OBSTETRICS

Maternal superobesity and perinatal outcomes

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OBJECTIVE: The purpose of this study was to determine the effect of maternal superobesity (body mass index [BMI], ≥50 kg/m^2) compared with morbid obesity (BMI, 40-49.9 kg/m^2) or obesity (BMI, 30-39.9 kg/m^2) on perinatal outcomes.

STUDY DESIGN: We conducted a retrospective cohort study of birth records that were linked to hospital discharge data for all liveborn singleton term infants who were born to obese Missouri residents from 2000-2006. We excluded major congenital anomalies and women with diabetes mellitus or chronic hypertension.

RESULTS: There were 64,272 births that met the study criteria, which included 1185 superobese mothers (1.8%). Superobese women were significantly more likely than obese women to have preeclampsia (adjusted relative risk [aRR], 1.7; 95% confidence interval [CI], 1.4–2.1), macrosomia (aRR, 1.8; 95% CI, 1.3–2.5), and cesarean delivery (aRR, 1.8; 95% CI, 1.5–2.1). Almost one-half of all superobese women (49.1%) delivered by cesarean section, and 33.8% of superobese nulliparous women underwent scheduled primary cesarean delivery.

CONCLUSION: Women with a BMI of ≥50 kg/m^2 are at significantly increased risk for perinatal complications compared with obese women with a lower BMI.

Key words: pregnancy outcome, superobesity

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The obesity epidemic remains unabated in the United States. In 2007-2008, 34% of American women who were 20-39 years old met obesity criteria (body mass index [BMI] ≥30 kg/m^2)[1]; obesity is now an increasingly common and harmful pregnancy complication. Superobesity, as coined in the gastric bypass literature to describe patients who weigh ≥225% of ideal body weight,[2] represents individuals with a BMI of ≥50 kg/m^2. The number of superobese individuals is growing 5 times faster than other obesity categories,[3] which means that healthcare providers increasingly will be challenged to accommodate their healthcare needs.

Obese women are more likely than normal weight women to experience preeclampsia, diabetes mellitus, cesarean delivery, fetal growth abnormalities, and stillbirth.[4] Although several studies compare obese women to normal-weight women, to date there have been limited studies on superobesity in pregnancy.[5-7] As the number of superobese pregnant women continues to rise, it is important to determine whether there is a "dose-response" relationship between the severity of maternal obesity and perinatal complications.

The objective of this study was to determine the effect of maternal superobesity on perinatal outcomes compared with maternal obesity (BMI, 30-39.9 kg/m^2) and morbid obesity (BMI, 40-49.9 kg/m^2). We hypothesized that pregnancy in superobese women, compared with obese and morbidly obese women, is associated with (1) increased risk of maternal complications of pregnancy, (2) greater risk of fetal growth abnormalities, and (3) greater risk of infant complications.

Materials and Methods

This was a population-based retrospective cohort study of all liveborn singleton, full-term infants who were born to Missouri residents between January 1, 2000, and December 31, 2006 (N = 502,452). Data were obtained from Missouri vital records, which includes birth certificate records that are linked to hospital discharge information, for the available period of 2000-2006. Women with prepregnancy BMI of ≥30 kg/m^2 were included. Exclusion criteria were documented in the birth certificate or hospital discharge data: (1) fetuses with major congenital anomalies (n = 872; 1.3%) and (2) women with diabetes mellitus (n = 5830; 8.3%) or chronic hypertension (n = 1773; 2.7%). Women with either pregestational or gestational diabetes mellitus were excluded because of the inability to reliably classify the type of diabetes mellitus based on the birth certificate or ICD-9 coding. Inclusion was limited to term infants to avoid confounding of neonatal outcomes that were due to complications that were associated with prematurity.

The primary predictor of interest was maternal BMI. BMI was calculated by self-reported prepregnancy weight in kilograms divided by height in meters squared. The World Health Organiza-

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TABLE 1
Population characteristics (n = 64,272 women)

Variable	Maternal body mass index: Obese 30-39.9 kg/m^2	Morbid 40-49.9 kg/m^2	Super ≥50 kg/m^2
Maternal race, n (%)[a]			
African American	9222 (17.4)	2178 (21.7)	376 (31.8)
White	41,143 (77.7)	7512 (74.9)	760 (64.3)
Hispanic	1962 (3.7)	259 (2.6)	30 (2.5)
Asian/other	621 (1.2)	86 (0.9)	16 (1.4)
Maternal age, n (%)[a]			
<18 y	896 (1.7)	81 (0.8)	5 (0.4)
18-34 y	46,806 (88.3)	8972 (89.2)	1053 (88.9)
≥35 y	5330 (10.0)	1001 (10.0)	127 (10.7)
Education, n (%)[a]			
High	25,482 (48.3)	4619 (46.1)	506 (42.9)
Average	19,683 (37.3)	3971 (39.7)	489 (41.5)
Low	7563 (14.3)	1418 (14.2)	184 (15.6)
Married, n (%)[a]	34,458 (65.0)	6370 (63.4)	664 (56.1)
Parity, n (%)[a]			
0	17,013 (32.2)	2993 (30.0)	296 (25.1)
1	18,470 (35.0)	3574 (35.8)	437 (37.0)
2	10,510 (19.9)	2020 (20.2)	256 (21.7)
≥3	6773 (12.8)	1398 (14.0)	192 (16.3)
Smoking status, n (%)[b]			
Yes	9378 (17.7)	1685 (16.8)	167 (14.1)
No	43,368 (81.8)	8319 (82.7)	1013 (85.5)
Unknown	286 (0.5)	51 (0.5)	5 (0.4)
Medicaid, n (%)[a]	25,331 (47.9)	5341 (53.3)	743 (63.1)
Prenatal care use, n (%)[a]			
Missing	774 (1.5)	151 (1.5)	18 (1.6)
None	258 (0.5)	46 (0.5)	7 (0.6)
Inadequate	2327 (4.5)	417 (4.2)	54 (4.7)
Adequate	27,928 (53.7)	5307 (53.9)	611 (52.9)
Intermediate	16,808 (32.3)	3056 (31.0)	344 (29.8)
Intensive	3891 (7.5)	877 (8.9)	121 (10.5)
Male infant, n (%)	27,122 (51.1)	5127 (51.0)	594 (50.1)
Gestational age, wk[c]	38.8 ± 1.0	38.7 ± 1.0	38.7 ± 1.0
Birthweight, g[c,d]	3460.6 ± 476.3	3490.1 ± 499.5	3517.6 ± 514.8

[a] $P < .0001$; [b] $P < .001$; [c] Data are given as mean ± SD; [d] $P < .05$.

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tion separates obesity (BMI, ≥30 kg/m^2) into 3 classes: class I (30-34.9 kg/m^2), class II (35.0-39.9 kg/m^2), and class III (≥40 kg/m^2).[8] Because the objective of this study was to determine the impact of superobesity on perinatal outcomes and whether there was a dose response to increasing obesity, we combined classes I and II as obese (30-39.9 kg/m^2) and separated class III into morbid obesity (40-49.9 kg/m^2) and superobesity, defined as a BMI of ≥50 kg/m^2.[2]

The primary outcomes of interest were preeclampsia, method of delivery, macrosomia (birthweight, >4500 g), and composite neonatal morbidity, which included low Apgar score (<7 at 5 minutes), birth trauma, neonatal infection, neonatal hypoglycemia, respiratory distress syndrome, neonatal seizures, neonatal length of stay of >5 days, and/or meconium aspiration syndrome. *Low birthweight* was defined as <2500 g. If a diagnosis such as preeclampsia, birth trauma, or respiratory distress syndrome was documented in either the birth certificate or the hospital discharge data, then the condition was considered present. Use of the combined birth certificate and hospital discharge data has been found to be more accurate for perinatal outcomes, compared with birth certificate data alone.[9,10]

Various maternal sociodemographic characteristics have been shown to be associated with maternal obesity and were evaluated as potential confounders in this study. Maternal education was categorized as high, average, or low on the basis of age and years of education.[11] Corrected for maternal age, average education included women within 2 grades of their expected level; low education was ≥2 or more grades below expected grade. Greater than 12 years of education was considered high, regardless of maternal age. The R-GINDEX (University of Manitoba, Winnipeg, Canada) was used to categorize prenatal care as no care, inadequate care, adequate care, intermediate care, intensive care, or missing based on initiation of prenatal care, total number of visits, and gestational age at delivery.[12,13] Smoking status was determined by maternal self-report on birth certificate records.

Bivariate analyses were completed with the χ^2 test, Fisher's exact test, and *t* test, as appropriate. Outcomes were assessed with the Cochrane-Armitage test for linear trend and multivariable regression for adjusted risk. Multivariable logistic regression models were used to evaluate outcomes and were controlled for maternal age, race, parity, smoking status, marital status, Medicaid use, prenatal care, level of

TABLE 2
Trend analysis for perinatal outcomes by obesity class

Variable	Body mass index, n (%)			
	Obese 30-39.9 kg/m^2	Morbid 40-49.9 kg/m^2	Super ≥50 kg/m^2	*P* value[a]
Preeclampsia	3842 (7.2)	980 (9.8)	129 (10.9)	< .0001
Neonatal length of stay >5 d	1629 (3.1)	381 (3.8)	53 (4.5)	< .0001
Low Apgar score	343 (0.7)	67 (0.7)	15 (1.3)	.05
Macrosomia	979 (1.9)	262 (2.6)	40 (3.4)	< .0001
Low birthweight	1074 (2.0)	223 (2.2)	31 (2.6)	.04
Neonatal hypoglycemia	1035 (2.0)	274 (2.7)	45 (3.8)	< .0001
Birth trauma	1716 (3.2)	348 (3.5)	41 (3.5)	.12
Composite neonatal	4924 (9.3)	1097 (10.9)	153 (12.9)	< .0001

[a] Cochran-Armitage trend.

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education, primary scheduled cesarean delivery, and repeat cesarean delivery. Mode of delivery was categorized by birth certificate designation as vaginal, operative vaginal, vaginal birth after cesarean delivery (VBAC), primary emergent cesarean delivery, primary elective cesarean delivery, and repeat cesarean delivery. For clarity, primary elective cesarean delivery is referred to as primary scheduled cesarean delivery. Comparisons were made among BMI groups (obese, morbidly obese, and superobese). Adjusted relative risk (aRR) and 95% confidence interval were calculated. A probability value of < .05 on 2-tailed tests was considered significant.

All analyses were completed with SAS software (version 9.2; SAS Institute Inc, Cary, NC). Approval for human subject research and a waiver of informed consent were received from the Institutional Review Board at Saint Louis University and the Missouri Department of Health and Senior Services, Section for Epidemiology for Public Health Practice.

RESULTS

There were 64,272 births that met the study criteria: 53,032 women (82.5%) were obese; 10,055 women (15.6%) were morbidly obese, and 1185 women (1.8%) were superobese. Increasing, BMI was associated with increased parity, single status, Medicaid use, African American race, intensive prenatal care usage, and previous cesarean delivery (Table 1). Lower BMI was associated with smoking and higher education levels.

Increasing maternal BMI was associated with a statistically significant increase in all studied perinatal outcomes, including preeclampsia, macrosomia, and composite neonatal morbidity, except for birth trauma (Table 2). Superobese women were significantly more likely than obese women to have preeclampsia (aRR, 1.7), macrosomia (aRR, 1.9) and neonatal hypoglycemia (aRR, 2.0; Table 3). Compared with morbidly obese women, superobese women remained at increased risk for composite neonatal morbidity (aRR, 1.2; $P = .02$). There was no difference between morbidly obese and superobese women regarding risk for preeclampsia, macrosomia, or neonatal length of stay of >5 days. Compared with obese women, morbidly obese women were at increased risk for these outcomes along with neonatal hypoglycemia and composite neonatal morbidity.

Increasing maternal obesity was associated significantly with an elevated risk of cesarean delivery and a decreased incidence of vaginal delivery, regardless of parity (Table 4). Among nulliparous

TABLE 3
Perinatal outcome comparison between obesity groups

Variable	Morbid vs obese		Super vs obese		Super vs morbid	
	Adjusted relative risk[a] (95% CI)	*P* value	Adjusted relative risk[a] (95% CI)	*P* value	Adjusted relative risk[a] (95% CI)	*P* value
Preeclampsia	1.4 (1.3–1.5)	< .0001	1.7 (1.4–2.1)	< .0001	1.2 (1.0–1.4)	.11
Neonatal length of stay >5 d	1.2 (1.1–1.3)	.003	1.3 (1.0–1.8)	.04	1.2 (0.9–1.6)	.36
Low Apgar score	1.0 (0.8–1.4)	.75	1.9 (1.1–3.2)	.02	1.9 (1.0–3.4)	.04
Macrosomia (≥4500 g)	1.4 (1.2–1.6)	< .0001	1.8 (1.3–2.5)	.0006	1.3 (0.9–1.8)	.16
Low birthweight	1.1 (0.9–1.3)	.24	1.3 (0.9–1.9)	.16	1.3 (0.9–1.9)	.22
Neonatal hypoglycemia	1.4 (1.2–1.6)	< .0001	2.0 (1.5–2.7)	< .0001	1.4 (1.0–1.9)	.05
Birth trauma	1.2 (1.0–1.3)	.008	1.3 (1.0–1.8)	.09	1.1 (0.8–1.6)	.44
Composite neonatal morbidity	1.2 (1.1–1.3)	< .0001	1.5 (1.2–1.8)	< .0001	1.2 (1.0–1.5)	.02

CI, confidence interval.

[a] Adjusted for smoking, Medicaid, age (18-34 years), education (average), prenatal care (adequate), married, nulliparous, repeat cesarean delivery, scheduled primary cesarean delivery, and race.

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TABLE 4
Trend analysis for mode of delivery by obesity class

Variable	Body mass index, n (%)			
	30-39.9 kg/m^2	40-49.9 kg/m^2	≥50 kg/m^2	*P* value[a]
Nulliparous pregnancy				
Vaginal delivery	9042 (53.2)	1331 (44.5)	94 (31.8)	< .0001
Operative vaginal delivery	1747 (10.3)	268 (9.0)	24 (8.1)	.0471
Primary scheduled cesarean delivery	3033 (17.8)	654 (21.9)	100 (33.8)	< .0001
Primary emergency cesarean delivery	3163 (18.6)	735 (24.6)	78 (26.4)	< .0001
Multiparous pregnancy				
Vaginal delivery	22,334 (62.5)	3690 (52.8)	421 (47.6)	< .0001
Operative vaginal delivery	1343 (3.8)	272 (3.9)	39 (4.4)	.3187
Vaginal birth after cesarean delivery	735 (2.1)	150 (2.2)	23 (2.6)	.3073
Primary scheduled cesarean delivery	1382 (3.9)	328 (4.7)	46 (5.2)	.0003
Primary emergency cesarean delivery	1400 (3.9)	323 (4.6)	49 (5.5)	.0004
Repeat scheduled cesarean delivery	8559 (23.9)	2229 (31.9)	307 (34.7)	< .0001
Totals				
Vaginal delivery	31,534 (59.5)	5053 (50.3)	517 (43.6)	< .0001
Operative vaginal delivery	3108 (5.9)	548 (5.5)	63 (5.3)	.0837
Cesarean delivery	17,653 (33.3)	4304 (42.8)	582 (49.1)	< .0001
Primary scheduled	4452 (8.4)	992 (9.9)	147 (12.4)	< .0001
Primary emergency	4580 (8.6)	1067 (10.6)	127 (10.7)	< .0001

[a] Cochran-Armitage χ^2 trend test.

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women, 31% of superobese women delivered vaginally compared with 53% of obese women; 33.8% of nulliparous superobese women underwent scheduled cesarean delivery. Of the 196 nulliparous superobese women who attempted a vaginal delivery, 94 women (48%) had a spontaneous vaginal birth; 24 women (12%) had an operative vaginal delivery, and 78 women (40%) were delivered by cesarean section. For multiparous women, previous vaginal birth was associated with a significantly decreased risk of emergency cesarean delivery, but most women with a previous cesarean delivery underwent a repeat cesarean delivery, with only 2% of women in each obesity class having a VBAC.

Nulliparous superobese women were significantly less likely than nulliparous obese women to have a vaginal delivery (aRR, 0.4) and significantly more likely to undergo a scheduled cesarean delivery (aRR, 2.4) or emergency cesarean delivery (aRR, 1.6; Table 5). Similar results were seen in multiparous women. Superobese women remained at increased risk compared with morbidly obese women for cesarean delivery (aRR, 1.2; $P = .03$) and had decreased rates of vaginal delivery for nulliparous (aRR, 0.6; $P < .0001$) and multiparous women (aRR, 0.8; $P = .001$). No significant difference in VBAC rates was seen among BMI groups, which were universally low.

COMMENT

Superobese women are at significantly increased risk of pregnancy complications, even compared with other obese and morbidly obese women. Our results support a dose-response relationship between worsening obesity and cesarean delivery, macrosomia, neonatal hypoglycemia, and preeclampsia. This study provides information regarding the increased risk of perinatal complications with increasing BMI within obesity classes that include superobese women and builds on the few published studies on superobesity in pregnancy that primarily examined single outcomes and limited comparisons to normal weight women[5,6] or combined obesity classes.[7]

Superobese women are at significantly increased risk of delivery by cesarean delivery, compared with morbidly obese and obese women. Although the overall cesarean delivery rate in the United States in 2007 was 31.8%,[14] 49.1% of all superobese women were delivered by cesarean delivery, which includes 12.1% who underwent primary scheduled cesarean delivery. Among nulliparous superobese women, 33.8% underwent primary scheduled cesarean delivery, and 40% of the women who attempted vaginal delivery were delivered by cesarean delivery. Previous studies have shown that, in addition to potential difficulties with regional anesthesia placement, superobese women are at increased risk for airway problems, deep venous thrombosis, and wound infection.[15-17] Superobese women must be counseled about these increased risks, and providers must be prepared for the likelihood of a surgical delivery and increased probability of repeat cesarean deliveries because <3% of superobese women delivered by VBAC. The rates of primary scheduled cesarean delivery are much higher than in other populations. Future prospective studies are needed to examine the indication for cesarean delivery in superobese women and to determine the influence of provider type and attitudes, which include unwillingness to attempt a vaginal delivery or decreased patience during labor.

In addition to the medical risks that are associated with cesarean delivery, there are also increased costs that are associated with the surgical procedure and prolonged hospital stay, compared with a vaginal delivery. Superobese women

TABLE 5
Mode of delivery comparison among obesity groups[a]

Variable	Morbid vs obese		Super vs obese		Super vs morbid	
	Adjusted relative risk[b] (95% CI)	*P* value	Adjusted relative risk[b] (95% CI)	*P* value	Adjusted relative risk[b] (95% CI)	*P* value
Nulliparous pregnancy						
Vaginal delivery	0.69 (0.64–0.75)	< .0001	0.40 (0.31–0.51)	< .0001	0.58 (0.45–0.75)	< .0001
Operative vaginal delivery	0.88 (0.77–1.01)	.06	0.81 (0.53–1.23)	.32	0.92 (0.59–1.42)	.69
Primary scheduled cesarean delivery	1.31 (1.19–1.45)	< .0001	2.41 (1.88–3.09)	< .0001	1.85 (1.43–2.40)	< .0001
Primary emergency cesarean delivery	1.42 (1.30–1.56)	< .0001	1.59 (1.22–2.07)	.001	1.09 (0.83–1.44)	.53
Multiparous pregnancy						
Vaginal delivery	0.66 (0.62–0.69)	< .0001	0.52 (0.45–0.60)	< .0001	0.79 (0.68–0.91)	.001
Operative vaginal delivery	1.06 (0.93–1.21)	.41	1.25 (0.90–1.73)	.19	1.17 (0.83–1.65)	.38
Vaginal birth after cesarean delivery	1.05 (0.88–1.26)	.57	1.19 (0.76–1.84)	.45	1.08 (0.68–1.73)	.73
Primary scheduled cesarean delivery	1.24 (1.09–1.40)	.001	1.42 (1.05–1.93)	.02	1.18 (0.86–1.63)	.30
Primary emergency cesarean delivery	1.19 (1.05–1.35)	.01	1.35 (1.00–1.83)	.048	1.13 (0.83–1.56)	.44
Repeat scheduled cesarean delivery	1.52 (1.43–1.61)	< .0001	1.80 (1.56–2.07)	< .0001	1.19 (1.02–1.38)	.03
Totals						
Vaginal delivery	0.67 (0.64–0.70)	.0001	0.50 (0.44–0.56)	< .0001	0.75 (0.66–0.84)	< .0001
Operative vaginal	0.95 (0.87–1.04)	.28	0.97 (0.75–1.25)	.81	1.01 (0.77–1.32)	.94
Cesarean delivery	1.42 (1.32–1.53)	< .0001	1.82 (1.48–2.22)	< .0001	1.27 (1.03–1.56)	.02
Primary scheduled cesarean delivery	1.23 (1.14–1.32)	< .0001	1.66 (1.39–1.98)	< .0001	1.37 (1.14–1.66)	.001
Primary emergency cesarean delivery	1.26 (1.18–1.36)	< .0001	1.28 (1.06–1.55)	.01	0.99 (0.81–1.21)	.93

[a] Example: women who were morbidly obese were 1.31 times more likely to deliver by primary scheduled cesarean delivery than were women who were obese; [b] Adjusted for smoking, insurance status, race/ethnicity, maternal age, education, prenatal care, and marital status.

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were more likely to use intensive prenatal care than are obese and morbidly obese women, which again reflects an increase in medical costs.

This study supports the importance of preconception counseling and the potentially beneficial effect of weight loss before pregnancy (as has been shown in women after gastric bypass surgery) with decreased rates of gestational diabetes mellitus, preeclampsia, and macrosomia compared with other obese women and to previous pregnancies.[4,18-20] Our findings suggest that women who are able to lower their prepregnancy BMI, even if it is only from superobese to morbidly obese, may decrease their risk of cesarean delivery, neonatal hypoglycemia, and composite neonatal morbidity. For a 5'4" woman, a change in weight of 5.9 lbs corresponds with a 1 unit change in BMI. For a 300-lb woman, losing 20 lbs will decrease her BMI from 51.5-48.1, and losing 40 lbs will drop her BMI to 44.6. Many superobese women may find the idea of losing enough weight to become normal weight inconceivable; however, by highlighting the potential benefits of even modest weight loss, obstetric providers can help patients set reasonable, achievable goals that hopefully will improve perinatal and lifelong health outcomes for women and infants. Clinical studies are urgently needed to determine the impact of prepregnancy weight loss, effective perinatal interventions, and track long-term health outcomes for both mothers and their children.

Limitations of this study include this use of birth certificate and hospital discharge data, which are dependent on the original quality of the data that were entered. This data set has been studied extensively and is considered very reliable[21]; a low percentage of records have with missing information.[14] Because we depended on birth certificate data, we were unable to evaluate stillbirth or miscarriage rates. We chose to focus on term deliveries to better evaluate infant birthweight and neonatal complications and therefore are not able to address preterm birth data. The potential for undercoding remains a concern for diagnoses such as birth trauma or preeclampsia, because severe undercoding of birth trauma (5%) and minimal undercoding of preeclampsia (85%) was found in an audit of Missouri birth certificates with hospital discharge data.[22] However, there is no reason to expect that undercoding would be biased by maternal BMI, particularly across the elevated BMI categories that were examined in these analyses. Patients whose condition was not coded properly would lead to an underrepresentation of the true incidence of these conditions, thus suggesting that the true differences were even larger than stated.

An additional limitation was the use of self-reported prepregnancy weight, which may be over- or underreported by participants. A previous integrated review of 34 studies found that women in all studies underestimated weight;[23] a 2006 study of reproductive-aged women reported that, although women underestimated weight by an average of 4.6 lbs, 84% of the women remained classified in the appropriate BMI categories.[24] Bodnar et al[25] examined the impact of exposure misclassification between prepregnancy BMI and adverse pregnancy outcomes and found that, although pregnancy outcomes were slightly overestimated, the dose-dependent associations persisted. Interestingly, they reported that the severely obese women (BMI, $\geq$35 kg/m^2) had the best predictive value (0.93) between self-reported and measured BMI, which would support the accuracy of our BMI classifications and perinatal outcomes. The use of birth certificate data contributed to 1 of our primary strengths, which was the ability to analyze perinatal outcomes on >1000 superobese, 10,000 morbidly obese, and 50,000 obese women.

Superobese women are at significantly increased risk of pregnancy complications that include cesarean delivery, preeclampsia, macrosomia, and neonatal hypoglycemia compared with obese women with a lower BMI. Although we support the role of preconception weight loss to improve perinatal outcomes, this study suggests that interventions to reduce excess morbidity in superobese women must be examined, especially mode of delivery, which is highly affected by physician influence. An analysis of the indication for primary cesarean delivery (and specifically elective cesarean delivery) in morbidly obese and superobese women is urgently needed. By better understanding the reason that superobese women are being delivered by cesarean delivery, it may be possible to decrease patient morbidity that is due to operative delivery by increasing provider education and awareness. Further, the economic implication of increasing levels of obesity requires study. ■

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