; federal, military, and Veterans Affairs hospitals are not included. Each discharge record in 1999–2009 contains up to seven International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) discharge diagnosis codes (NHDS 2010 has up to 15) and up to four ICD-9-CM procedure codes (NHDS 2010 has up to eight) and is population weighted on the basis of the probability of sample selection and adjusted for nonresponse. Nationally representative estimates of care within hospitalizations in the United States can be computed with the NHDS.

We identified patients who received bariatric surgery by the presence of bariatric surgery procedure codes 44.31 (high gastric bypass), 44.38 (laparoscopic gastroenterostomy), 44.39 (other gastroenterostomy), 44.68 (laparoscopic gastroplasty), 44.93 (insertion of gastric bubble (balloon)), 44.95 (laparoscopic gastric restrictive procedure), or 44.99 (other operations on stomach) in the records of patients who also had an obesity-related diagnosis code of 278.0 (overweight or obese), 250.0 (type 2 diabetes), 425.7 (metabolic cardiomyopathy), or 780.57 (sleep apnea) or a

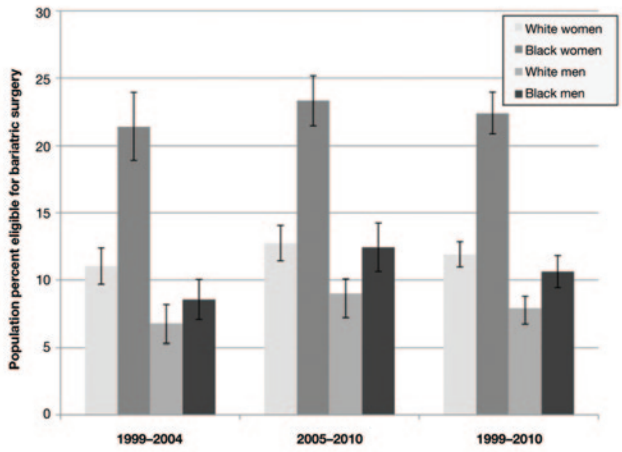

Figure 1. Percentage of adults aged 20–64 eligible for bariatric surgery on the basis of body mass index and comorbidities, by sex and race, with 95% confidence intervals.

diagnosis-related group code of 288. We excluded people who were admitted to the hospital on an emergency basis or had a diagnosis code of 150.0–159.9 (stomach or intestinal cancer) or 230.1–230.9 (*in situ* cancer).

Population eligible for bariatric surgery—NHANES. The NHANES included participants from a nationally representative sample of noninstitutionalized residents of the United States. This survey included examination and interview information. Samples were weighted to be representative of the US population so that population estimates could be made.

According to the guidelines provided by Mechanick *et al.* (15), people eligible for bariatric surgery include those with a body mass index of at least 40 kg/m^2, or with a body mass index of at least 35 kg/m^2 and at least one obesity-associated comorbidity. For our analyses we applied these eligibility criteria using body mass indices calculated from the measured weight and height collected by protocol as well as self-reporting of previous diagnosis of the following obesity-associated medical conditions: diabetes, high blood pressure, high cholesterol, coronary heart disease, congestive heart failure, heart attack, or stroke.

Inpatients eligible for bariatric surgery—NHDS. We identified inpatients eligible for bariatric surgery in the NHDS in order to create a comparison group for health insurance status. Inpatients were considered to be eligible if they had an ICD-9-CM diagnosis code for clinically severe obesity (also called morbid obesity; 278.01) and if they were not admitted on an emergency basis nor had the above-listed cancer codes.

Race. In the NHDS we computed population estimates for people with a recorded race of white or black/African American. Race is not a required field in all hospital discharge abstracts. After exclusion of NHDS data for people younger than 20 and older than 64, and for records that did not include at least one procedure code, 22.7% of the weighted sample had missing data for race. In the NHANES, race was a required field, and we computed population estimates on people who were white or black.

Analysis. We used SUDAAN (Research Triangle Institute, Research Triangle, NC), a specialized statistical program that accounts for the complex survey design used in the NHDS and NHANES. Using SUDAAN allowed us to correct for unequal probabilities of selection and different response rates, ensuring that the results could be generalized to the noninstitutionalized civilian population of the United States. Thus the percentages and population estimates in the study represent weighted values. SUDAAN also adjusts standard errors to account for the weighting and clustering of the complex sampling design.

To estimate the number of blacks and whites aged 20–64 who received bariatric surgery out of 1,000 eligible within each race in the United States in an average year, we applied the above criteria to identify the sample in the NHDS who received bariatric surgery and the sample in the NHANES who were eligible for bariatric surgery. Then we used SUDAAN to calculate population estimates for the number of people who received bariatric surgery per year and the number of people who were eligible for bariatric surgery per year, and to calculate the standard errors for each of those estimates. Next, we created a ratio estimate by dividing the population estimate from the NHDS for the number of people who received bariatric surgery by the population estimate from the NHANES for the number of people who were eligible for bariatric surgery, and multiplied the result by 1,000 to convert to units of number of bariatric surgeries per 1,000 eligible adults.

To calculate 95% confidence intervals (CIs) for our ratio estimates, we first calculated relative standard errors using the population estimate and the standard error for each NHDS and NHANES estimate. Then we applied the following formula to calculate the relative standard error (RSE) for each ratio estimate from the relative standard errors of the NHDS (X) and NHANES (Y) estimates (16):

$$\text{RSE}\,(X/Y) = \text{sqrt}[\text{RSE}^2(X) + \text{RSE}^2(Y)]$$

Table 1. Characteristics of adults aged 20–64 who were eligible for bariatric surgery and who received bariatric surgery, by race and sex, 1999–2010

	Eligible for bariatric surgery—NHANES				Received bariatric surgery—NHDS			
	Non-Hispanic white		Non-Hispanic black		White		Black	
	Women	Men	Women	Men	Women	Men	Women	Men
Sample size (*N*)	646	420	569	254	3,645	889	965	99
Weighted annual population size	6,965,838	4,529,512	2,473,882	955,814	43,297	10,282	8,554	1,008
Age (%)								
20–40 years	32.1	33.6	43.3	44.8	41.5	35.5	53.1	32.4
41–64 years	67.9	66.4	56.7	55.2	58.5	64.5	46.9	67.6
Health insurance (NHANES) and expected source of payment (NHDS) (%)								
Private insurance	69.8	71.4	49.9	52.4	72.9	75.9	71.1	74.7
Government insurance	18.1	17.1	29.9	19.0	16.4	15.3	24.9	20.7
No insurance (NHANES)/ self-pay (NHDS)	11.8	11.5	19.3	27.3	4.3	6.7	1.2	2.8
No charge or other (NHDS)	0.0	0.0	0.0	0.0	2.4	1.3	1.0	1.8
Not stated	0.2	0.0	0.9	1.3	4.1	0.9	1.8	0.0
Body mass index								
≥35	45.7	50.4	31.9	43.4				
≥40	54.3	49.6	68.1	56.6				
Consider self overweight[a] (%)	99.2	98.0	96.0	89.8				
Doctor said you had diabetes (%)	17.1	21.8	19.7	25.7				
Doctor said you had high blood pressure (%)	59.7	61.1	61.6	65.8				
Doctor said you had high cholesterol[b] (%)	51.1	51.5	41.6	50.9				
Doctor said you had congestive heart failure (%)	3.2	4.1	4.0	6.1				
Doctor said you had coronary heart disease (%)	2.4	6.4	1.6	4.2				
Doctor said you had a heart attack (%)	3.1	7.8	3.0	7.3				
Doctor said you had a stroke (%)	3.2	3.0	4.9	4.1				

NHANES, National Health and Nutrition Examination Survey; NHDS, National Hospital Discharge Survey.
[a]Not available for adults in NHANES 2009–2010.
[b]Available only for individuals who responded that they had had their cholesterol checked: 83.1%, 83.6%, 76.6%, and 76.4%, respectively.

We calculated the standard error for each ratio estimate from the relative standard error, and calculated the lower and upper bounds of the 95% CIs by multiplying the standard error by 1.96 and subtracting and adding the result from and to the ratio estimate.

Results

According to our NHDS population estimates for black and white adults aged 20–64 years, the incidence of bariatric surgery in the United States increased for both races over time. From 1999 to 2004 an average of 31,302 white women, 5,778 black women, 5,819 white men, and 472 black men received bariatric surgery per year, and from 2005 to 2010 an average of 55,291 white women, 11,331 black women, 14,744 white men, and 1,544 black men received bariatric surgery per year. **Table 1** shows the annualized number of eligible adults, the annualized number of adults who received bariatric surgery, and descriptive statistics including age group, health insurance categories, and other characteristics for each group over the full 1999–2010 time period.

A significantly higher percentage of black women (22.4%, 95% CI 20.9–23.9%) than white women (11.9%, 95% CI 11.0–12.9%) met the eligibility criteria for bariatric surgery in the US population in 1999–2010 (**Figure 1**). In contrast, a significantly higher proportion of eligible white women (6.22 individuals per 1,000 eligible, 95% CI 4.77–7.66) than black women (3.46 individuals per 1,000 eligible, 95% CI 2.37–4.54) aged 20–64 received bariatric surgery during the same time period (**Figure 2**). This pattern also held for men: a significantly higher percentage of black men (10.6%, 95% CI 9.4–11.8%) compared with white men (7.9%, 95% CI 7.0–8.8%) were eligible for bariatric surgery, but there was a higher frequency of bariatric surgery among eligible white men (2.27 individuals per 1,000 eligible, 95% CI 1.71–2.83) than black men (1.05 individuals per 1,000 eligible, 95% CI 0.60–1.51).

Within each race, a significantly higher percentage of women were eligible for bariatric surgery than men, and a significantly higher proportion of eligible women than eligible men received bariatric surgery.

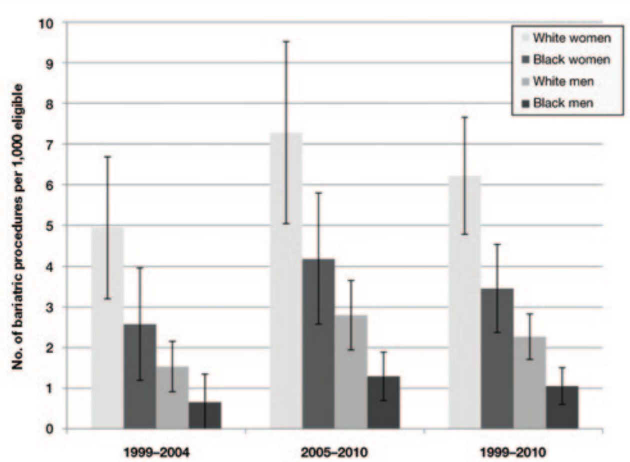

Figure 2. Number of bariatric procedures per 1,000 eligible among adults aged 20–64, by sex and race, with 95% confidence intervals.

Compared with the age distribution of the NHANES-based population eligible for bariatric surgery, a higher proportion of younger women are receiving bariatric surgery: 53.1% of black women receiving bariatric surgery are in the 20–40 years age group vs. 43.3% of black women in the eligible group, and 41.5% vs. 32.1% of white women, respectively. In contrast, a lower proportion of black men in the 20–40 years age group are receiving bariatric surgery (32.4%) compared with those eligible (44.8%) in that age group. Within the NHANES-estimated eligible population, black men were the least likely to respond that they consider themselves to be overweight (89.8% vs. ≥96.0% in the other three race/sex groups).

A lower percentage of black men (52.4%) and black women (49.9%) in the NHANES-estimated population eligible for bariatric surgery had private health insurance than white men (71.4%) and white women (69.8%). Among whites who received bariatric surgery, the proportion whose expected source of payment was private health insurance was similar to the proportion in the NHANES-estimated eligible group. In contrast, the proportion of blacks who received bariatric surgery and whose expected source of payment was private health insurance was higher than the proportion in the NHANES-estimated eligible group: 71.1% vs. 49.9% among black women and 74.7% vs. 52.4% among black men, respectively. Within the weighted group of NHDS inpatients, the percentage of black men and women who received bariatric surgery and whose expected source of payment was private health insurance was also higher than the percentage who were eligible for bariatric surgery on the basis of clinically severe obesity: 71.1% vs. 49.4% among black men and 74.7% vs. 36.1% among black women.

Discussion

Even though bariatric surgery has been shown to be a safe and effective method to help people lose weight, our findings indicate a significantly lower use of this weight reduction strategy among eligible blacks than eligible whites. This finding across a 12-year period is consistent among both men and women and is similar to findings from a study using one year of data from 2000 that included self-reported estimates of obesity (17). Moreover, this finding of under-utilization of the technique by blacks is particularly striking in light of the fact that blacks are more likely to be obese than whites, and the remarkably large percentage of black women who are obese.

Our data clearly show a lower rate of inpatient bariatric surgery utilization by blacks than whites, even though a greater proportion of blacks were eligible for surgery than whites, and this may indicate a health disparity in inpatient bariatric utilization among eligible blacks. This difference may represent an access-to-care issue as manifested by a difference in insurance coverage between the eligible black and white populations. Nearly one-fifth (19%) of black women who would be eligible for bariatric surgery have no insurance, and only 1% of black women who received bariatric surgery had no insurance. Granting that eligible white women are less likely to be uninsured, a larger proportion of white women without insurance receive bariatric surgery. It is unclear whether this increased proportion of white women receiving bariatric surgery who state no insurance or self-pay for the procedure are truly uninsured or are simply choosing to pay out of pocket because of the elective nature of the procedure.

Another potential explanation for this health-care disparity may be a persistent lack of trust by blacks of physicians, leading to a tendency of decreased adherence to treatment recommendations (18). It has also been observed that blacks assess the risks of a surgical treatment differently from whites, leading to a tendency to decline surgery, which may explain the differences found here between blacks and whites in bariatric surgery (19). It may be worthwhile to further investigate the role of trust and attitudes regarding bariatric surgery across racial and ethnic groups.

A possible additional reason for the racial differences in the use of bariatric surgery among obese people is that being obese is more culturally accepted in the African-American population; these patients therefore tend to have less motivation to try to lose weight and choose to have this operation (20,21). Our data indicate that more than 95% of black women, white women, and white men who are eligible for bariatric surgery consider themselves to be overweight. Nine out of ten eligible black men also consider themselves to be overweight. Thus, these people have a realistic view of themselves as heavier than is optimal, but cultural attitudes may suggest no need to undertake the expense and risk of surgical interventions to change.

Several limitations should be considered in interpreting the results of this study. First, inpatient obesity diagnoses may underestimate inpatient utilization, thereby misidentifying patterns of care for obese patients (22). We attempted to overcome this limitation by considering a set of procedure codes to be bariatric surgery if the patient record had an affiliated diagnosis code for obesity, as well as other conditions, such as type 2 diabetes or obstructive sleep apnea. Second, bariatric surgery can be performed in an outpatient setting, and those instances of care would be missing from this analysis of inpatient data. Our analysis of outpatient bariatric procedures from the National Hospital Ambulatory Medical Care Survey (NHAMCS), a database cataloguing ambulatory surgery services in the United States, yielded sample sizes too small to calculate a nationally representative estimate of outpatient bariatric procedure usage. Our inpatient results may underestimate total national bariatric usage by eligible blacks or the uninsured if the reduced cost of outpatient bariatric surgery relative to inpatient bariatric surgery was seen as cost-effective for people to pay out of pocket for this service. This issue could be addressed if a nationally representative registry of bariatric surgery (both inpatient and ambulatory) were publicly available for research and analysis. Because of safety concerns, most bariatric surgery is performed in inpatient settings, and consequently most national estimates of bariatric surgery are based on inpatient data. Our analysis allows for more consistent comparisons with previous estimates.

A third limitation is that we limited our analyses to adults and did not include adolescents even though bariatric surgery in adolescents is a current topic of discussion (23), because national trends in adolescent bariatric surgery up to 2003 suggested that bariatric surgery in adolescents is relatively uncommon (10,24,25). Fourth, the NHDS included Hispanics within the white and black categories, whereas the NHANES identified Hispanic as a separate category from white and black, potentially leading to an underestimation of the eligible populations. Fifth, we limited our NHDS analyses to people whose race was recorded as black or white because of small sample sizes of data on bariatric procedures in other racial/ethnic groups. Sixth, race is not a required field for the hospital discharge abstract, and thus some data are missing in the NHDS. Because 22.7% of people in the NHDS were missing race from their records and were therefore not included in our analysis, we may have underestimated utilization of bariatric surgery. The current analysis does still allow us to examine the relationship between race and use of bariatric surgery in the US population.

In conclusion, a significant racial difference exists in the use of inpatient bariatric surgery among eligible adults. Considering the recent evidence showing immediate metabolic advantages to bariatric surgery and the exceptionally large proportion of black women who are obese, a more concerted effort to increase the use of this strategy among those refractory to standard weight loss strategies may be worthwhile.

CONFLICT OF INTEREST

Guarantor of the article: Arch G. Mainous III, PhD.
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REFERENCES

1. Hensrud DD, Klein S. Extreme obesity: a new medical crisis in the United States. Mayo Clin Proc 2006;81:S5–10.
2. Flegal KM, Graubard BI, Williamson DF *et al.* Excess deaths associated with underweight, overweight, and obesity. JAMA 2005;293:1861–7.
3. Flegal KM, Carroll MD, Kit BK *et al.* Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999–2010. JAMA 2012;307:491–7.
4. Buchwald H, Avidor Y, Braunwald E *et al.* Bariatric surgery: a systematic review and meta-analysis. JAMA 2004;292:1724–37.
5. Picot J, Jones J, Colquitt JL *et al.* The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation. Health Technol Assess 2009;13:1–358.
6. National Institutes of Health. The Practical Guide to the Identification, Evaluation and Treatment of Overweight and Obesity in Adults. NIH Publication no. 00-4084, 2000.
7. Mingrone G, Panunzi S, De Gaetano A *et al.* Bariatric surgery versus conventional medical therapy for type 2 diabetes. N Engl J Med 2012;366:1577–85.
8. Schauer PR, Kashyap SR, Wolski K *et al.* Bariatric surgery versus intensive medical therapy in obese patients with diabetes. N Engl J Med 2012;366:1567–76.
9. Choban PS, Jackson B, Poplawski S *et al.* Bariatric surgery for morbid obesity: why, who, when, how, where, and then what? Cleve Clin J Med 2002;69:897–903.
10. Santry HP, Gillen DL, Lauderdale DS. Trends in bariatric surgical procedures. JAMA 2005;294:1909–17.
11. Kohn GP, Galanko JA, Overby DW *et al.* Recent trends in bariatric surgery case volume in the United States. Surgery 2009;146:375–80.
12. Eapen ZJ, Peterson ED, Fonarow GC *et al.* Quality of care for sudden cardiac arrest: proposed steps to improve the translation of evidence into practice. Am Heart J 2011;162:222–31.
13. Landrum MB, Keating NL, Lamont EB *et al.* Reasons for underuse of recommended therapies for colorectal and lung cancer in the Veterans Health

Administration. Cancer 2012;118:3345–55.
14. Massarweh NN, Legner VJ, Symons RG *et al.* Impact of advancing age on abdominal surgical outcomes. Arch Surg 2009;144:1108–14.
15. Mechanick JI, Kushner RF, Sugerman HJ *et al.* American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery medical guidelines for clinical practice for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient. Obesity (Silver Spring) 2009;17(Suppl 1):S1–70.
16. National Center for Health Statistics. National Hospital Discharge Survey 2010 (public-use data file documentation) <http://www.cdc.gov/nchs/nhds.htm> (2012). Accessed 4 April 2012.
17. Livingston EH, Ko CY. Socioeconomic characteristics of the population eligible for obesity surgery. Surgery 2004;135:288–96.
18. Armstrong K, Ravenell KL, McMurphy S *et al.* Racial/ethnic differences in physician distrust in the United States. Am J Public Health 2007;97:1283–9.
19. McCann J, Artinian V, Duhaime L *et al.* Evaluation of the causes for racial disparity in surgical treatment of early stage lung cancer. Chest 2005;128:3440–6.
20. Greenberg DR, LaPorte DJ. Racial differences in body type preferences of men for women. Int J Eat Disord 1996;19:275–8.
21. Stevens J, Kumanyika SK, Keil JE. Attitudes toward body size and dieting: differences between elderly Black and White women. Am J Public Health 1994;84:1322–5.
22. Woo JG, Zeller MH, Wilson K *et al.* Obesity identified by discharge ICD-9 codes underestimates the true prevalence of obesity in hospitalized children. J Pediatr 2009;154:327–31.
23. Ingelfinger JR. Bariatric surgery in adolescents. N Engl J Med 2011;365:1365–7.
24. Tsai WS, Inge TH, Burd RS. Bariatric surgery in adolescents: recent national trends in use and in-hospital outcome. Arch Pediatr Adolesc Med 2007;161:217–21.
25. Schilling PL, Davis MM, Albanese CT *et al.* National trends in adolescent bariatric surgical procedures and implications for surgical centers of excellence. J Am Coll Surg 2008;206:1–12.