

Prepregnancy Body Mass Index and Infant Outcomes by Race and Hispanic Origin: United States, 2020

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Abstract

Objectives—This report presents data on distributions in prepregnancy body mass index (BMI), including the three classes of obesity, by maternal race and Hispanic origin for women who gave birth in 2020. It also examines newborn outcomes by BMI by maternal race and Hispanic origin.

Methods—Data are from the 2020 birth file from the National Vital Statistics System. Prepregnancy BMI distributions, including obesity classes, were calculated for all women and for the three largest race and Hispanic-origin groups (Hispanic, non-Hispanic White, non-Hispanic Black). Comparisons of preterm birth, low birthweight, and neonatal intensive care unit (NICU) admission by prepregnancy BMI are examined. Differences in outcomes between BMI categories were tested, as were differences between each obesity class.

Results—Among all women, 2.8% were underweight, 40.0% were normal weight, 27.2% were overweight, and 30.0% had prepregnancy obesity. Prepregnancy BMI distribution varied by race and Hispanic origin. Non-Hispanic White women were most likely to be normal weight (44.0%); non-Hispanic Black women were most likely to have prepregnancy obesity (40.3%). Infants of normal weight women had the lowest preterm birth and NICU admission rates (8.68% and 8.03%, respectively), and infants of women with Class III obesity had the highest rates (14.36% and 13.80%, respectively). Except for infants of non-Hispanic Black women, for whom preterm rates were lowest for infants of overweight women, this pattern was also found for each race and Hispanic-origin group. Low birthweight rates were lowest for infants of overweight women (7.54%) and highest for infants of underweight women (13.16%). This pattern was also found for each race and Hispanic-origin group. Rates for all three outcomes increased with obesity class for infants of all women and for those of each race and Hispanic-origin group. Infants of

non-Hispanic Black women generally had the highest rates of adverse outcomes within each BMI category.

Keywords: BMI • births • race and ethnicity • National Vital Statistics System

Introduction

Body mass index (BMI) and obesity in the United States have risen in recent decades. Mean BMI has steadily risen for women of all ages and most racial groups (1), and obesity has risen across population subgroups as well as both sexes (2). In the early 1960s, 15.8% of women had obesity; by the late 2010s, this percentage increased to 42.1% (3). While overall obesity rates increased 16% from 2007–2008 to 2015–2016 among women, severe obesity rates increased 33% during the same period (2).

As with the general population, BMI and obesity have increased among women giving birth (4,5). In 2019, 29.0% of women giving birth had prepregnancy obesity, up 11% from 2016 (5). Within the obesity category, increases were greatest for the highest obesity class (5). Maternal overweight and obesity have been associated with a variety of adverse health outcomes for mothers, such as gestational diabetes, hypertension, and preeclampsia (6). Maternal obesity has also been associated with worse outcomes for infants, including preterm delivery, low birthweight (7,8), and infant death (9–11); however, the risks differ by maternal age and race and Hispanic origin (12).

This report describes prepregnancy BMI distributions for all women who gave birth in the United States in 2020 and for non-Hispanic White, non-Hispanic Black, and Hispanic women. It also compares three infant outcomes—preterm birth, low birthweight, and neonatal intensive care unit (NICU) admission—by prepregnancy BMI across the three largest race



and Hispanic-origin groups. Finally, it describes the association between prepregnancy BMI and infant outcomes by race and Hispanic origin.

Methods

The data for this analysis are from the National Vital Statistics System 2020 birth file. Birth certificate data are based on 100% of births registered in the 50 states and the District of Columbia (13).

BMI is moderately correlated with direct measures of body fat and is based on weight and height and calculated as kg / m^2 [$(\text{lb} / \text{in}^2) \cdot 703$]. BMI values under 18.5 are classified as underweight; those from 18.5 to 24.9 are classified as normal or healthy weight; values from 25.0 to 29.9 are classified as overweight; and values of 30.0 and over are classified as obesity (14). Within the obesity category, BMI is further divided into three classes. Class I obesity includes BMI values from 30.0 to 34.9, Class II obesity includes values from 35.0 to 39.9, and Class III obesity includes BMI values of 40.0 and over (15). Prepregnancy BMI is calculated from maternal height and prepregnancy weight immediately before pregnancy as reported by the mother. Mother's weight immediately before pregnancy was reported by the mother via the question, "What was your prepregnancy weight, that is, your weight immediately before you became pregnant with this child?" Mother's height also was reported by the mother via the question, "What is your height?" The analyses are based on the birth records with complete BMI data ($N = 3,543,239$).

Results for the three largest race and Hispanic-origin groups were reported separately. Race and Hispanic origin of the mother are reported separately on the birth certificate. This report presents data on race and Hispanic origin based on the 1997 Office of Management and Budget standards (13), which allow for the reporting of a minimum of five race categories either alone (single race) or in combination (more than one race or multiple races). Single-race categories are reported.

Three infant outcomes were examined: preterm birth, low birthweight, and NICU admission. The preterm birth rate is the percentage of births delivered at less than 37 completed weeks of gestation based on the obstetric estimate of gestation. The low birthweight rate is the percentage of infants born at less than 2,500 grams (5 pounds, 8 ounces). The NICU rate is the percentage of infants admitted to a facility or unit staffed and equipped to provide continuous mechanical ventilatory support for a newborn for any amount of time.

The distribution of BMI categories for each race and Hispanic-origin group were calculated to provide context for the interpretation of the race-specific patterns. To assess outcome patterns, statistical differences between each BMI category and class were tested. The category with the lowest value was used as the anchor for Cochran–Armitage tests for trends, a modified chi-square test. In addition, differences in outcomes between each of the three obesity classes were tested. All differences noted in the text are statistically significant.

Results

Prepregnancy BMI by race and Hispanic origin

Among all women, 2.8% were underweight, 40.0% were normal weight, 27.2% were overweight, and 30.0% had prepregnancy obesity (Table 1, Figure 1). Among women with obesity, most had Class I obesity (16.1%), followed by 8.1% with Class II obesity and 5.9% with Class III obesity.

Similar percentages of non-Hispanic White and Black women were underweight (2.8%) compared with 2.1% of Hispanic women. Forty-four percent of non-Hispanic White women were normal weight, as were 30.2% of non-Hispanic Black women and 33.2% of Hispanic women. More than one in four (27.4%) non-Hispanic White women had prepregnancy obesity, as did 40.3% of non-Hispanic Black women and 33.6% of Hispanic women.

Within the prepregnancy obesity category, Class I obesity was the largest obesity class for women for all three race and Hispanic-origin groups; Class III obesity was the smallest. Equal percentages of non-Hispanic Black (19.3%) and Hispanic (19.4%) women had Class I obesity; the percentage was lower for non-Hispanic White women (14.4%). Non-Hispanic Black women had higher rates of Class III obesity (9.9%) than non-Hispanic White (5.5%) and Hispanic (5.4%) women.

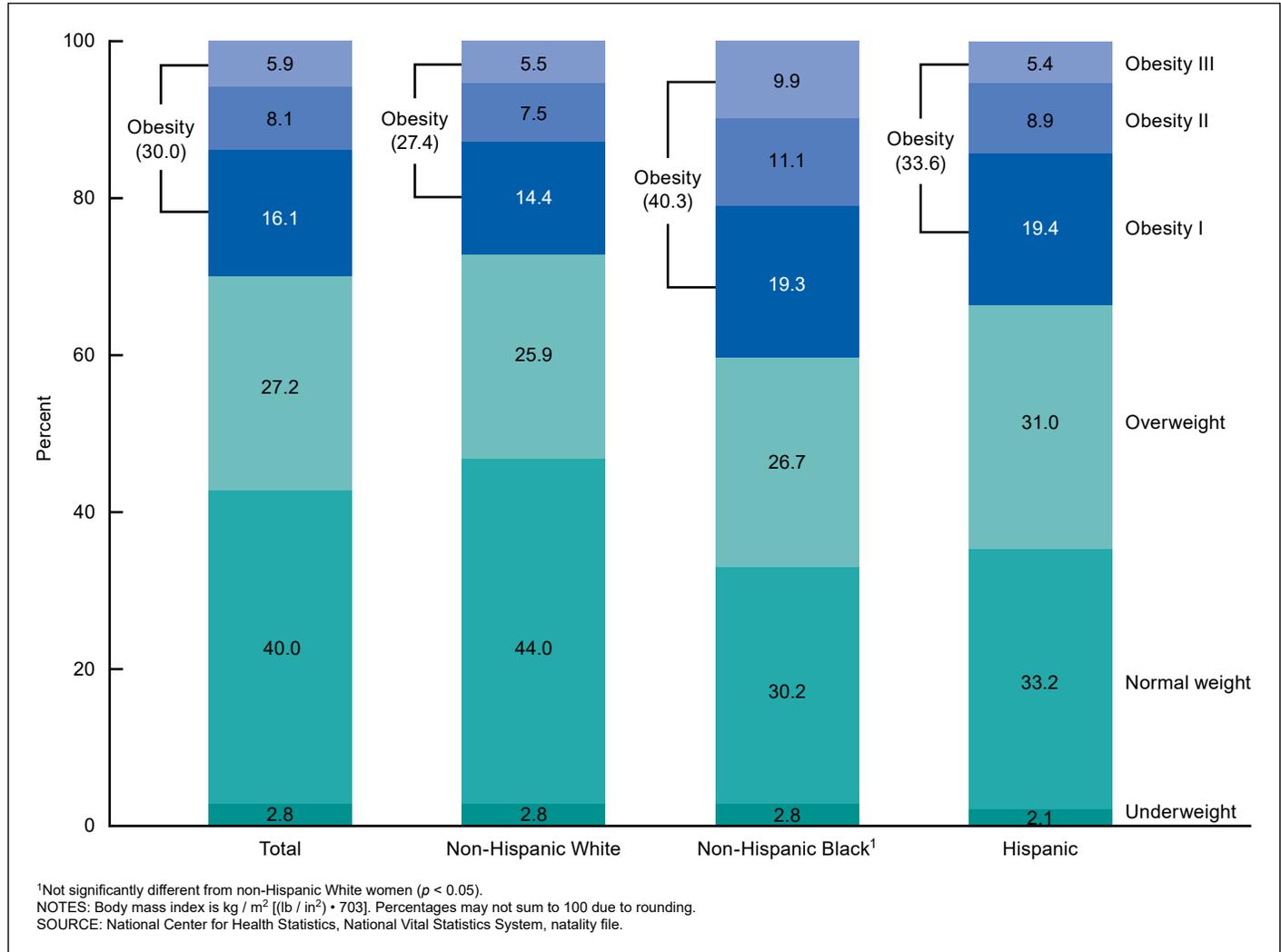
Prepregnancy BMI and infant outcomes

Preterm birth

Preterm birth rates were 11.46% for infants of underweight women, declined to a low of 8.68% for infants of normal weight women, then increased to 14.36% for those born to women with Class III obesity (Table 2, Figure 2). Preterm birth rates also increased with each obesity class; infants of women with Class III obesity were 30% more likely to be born preterm than infants of women with Class I obesity (11.01%).

Infants of non-Hispanic Black women had the highest preterm birth rate (14.36%), followed by infants of Hispanic women (9.84%); infants of non-Hispanic White women had the lowest rate (9.10%) (Table 2). For each BMI category, infants of non-Hispanic Black women had higher preterm birth rates than those of non-Hispanic White and Hispanic women.

Among infants of non-Hispanic White women, the preterm birth rate was 11.22% for infants of underweight women, declined to a low of 7.88% for infants of normal weight women, then increased to 13.29% for those of women with Class III obesity (Table 2). Among infants of non-Hispanic Black women, the preterm birth rate was 16.34% for infants of underweight women, declined to a low of 13.06% for those of overweight women, then increased to 17.56% for infants of women with Class III obesity. Among infants of Hispanic women, the preterm birth rate was 10.95% for infants of underweight women, declined to a low of 8.74% for infants of normal weight women, then increased to 13.22% for infants of women with Class III obesity. Compared with infants of women with Class I obesity, infants of women with Class III obesity were 21%–33% more

Figure 1. Prepregnancy body mass index, by race and Hispanic origin: United States, 2020

likely to be born preterm across the race and Hispanic-origin groups.

Low birthweight

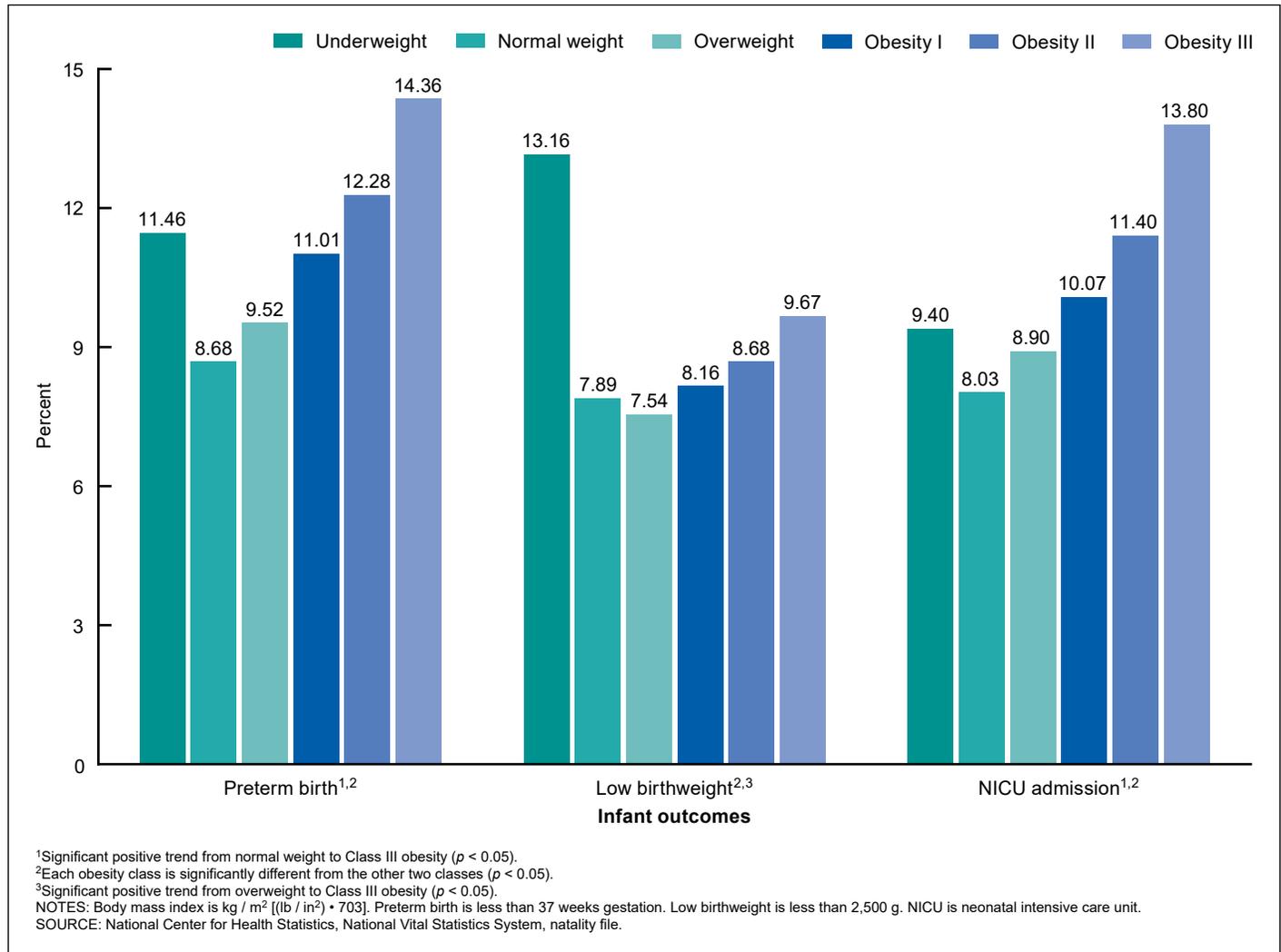
Infants born to overweight women had the lowest rate of low birthweight (7.54%); the rate was highest for infants born to underweight women (13.16%) (Table 2, Figure 2). Low birthweight rates increased with increasing class of obesity. The rate for infants of women with Class III obesity (9.67%) was 19% higher than the rate for infants of women with Class I obesity (8.16%).

Infants of non-Hispanic Black women had the highest rate of low birthweight (14.19%), followed by infants of Hispanic women (7.40%); infants of non-Hispanic White women had the lowest rate (6.84%) (Table 2). For each BMI category, infants of non-Hispanic Black women had a higher rate of low birthweight than those of non-Hispanic White and Hispanic women. For most BMI categories, the rate for infants of non-Hispanic Black women was about twice that of infants of non-Hispanic White women. For each race and Hispanic-origin group, infants of overweight women were the least likely, and those born to underweight

women were the most likely to be low birthweight (Table 2). For all three groups, rates rose from infants of overweight women to infants of women with Class III obesity. Among infants of non-Hispanic White women, those born to women with Class III obesity (7.80%) were 26% more likely to be low birthweight than those of overweight women (6.19%). Among infants of non-Hispanic Black women, those born to women with Class III obesity (14.88%) were 16% more likely to be low birthweight than those of overweight women (12.87%); among infants born to Hispanic women, those of women with Class III obesity (8.05%) were 18% more likely to be low birthweight than those of overweight women (6.84%). Compared with infants of women with Class I obesity, infants of women with Class III obesity were 12%–16% more likely to be low birthweight across race and Hispanic-origin groups.

NICU admission

The NICU admission rate was 9.40% for infants of underweight women, declined to a low of 8.03% for infants of normal weight women, then increased to 13.80% for those born to women with Class III obesity (Table 2, Figure 2). The

Figure 2. Infant outcomes, by prepregnancy body mass index: United States, 2020

NICU admission rate increased with each obesity class; infants of women with Class III obesity were 37% more likely to be admitted to the NICU than infants of women with Class I obesity (10.07%).

Infants of non-Hispanic Black women had a higher NICU admission rate (12.72%) than that of infants of non-Hispanic White (8.72%) or Hispanic women (8.74%) (Table 2). For each BMI category, infants of non-Hispanic Black women had higher NICU admission rates than those of non-Hispanic White and Hispanic women.

Among infants of non-Hispanic White women, the NICU admission rate was 9.14% for infants of underweight women, declined to a low of 7.53% for infants of normal weight women, then increased to 13.19% for those of women with Class III obesity (Table 2). Among infants of non-Hispanic Black women, the NICU admission rate was 13.02% for infants of underweight women, declined to a low of 11.32% for infants of normal weight women, then increased to 16.41% for those of women with Class III obesity. Among infants of Hispanic women, the NICU admission rate was 8.89% for infants of underweight women, declined to a low of 7.82% for infants of normal weight women, then increased to 12.19% for those of women with Class III

obesity. Compared with infants of women with Class I obesity, infants of women with Class III obesity were 27%–39% more likely to be admitted to the NICU across race and Hispanic-origin groups.

Conclusions

The distribution of prepregnancy BMI varies by race and Hispanic origin. For example, 44.0% of non-Hispanic White women were normal weight, and 27.4% were in one of the obesity classes. By comparison, 30.2% of non-Hispanic Black women were normal weight, and 40.3% had obesity. Within the obesity category, more than one-half of Hispanic and non-Hispanic White women had Class I obesity; one-quarter of non-Hispanic Black women had Class III obesity. Non-Hispanic Black women were almost twice as likely as Hispanic and non-Hispanic White women to have Class III obesity. Within each BMI category and obesity class, rates for all three infant outcomes were highest for infants of non-Hispanic Black women.

The three infant outcomes examined varied by prepregnancy BMI for each race and Hispanic-origin group, but the patterns were more similar between preterm and NICU admission rates

compared with low birthweight. Except for preterm birth rates for infants of non-Hispanic Black women with overweight, for whom rates were lowest, infants of normal weight non-Hispanic White and Hispanic women had the lowest preterm birth rate; these rates rose with increasing BMI category. Both preterm birth and NICU rates also increased with each obesity class. This pattern was found for infants of all women and for those of women in each race and Hispanic-origin group examined.

In comparison with the BMI patterns for preterm birth and NICU admission, rates of low birthweight were lowest for infants of overweight women and highest for those of underweight women. Rates rose with BMI from infants of overweight women to those of women with Class III obesity. As with preterm birth and NICU rates, low birthweight rates also increased with each obesity class. This pattern was found for infants of all women and for those of women in each race and Hispanic-origin group examined.

Building on previous research (7–12), these results suggest that infant outcomes differ by maternal BMI, although they also highlight the disproportionately higher rates of adverse outcomes in infants of non-Hispanic Black women regardless of BMI category. Infants of women with obesity and those of underweight women are more likely to experience adverse outcomes; moreover, the likelihood of adverse outcomes increases with obesity class. Consequently, recent increases in the percentage of women giving birth who have obesity may have adverse consequences for infant health, particularly among non-Hispanic Black women. It is important to note that recent research suggests that the association between obesity and some infant outcomes may be due in part to both demographic and health factors that vary by race and Hispanic origin as well (16). However, this analysis was limited in its ability to account for other factors when describing these relationships. These results are meant to serve as a baseline reference for further study of these relationships.

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Table 1. Body mass index, by maternal race and Hispanic origin: United States, 2020

Maternal body mass index	Total ¹	Non-Hispanic White ²	Non-Hispanic Black ²	Hispanic ^{2,3}
Underweight (less than 18.5)	2.8	2.8	42.8	2.1
Normal weight (18.5–24.9)	40.0	44.0	30.2	33.2
Overweight (25.0–29.9)	27.2	25.9	26.7	31.0
Obesity (30.0 and over)	30.0	27.4	40.3	33.6
Class I (30.0–34.9)	16.1	14.4	19.3	19.4
Class II (35.0–39.9)	8.1	7.5	11.1	8.9
Class III (40.0 and over)	5.9	5.5	9.9	5.4
Number of births	3,543,239	1,815,905	517,496	846,433

¹Includes race and Hispanic-origin groups not shown (non-Hispanic Asian, non-Hispanic Native Hawaiian or Other Pacific Islander, other non-Hispanic races, non-Hispanic multi-race).

²Race and Hispanic origin are reported separately on birth certificates; people of Hispanic origin may be of any race. In this table, non-Hispanic women are classified by race. Race categories are consistent with the 1997 Office of Management and Budget standards. Single race is defined as only one race reported on the birth certificate.

³Includes all people of Hispanic origin of any race.

⁴Not significantly different from non-Hispanic White women ($p < 0.05$).

NOTES: Body mass index is kg / m^2 [$(\text{lb} / \text{in}^2) \cdot 703$]. Percentages may not sum to 100 due to rounding.

SOURCE: National Center for Health Statistics, National Vital Statistics System, natality file.

Table 2. Infant outcomes, by maternal body mass index and race and Hispanic origin: United States, 2020

Maternal body mass index	Total ^{1,2}	Non-Hispanic White ¹⁻³	Non-Hispanic Black ²⁻⁴	Hispanic ^{1-3,5}
Preterm birth⁶				
Total	10.09	9.10	14.36	9.84
Underweight (less than 18.5)	11.46	11.22	16.34	10.95
Normal weight (18.5–24.9)	8.68	7.88	13.30	8.74
Overweight (25.0–29.9)	9.52	8.60	13.06	9.23
Obesity (30.0 and over)	12.01	11.01	15.53	11.15
Class I (30.0–34.9)	11.01	10.00	14.50	10.41
Class II (35.0–39.9)	12.28	11.28	15.50	11.52
Class III (40.0 and over)	14.36	13.29	17.56	13.22
Low birthweight⁷				
	Total ^{2,4}	Non-Hispanic White ²⁻⁴	Non-Hispanic Black ²⁻⁴	Hispanic ²⁻⁵
Total	8.24	6.84	14.19	7.40
Underweight (less than 18.5)	13.16	12.16	21.13	11.67
Normal weight (18.5–24.9)	7.89	6.57	14.87	7.53
Overweight (25.0–29.9)	7.54	6.19	12.87	6.84
Obesity (30.0 and over)	8.59	7.09	13.78	7.33
Class I (30.0–34.9)	8.16	6.74	13.27	7.10
Class II (35.0–39.9)	8.68	7.22	13.70	7.41
Class III (40.0 and over)	9.67	7.80	14.88	8.05
NICU⁸ admission				
	Total ^{1,2}	Non-Hispanic White ¹⁻³	Non-Hispanic Black ¹⁻³	Hispanic ^{1-3,5}
Total	9.34	8.72	12.72	8.74
Underweight (less than 18.5)	9.40	9.14	13.02	8.89
Normal weight (18.5–24.9)	8.03	7.53	11.32	7.82
Overweight (25.0–29.9)	8.90	8.38	11.72	8.25
Obesity (30.0 and over)	11.16	10.62	14.08	9.90
Class I (30.0–34.9)	10.07	9.51	12.92	9.10
Class II (35.0–39.9)	11.40	10.85	14.03	10.26
Class III (40.0 and over)	13.80	13.19	16.41	12.19

¹Significant positive trend from normal weight to Class III obesity ($p < 0.05$).

²Class III obesity significantly higher than Class II obesity; Class II obesity significantly higher than Class I obesity ($p < 0.05$).

³Race and Hispanic origin are reported separately on birth certificates; people of Hispanic origin may be of any race. In this table, non-Hispanic women are classified by race. Race categories are consistent with the 1997 Office of Management and Budget standards. Single race is defined as only one race reported on the birth certificate.

⁴Significant positive trend from overweight to Class III obesity.

⁵Includes all people of Hispanic origin of any race.

⁶Gestational age under 37 weeks.

⁷Birthweight less than 2,500 grams.

⁸Neonatal intensive care unit.

NOTE: Body mass index is kg / m^2 [$(\text{lb} / \text{in}^2) \cdot 703$].

SOURCE: National Center for Health Statistics, National Vital Statistics System, natality file.

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