Racial/Ethnic Differences in Low Birth Weight Between US- and Foreign-Born Women

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Abstract

Objective: This study explores national differences in low birth weight (LBW) outcomes in the US by individuals' race/ethnicity and nativity. The objective is to examine the weathering and healthy immigrant hypotheses using evidence on LBW prevalence across US- versus foreign-born residents.

Methods: This study used the 2018 Natality Public Use File from the Center for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS). The outcome of interest was all LBW births, which includes any infant born at < 2500 grams. Chi square tests were conducted to estimate LBW prevalence across maternal demographic characteristics. Two models were estimated using modified Poisson regression to determine whether initial racial/ethnic differences in US- versus foreign-born LBW rates were primarily a function of differences in individual characteristics.

Results: The rate of LBW for the entire sample (N = 3,602,085) was 6.65%. Compared to LBW prevalence for non-Hispanic White women (5.30%, $p < 0.001$), LBW was 123% higher for non-Hispanic Black women (11.81%), 33% higher for non-Hispanic Asian women (7.03%), and 17% higher for Hispanic women (6.19%). The rate of LBW was 13% higher for women born in the United States (6.83%) than for those born outside the United States (6.05%, $p < 0.001$.). Across all racial/ethnic groups, foreign-born mothers had lower LBW prevalence and were less likely to have LBW infants than were their native-born counterparts. Compared to US-born non-Hispanic White women, foreign-born status decreased the risk of LBW across all racial/ethnic groups: from 1.00 to 0.83 (0.80-0.85) for White women, 1.73 (1.71-1.75) to 1.12 (1.10-1.15) for Black women, 1.39 (1.35-1.44) to 1.20 (1.18-1.23) for Asian women, 1.13 (1.12-1.15) to 0.90 (0.88-0.91) for Hispanic women, and 1.08 (1.06-1.10) to 0.98 (0.94-1.03) for other women.

Discussion: Foreign-born status is associated with lower risk of LBW within each racial/ethnic subgroup. This corresponds to the healthy immigrant hypothesis, which suggests that many foreign-born mothers are likely healthy immigrants most able to move to the United States. With non-Hispanic White women exhibiting the lowest LBW rates regardless of immigrant status, it is important to further analyze the association between race/ethnicity, nativity, and birth outcomes. This might be understood through the weathering hypothesis, which suggests that cumulative exposure to social inequalities and racialized stressors can lead to higher rates of LBW.

Introduction

Public Health Relevance

Low birth weight (LBW) is defined as an infant born at less than 2,500 grams[1] regardless of gestational age and cause of LBW.[2] This definition is accepted internationally by the World Health Organization (WHO) and was formulated by the International Federation of Gynecology and Obstetrics.[2] Moderately low birth weight (MLBW) includes infants ranging from 1,500 to 2,499 grams, while very low birth weight (VLBW) includes infants weighing less than 1,500 grams. As of 2015, the global rate of LBW was 14.6%, varying widely across regions from 7.2% in more developed regions to 17.3% in Asian.[3] The United States has been battling LBW for decades. Overall LBW levels saw a dramatic increase from 6.97% in 1990 to 8.26% in 2006. From 2007 to 2012, rates steadily declined from 8.22% to 7.99%. After reaching this low, LBW rates rose once again.[4] From 2017 to 2018, the overall rate of LBW in the United States remained unchanged at 8.28% and for singleton births only, 6.60%.[1]

There is a large body of research on how LBW is associated with health throughout the infant's lifespan. The role of birthweight in adult health was first proposed as the Barker hypothesis, which provided evidence for physiological mechanisms underlying how LBW and adverse health in early life leads to an increased susceptibility for child and adult health complications.[5] Those born LBW experience a higher frequency of perinatal morbidity and mortality and are at risk of impaired neurological function and hypertension.[2] It has been shown that LBW is associated with poor overall adult health status and an increased risk of cardiovascular disease.[6,7]

Social Determinants of Health & LBW in the United States

LBW is a global indicator of societal health. High rates of LBW indicate larger public health problems, such as widespread maternal malnutrition and poor overall maternal health.[2,8,9] In the United States, LBW disparities have also been associated with an inequitable health care system.[10] The social determinants of LBW have been studied since the 1990s but are still not clearly understood. Research has focused on social risk factors such as health behavior, access to economic and social resources, and medical care. Many epidemiological studies have shown that LBW is associated with being an unmarried, non-Hispanic Black women, being under the age of 20 and over the age of 35, and with educational attainment of high school or less, poor access to health care, chronic stress, and certain chronic pre-pregnancy conditions including tobacco use, diabetes, and hypertension.[2]

Several studies have evaluated the effects of stress throughout the lifespan and during pregnancy. A 2007 study examined pregnancy outcomes in New York City after the September 11, 2001 World Trade Center disaster and discovered increased odds of LBW among infants who were in the first or second trimester at the time of the event.[11] A study by Miller et al. demonstrated that women raised in families with economic hardship had worse pregnancy outcomes, suggesting the health consequences of psychosocial stress can be transmitted across generations.[12] Studies have demonstrated that racialized stressors in particular can increase the likelihood of premature birth and LBW. A 2016 study by Novak, Geronimo, & Martinez-Cardoso highlighted the negative impact of psychosocial, economic, communal, and identity-based stressors on mothers' neuroendocrine balance and coping resources throughout pregnancy. After the federal immigration raid in Postville, Iowa in 2008, infants born to Latina mothers had

a 24% greater risk of LBW than they did during the same period one year earlier.[13] A 2019 study by Gemmill et al. specifically addressed preterm birth among pregnant Latina women after the 2016 presidential election, which marked the beginning of the proposal and enforcement of anti-immigration policies. They found that the election was associated with an increase in preterm births for Latina women.[14]

LBW Rates by Race & Ethnicity

In 2017, LBW rates were 7.43% for Hispanic women, 8.52% for non-Hispanic Asian women, and 13.89% for non-Hispanic Black women in the United States. Meanwhile, LBW rates remained steady at 7.00% for non-Hispanic White women.[15] It is well-known that Black women have a particularly higher prevalence of LBW than do their White counterparts.[2] From 2016 to 2018, Black infants were two times more likely to be born LBW than were White infants. LBW rates have declined from 7.00% in 2017 to 6.91% in 2018 among births to non-Hispanic White women as compared to rising LBW rates from 13.89% in 2017 to 14.07% in 2018 among births to non-Hispanic Black women. LBW rates have remained steady for Asian women, increasing from 8.52% in 2017 to 8.58% in 2018, and for Hispanic women, increasing from 7.43% in 2017 to 7.49% in 2018.[1] A 2018 study by De Maio, Ansell, & Shah examined the association between racial and ethnic minority segregation and low birthweight in five North American cities. Across all cities, a 10% increase in minority population was associated with a 0.7% increase in LBW. In the United States, segregation and unemployment have been shown to have a strong and significant association with LBW.[16]

First introduced by Arline Geronimus in 1992, the weathering hypothesis proposes that Black Americans experience early health deterioration due to cumulative exposure to social inequalities.[17] In 1996, a study by Geronimus et al. suggested that Black women experience worsening health problems throughout their teens and young adulthood, contributing to an increased risk of LBW.[18] A 2006 study measured biological indicators of repeated exposure and adaptation to stressors and found that poor and non-poor Black women had the highest probabilities of high allostatic load, which indicates wear and tear on the body regardless of socioeconomic status.[19]

LBW Rates by Nativity

Over two decades ago, several studies examined racial/ethnic differences in LBW between US- versus foreign-born women. A study of births in California in 1992 showed maternal nativity was only associated with LBW outcomes for Hispanic women, with foreign-born Hispanic women 9% less likely to have LBW infants than US-born Hispanic women. There was no significant difference in odds of LBW between US- and foreign-born Asian and Black women.[20] A study by Acevedo-Garcia et al. analyzed the NCHS Natality Data from 1998 to examine differences in LBW by nativity across racial/ethnic groups. They found that foreign-born status did not protect against LBW in White women, increased risk in Asian women by 24%, reduced risk among Black women by 25%, and reduced risk in Hispanic women by 19%.[21] A 2010 systematic review further concluded that both foreign-born Black and Hispanic women were less likely to deliver LBW than their US-born counterparts.[22]

Two recent studies have revisited the racial/ethnic differences between US- and foreign-born mothers. A 2017 study in Washington state found that LBW risk was 32% lower for Asian women from Eastern Asia, 42% lower for non-Hispanic Black women from Sub-Saharan Africa, and 17% lower for non-Hispanic white women from other developed countries as compared with each of their US-born racial and ethnic counterparts.[23] A 2019 study used US natality data from 2011 to 2013 to explore associations between LBW and Black Latina women, US- and foreign-born. Compared to non-Latina white women, US-born Black Latina women had 81% higher odds of LBW, and foreign-born Black Latina women had 22% higher odds of LBW.[24] This demonstrates that foreign-born status still acts as a buffer against LBW for women across racial/ethnic backgrounds. LBW rates are typically higher for US-born mothers, who are more likely to be exposed to established LBW risk factors than are foreign-born mothers.[20]

In 2018, the United States foreign-born population reached a record high of 44.8 million. This means that about one in every eight U.S. residents (13.7%) is foreign-born. The majority of US immigrants (73%) have authorization, but less than half (47.2%) have become US citizens.[25] Since the year 2000, around one million foreign nationals have obtained lawful permanent resident status each year. In 2018, a total of 1,096,611 immigrants received a green card, 45.4% of which identified as females 16 years and over.[26] According to the Pew Research Center, the US foreign-born population is 44.3% Hispanic, 17.7% non-Hispanic White, 8.9% non-Hispanic Black, 26.9% non-Hispanic Asian, and 2.3% Other.[27] The increasingly diverse US population provides an opportunity to examine potential differences in native versus immigrant health. We would expect better birth outcomes from foreign-born mothers, many of whom were likely healthy immigrants able to move to the United States. However, there are likely to be many

types of confounding across racial/ethnic groups, differences in ancestry, and terms of immigration. This study was designed to examine the weathering and healthy immigrant hypotheses with how LBW prevalence may differ within the major US racial/ethnic groups, both US- and foreign-born.

Methods

We used the 2018 Natality Public Use File from the Center for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS) to examine racial/ethnic differences in LBW prevalence between US- and foreign-born women.

Data Source

The NCHS 2018 Birth File consists of public de-identified data that is IRB exempt. This file contains completed birth certificates within the United States for US- and foreign-born women from all states and the District of Columbia. We excluded non-singleton births, births not in hospital facilities, mothers with unknown birthplace, and mothers with unknown birthweight.

Low Birth Weight

Our outcomes of interest included prevalence of all low birth weight births (LBW), very low birth weight births (VLBW), and macrosomia births. LBW was characterized as any infant weighing < 2,500 grams. VLBW included infants weighing < 1,500 grams, and macrosomia included infants weighing > 4,000 grams.

Sociodemographic Characteristics

Sociodemographic variables included mother's race/ethnicity, nativity, age, marital status, educational attainment, use of Women, Infants, and Children (WIC), and insurance. We used the mothers' reported race, ethnicity, and birthplace to characterize native and foreign born non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic (of all races), and other. Nativity compares those born in the United States (50 U.S. States) to those born outside the U.S. (including possessions). Age was characterized as <19, 20-24, 25-29, 30-34, 35-39, and >40 years. Marital status compared married to other (nonmarried or unknown). Educational attainment was characterized by high school or less/unknown, some college or associate degree, and bachelor's degree or more. WIC compared users to other (non-users or unknown). Insurance status at birth compared private insurance to other (Medicaid, uninsured, unknown). We included a variable for whether a birth certificate had data for a father. If a mother had missing data for father's race/ethnicity, age, and highest level of education, it was characterized as no father on the birth certificate.

Behavioral Risk Factors

Behavioral risk variables included attendance at prenatal care visits, smoking during pregnancy, pre-pregnancy body mass index (BMI), and weight gain from pre-pregnancy to delivery. Prenatal care was measured by the number of visits: 5 or less/unknown, 5-8 visits, 9-14 visits, and 15 or more visits. Smoking status was determined as those who smoked anytime during pregnancy. BMI was characterized as underweight <18.5/unknown, normal 18.5-24.9, overweight 25.0-29.9, and obese ≥30.0. Weight gain from pre-pregnancy to delivery was

characterized as 20 pounds or less, 21 to 30 pounds, 31 to 40 pounds, and 41 to 90 pounds/unknown.

Clinical Characteristics

Clinical characteristics included interval since last pregnancy, previous preterm birth, pre-existing conditions, pregnancy-related conditions, and use of infertility treatment. Interval since last pregnancy was characterized as <24 months, 24-71 months, 72 months and over, no previous pregnancy, and unknown. Pre-existing conditions included pre-pregnancy diabetes and pre-pregnancy hypertension, while pregnancy-related conditions included gestational diabetes, gestational hypertension, and hypertension eclampsia. Infertility treatment included the use of fertility enhancing drugs or assisted reproductive technology.

US- and Foreign-Born Racial/Ethnic Groups

Ten racial/ethnic and US- vs. foreign-born groups were identified: non-Hispanic White natives, non-Hispanic White immigrants, non-Hispanic Black natives, non-Hispanic Black immigrants, Hispanic natives, Hispanic immigrants, non-Hispanic Asian natives, non-Hispanic Asian immigrants, Other natives, and Other immigrants.

Statistical Analysis

The significance of bivariate differences between maternal characteristics and the proportion of LBW births was tested using chi square tests. We used a modified Poisson regression analysis of the likelihood of a LBW birth, which provides incidence rate ratios (IRR),

which are closer to relative risk than are odds ratios when failure outcomes are <10%.[28] The Poisson model estimated the likelihood of a LBW birth between non-Hispanic White native versus the other nine US- and foreign-born racial/ethnic populations. Our first model identified the IRRs associated with immigrants from each racial/ethnic group relative to non-Hispanic White. We then estimated a second model that controlled for the simultaneous effects of maternal sociodemographic, behavioral, and clinical characteristics and assessed changes in the IRRs for LBW for each immigrant group. By analyzing change in the IRRs for US- versus foreign-born women, this analysis provides evidence of whether initial racial/ethnic differences in immigrant LBW rates were primarily a function of differences in individual risk factors. Data were analyzed using Stata Version 15 statistical software (College Station, TX).

Results

From a sample of 3,801,534 births in 2018, we removed non-singleton births (126,899), births not in hospital facilities (63,782), mothers with unknown birthplace (6,938), and mothers with unknown birthweight (1,830) to get a sample size of 3,602,085 (61.9% non-Hispanic White native, 15.0% non-Hispanic White immigrant, 15.7% non-Hispanic Black native, 10.6% non-Hispanic Black immigrant, 16.3% Hispanic native, 49.1% Hispanic immigrant, 1.6% non-Hispanic Asian native, 22.5% non-Hispanic Asian immigrant, 4.5% Other native, and 2.7% Other immigrant).

As shown in Table 1, the overall rate of LBW was 6.65%. Compared to LBW prevalence for non-Hispanic White women (5.30%), LBW was 123% higher for non-Hispanic Black women (11.81%), 33% higher for non-Hispanic Asian women (7.03%, $p<0.001$), and 17% higher for

Hispanic women (6.19%). The rate of LBW was 13% higher among women born in the United States (6.83%) than those born outside the United States (6.05%, p<0.001). Prevalence of LBW among the 47.7% of the sample that were unmarried (8.07%) was 51% higher than prevalence of LBW among married women (5.35%, p<0.001). The 11.5% of mothers with no father identified on the birth certificate had an 81% higher LBW prevalence (11.0%) than those with an identified father (6.09%, p<0.001). The rate of LBW was 49% higher for women not on private insurance (7.94%) than those on private insurance (5.33%, p<0.001). Mothers with a previous preterm birth had 182% higher LBW prevalence (17.64%) than those without a previous preterm birth (6.25%, p<0.001).

Also shown in Table 1, the overall prevalence of VLBW was 1.09% and followed similar patterns as did LBW prevalence. The overall rate of macrosomia was 7.89%. Racial/ethnic patterns of macrosomia did not mimic patterns of LBW. Non-Hispanic White women had the highest rate of macrosomia (9.67%), followed in descending order by Hispanic women (7.11%), non-Hispanic Black women (4.43%), and non-Hispanic Asian women (4.24%, p<0.001). The rates of macrosomia were 18% higher for women born in the US (8.19%) than for women born outside the US (6.93%, p<0.001). Similarly, macrosomia rates were higher for married women, women with a father identified on the birth certificate, women on private insurance, and women with no previous preterm birth. Patterns of macrosomia prevalence and LBW prevalence were reversed.

Figure 1 demonstrates how LBW rates varied across race/ethnicity and nativity. For each racial/ethnic group, foreign-born women showed lower rates of LBW than did their US-born counterparts. LBW prevalence was 39% lower for non-Hispanic Black immigrants (7.72%) than

for non-Hispanic Black natives (12.65%, p<0.001). Compared to the LBW prevalence of their native-born counterparts, non-Hispanic White immigrants saw a 17% decrease (5.37% to 4.44%), Hispanic immigrants saw a 12% decrease (6.58% to 5.76%), and non-Hispanic Asian immigrants saw a 10% decrease (7.62% to 6.89%, p<0.001).

In Table 2, Model 1 with just race/ethnicity and US- versus foreign-born status shows that non-Hispanic Black natives were 2.36 (95% CI: 2.33-2.38) times more likely to have a LBW birth than non-Hispanic White natives. Non-Hispanic Black immigrants were 1.44 (95% CI: 1.41-1.47) times more likely to have an LBW birth than non-Hispanic White natives, followed in descending order by non-Hispanic Asian natives (IRR: 1.42, 95% CI: 1.37-1.47), other natives (IRR: 1.36, 95% CI: 1.33-1.39), non-Hispanic Asian immigrants (IRR: 1.28, 95% CI: 1.26-1.31), other immigrants (IRR: 1.27, 95% CI: 1.21-1.33), Hispanic natives (IRR: 1.23, 95% CI: 1.21-1.24), Hispanic immigrants (IRR: 1.07, 95% CI: 1.06-1.09), and non-Hispanic White immigrants (IRR: 0.83, 95% CI: 0.81-0.85). After adjusting for the effects of maternal sociodemographic, behavioral, and clinical characteristics in Model 2, non-Hispanic Black natives are still at the highest risk of LBW (IRR: 1.73, 95% CI: 1.71-1.75) when compared to non-Hispanic White natives, followed in descending order by non-Hispanic Asian natives (IRR: 1.39, 95% CI: 1.35-1.44), non-Hispanic Asian immigrants (IRR: 1.20, 95% CI: 1.18-1.23), Hispanic natives (IRR: 1.13, 95% CI: 1.12-1.15), non-Hispanic Black immigrants (IRR: 1.12, 95% CI: 1.10-1.15), other natives (IRR: 1.08, 95% CI: 1.06-1.10), other immigrants (IRR: 0.98, 95% CI: 0.94-1.03), Hispanic immigrants (IRR: 0.90, 95% CI: 0.88-0.91), and non-Hispanic White immigrants (IRR: 0.83, 95% CI: 0.80-0.85). These values are highlighted in Figure 2, which also shows that IRR for LBW is lower for foreign-born women than for US-born women across all racial/ethnic groups.

No change in IRR from Model 1 to Model 2 indicated the independent effect of foreign-born status on LBW. A change in IRR between models signified that LBW rates were explained by differential distribution of risk factors. Model 2 demonstrates that certain maternal characteristics pose a higher risk of LBW birth after controlling for confounding. This includes women over the age of 40 (IRR: 1.40, 95% CI: 1.37-1.43), having 5 or less prenatal care visits (IRR: 2.54, 95% CI: 2.51-2.57), smoking anytime during pregnancy (IRR: 1.56, 95% CI: 1.54-1.58), BMI <18.5 (IRR: 1.62, 95% CI: 1.60-1.65), gaining 20 pounds or less from pre-pregnancy to delivery (IRR: 1.53, 95% CI: 1.52-1.55), previous preterm birth (IRR: 2.22, 95% CI: 2.19-2.25), pre-pregnancy diabetes (IRR: 1.26, 95% CI: 1.23-1.30), pre-pregnancy hypertension (IRR: 2.56, 95% CI: 2.51-2.60), gestational hypertension (IRR: 2.80, 95% CI: 2.77-2.83), hypertension eclampsia (IRR: 3.10, 95% CI: 2.99-3.21), and infertility treatment (IRR: 1.45, 95% CI: 1.41-1.49).

Discussion

There are statistically significant variations in LBW by race/ethnicity and nativity, and foreign-born status is protective against LBW across all racial/ethnic groups. Although all immigrant subgroups are at a lower risk of LBW than are their US-born counterparts, non-Hispanic Black women still exhibit the highest rates of LBW regardless of immigrant status. Over the past few years, LBW prevalence has declined for non-Hispanic White women but remained steady or increased for women of color. Our analysis suggests hypotheses for future research regarding the association between race/ethnicity, nativity, and maternal and child health outcomes.

The weathering hypothesis can be further explored to better understand LBW disparities across racial/ethnic and US- vs. foreign-born populations. A 2020 study sought to measure variation in stressful events across race, ethnicity, and nativity, along with the association of prenatal stress and prevalence of preterm birth. This study found that stressful events were much more common among US-born women compared to immigrants, regardless of race/ethnicity.[29] Stress was associated with increased prevalence of preterm birth across racial/ethnic and nativity groups. This indicates that growing up, specifically as a Black woman in a structurally racist US, might be associated with higher levels of chronic stress and thus poorer birth outcomes.

Future research must address the specific birth outcomes that result from trauma. In 2020, Mélançon et al. found that women exposed to high psychological stress during the second trimester of pregnancy had an 80% greater risk for a macrosomia birth when compared to women exposed to low psychological stress.[30] This indicates that trauma and stress might be associated with both LBW and macrosomia. However, our data show opposite trends for LBW and macrosomia across race/ethnicity, and nativity. Similarly, a 2019 study examined all birth data in New Jersey from 1999 to 2014 and found that racial/ethnic and nativity patterns of LBW and macrosomia were reversed. For White and Asian mothers, immigrants had higher risk of LBW and lower risk for macrosomia compared to their US-born counterparts. Meanwhile, foreign-born Black and Hispanic mothers had lower risk for LBW and higher risk for macrosomia than their US-born counterparts.[31]

Implications for Public Health Policy

Policy interventions must be created to reduce both racial/ethnic and immigrant disparities in LBW prevalence. A 2020 cross sectional study analyzed the associations between state-level reproductive rights policies and low birth weight in the US. They found that LBW risk was 8% lower among Black women living in the least restrictive states than among their counterparts living in the most restrictive states.[32] By modeling reproductive policy after states with lower LBW rates, we can work to reduce the racial/ethnic disparities that persist.

Limitations

Certain limitations in this study should be considered. First, we categorized maternal race/ethnicity into 5 variables for statistical analyses purposes. American Indian or Alaskan Native (AIAN), Native Hawaiian or Other Pacific Islander (NHOPI), and those who identified as more than one race were categorized as "Other" to focus on larger populations. Second, we did not have data on the length of time that foreign-born women had lived in the United States. This is a key limitation, as the weathering hypothesis refers to the health effects of growing up in the US. It would be important to examine the association between rates of LBW and length of time in the US. Third, we were not able to distinguish whether a mother was a second-generation immigrant, meaning that they were born in the US to foreign-born parents. This information might help explain how the effects of psychosocial stress transmit across generations. Lastly, given the diversity among the US immigrant population, it would be advisable to break down foreign-born mothers by country of origin. However, we did not have

access to this information. Studies have shown that the protective effect of foreign-born status varies significantly by country of origin.

Conclusion

Foreign-born status is protective against LBW across all racial/ethnic groups. Although immigrant subgroups are at a lower risk of LBW than are their US-born counterparts, non-Hispanic Black and Asian women still exhibited higher rates of LBW than did their White counterparts regardless of immigrant status. For Hispanic women, foreign-born status reduced the rate of LBW to less than that of US-born White women. Further exploration of the weathering hypothesis is required to better address root causes of LBW disparities across racial/ethnic and immigrant populations.

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Tables and Figures

Table 1. Maternal characteristics by birth weight category: United States, National Center for Health Statistics Natality Data 2018.

	Column Percent All Births N = 3,602,085	Row Percent Low Birth Weight (< 2499 grams) N = 239,559	Row Percent Very Low Birth Weight (< 1499 grams) N = 39,254	Row Percent Macrosomia (> 4000 grams) N = 284,348
All Births	100	6.65	1.09	7.89
Race/ethnicity				
Non-Hispanic White	51.0	5.30	0.76	9.67
Non-Hispanic Black	14.5	11.81	2.41	4.43
Non-Hispanic Asian	6.4	7.03	0.89	4.24
Hispanic	24.0	6.19	1.01	7.11
Other	4.1	7.22	1.24	8.39
Nativity				
Born in the U.S.	76.8	6.83	1.13	8.19
Born outside the U.S.	23.2	6.05	0.97	6.93
Age				
< 19 years	4.9	8.98	1.45	4.29
20-24 years	19.4	7.28	1.15	6.01
25-29 years	29.1	6.22	1.01	7.87
30-34 years	28.6	5.90	0.96	9.09
35-39 years	14.7	6.85	1.19	9.26
> 40 years	3.3	8.89	1.59	8.09
Marital status				
Married	52.3	5.35	0.84	9.12
Unmarried	47.7	8.07	1.36	6.55
Highest level of education				
High school or less, or unknown	39.5	8.09	1.33	6.59
Some college or associate degree	28.2	6.75	1.17	8.14
Bachelor's degree or more	32.4	4.81	0.73	9.28
Women, Infants, and Children (WIC) User				
Yes	36.1	7.55	1.10	6.73
No	63.9	6.14	1.08	8.55
Insurance				
Medicaid, self-pay, other or unknown[1]	50.6	7.94	1.30	6.68
Private insurance	49.5	5.33	0.88	9.13
Father identified on birth certificate				
Yes	88.5	6.09	0.98	8.26
No	11.5	11.00	1.97	5.07
Prenatal care visits				
5 or less, or unknown	7.7	15.76	5.00	5.29

5-8 visits	13.6	13.32	3.08	5.49
9-14 visits	63.14	4.64	0.37	8.24
15 or more visits	15.6	4.52	0.33	9.85
Smoked anytime during pregnancy				
Yes	6.5	12.40	1.57	4.30
No	93.5	6.25	1.06	8.15
Body mass index (BMI) pre-pregnancy				
Underweight <18.5, unknown	5.3	11.19	1.92	4.43
Normal 18.5-24.9	41.1	6.42	0.84	6.08
Overweight 25.0-29.9	26.1	6.00	1.00	8.54
Obesity I ≥ 30.0	27.6	6.73	1.39	10.66
Weight gain from pre-pregnancy to delivery				
20 pounds or less	27.2	10.49	2.26	5.28
21 to 30 pounds	27.7	6.41	0.79	6.26
31 to 40 pounds	23.2	4.36	0.44	8.73
41 to 98 pounds, or unknown	22.0	4.62	0.71	12.29
Interval since last pregnancy				
< 24 months	18.6	6.47	1.07	8.44
24 to 71 months	28.7	4.97	0.69	9.37
72 months and over	9.3	7.49	1.23	7.65
No previous pregnancy	31.4	7.46	1.25	6.32
Unknown	12.0	8.18	1.55	7.85
Previous preterm birth				
Yes	3.5	17.64	3.49	4.95
No	96.5	6.25	1.00	8.00
Pre-existing conditions				
Pre-pregnancy diabetes	1.0	12.48	2.91	15.14
Pre-pregnancy hypertension	2.1	17.47	4.19	5.66
Pregnancy-related conditions				
Gestational diabetes	6.7	6.92	0.85	10.07
Gestational hypertension	7.0	15.97	3.07	5.88
Hypertension eclampsia	0.2	29.14	8.21	4.21
Infertility treatment used[2]				
Yes	1.5	8.32	1.73	8.82
No	98.5	6.63	1.08	7.88

$p < 0.001$ for all comparisons

[1]3.6% of sample self-pay, 3.9% of sample other, 0.5% of sample unknown

[2]Includes fertility enhancing drugs or assisted reproductive technology

Figure 1. Percent low birth weight births by race/ethnicity & nativity: United States, National Center for Health Statistics Natality Data 2018.

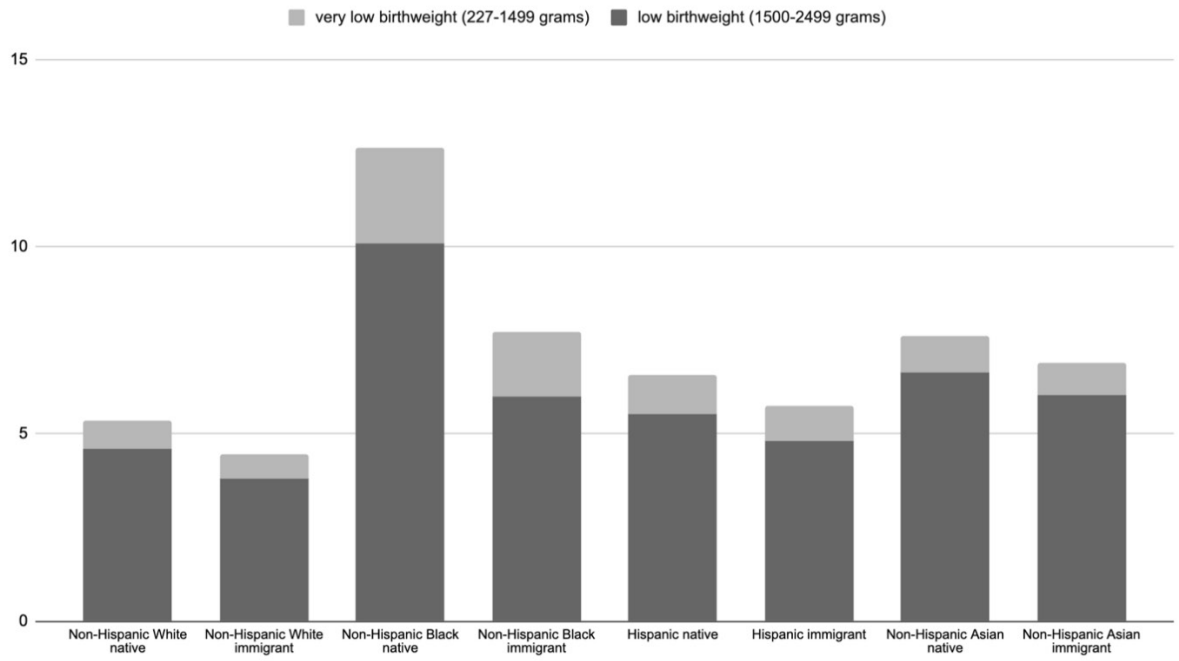

Table 2. Poisson regression incidence rate ratios (IRR) for low birth weight: United States, National Center for Health Statistics Natality Data 2018.

	Model 1	Model 2
	IRR (95% Confidence Interval)	
Mother's race/ethnicity & nativity		
Non-Hispanic White native	Reference	Reference
Non-Hispanic White immigrant	0.83 (0.81 - 0.85)	0.83 (0.80 - 0.85)
Non-Hispanic Black native	2.36 (2.33 - 2.38)	1.73 (1.71 - 1.75)
Non-Hispanic Black immigrant	1.44 (1.41 - 1.47)	1.12 (1.10 - 1.15)
Non-Hispanic Asian native	1.42 (1.37 - 1.47)	1.39 (1.35 - 1.44)
Non-Hispanic Asian immigrant	1.28 (1.26 - 1.31)	1.20 (1.18 - 1.23)
Hispanic native	1.23 (1.21 - 1.24)	1.13 (1.12 - 1.15)
Hispanic immigrant	1.07 (1.06 - 1.09)	0.90 (0.88 - 0.91)
Other native	1.36 (1.33 - 1.39)	1.08 (1.06 - 1.10)
Other immigrant	1.27 (1.21 - 1.33)	0.98 (0.94 - 1.03)
Socio-demographic variables		
Age		
< 19 years		0.92 (0.90 - 0.93)
20-24 years		0.97 (0.96 - 0.98)
25-29 years		Reference
30-34 years		1.08 (1.07 - 1.09)
35-39 years		1.22 (1.20 - 1.23)
> 40 years		1.40 (1.37 - 1.43)
Married		0.92 (0.91 - 0.93)
Highest level of education		
High school or less, or unknown		Reference
Some college or associate degree		0.97 (0.96 - 0.98)
Bachelor's degree or more		0.81 (0.80 - 0.82)
Women, Infants, and Children (WIC) User		0.97 (0.96 - 0.98)
Insurance		
Medicaid, uninsured, other, or unknown[1]		1.02 (1.01 - 1.03)
Private insurance		Reference
Father identified on birth certificate		1.04 (1.03 - 1.05)
Behavioral risk variables		
Prenatal care visits		
5 or less, or unknown		2.54 (2.51 - 2.57)
5-8 visits		2.37 (2.35 - 2.40)
9-14 visits		Reference
15 or more visits		0.92 (0.91 - 0.93)
Smoked anytime during pregnancy		1.56 (1.54 - 1.58)
BMI pre-pregnancy		
Underweight <18.5, unknown or not stated		1.62 (1.60 - 1.65)
Normal 18.5-24.9		Reference
Overweight 25.0-29.9		0.80 (0.79 - 0.81)
Obesity I ≥ 30.0		0.67 (0.66 - 0.67)
Weight gain from pre-pregnancy to delivery		
20 pounds or less		1.53 (1.52 - 1.55)
21 to 30 pounds		Reference

31 to 40 pounds		0.69 (0.68 - 0.69)
41 to 98 pounds, unknown or not stated		0.57 (0.56 - 0.57)
Clinical variables		
Interval since last pregnancy		
< 24 months		0.70 (0.69 - 0.70)
24 to 71 months		0.59 (0.59 - 0.60)
72 months and over		0.79 (0.78 - 0.80)
No previous pregnancy		Reference
Unknown		0.76 (0.75 - 0.77)
Previous preterm birth		2.22 (2.19 - 2.25)
Pre-existing conditions		
Pre-pregnancy diabetes		1.26 (1.23 - 1.30)
Pre-pregnancy hypertension		2.56 (2.51 - 2.60)
Pregnancy-related conditions		
Gestational diabetes		0.96 (0.95 - 0.98)
Gestational hypertension		2.80 (2.77 - 2.83)
Hypertension eclampsia		3.10 (2.99 - 3.21)
Infertility treatment used		1.45 (1.41 - 1.49)

Figure 2. IRRs for low birth weight births between Non-Hispanic White native and other groups after adjustment for maternal risk factors: United States, National Center for Health Statistics Natality Data 2018.