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The effects of maternal weight gain patterns on term birth weight in African-American women

Vinod K. Misra, MD, PhD¹, Calvin J. Hobel, MD², and Charles F. Sing, PhD³

¹Department of Pediatrics & Communicable Diseases, Division of Medical Genetics, The University of Michigan, Ann Arbor, MI 48109

²Departments of Obstetrics and Gynecology & Pediatrics, Division of Maternal and Fetal Medicine, Burns Allen Research Institute, Cedars-Sinai Medical Center, Los Angeles, CA 90048

³Department of Human Genetics, The University of Michigan, Ann Arbor, MI 48109

Abstract

Objective—The goals of our study were 1) to estimate the trends in maternal weight gain patterns and 2) to estimate the influence of variation in maternal weight and rate of weight gain over different time periods in gestation on variation in birth weight in African-American and non-African-American gravidas.

Study Design and Setting—Data from a prospective cohort study in which pregnant women were monitored at multiple time points during pregnancy were analyzed. Maternal weight was measured at three times during pregnancy, preconception (W_0); 16-20 weeks gestation (W_1); and 30-36 weeks gestation (W_2), in a cohort of 435 women with full-term singleton pregnancies. The relationship between gestational age-adjusted birth weight (aBW) and measures of maternal weight and rate of weight gain across pregnancy was estimated using a multivariable longitudinal regression analysis stratified on African-American race.

Results—The aBW was significantly associated with maternal weight measured at any visit in both strata. For African-American women, variation in aBW was significantly associated with variation in the rate of maternal weight gain in the first half of pregnancy (W_{01}) but not the rate of maternal weight gain in the second half of pregnancy (W_{12}); while for non-African-American women, variation in aBW was significantly associated with W_{12} but not W_{01} .

Conclusion—Factors influencing the relationship between aBW and maternal weight gain patterns depend on the context of the pregnancy defined by race. Clinical decisions and recommendations about maternal weight and weight gain during pregnancy may need to account for such heterogeneity.

Keywords

pregnancy; weight gain; birth weight; race; gestation; heterogeneity

Introduction

Maternal weight gain during pregnancy has a well-established influence on birth weight and infant health outcomes¹. As such, prenatal care guidelines emphasize the importance of overall maternal weight gain during pregnancy and its role in perinatal health¹. Maternal weight gain is influenced by a number of factors, including physiological, psychological, behavioral,

family, social, cultural, and environmental^{1,2}. The rate of maternal weight gain per trimester also depends on a number of maternal factors, and can vary greatly throughout pregnancy³⁻⁵. The timing of maternal weight gain during pregnancy is an important determinant of birth weight⁶ yet there have been comparatively few studies on the influence of maternal weight gain at different time points in gestation. Due to the lack of data, the recent report on gestational weight gain in pregnancy from the Institute of Medicine (IOM) could not make specific recommendations for optimal weight gain patterns during pregnancy¹.

Race can be regarded as a summary measure^{7,8} that encompasses many of the factors that influence maternal weight and weight gain. Although African-American infants are more than twice as likely to be growth restricted and be born low birth weight than any other major ethnic group⁹, very few prior studies have studied how variation in maternal weight gain patterns in African-American women may influence variation in birth weight differently than their non-African-American counterparts. The existing studies suggest that maternal weight gain patterns and their influence on variation in birth weight may differ between these groups^{10,11}. In general, however, little is known about weight gain patterns in different racial groups and how variation in these patterns may contribute to variation in birth weight in different racial strata.

We are particularly interested in the timing of maternal weight gain and its relationship to birth weight in African-American women because this group is clearly at higher risk for adverse birth outcomes, including preterm delivery, low birth weight, and infant mortality, than other groups in the United States^{12,13}. This paper examines the relationship between an infant's birth weight and the timing of maternal weight gain during pregnancy within a cohort of African-American women gravidas and a lower-risk group. The goals of our study were 1) to estimate the trends in maternal weight gain patterns and 2) to estimate the influence of variation in maternal weight and rate of weight gain over different time periods in gestation on variation in birth weight.

Methods

Data Collection

This was a secondary data analysis of measures collected over a three year period as part of the Behavior in Pregnancy Study (BIPS) at Cedars-Sinai Medical Center in Los Angeles, California as described elsewhere^{14,15}. BIPS was a prospective cohort study in which pregnant women 18 years or older and less than 20 weeks pregnant with a singleton pregnancy were recruited and monitored at multiple time points during pregnancy. The Cedars-Sinai Medical Center Institutional Review Committee approved the study. Informed consent was obtained from all participants. Subjects with major structural fetal abnormalities or prenatally diagnosed fetal aneuploidy were excluded from the study. Data analyses were restricted to 435 eligible women who delivered an infant between 37 and 44 weeks gestation. Fewer than 10% of women were excluded from any particular analysis because of missing data. Therefore, each analysis was restricted to individuals measured for all relevant variables.

Baseline maternal psychosocial and demographic characteristics were recorded at time of entry into the study. The current pregnancy history including date of last menstrual period (LMP), maternal illness, medications, and drug, alcohol, and cigarette use before and during pregnancy was collected at baseline and updated at each follow-up visit. Self reported race was categorized as African-American (n=248) and non-African-American (n=187). The latter category was a low-risk group that included non-Hispanic Whites along with individuals of Hispanic and Asian ethnicity. There were no significant differences in birth outcomes between low-risk ethnic groups. Maternal prepregnancy weight from the year prior to conception was abstracted from the medical record. Maternal height was measured at the initial visit. Maternal prepregnancy BMI was calculated for each participant using maternal height and prepregnancy

weight ($BMI = \text{weight (kg)} / \text{height (m)}^2$). Data for maternal weight measured at mid-pregnancy (16 to 20 weeks gestation) and late pregnancy (30 to 36 weeks gestation) were analyzed. For all analyses, the maternal weight at each study visit was corrected by subtracting the estimated fetal weight determined by ultrasound biometry using the method of Hadlock¹⁶. This correction was done to minimize “part-whole” correlations between predictor and outcome variables as described below^{17,18}.

Infant birth weight was recorded at the time of delivery. Gestational age was estimated from the self-reported LMP and corroborated by available ultrasound estimates at each follow-up visit. Since birth weight varies significantly with gestational age even for term infants, the birth weight was regressed onto gestational age using a set of polynomial functions. We found that the third order polynomial function to be the best-fitting model using an F-test. The residual values from this fit were used to represent the gestational age-adjusted birth weight (aBW). These residuals were then used as the dependent variable for the modeling of the contribution of maternal weight and rate of weight gain to the prediction of aBW as described below.

Statistical Analysis

Analyses used the SAS statistical software version 9.1 (SAS Institute, Cary, NC). We first estimated the mean and standard deviation of the prepregnancy weight measured in kg (W_0) and the corrected maternal weight at each time point (W_1 , and W_2), as well as the rate of weight gain between visits x and y defined as $W_{xy} = (W_y - W_x) / (GA_y - GA_x)$, where GA is the gestational age in fractions of weeks at time of measurement. We tested the hypothesis of homogeneity of the means between racial groups using the Fisher's exact test for categorical variables and the t test for continuous variables. Univariate analyses testing the relationship between aBW and maternal weight at each time point were performed using linear regression.

We used a standard longitudinal analytic approach to estimate the effect of repeated measures of a predictor variable (maternal weight, given by W_0 , W_1 , and W_2) on an outcome (aBW) measured at one time point using the following model¹⁹:

$$E(aBW) = \beta'_0 + (\beta_0 + \beta_1 + \beta_2) W_0 + (\beta_0 + \beta_1) W_{01} + (\beta_1 + \beta_2) W_{12} + \sum_i (\beta_i) C_i \quad (1)$$

As described elsewhere¹⁹, the coefficient for $W_0 (\beta_0 + \beta_1 + \beta_2)$ defines the effect of increasing the maternal weight by one unit at *any* study visit. This coefficient describes, for example, the effect of prepregnancy obesity that may increase the magnitude of the maternal weight across all study visits by uniformly shifting the trajectory upward resulting in a cumulative effect on aBW. The coefficients for $W_{01} (\beta_0 + \beta_1)$ and $W_{12} (\beta_1 + \beta_2)$ define how variation in the *rate* of weight gain in each visit interval may affect variation in aBW.

In this model, the rightmost summation defines the contribution of maternal covariates to the expected value of aBW. The covariates were determined using a multivariable backward stepwise linear regression procedure was used to establish the combination of covariates (maternal age, parity, marital status, education, source of payment, chronic illness, and smoking) that explained the greatest amount of variation in aBW in each group. Maternal characteristics that significantly contributed to prediction at $P < 0.1$ were selected for retention at each step. The selected variables were used in equation 1 to adjust aBW for the effects of the maternal covariates within each racial group. Only those covariates that significantly influenced aBW were used to adjust the model within each racial group. This approach was used to focus on the optimal prediction of aBW by maternal weight and weight gain characteristics during pregnancy.

Results

Table 1 describes maternal and infant characteristics of the 435 singleton pregnancies resulting in live term births in our sample. Comparing the African-American gravidas ($n=187$) to a low-risk multiethnic, non-African-American group ($n=248$), there were statistically significant differences in maternal age, marital status, education, source of payment, and parity. In this sample of term births (37-42 completed weeks gestation), the mean gestational age at delivery was similar between the African-American group and the low-risk comparison group. African-American infants were about 80g smaller than their non-African-American counterparts at birth (95% confidence interval (CI): -161.24g, 6.42g).

Table 2 gives the maternal morphometric characteristics for our sample. Prepregnancy BMIs were greater for African-American women compared to non-African-Americans with a much higher percentage of African-American women in the overweight/obese category (BMI > 26, 41.2% vs. 28.6%). In addition, maternal weight at each time point (W_0 , W_1 , and W_2) were all significantly larger for African-American women. We found that the rate of weight gain in the first half of pregnancy (W_{01}) for African-Americans was significantly larger compared to non-African-Americans. African-American women gained an average of 0.30 kg/week from the preconceptional period to the first visit at 16 to 20 weeks gestation, while non-African-American women gained an average of 0.24 kg/week in this interval. We did not observe a significant difference between the groups in the rate of weight gain later from the first study visit at 16 to 20 weeks gestation to the second study visit at 30 to 36 weeks gestation (W_{12}).

The differences observed in Table 1 and the heterogeneity of the weight gain characteristics presented in Table 2 support the separate analyses of the African-American and non-African-American subjects in our sample. We also tested the significance of coefficients for the interaction terms between maternal weight gain variables in Equation 1 and African-American race using chi-square tests of model fit. We found significant interaction terms (data not shown) of African-American race with the rate of weight gain in each half of pregnancy (W_{01} and W_{12}). These results document the differences between African-American and non-African-American subgroups in our sample and support the stratification of our sample in subsequent analyses.

Table 3 presents the regression coefficients for the relationship between gestational age-adjusted birth weight (aBW) and maternal morphometric measures (weight and BMI) determined at each of the three time points during pregnancy (W_0 , W_1 , and W_2) in African-American and non-African-American strata. In these cross-sectional analyses, each time point was separately analyzed to demonstrate difference between the strata. We found that the magnitude of the influence of maternal morphometric measures on aBW at each time-point depends on race. At each time-point, the effect of maternal weight (W_0 , W_1 , and W_2) and BMI (BMI_0 , BMI_1 , and BMI_2) on aBW is consistently larger and more significant in African-Americans compared to non-African-Americans. The racial difference in the relationships between the gestational adjusted birth weight and BMI at each time point were found to be statistically significant ($P<0.10$) using an analysis of variance. Thus, in African-American women, a 6.9 g increase in aBW (95% CI: 3.5g, 10.2g) was associated with a 1 kg increase in maternal weight measured between 30 to 36 weeks gestation (W_2); while in non-African-American women, a 4.2 g increase in aBW (95% CI: 0.4g, 7.9g) was associated with a 1 kg increase in W_2 . Similarly, for African-American women, a 19.7 g increase in aBW (95% CI: 9.7, 29.6) was associated with a 1 kg/m² increase in maternal BMI determined between 30 to 36 weeks gestation (BMI_2); while for non-African-American women, there was no significant relationship between aBW and BMI at this time point.

Table 4 gives the results of multivariable longitudinal regression analyses of the influence of variation in maternal weight measured at three time points on variation in aBW (Equation 1) for each racial strata. The estimates of the regression coefficients were adjusted for the effects of maternal covariates that were shown influence outcomes in each stratum (listed in the footnote to the Table). For African-American women, the coefficient for W_0 in this model shows that a 5.9 g increase in aBW (95% CI: 2.6, 9.3) was significantly associated with about a 1 kg increase in the magnitude of maternal weight measured at *any* time-point during gestation; while a 284 g increase in aBW (95% CI: 51.2, 517.4) was significantly associated with a 1 kg per week increase in the rate of weight gain from the preconceptional period to the first visit at 16 to 20 weeks gestation. In this model, there was no relationship between variation in aBW and variation in the rate of weight gain from the first study visit (16 to 20 weeks gestation) to the second study visit (30 to 36 weeks gestation) for African-Americans. For non-African-Americans, a 4.4 g increase in aBW (95% CI: 0.7, 8.1) for non-African-Americans was associated with about a 1 kg increase in the magnitude of maternal weight measured at *any* time point. However, in contrast to their non-African-American counterparts, a 329 g increase in aBW (95% CI: 66.5, 590.8) was significantly associated with a 1 kg per week increase in the rate of weight gain during the second half of pregnancy (W_{12}) in non-African-American women, while aBW was not associated with variation in the rate of weight gain from the preconceptional period to the first study visit (16 to 20 weeks gestation) in this group. Table 4 also contains the results of multivariable longitudinal regression analyses of the influence of variation in maternal BMI measured at three time points on variation in aBW using Equation 1. These results are very similar to those found for maternal weight.

Discussion

The pattern of maternal weight gain during pregnancy is an important determinant of fetal growth¹. Although, several studies have reported how differences in the timing of maternal weight gain may be related to fetal growth outcomes^{3,20}, none of these studies address racial differences in the pattern of maternal weight gain and its relationship to birth weight¹. In this paper, we were interested in the timing of maternal weight gain and its relationship to birth weight in African-American women because this group is clearly at higher risk for adverse birth outcomes than other groups in the United States. Although the rate of maternal weight gain and its effect on fetal growth are known to vary greatly throughout pregnancy^{6,20}, our study is among the first to evaluate these relationships focusing on African-American women compared to other women. We found that the influence of the rate of maternal weight gain on infant birth weight occurs at different times in gestation in different racial strata.

The prospective cohort design of this study is well-suited for modeling longitudinally the effect of the rate and pattern of weight gain over the course of gestation on perinatal outcomes. Because we measured maternal weight at three time points, our analytic approach was able to distinguish how birth weight is influenced by the magnitude and rate of change of maternal weight over different intervals during pregnancy. Our strategy for identifying and recruiting participants early in gestation was important to examine the effects of weight gain early in pregnancy. However, such a study design inherently limits study participation to a group of women who are present for prenatal care and are able to attend multiple study visits. As a result of our recruitment strategy, women without prenatal care or with late, interrupted, or sporadic care are implicitly excluded. These factors may limit the generalizability of our findings to these high risk women.

A strength of our study is the availability of fetal ultrasound biometry for fetal weight estimation at each visit. On average, fetal weight accounts for approximately 25% of the total gestational weight gain²¹. The problem of part-whole correlations in the analysis of maternal weight gain has been well described in the literature^{18,22}. Since the weight of the fetus comprises a

significant percentage of gestational weight gain, use of total weight gain overestimates relationships between mother and infant. When two variables are compared and one is a sum containing the other variable, a spurious increase in association results, called the part-whole bias. The inflated correlation between birth weight and total maternal gain is a classic example. One strategy to address this issue is to use net maternal weight gain calculated by subtracting the estimated fetal weight from the mother's weight to remove artificial structural biases from the association between birth weight and maternal weight gain.

The use of fetal ultrasound biometry for fetal weight estimation may introduce measurement error, particularly in obese women. Several large studies have documented the utility of ultrasound biometry as a tool to accurately estimate fetal weight^{23,24}. While there has been concern about the influence of maternal obesity on the ultrasound evaluation of fetal anatomy²⁵, the effect of maternal obesity on fetal weight estimates is less clear. Several studies have found that maternal obesity does not affect the accuracy ultrasound estimates of fetal weight²⁶⁻²⁸. However, a more recent retrospective analysis suggests that increasing maternal BMI was associated with decreased clinical estimated fetal weight accuracy in term pregnancies²⁹. In any case, such measurement error is unlikely to systematically bias our observed relationships in African-American women compared to other women.

In our analyses, we deliberately selected a group of women with singleton pregnancies who delivered a live-born infant after 37 weeks of gestation in order to focus on the effects of maternal weight gain on birth weight without confounding by preterm delivery. African-American infants have a lower mean birth weight and higher infant mortality rates than non-African-American infants because of their higher preterm delivery rates³⁰. However, even term and post-term African-American infants have higher risks of mortality than their non-African-American counterparts^{31,32}. These types of racial disparities remain among the most vexing health problems in the United States^{32,33}.

Racial identity is a broad construct that defines a context determined by a set of dynamic interactions among an array of genetic, physiologic, psychosocial, behavioral, economic, cultural, and other unmeasured factors^{7,8}. Socioeconomic status, racial bias/discrimination, and health behaviors (including diet, physical activity, and nutrition) are all correlated with racial and ethnic background. Because of the heterogeneity of factors related to race, the covariates influencing the relationship between variation in maternal weight and weight gain to variation of birth weight will necessarily differ by racial group. Moreover, because of the incommensurability of measures, it has been recognized that the meaning of these covariates will also differ by racial group³⁴ so that direct statistical comparison of African-Americans and to non-African-Americans are generally not informative. As such, we chose to model the relationships separately for African-Americans and non-African-Americans.

We found differences in the rate of maternal weight gain for African-American compared to lower-risk non-African-American women in our sample. For non-African-American women, the rate of weight gain is about 0.24 kg/week from the preconceptional period to the first visit at 16 to 20 weeks gestation (W_{01}) and increases to about 0.36 kg/week from the first study visit at 16 to 20 weeks gestation to the second study visit at 30 to 36 weeks gestation (W_{12}) consistent with prior studies¹. In contrast, African-American women in our sample gain weight more consistently across pregnancy; 0.30 kg/week during the first half of pregnancy (W_{01}) and 0.33 kg/week in the second half of pregnancy (W_{12}). The rate of weight gain for African-American women in our sample is significantly larger than for non-African-American women from the preconceptional period to the first visit at 16 to 20 weeks gestation (W_{01}) while they are more similar from the first study visit at 16 to 20 weeks gestation to the second study visit at 30 to 36 weeks gestation (W_{12}).

We found the best model describing the influence of the rate of maternal weight gain on infant birth weight differs between African-American and non-African-American racial strata. Specifically, in African American gravidas, variation in aBW was significantly associated with variation W_{01} while, there was no relationship between variation in aBW and variation in W_{12} . In contrast, in a low-risk group of non- African American gravidas, variation in aBW was associated with variation in W_{12} but not with variation in W_{01} . (Table 4). Our findings in the low-risk non-African-American cohort are similar to those from prior large population based cohorts that suggest the importance of maternal weight gain in late pregnancy ^{1,20}. However, it is interesting to note that the importance of early weight gain in high-risk groups has also been previously noted in a cohort of urban adolescent gravidas ^{35,36}.

Our study provides evidence that birth outcome may be mediated, in part, by factors related to maternal weight and weight gain that have different effects in different racial strata. Although our decision to develop separate models for each racial strata is supported by statistical tests of interaction between weight gain and race on birth weight, the effects of factors associated with racial differences in maternal weight on birth weight are confounded with differences in the contribution of variation in maternal weight and weight gain to variation of birth weight within racial groups. These issues necessarily preclude formal statistical testing to determine if there are indeed significant racial differences in the influence of maternal weight on birth weight ³⁴.

If the relationship between aBW and maternal weight gain patterns over the course of pregnancy varies by race, it would also suggest etiologic heterogeneity in the context of the maternal-fetus relationship between the races. Such results suggest that factors associated with maternal weight gain in different racial strata may differentially influence variation in birth outcomes within racial groups and may contribute to differences in neonatal morphometric phenotypes ³⁷ and to differences in the risk for morbidity between African-American and other infants. However, the difference in the influence of factors associated with maternal weight gain in different racial strata illustrates the general problem of evaluating how variation in any of the factors that influence variation in birth outcomes within racial groups may contribute to differences in outcomes between racial groups. The covariates and their relationships to outcomes differ by racial group making direct comparisons between groups impossible ³⁴. Nevertheless, such data may ultimately suggest how the racial, cultural, and sociodemographic context of a pregnancy may influence the effect of clinical outcomes related to measures of maternal weight and weight gain within each group.

Maternal weight gain can be altered through intervention. At the population level, maternal weight gain tend to follow the recommendations of their health care providers ³⁸. Our results suggest that physicians should consider the context of a particular pregnancy, as marked by racial, cultural, and other sociodemographic factors, when making individual clinical decisions and recommendations about maternal weight and weight gain during pregnancy. For example, nutritional interventions may have disparate results in different contexts depending on the timing of the intervention. With regard to specific guidelines and recommendations, the broader implications of our analyses await larger and more detailed studies.

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Abbreviations

aBW gestational age-adjusted birth weight

W_0	maternal preconceptional weight
W_1	maternal weight measured at 16-20 weeks gestation
W_2	maternal weight measured at 30-36 weeks gestation
W_{01}	rate of maternal weight gain in the first half of pregnancy
W_{12}	rate of maternal weight gain in the second half of pregnancy

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Table 1

Maternal and infant characteristics of our study sample stratified on racial group.

	African-American N (%)	Non-African-American N (%)
Sample size	187 (43.0)	248 (57.0)
Maternal Characteristics		
Maternal Age (years)		
< 21	23 (12.3)	23 (9.3)
21-30	110 (58.8)	127 (51.2)
> 30	54 (28.9)	98 (39.5)
Marital Status *		
Married	57 (30.5)	170 (68.5)
Single	130 (69.5)	78 (31.5)
Highest Educational Level *		
Elementary	0 (0.0)	8 (3.2)
High School	101 (54.0)	119 (48.0)
College	80 (42.8)	93 (37.5)
Post-Graduate	6 (3.2)	28 (11.3)
Source of Payment *		
Government Assistance	116 (62.0)	86 (34.7)
Private Insurance	70 (37.4)	159 (64.1)
Self Pay	1 (0.6)	3 (1.2)
Chronic Illness		
Diabetes	9 (4.8)	8 (3.2)
Hypertension	9 (4.8)	7 (2.8)
Parity *		
Nulliparous	56 (30.0)	112 (45.2)
Multiparous	131 (70.0)	136 (54.8)
Smoking		
During Pregnancy	34 (18.2)	35 (14.1)
Not During Pregnancy	153 (81.8)	213 (85.9)
Infant Characteristics		
	Mean (SD)	Mean (SD)
Gestational Age at Delivery (days)	277.4 (8.9)	278.4 (8.6)
Birthweight (grams)	3403.8 (458.4)	3481.2 (428.6)
Gender (No., %)		
Male	87 (46.5)	124 (50.0)
Female	100 (53.5)	124 (50.0)

* Statistically significant difference between races ($P < 0.05$) calculated using the Fisher's exact test for categorical variables and the t test for continuous variables.

Table 2

Maternal morphometric characteristics of the study sample stratified on racial group.

	African-American mean (SD)	Non-African-American mean (SD)
Maternal BMI (kg/m ²) [*]	26.9 (6.9)	24.7 (5.5)
Maternal BMI Categories (No., %) [*]		
≤ 26.0	107 (58.8)	177 (71.4)
> 26.0	75 (41.2)	71 (28.6)
Corrected maternal weight (kg) [†]		
W ₀ [*]	72.9 (19.2)	64.9 (15.2)
W ₁ [*]	78.5 (18.8)	69.5 (14.4)
W ₂ [*]	84.3 (17.7)	75.8 (13.5)
Rate of Weight Gain (kg/week) [‡]		
W ₀₁ [*]	0.30 (0.25)	0.24 (0.23)
W ₁₂	0.33 (0.25)	0.36 (0.20)

^{*} Statistically significant difference between races ($P < 0.05$) calculated using the t test.

[†] W₀ is the pre-pregnancy weight; W₁ is the weight at 16 to 20 weeks gestation (visit 1); and W₂ is the weight at 30 to 36 weeks gestation (visit 2). Each weight is corrected for the estimated fetal weight as described in the text.

[‡] The rate of maternal weight gain between visits, calculated as the difference in the corrected maternal weights divided by the time interval between visits. W₀₁ is the rate of weight gain (kg per week) from the preconceptional period to visit 1; W₁₂ is the corresponding rate of weight gain from visit 1 to visit 2.

Table 3

The cross-sectional relationships between infant birth weight and maternal morphometric measures at each time-point[†].

Time Point	Prepregnancy β (95% CI)	16-20 weeks β (95% CI)	30-36 weeks β (95% CI)
Weight variable	W_0	W_1	W_2
African-Americans	5.6 ^{**} (2.4, 8.7)	6.4 ^{**} (3.2, 9.6)	6.9 ^{**} (3.5, 10.2)
Non-African-Americans	2.5 (-0.9, 5.8)	2.8 (-0.8, 6.3)	4.2 [*] (0.4, 7.9)
BMI variable	BMI_0	BMI_1	BMI_2
African-Americans	14.9 ^{**} (6.0, 23.8)	17.5 ^{**} (8.4, 26.6)	19.7 ^{**} (9.7, 29.6)
Non-African-Americans	3.3 (-6.0, 12.7)	3.3 (-6.7, 13.3)	6.4 (-4.3, 17.0)

* $P \leq 0.05$

** $P \leq 0.001$

[†] Each entry gives the regression coefficient (β) and the 95% confidence interval (CI) for a univariate linear regression analysis for the cross-sectional relationship between aBW (grams) and corrected maternal weight (kg) or BMI (kg/m^2) determined at each study visit.