HHS Public Access

Racial/Ethnic Standards for Fetal Growth, the NICHD Fetal Growth Studies

Germaine M. BUCK LOUIS, PhD, MS[1], **Jagteshwar GREWAL, PhD, MPH**[1], **Paul S. ALBERT, PhD**[1], **Anthony SCISCIONE, DO**[2], **Deborah A. WING, MD**[3,4], **William A. GROBMAN, MD, MBA**[5], **Roger B. NEWMAN, MD**[6], **Ronald WAPNER, MD**[7], **Mary E. D'ALTON, MD**[7], **Daniel SKUPSKI, MD**[8], **Michael P. NAGEOTTE, MD**[9], **Angela C. RANZINI, MD**[10], **John OWEN, MD, MSPH**[11], **Edward K. CHIEN, MD**[12], **Sabrina CRAIGO, MD**[13], **Mary L. HEDIGER, PhD**[1], **Sungduk KIM, PhD**[1], **Cuilin ZHANG, MD, MPH, PhD**[1], and **Katherine L. GRANTZ, MD, MS**[1]

[1]Eunice Kennedy Shriver National Institute of Child Health and Human Development [2]Christiana Care Health System [3]University of California, Irvine [4]Fountain Valley Regional Hospital and Medical Center [5]Northwestern University Feinberg School of Medicine [6]Medical University of South Carolina [7]Columbia University Medical Center [8]New York Hospital Queens [9]Miller Children's Hospital/Long Beach Memorial Medical Center [10]St. Peter's University Hospital [11]University of Alabama at Birmingham [12]Women and Infants Hospital of Rhode Island [13]Tufts Medical Center

Abstract

Objective—Fetal growth is associated with long-term health yet no appropriate standards exist for the early identification of under- or over-grown fetuses. We sought to develop contemporary fetal growth standards for four self-identified U.S. racial/ethnic groups.

Study Design—We recruited for prospective follow-up 2,334 healthy women with low-risk, singleton pregnancies from 12 community and perinatal centers between July 2009 and January 2013. The cohort comprised: 614 (26%) non-Hispanic Whites, 611 (26%) non-Hispanic Blacks, 649 (28%) Hispanics, and 460 (20%) Asians. Women were screened at 8w0d to 13w6d for maternal health status associated with presumably normal fetal growth (aged 18–40 years; body mass index 19.0–29.9 kg/m^2; healthy lifestyles and living conditions; low-risk medical and obstetrical history); 92% of recruited women completed the protocol. Women were randomized among four ultrasonology schedules for longitudinal fetal measurement using the Voluson E8 GE Healthcare. In-person interviews and anthropometric assessments were conducted at each visit; medical records were abstracted. The fetuses of 1,737 (74%) women continued to be low-risk

Corresponding Author: Germaine M. Buck Louis, 6100 Executive Blvd., Room 7B03, Rockville, MD 20852, 301-496-67155, louisg@mail.nih.gov.

(uncomplicated pregnancy, absent anomalies) at birth, and their measurements were included in the standards. Racial/ethnic-specific fetal growth curves were estimated using linear mixed models with cubic splines. Estimated fetal weight and biometric parameter percentiles (5th, 50th, 95th) were determined for each gestational week and comparisons made by race/ethnicity, with and without adjustment for maternal and socio-demographic factors.

Results—Estimated fetal weight differed significantly by race/ethnicity after 20 weeks. Specifically at 39 weeks, the 5th, 50th, and 95th percentiles were 2790, 3505, and 4402 grams for White, 2633, 3336, and 4226 grams for Hispanic, 2621, 3270, and 4078 grams for Asian, and 2622, 3260, and 4053 grams for Black women (adjusted global p<0.001). For individual parameters, racial/ethnic differences by order of detection were: humerus and femur lengths (10 weeks), abdominal circumference (16 weeks), head circumference (21 weeks), and biparietal diameter (27 weeks). The study-derived standard based solely on the White group erroneously classifies as much as 15% of non-White fetuses as growth-restricted (estimated fetal weight < 5th percentile).

Conclusions—Significant differences in fetal growth were found among the four groups. Racial/ethnic-specific standards improve the precision in evaluating fetal growth.

Keywords

Birthweight; Epidemiology; Estimated fetal growth; Fetal growth; Pregnancy

Background and Objective

Optimal fetal growth is recognized as a basic foundation for long-term health, while aberrations in growth may have implications for disease risk across the lifespan. While abnormal fetal growth, both restriction and overgrowth, is associated with fetal, infant and child mortality and morbidity,[1,2] it also has implications for reproductive disorders and later-onset chronic diseases. For example, girls born small-for-gestational age, a proxy for restricted fetal growth, are reported to have earlier onset and progression of puberty, and a higher incidence of diseases during pregnancy than unaffected girls.[3–5] Other population level data suggest a relation between diminished birth size and hypertension as well as other chronic disorders.[6,7] These data support the early origins of health and disease research paradigm.[8]

Despite the importance of adequate fetal growth for humans, no U.S. intrauterine standards for ultrasound-measured fetal growth exist. Unlike references that describe the gestational age distribution of birthweight for all fetuses, including growth-restricted preterm infants,[9–11] ultrasonographic standards are purposefully developed to reflect optimal growth by restricting study populations to healthy women in optimum conditions at low risk for adverse pregnancy complications and then restricting to actual uncomplicated pregnancies with fetuses free of anomalies.[12] The underlying assumption of a standard is that fetuses of low-risk pregnant women should grow to their fullest extent absent pregnancy complications associated with growth restriction or overgrowth, and that the distributions are not affected by secular trends in maternal intrinsic factors, such as obesity or advanced maternal age.

While many factors including race/ethnicity have been reported to be associated with suboptimal fetal growth,[13–15] the absence of a fetal growth standard precludes a more complete interpretation of these findings. The need for an ultrasonographic standard is even more pressing given the changing socio-demographic and maternal clinical characteristics of U.S. populations, including a higher percentages of births to older, non-White, and heavier mothers relative to earlier cohorts.[16,17] In response, we designed the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) Fetal Growth Studies. The overarching goal of this study was to establish a standard for fetal growth and size-for-gestational age and to address possible differences among non-Hispanic White, non-Hispanic Black, Hispanic, and Asian or Pacific Islander singleton fetuses. We also assessed the racial/ethnic patterns for estimated fetal weight (EFW) and measured birthweight.

Materials and Methods

Study Design and Cohort Selection

Using a prospective cohort design with longitudinal data collection, pregnant women were recruited from 12 participating U.S. clinical sites between July 2009 and January 2013. Women underwent ultrasound screening (8w0d to 13w6d) to ensure valid gestational dating consistent with last menstrual period dating. Women were asked to self-identify their predominant race/ethnicity as: non-Hispanic White; non-Hispanic Black; Hispanic; and Asian or Pacific Islander. Hereafter, we refer to these groups as White, Black, Hispanic, and Asian. Eligibility criteria included: aged 18–40 years; pregravid body mass index (BMI) 19.0–29.9 kg/m^2; viable singleton pregnancy; and planning to deliver at participating hospitals. Exclusion criteria were extensive to ensure pregravid women's low-risk status: previous history of preterm, low birthweight (<2500 g) or macrosomic (>4000 g) neonate; history of stillbirth or neonatal death; medically-assisted conception; cigarette smoking or illicit drug use in past 6 or 12 months, respectively; 1 daily alcoholic drinks; previous fetal congenital malformation; history of non-communicable diseases (asthma requiring weekly medication, autoimmune disorders, cancer, diabetes mellitus, epilepsy or seizures requiring medication, hematologic disorders, hypertension, psychiatric disorders, renal disease, thyroid disease), or history of gravid diseases (gestational diabetes, severe preeclampsia/ eclampsia, or Hemolysis, Elevated Liver enzymes, Low Platelet count Syndrome). From the targeted sample, 2,334 (93%) women were enrolled including 614 White, 611 Black, 649 Hispanic, and 460 Asian or Pacific Islander women with protocol completion rates of 93%, 92%, 93%, and 90%, respectively. Sample size was determined so that the 5th and 95th percentiles for each racial/ethnic group could be precisely estimated over gestation, and assuming a 10% attrition and 30% exclusion rate for women with pregnancy or neonatal complications. We estimated needing 600 women in each group to reach our estimate of 320 women; our high completion and lower than expected exclusion rate resulted in larger cohorts. Human subjects' approval was obtained from all participating sites; women gave informed consent before data collection.

Data Collection

Research nurses conducted in-person interviews with the women during prenatal visits to ascertain information on lifestyle and reproductive and medical history, followed by the

completion of anthropometric assessments, including after delivery, using a standardized protocol.[18,19] Recalled pregravid weight and self-reported height were used for the calculation of pregravid body mass index (BMI, kg/m^2), given that women were already pregnant at enrollment. Women's eligibility for their fetuses' inclusion in the standard was verified with regard to compliance with the protocol, and absence of pregnancy or neonatal complications to ensure their pregnancies resulted in delivery of a healthy live-born infant.

Sonology

One comprehensive sonology center (Columbia University) was established to oversee the finalization, implementation, and oversight of the sonology protocol. All participating sonographers underwent *ante hoc* training and credentialing for quality control, and their measurement techniques were subject *post hoc* to rigorous quality assurance.

Following the baseline interview, women were randomized to one of four ultrasonology schedules. By design, this mixed longitudinal randomization scheme captured weekly fetal growth data without exposing women to weekly ultrasound examinations as follows:

Group	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
A	16	24	30	34	38
B	18	26	31	35	39
C	20	28	32	36	40
D	22	29	33	37	41

Each study visit was scheduled within ±1 week of the targeted gestational age to accommodate women's availability. At each ultrasound exam, biometric measurements were performed using standard operating procedures and identical equipment (Voluson E8 GE Healthcare; Milwaukee, WI) using a transabdominal curved multi-frequency volume transducer (RAB 4–8MHz) and endovaginal multi-frequency volume transducer (RIC 6–12 MHz). All measurements and images were captured in ViewPoint (GE Healthcare) and electronically transferred to the Study's imaging data coordination center. Longitudinal measurements were taken for biparietal diameter (BPD; outer to inner), humerus length (HL), and femur length (FL) using the linear function and for head circumference (HC) and abdominal circumference (AC) using the ellipse function, with the intent of creating separate standards for each parameter. Estimated fetal weight was computed from HC, AC and FL using a Hadlock formula.[20] We also calculated the HC/AC ratio as an index of proportionality.

Statistical Analysis

In the descriptive analysis, baseline and clinical data were compared for participants by women's self-reported race/ethnicity. Significance (p<0.05) was determined using Chi-square or *t*-tests for categorical and continuous data, respectively. All serial ultrasound data were used to estimate fetal growth relative to individual parameters, EFW and birthweight. Ultrasonography measurements (BPD, HC, AC, HL, FL), HC/AC, and EFW were log-

transformed to stabilize variances across gestational ages and to improve normal approximations for the error structures.

The primary analysis was performed using linear mixed models with cubic splines for estimating racial/ethnic-specific fetal growth curves for size, methods that accounted for the variation across individual fetuses.[21] Three-knot points (25th, 50th, 75th percentiles) were chosen at gestational ages that evenly split the distributions. Percentiles were estimated based on the assumed normal distribution of the random effects and error structure. Estimated curves (5th, 50th, and 95th percentiles) were determined across gestational age from the 15th to the 40th week and for each racial/ethnic group. For EFW and each individual anthropometric parameter, we tested for overall differences in the racial/ethnic-specific curves using a likelihood-ratio test. When the global test was significant (<0.05 level), we tested for week-specific differences by race/ethnicity using Wald tests at each week of gestation. These tests were conducted on the estimated curves with and without adjustment for maternal characteristics: age, self-reported height and pregravid weight, parity, full-time employment/student status (yes/no), marital status (married/living as married versus not), health insurance (private/managed versus Medicaid/other), income, education, and infant sex (male/female). All covariates were treated as continuous unless otherwise stated. Annual income and education were analyzed categorically: income < $30,000; $30,000-$39,999; $40,000-$49,999; $50,000-$74,999; $75,000-$99,999; $100,000 and education: < high school; high school or equivalent; some college or associate degree, bachelor degree; and master's or higher degree. We used multiple imputation (with 20 imputations) to account for missing covariate information measurements when performing covariate-adjusted tests for week-specific racial/ethnic differences in the fetal growth curves.[22] We empirically assessed the validity of our statistical model to ensure it produced unbiased percentile estimates using simulation analysis, and compared different linear mixed models (i.e., cubic splines, cubic polynomials and second order fractional polynomials) and also individual-specific interpolation or smoothing methods.[23,24]

Lastly, to interpret findings in terms of clinical relevancy, we evaluated the degree of misclassification that would be introduced if the study-derived White standard was used for estimating fetal growth for all other racial/ethnic groups using methods grounded in normal probability theory.[25] All analyses were implemented using SAS (version 9.4, SAS Institute, Inc., Cary, North Carolina) or R (version 3.1.2, http://www.R-project.org).

Results

Among the 2,334 enrolled women, 597 (25%) were excluded from the standard resulting in 1,737 women and fetuses available for analysis (Figure 1). Seven percent (n=169) of women were lost to follow-up, while 356 (20%) were excluded for pregnancy complications or 4% (n=72) for neonatal complications. Few significant differences were observed between indications for exclusion and race/ethnicity. Asian women were more likely to decline continued participation and to develop gestational diabetes, while Black women developed more hypertension in pregnancy, and White women experienced more placental/umbilical cord complications in comparison with other racial/ethnic groups (data not shown).

Characteristics of women retained in the standard by race/ethnicity are presented in Table 1. Mean (±SD) ages ranged from 25.5±5.4 years for Black to 26.9±5.4 for Hispanic, 30.3±4.3 for White, and 30.5±4.4 for Asian women, though all standard deviations overlapped. A slight excess of White and Asian women were nulliparous in comparison with Black and Hispanic women. Even within the proscribed BMI range, Black women tended to be taller and heavier, while Hispanic women were shorter and heavier and Asian women shorter and lighter than their respective counterparts. Most women were not using contraception at the time of conception, and most were married and held jobs.

Figure 2 presents the curves for EFW that include the 5th, 50th, and 95th percentiles. The curves differ significantly by race/ethnicity starting at 16 weeks gestation extending to delivery (global test p<0.001). At 32 weeks, representing a time when an obstetrical ultrasound might be obtained to evaluate fetal growth, the 5th, 50th, and 95th EFW percentiles were 1615, 1958, 2374 g for White, 1523, 1877, 2313 g for Hispanic, 1514, 1836, 2228 g for Black, and 1508, 1831, 2222 g for Asian fetuses, respectively (p<0.001). At approximately full term (39 weeks), 5th, 50th, and 95th percentiles for EFW were 2790, 3505, and 4402 g for White; 2633, 3336, and 4226 g for Hispanic; 2621, 3270, and 4078 g for Asian; and 2622, 3260, and 4053 g for Black fetuses (p< 0.001).

Figure 3 presents the distribution of racial/ethnic-specific curves for AC, BPD, HC, HL, FL, and HC/AC, along with p-values for the differences in Figure 4. Differences in AC paralleled EFW with the largest circumferences for Whites and the lowest for Blacks beginning at 16 weeks' gestation through term. Significant differences in HC were detected at 21 weeks (in descending order): Whites, Asians, Hispanics, and Blacks (all pairwise comparisons were highly significant except between Asians and Hispanic groups). BPD demonstrated significant differences later (27 weeks) in pregnancy through term, similar to the pattern for HC. Conversely, significant differences in HL were detected early (10 weeks) and remained significant through term, as did differences in FL from 10–39 weeks, with the longest lengths observed for Black fetuses. The HC/AC ratio was significantly higher for Blacks than other groups commencing at ≈15 weeks. Data for percentiles (3rd, 5th, 10th, 50th, 90th, 95th, 97th) for all anthropometric measurements, HC/AC and EFW for each racial/ethnic group are presented in Table 2. All pairwise comparisons between racial/ethnic groups for all measurements are presented in Table 3.

Racial/ethnic patterns for birthweight are similar to those for EFW as illustrated in Figure 5. Neonates born to White women had the highest mean birthweight followed by those born to Hispanic, Asian, and Black women (global test p<0.001). A flattening of the curve is observed between 39–40 weeks, which was clearly demonstrated when the lowess curve was superimposed on the data suggesting it is not an artifact.

Lastly, we evaluated the clinical implications of using our White standard for non-White fetuses, similar to the approach undertaken in the Hadlock reference.[22] Figure 6 illustrates the percentage of fetuses classified as being <5th percentile for EFW when using the White standard, which ranged from 5% to 15% across gestation. With the sole exception of Black fetuses <18 weeks' gestation, substantially more than 5% of Black, Hispanic, and Asian fetuses are classified as <5th percentile for EFW at all gestations. For example at 35 weeks'

gestation, 14%, 12%, 15% of Black, Hispanic, and Asian fetuses, respectively, would have been classified as <5th percentile based upon the White standard. Our findings remained even when using a pooled (all races combined) reference (data not shown).

Comment

The findings from the NICHD Fetal Growth Studies suggest significant differences in fetal growth among different racial/ethnic groups as exemplified by individual biometrics and EFW. The curves were estimated for singleton fetuses born at term to low-risk mothers without pregnancy complications or neonatal conditions that could affect fetal growth. Such pregnancies are presumed to support optimal fetal growth unconstrained by environmental factors and constrained only by the limitations of maternal metabolism and the intrauterine environment.[26] Thus, our observed racial/ethnic differences primarily reflect maternal intrinsic characteristics such as age and height, possibly as shaped by evolutionary processes.[26]

Distinct patterns emerged from these data with regard to the timing and duration of observed differences for the various sonographic measurements, which are generally consistent with the recognized patterns of timing in growth velocity.[27] We observed the earliest racial/ethnic-specific differences for humerus and femur lengths, which were longer for Black fetuses in comparison with others. By 16 weeks' gestation, racial/ethnic-specific differences were observed for AC and EFW. In contrast to the long bones, these measurements were largest in White and smallest in Black fetuses. Other notable differences included HC and BPD commencing at 21 and 27 weeks, respectively. Of particular note were the similarity of fetal growth curves for EFW to birth weight distributions by gestational age, with higher estimated and measured weights for White and Hispanic, and lower weights for Asian and Black fetuses/neonates.

Our finding that the White standard overestimates the percentage of non-White fetuses <5th percentile agrees with recent findings from a prospective study of fetal growth for three racial groups in Papua New Guinea.[28] Despite the low-risk status of the pregnant women followed with serial ultrasonology for EFW and birthweight, use of the Hadlock formula (Caucasian) or Congolese standard[14] overestimated the percentage of Papua New Guinea fetuses considered <10th percentile.

Our inability to substantiate a single standard for fetal growth, particularly in the third trimester when fetuses undergo active clinical surveillance for growth deviations associated with maternal complications,[29] underscores the potential for inappropriate classification of fetuses and antenatal testing and/or delivery. While our findings are consistent with other countries' assessment of racial/ethnic or regional differences in fetal growth,[13,14,30] they differ from the assumption of the INTERGROWTH-21st Project. This study recruited low-risk pregnant women from eight geographically diverse populations and pooled ultrasonographic data to construct a single standard predicated on no assumed differences in CRL, HC, and neonatal length.[31,32] However, as recently reported, even a small difference in the distribution between sites has a large effect on estimating percentiles (e.g., 5th or 95Th

centile).[25] These reported calculations showed a similar degree of misclassification as seen in our results.

Instead of presupposing no racial/ethnic differences, we considered that fetal dimensions could vary even in early pregnancy, as we found for FL and AC, consistent with adult racial/ethnic differences in size and proportion. While we observed little variation by race/ethnicity for BPD early in pregnancy, highly significant differences are detectable in HC by about 21 weeks' gestation and remained until delivery even in adjusted analyses. The ratio of HC/AC generally declines over gestation as expected, but the differences in trajectories demonstrate that there are significant differences in proportions by racial/ethnic group that should be considered in the evaluation of growth restriction.

Our findings also corroborate previously reported geographic differences in neonatal growth phenotypes,[33] and multi-ethnic differences in neonatal body composition within an established population where neonates from low and middle income countries were relatively "thin-fat" in comparison to neonates from Western Europe.[34] However, caution is needed when interpreting our findings in light of the many complexities underlying racial/ethnic definitions, including the continually changing nature of the self-identified race construct and the phenotypic heterogeneity within broad racial/ethnic groups. Still, this is the construct used clinically in the management of pregnant women, and self-identification is the approach used for census and research purposes.[35]

Our findings are strengthened by our standardized protocol implemented at 12 different U.S. clinical sites accompanied by a high completion rate and use of an extensive credentialing protocol for participating sonographers (who had a mean of 12 years of obstetrical ultrasonographic experience). In addition, we undertook concerted effort to validate our modeling approaches in developing the standards. Our exclusion of 25% of women no longer low risk is consistent with 29% of low risk pregnancies resulting in complications requiring non-normative obstetrical or neonatal care for U.S. births, 2011–2013.[36] Moreover, our findings remained when analyzing all women as with a reference and not just those retained in the standard (data not shown). In light of the continued controversy as to whether fetal growth standards are needed and to what extent (population or customized),[37] our findings suggest the need for continual efforts to ensure that standards reflect fetal growth that is independent of the changing characteristics of contemporary obstetrical populations.

We acknowledge the important limitations reflecting our observational design, including possible biases stemming from cohort selection and retention, measurement error in biometric endpoints, and residual confounding such as physical activity. The generalizability of our findings to obese women with otherwise low-risk obstetrical profiles remains to be established. And finally, we recognize that pregnancy is a couple-dependent outcome. Our findings await corroboration as applied to other U.S. pregnancy cohorts before reaching a conclusive interpretation.

In summary, we found highly significant differences in fetal growth by self-identified maternal race/ethnicity for BPD, HC, AC, HL, FL, HC/AC, and EFW among low-risk

women randomized to longitudinal ultrasonology examinations. These findings should help inform clinical management consistent with precision medicine initiatives.[38]

Acknowledgments

References

1. Rossen LM, Schoendorf KC. Trends in racial and ethnic disparities in infant mortality rates in the United States, 1989–2006. Am J Pub Health. 2014; 104(8):1549–56. [PubMed: 24028239]

2. Mikkola K, Ritari N, Tommiska V, et al. Neurodevelopmental outcome at 5 years of age of a national cohort of extremely low birth weight infants who were born in 1996–1997. Pediatrics. 2005; 116(6):1391–1400. [PubMed: 16322163]

3. Ibáñez L, Potau N, de Zegher F. Ovarian hyporesponsiveness to follicle stimulating hormone in adolescent girls born small for gestational age. J Clin Endocrinol Metab. 2000; 85:2624–6. [PubMed: 10902818]

4. Ibáñez L, Potau N, Ferrer A, Rodriguez-Hierro F, Marcos MV, de Zegher F. Reduced ovulation rate in adolescent girls born small for gestational age. J Clin Endocrinol Metab. 2002; 87:3391–3. [PubMed: 12107255]

5. Hokken-Koelega AC, De Waal WJ, Sas TC, Van Pareren Y, Arends NJ. Small for gestational age (SGA): endocrine and metabolic consequences and effects of growth hormone treatment. J Pediatr Endocrinol Metab. 2004; (Suppl 3):463–9. [PubMed: 15134308]

6. Dennison EM, Arden NK, et al. Birthweight, vitamin D receptor genotype and the programming of osteoporosis. Paediatr Perinat Epidemiol. 2001; 15(3):211–9. [PubMed: 11489147]

7. Bonamy AK, Parikh NI, Cnattingius S, Ludvigsson JF, Ingelsson E. Birth characteristics and subsequent risks of maternal cardiovascular disease: effects of gestational age and fetal growth. Circulation. 2011; 124(25):2839–46. [PubMed: 22124377]

8. Gluckman PD, Hanson MA. Developmental plasticity and human disease: research directions. J Intern Med. 2007; 261(5):461–71. [PubMed: 17444885]

9. Alexander GR, Himes JH, Kaufman RB, Mor J, Kogan M. A United States national reference for fetal growth. Obstet Gynecol. 1996; 87(2):163–8. [PubMed: 8559516]

10. Talge NM, Mudd LM, Sikorskii A, Basso O. United States birth weight reference corrected for implausible gestational age estimates. Pediatrics. 2014; 133(5):844–53. [PubMed: 24777216]

11. Duryea EL, Hawkins JS, McIntire DD, Casey BM, Leveno KJ. A revised birth weight reference for the United States. Obstet Gynecol. 2014; 124:16–22. [PubMed: 24901276]

12. Hediger, M.; Joseph, KS. Fetal growth, measurement and evaluation. In: Buck Louis, GM.; Platt, RW., editors. Reproductive and Perinatal Epidemiology. New York, NY: Oxford University Press; 2011. p. 168-85.

13. Pollack RN, Divon MY. Intrauterine growth retardation: definition, classification, an etiology. Clin Obstet Gynecol. 1992; 35(1):99–107. [PubMed: 1544253]

14. Landis SH, Ananth CV, Lokomba V, et al. Ultrasound-derived fetal size nomogram for a sub-Saharan African population: a longitudinal study. Ultrasound Obstet Gynecol. 2009; 34:379–86. [PubMed: 19402076]

15. Norris T, Tuffnell D, Wright J, Cameron N. Modelling foetal growth in a bi-ethnic sample: results from the Born in Bradford (BiB) birth cohort. Ann Hum Biol. 2014; 41(6):481–7. [PubMed: 24564820]

16. Martin, JA.; Hamilton, BE.; Osterman, MJK. NCHS data brief, no 175. Hyattsville, MD: National Center for Health Statistics; 2014. Births in the United States, 2013.

17. Mathews, TJ.; Hamilton, BE. NCHS data brief, no. 152. Hyattsville, MD: National Center for Health Statistics; 2014. First births to older women continue to rise.

18. Lohman, TG.; Roche, AF.; Martorell, R., editors. Anthropometric Standardization Reference Manual. Champaign, IL: Human Kinetics Books; 1988.

19. Ulijaszek SJ, Kerr DA. Anthropometric measurement error and the assessment of nutritional status. Br J Nutr. 1999; 82(3):165–77. [PubMed: 10655963]

20. Hadlock FP, Harrist RB, Sharman RS, Deter RL, Park SK. Estimation of fetal weight with the use of head, body, and femur measurements – A prospective study. Am J Obstet Gynecol. 1985; 151(3):333–7. [PubMed: 3881966]

21. Pinheiro, J.; Bates, D. Mixed-effects models in S and S-Plus (Statistics and Computing). New York, NY: Springer; 2000.

22. Sterne JA, White IR, Carlin JB, et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ. 2009; 338:b2393. [PubMed: 19564179]

23. Royston P, Altman D. Regression using fractional polynomials of continuous covariates: parsimonious parametric modeling. JRSS, Series C. 1994; 43(3):429–67.

24. Cleveland WS. LOWESS: A program for smoothing scatterplots by robust locally weighted regression. Am Stat. 1981; 35(1):54.

25. Albert PS, Grantz KL. Fetal growth and ethnic variation. Lancet Diabetes Endocrinol. 2014; 2(10): 773. [PubMed: 25258202]

26. Hanson MA, Gluckman PD. Early developmental conditioning of later health and disease: physiology of pathophysiology. Physiol Rev. 2014; 94:1027–1076. [PubMed: 25287859]

27. Milani S, Bossi A, Bertino E, et al. Differences in size at birth are determined by differences in growth velocity during early prenatal life. Pediatr Res. 2005; 57(2):205–10. [PubMed: 15611356]

28. Unger HW, Karl S, Wangnapi RA, Siba P, et al. Fetal size in a rural Melanesian population with minimal risk factors for growth restriction: as observational ultrasound study from Papua New Guinea. Am J Trop Med Hyg. 2015; 92(1):178–86. [PubMed: 25385863]

29. Khali A, Rezende J, Akolekar R, Syngelaki A, Nicolaides KH. Maternal racial origin and adverse pregnancy outcome: a cohort study. Ultrasound Obstet Gynecol. 2013; 41(3):278–85. [PubMed: 23023978]

30. Kierans WJ, Joseph KS, Luo ZC, Platt R, Wilkins R, Kramer MS. Does one size fit all? The case for ethnic-specific standards of fetal growth. BMC Pregnancy Childbirth. 2008 Jan 8.8:1.10.1186/1471-2393-8-1 [PubMed: 18179721]

31. Papageorghiou AT, Ohuma EO, Altman DG, et al. International standards for fetal growth based on serial ultrasound measurements: the Fetal Growth Longitudinal Study of the INTERGROWTH-21st Project. Lancet. 2014; 384(9946):869–79. Erratum in: Lancet 2014 Oct 4;384(9950):1264. [PubMed: 25209488]

32. Villar J, Papageorghiou AT, Pang R, et al. The likeness of fetal growth and newborn size across non-isolated populations in the INTERGROWTH-21st Project: the Fetal Growth Longitudinal Study and Newborn Cross-Sectional Study. Lancet Diabetes Endocrinol. 2014; 2(10):781–92. [PubMed: 25009082]

33. Leary S, Fall C, Osmond C, et al. Geographical variation in neonatal phenotype. Acta Obstet Gynecol Scand. 2006; 85(9):1080–89. [PubMed: 16929412]

34. Sletner L, Nakstad B, Yajnik CS, et al. Ethnic differences in neonatal body composition in a multi-ethnic population and the impact of parental factors: A population-based cohort study. PLOS. 2013; 8(8):e73058.

35. [last accessed 6-2-15] http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf

36. Danilack VA, Nunes AP, Phipps M. Unexpected complications of low-risk pregnancies in the United States. Am J Obstet Gynecol. 2015:809.e1–e6. [PubMed: 26042957]

37. Mayer C, Joseph KS. Fetal growth: a review of terms, concepts and issues relevant to obstetrics. Ultrasound Obstet Gynecol. 2013; 41(2):136–45. [PubMed: 22648955]

38. Collins FS, Varmus H. A new initiative on precision medicine. N Engl J Med. 2015; 372:793–5. [PubMed: 25635347]

Clinical implications

- By the second trimester in uncomplicated pregnancies, there are already significant differences in the size of individual fetal dimensions (BPD, HC, AC, HL, FL) by broad categories of maternal self-identified race/ethnicity, and trajectories are established that continue to diverge throughout gestation.

- These findings suggest that assessment of fetal growth by ultrasound needs to be evaluated clinically using racial/ethnic-specific standards for early identification of potential abnormalities and to preclude over-diagnosis of intrauterine growth restriction and unnecessary intervention.

- Future research should address the heterogeneity within the broader racial/ethnic groups (e.g., Southeast compared with South Asian (India) or East Asian (Chinese) women) to further improve the diagnosis of growth abnormalities.

- These findings should help inform clinical management consistent with precision medicine initiatives.
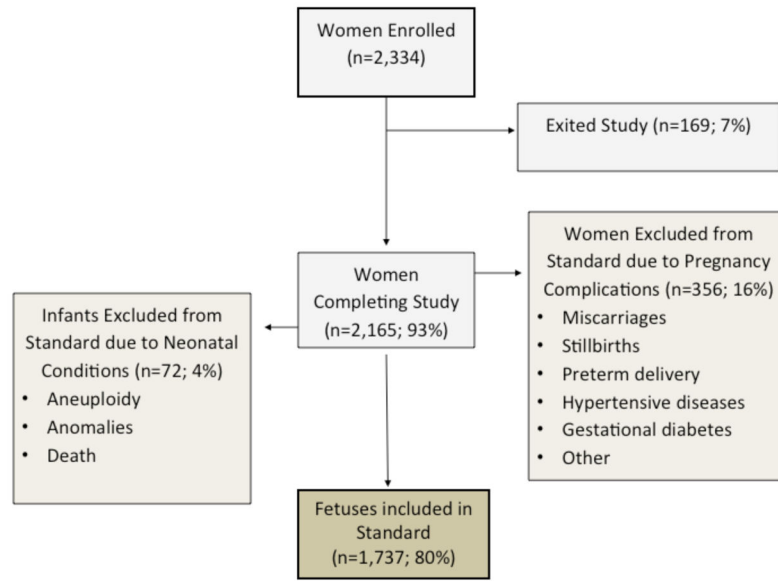
Figure 1. Cohort recruitment, retention or exclusion and inclusion of fetuses in the standard, NICHD Fetal Growth Studies - singletons

Illustration of women enrolled and retained in the final analysis of the fetal growth standards.
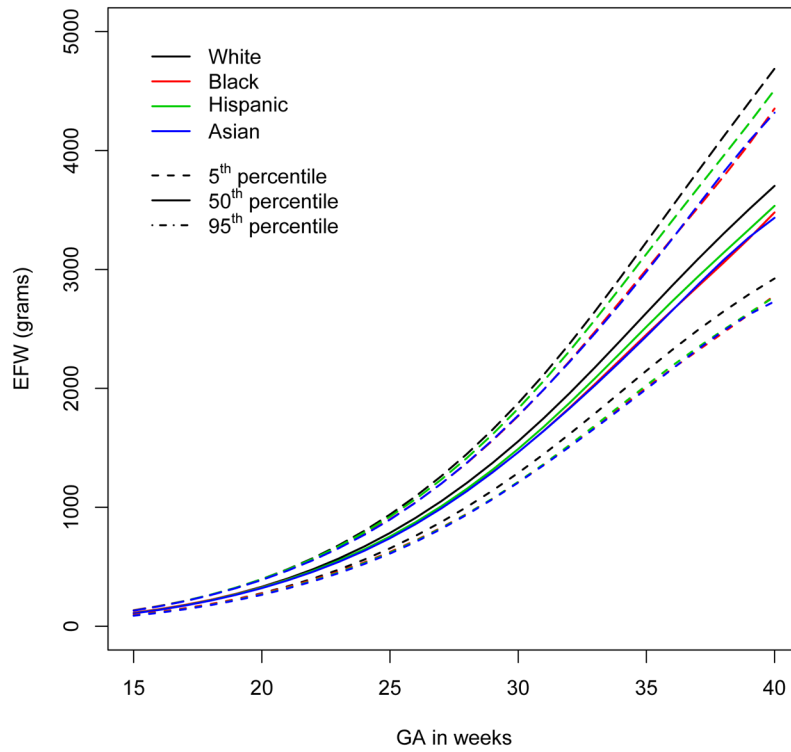
Figure 2. Distribution of estimated fetal weight by race/ethnicity and gestation, NICHD Fetal Growth Studies - singletons

Estimated 5th, 50th and 95th percentiles for fetal weight by maternal self reported race/ethnicity, as estimated from linear mixed models with log-transformed outcomes and cubic splines.

EFW, estimated fetal weight; GA, gestational age
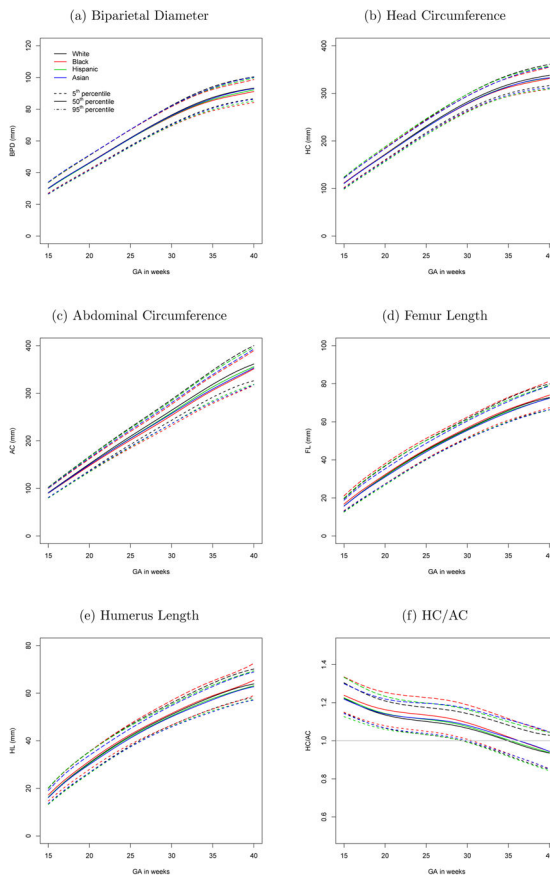
Figure 3. Distribution of fetal anthropometric measurements by race/ethnicity and gestation, NICHD Fetal Growth Studies - singletons

Estimated 5th, 50th and 95th percentiles for the fetal anthropometric parameters by self reported race/ethnicity (a–e), as estimated from linear mixed models with log-transformed outcomes and cubic splines.

GA, gestational age
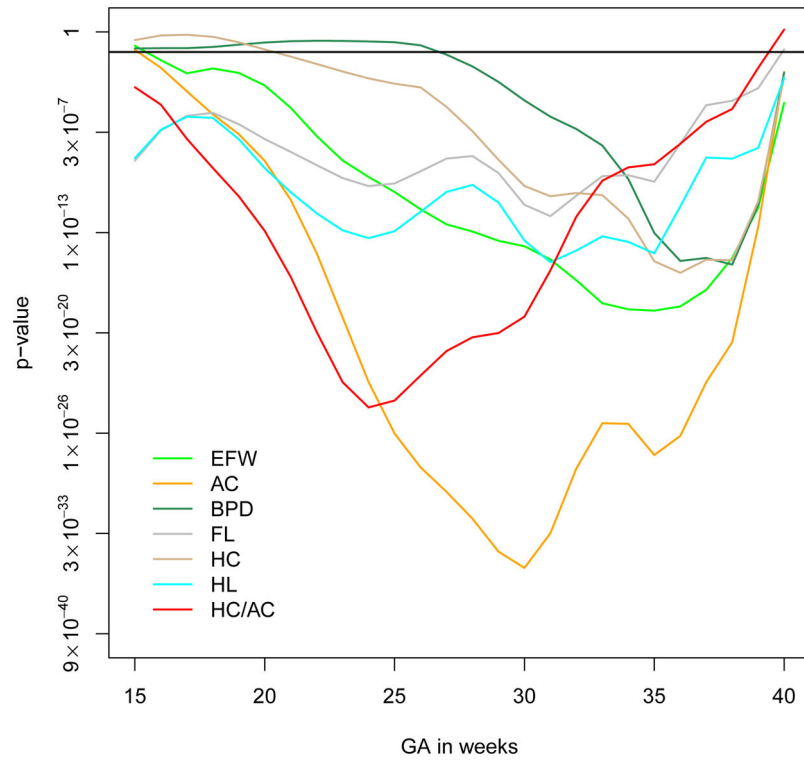
Figure 4.
Distribution of statistical significance (p-values) for individual fetal anthropometric measurements and estimated fetal weight, by race/ethnicity and gestation, NICHD Fetal Growth Studies-singletons.
Distribution of p-values by fetal anthropometric measurement and race/ethnicity.
GA, gestational age
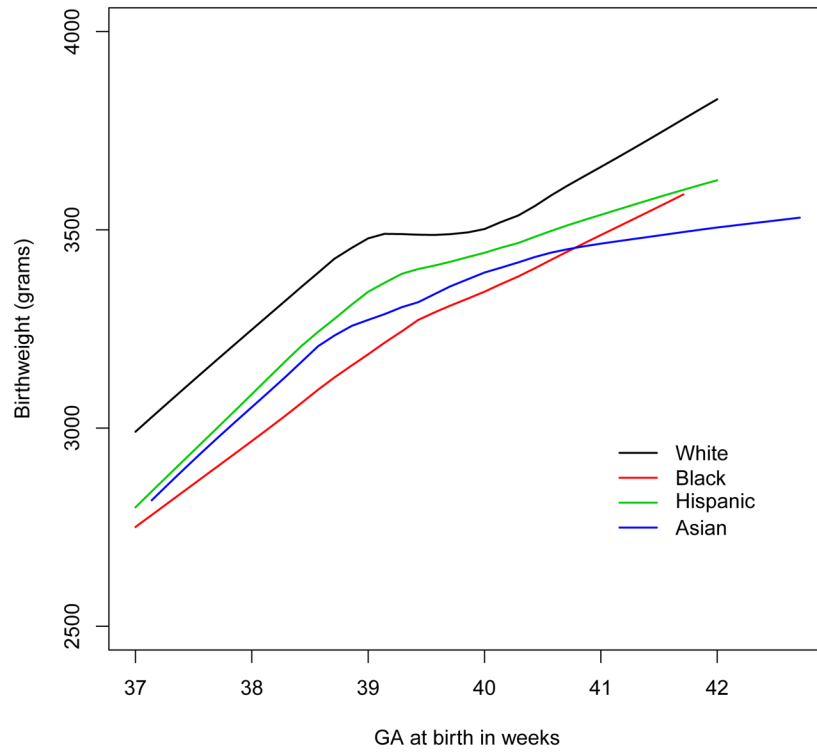
Figure 5. Distribution of birthweight (grams) by race/ethnicity and gestation, NICHD Fetal Growth Studies - singletons

Plots are generated by fitting a lowess smoothing spline (birthweight versus gestation age)

for each racial/ethnic group.

GA, gestational age
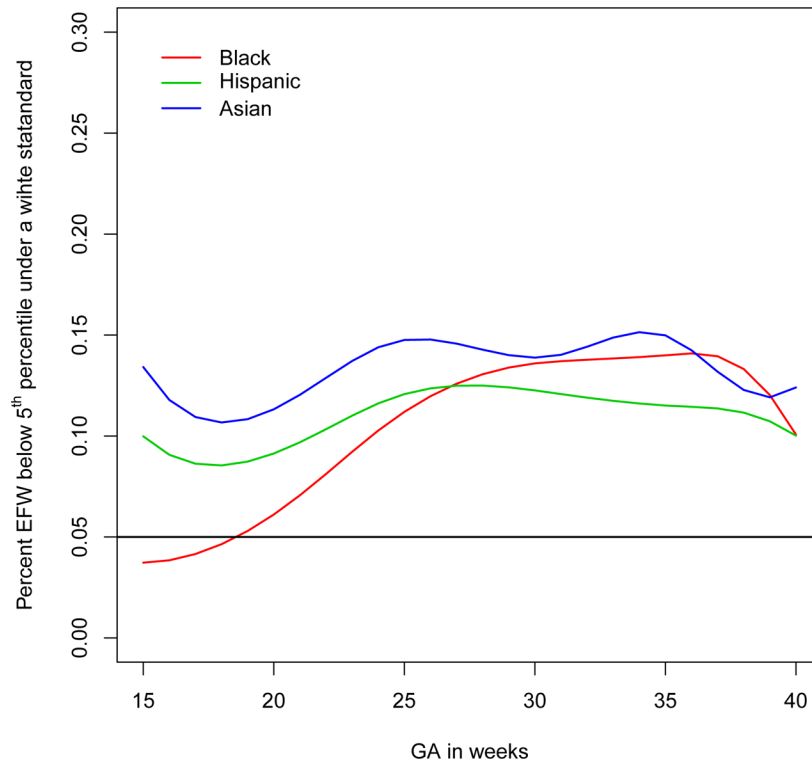
Figure 6. Percentage of non-White fetuses below the 5th percentile of the Non-Hispanic White Standard

Percentage of non-White fetuses below the 5th percentile of the Non-Hispanic White Standard by gestational age. The difference between the race/ethnic-specific curves and the 0.05 line reflect the amount of misclassification attributed to using the Non-Hispanic White standard.

GA, gestational age

Table 1

Maternal characteristics at enrollment by race/ethnicity, NICHD Fetal Growth Studies, July 2009 – January 2013, (n=1,737).

Characteristic	Non-Hispanic White (n=481) n (%)	Non-Hispanic Black (n=426) n (%)	Hispanic (n=488) n (%)	Asian/Pacific Islander (n=342) n (%)
Native born United States:				
Yes	446 (93)	388 (91)	221 (45)	92 (27)
No	35 (7)	38 (9)	267 (55)	250 (73)
Age (years):				
<20	8 (2)	53 (12)	33 (7)	2 (1)
20–29	177 (37)	278 (65)	297 (61)	141 (41)
30–39	291 (60)	94 (22)	157 (32)	198 (58)
40–44	5 (1)	1 (<1)	1 (<1)	1 (<1)
Mean (±SD)	30.3 (4.3)	25.5 (5.4)	26.9 (5.4)	30.5 (4.4)
Self-reported height (cm):				
Quartile 1 (134.6–154.9)	46 (10)	42 (10)	126 (26)	91 (27)
Quartile 2 (157.5–160.0)	88 (18)	95 (22)	164 (34)	115 (34)
Quartile 3 (162.6–165.1)	116 (24)	135 (32)	113 (23)	71 (21)
Quartile 4 (167.6–188.0)	231 (48)	153 (36)	85 (17)	65 (19)
Mean (±SD)	165.7 (7.1)	164.4 (6.9)	160.0 (6.3)	160.4 (6.0)
Self-reported pre-pregnancy weight (kg):				
Quartile 1 (39.6 – 56.6)	80 (17)	67 (16)	117 (24)	164 (48)
Quartile 2 (56.7 – 63.6)	110 (23)	80 (19)	102 (21)	78 (23)
Quartile 3 (63.7 – 70.9)	152 (32)	118 (28)	143 (29)	56 (16)
Quartile 4 (71.0 – 122.6)	139 (29)	158 (37)	125 (26)	44 (13)
Mean (±SD)	63.5 (9.0)	65.0 (9.8)	62.0 (8.6)	57.0 (8.3)
BMI (kg/m^2):				
<19.0	11 (2)	5 (1)	5 (1)	10 (3)
19.0 – 24.9	350 (73)	269 (64)	293 (60)	285 (83)
25.0 – 29.9	119 (25)	147 (35)	186 (38)	46 (13)
30.0	1 (0)	1 (0)	3 (1)	1 (0)

BUCK LOUIS et al.

Page 20

Characteristic	Non-Hispanic White (n=481) n (%)	Non-Hispanic Black (n=426) n (%)	Hispanic (n=488) n (%)	Asian/Pacific Islander (n=342) n (%)
Mean (±SD)	23.1 (2.8)	24.0 (3.1)	24.2 (2.8)	22.1 (2.5)
Parity (# births):				
0	257 (53)	207 (49)	189 (39)	176 (52)
1	163 (33)	140 (33)	186 (38)	132 (39)
2	50 (10)	61 (14)	71 (15)	28 (8)
3	11 (2)	18 (4)	42 (9)	6 (2)
Mean (±SD)	1.3 (0.7)	1.5 (0.7)	1.6 (0.9)	1.25 (0.5)
Using birth control when became pregnant:				
Yes	24 (5)	61 (14)	75 (15)	20 (6)
No	457 (95)	365 (86)	412 (85)	322 (94)
Marital status:				
Never married	22 (5)	205 (48)	107 (22)	21 (6)
Married/living as married	452 (94)	205 (48)	357 (73)	313 (92)
Divorced/separated	6 (1)	15 (4)	24 (5)	8 (2)
Education:				
<High school	4 (1)	47 (11)	108 (22)	18 (5)
High school/GED	22 (5)	122 (29)	114 (23)	40 (12)
Some college/associates degree	88 (18)	153 (36)	181 (37)	67 (20)
College undergraduate	203 (42)	66 (16)	67 (14)	106 (31)
Postgraduate college	164 (34)	38 (9)	18 (4)	111 (33)
Family income:				
$29,999	17 (4)	180 (49)	157 (39)	43 (17)
$30,000–49,999	30 (7)	71 (19)	109 (27)	32 (12)
$50,000–$74,999	59 (13)	33 (9)	55 (14)	33 (13)
$75,000–$99,999	88 (19)	38 (10)	30 (7)	54 (21)
$100,000	270 (58)	47 (13)	54 (13)	96 (37)
Health insurance:				
Private/managed care	452 (94)	204 (48)	169 (35)	211 (62)
Medicaid; other	24 (5)	217 (51)	298 (61)	126 (37)

Characteristic	Non-Hispanic White (n=481) n (%)	Non-Hispanic Black (n=426) n (%)	Hispanic (n=488) n (%)	Asian/Pacific Islander (n=342) n (%)
Self pay	5 (1)	5 (1)	21 (4)	5 (2)
Currently paid jobs:				
0	89 (19)	141 (33)	221 (45)	132 (39)
1	345 (72)	260 (61)	257 (53)	202 (59)
2	47 (10)	25 (6)	10 (2)	8 (2)
Infant sex:				
Male	260 (54)	213 (50)	246 (50)	178 (52)
Female	221 (46)	213 (50)	242 (50)	164 (48)

NOTE: All comparisons for each characteristic by race/ethnicity were significant at p<0.0001 using the Chi-square or t-tests for categorical and continuous data, respectively.

BMI, body mass index, as estimated from self-reported height (m) and pregravid weight (kg) at enrollment.

Table 2

Race/ethnic-specific percentiles for fetal anthropometric measurements by gestational age, NICHD Fetal Growth Studies.

Gestational age, weeks	Bi-parietal Diameter (mm) – White								
	3rd	5th	10th	50th	90th	95th	97th
10	10.4	10.6	10.9	12.1	13.5	13.9	14.2
11	13.4	13.6	14.0	15.5	17.2	17.7	18.0
12	16.6	16.9	17.4	19.2	21.1	21.7	22.1
13	20.0	20.3	20.9	22.9	25.2	25.9	26.3
14	23.3	23.7	24.3	26.7	29.2	30.0	30.5
15	26.6	27.1	27.7	30.3	33.0	33.9	34.4
16	29.8	30.3	31.0	33.7	36.7	37.6	38.2
17	32.8	33.3	34.1	37.0	40.1	41.0	41.7
18	35.8	36.3	37.1	40.1	43.4	44.3	45.0
19	38.7	39.2	40.0	43.2	46.6	47.6	48.3
20	41.6	42.2	43.0	46.3	49.8	50.9	51.5
21	44.6	45.2	46.1	49.4	53.1	54.1	54.9
22	47.6	48.2	49.1	52.6	56.3	57.4	58.2
23	50.5	51.2	52.1	55.7	59.6	60.7	61.5
24	53.5	54.1	55.1	58.9	62.8	64.0	64.8
25	56.4	57.1	58.1	61.9	66.0	67.2	68.0
26	59.3	60.0	61.0	65.0	69.2	70.4	71.2
27	62.1	62.8	63.9	68.0	72.3	73.5	74.4
28	64.8	65.5	66.7	70.8	75.3	76.6	77.5
29	67.4	68.2	69.4	73.6	78.2	79.6	80.4
30	70.0	70.7	71.9	76.4	81.0	82.4	83.3
31	72.4	73.2	74.4	78.9	83.7	85.2	86.1
32	74.6	75.4	76.7	81.4	86.3	87.7	88.7
33	76.7	77.6	78.8	83.6	88.6	90.1	91.1
34	78.6	79.5	80.8	85.6	90.8	92.3	93.3
35	80.3	81.2	82.5	87.4	92.7	94.2	95.2

Gestational age, weeks	Bi-parietal Diameter (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
36	81.7	82.6	84.0	89.0	94.3	95.9	96.9
37	83.0	83.9	85.3	90.3	95.7	97.3	98.3
38	84.1	85.0	86.3	91.5	96.9	98.5	99.5
39	85.0	85.9	87.3	92.4	97.9	99.5	100.6
40	85.7	86.6	88.0	93.3	98.8	100.4	101.5

Gestational age, weeks	Head Circumference (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
10	41.4	42.1	43.1	47.1	51.3	52.6	53.5
11	52.2	53.0	54.3	59.0	64.2	65.7	66.8
12	63.9	64.9	66.3	71.9	77.9	79.6	80.8
13	76.1	77.2	78.9	85.1	91.9	93.9	95.3
14	88.4	89.6	91.5	98.5	106.0	108.2	109.7
15	100.7	102.0	104.0	111.6	119.7	122.1	123.7
16	112.7	114.1	116.3	124.3	132.9	135.4	137.1
17	124.4	125.8	128.1	136.6	145.6	148.2	150.0
18	135.8	137.3	139.7	148.5	157.8	160.6	162.4
19	147.1	148.7	151.2	160.3	169.9	172.7	174.6
20	158.6	160.3	162.8	172.2	182.1	185.0	186.9
21	170.2	171.9	174.5	184.1	194.2	197.2	199.2
22	181.7	183.5	186.2	196.0	206.4	209.4	211.4
23	193.2	195.0	197.7	207.8	218.4	221.5	223.5
24	204.4	206.3	209.1	219.4	230.2	233.4	235.5
25	215.4	217.3	220.2	230.8	241.8	245.1	247.2
26	226.1	228.0	231.0	241.8	253.1	256.4	258.6
27	236.3	238.3	241.3	252.5	264.1	267.5	269.7
28	246.1	248.1	251.3	262.7	274.7	278.2	280.5
29	255.3	257.4	260.7	272.5	284.8	288.4	290.8
30	264.0	266.2	269.5	281.8	294.5	298.2	300.7

Gestational age, weeks	Head Circumference (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
31	272.1	274.3	277.8	290.4	303.7	307.5	310.0
32	279.5	281.8	285.4	298.5	312.2	316.2	318.8
33	286.2	288.6	292.3	305.9	320.1	324.2	326.9
34	292.1	294.6	298.5	312.5	327.2	331.5	334.3
35	297.3	299.8	303.8	318.4	333.6	338.0	341.0
36	301.7	304.3	308.5	323.5	339.2	343.8	346.9
37	305.4	308.2	312.4	327.9	344.2	348.9	352.1
38	308.6	311.4	315.8	331.8	348.5	353.4	356.7
39	311.2	314.1	318.6	335.1	352.4	357.4	360.8
40	313.4	316.4	321.0	338.0	355.8	361.1	364.5

Gestational age, weeks	Abdominal Circumference (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
10	30.5	31.1	32.1	35.8	40.0	41.3	42.1
11	38.8	39.6	40.8	45.4	50.5	52.0	53.0
12	48.1	49.0	50.4	55.9	61.9	63.8	65.0
13	58.1	59.2	60.9	67.2	74.2	76.3	77.7
14	68.7	69.9	71.8	79.0	86.9	89.3	90.9
15	79.7	81.0	83.2	91.2	99.9	102.6	104.3
16	90.8	92.3	94.7	103.4	112.9	115.8	117.7
17	102.0	103.6	106.2	115.6	125.8	128.9	131.0
18	113.2	114.9	117.6	127.7	138.6	141.8	144.0
19	124.4	126.2	129.1	139.7	151.2	154.6	156.9
20	135.6	137.6	140.6	151.7	163.7	167.3	169.7
21	146.8	148.9	152.0	163.6	176.2	179.9	182.4
22	157.9	160.0	163.3	175.4	188.4	192.3	194.8
23	168.9	171.0	174.4	187.0	200.5	204.5	207.1
24	179.6	181.8	185.4	198.4	212.3	216.4	219.2
25	190.1	192.4	196.1	209.6	224.0	228.2	231.0

Gestational age, weeks	Abdominal Circumference (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
26	200.4	202.8	206.6	220.6	235.5	239.9	242.8
27	210.5	213.0	217.0	231.4	246.9	251.5	254.5
28	220.5	223.1	227.2	242.3	258.4	263.1	266.3
29	230.5	233.2	237.5	253.2	270.0	274.9	278.2
30	240.5	243.4	247.8	264.3	281.8	287.0	290.4
31	250.5	253.5	258.2	275.4	293.8	299.3	302.9
32	260.3	263.4	268.4	286.5	305.9	311.6	315.4
33	269.9	273.2	278.4	297.5	318.0	324.0	328.0
34	279.2	282.7	288.1	308.3	329.9	336.3	340.5
35	288.0	291.7	297.5	318.8	341.6	348.3	352.8
36	296.4	300.2	306.3	328.8	352.9	360.1	364.8
37	304.0	308.1	314.5	338.2	363.7	371.2	376.2
38	310.9	315.2	321.9	346.9	373.8	381.8	387.0
39	316.8	321.4	328.4	354.7	383.0	391.4	397.0
40	321.7	326.4	333.8	361.4	391.2	400.1	406.0

Gestational age, weeks	Femur Length (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
10	1.7	1.8	1.9	2.4	3.0	3.2	3.3
11	2.9	3.1	3.2	4.0	5.0	5.3	5.5
12	4.7	4.9	5.1	6.3	7.7	8.2	8.5
13	6.9	7.1	7.5	9.1	11.0	11.6	12.0
14	9.5	9.8	10.3	12.3	14.8	15.5	16.0
15	12.4	12.8	13.4	15.8	18.7	19.6	20.2
16	15.3	15.8	16.5	19.3	22.5	23.5	24.2
17	18.3	18.8	19.6	22.6	26.1	27.2	28.0
18	21.1	21.7	22.5	25.7	29.5	30.6	31.4
19	23.9	24.5	25.4	28.7	32.6	33.7	34.5
20	26.7	27.3	28.2	31.7	35.6	36.8	37.5

Gestational age, weeks	Femur Length (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
21	29.5	30.1	31.0	34.6	38.5	39.7	40.5
22	32.3	32.9	33.8	37.4	41.3	42.5	43.3
23	35.0	35.6	36.5	40.1	44.0	45.2	46.0
24	37.5	38.2	39.1	42.7	46.6	47.8	48.5
25	40.0	40.6	41.6	45.2	49.1	50.2	51.0
26	42.3	43.0	43.9	47.5	51.4	52.6	53.4
27	44.6	45.2	46.2	49.8	53.7	54.9	55.7
28	46.7	47.3	48.3	52.0	56.0	57.2	57.9
29	48.7	49.3	50.4	54.1	58.2	59.4	60.2
30	50.6	51.3	52.4	56.3	60.4	61.7	62.5
31	52.5	53.2	54.3	58.4	62.7	64.0	64.8
32	54.4	55.1	56.2	60.4	64.9	66.2	67.1
33	56.1	56.9	58.1	62.4	67.0	68.4	69.3
34	57.8	58.6	59.8	64.3	69.1	70.5	71.4
35	59.4	60.2	61.5	66.1	71.0	72.5	73.4
36	60.9	61.7	63.0	67.7	72.8	74.3	75.3
37	62.3	63.1	64.4	69.3	74.5	76.0	77.0
38	63.5	64.4	65.7	70.6	75.9	77.5	78.5
39	64.6	65.4	66.8	71.8	77.2	78.8	79.9
40	65.4	66.3	67.7	72.8	78.3	79.9	81.0

Gestational age, weeks	Humerus Length (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
10	1.8	1.9	2.0	2.5	3.1	3.3	3.4
11	3.2	3.3	3.5	4.2	5.2	5.5	5.7
12	5.0	5.2	5.5	6.6	8.0	8.5	8.8
13	7.4	7.6	8.0	9.6	11.5	12.1	12.5
14	10.1	10.4	10.9	12.9	15.3	16.0	16.5
15	13.0	13.3	14.0	16.3	19.1	20.0	20.6

Gestational age, weeks	Humerus Length (mm) – White						
	3rd	5th	10th	50th	90th	95th	97th
16	15.9	16.3	17.0	19.7	22.8	23.8	24.5
17	18.6	19.1	19.9	22.8	26.2	27.2	27.9
18	21.2	21.7	22.5	25.6	29.1	30.2	30.9
19	23.7	24.2	25.0	28.2	31.8	32.9	33.6
20	26.1	26.6	27.5	30.8	34.4	35.5	36.2
21	28.5	29.1	29.9	33.2	36.9	38.0	38.7
22	30.9	31.4	32.3	35.6	39.2	40.3	41.1
23	33.1	33.7	34.6	37.9	41.5	42.6	43.3
24	35.3	35.9	36.7	40.0	43.6	44.7	45.4
25	37.3	37.9	38.8	42.1	45.7	46.8	47.5
26	39.3	39.8	40.7	44.0	47.6	48.7	49.4
27	41.1	41.6	42.5	45.9	49.5	50.6	51.3
28	42.8	43.4	44.3	47.6	51.3	52.4	53.1
29	44.4	45.0	45.9	49.4	53.1	54.2	54.9
30	45.9	46.5	47.5	51.0	54.8	55.9	56.7
31	47.4	48.0	49.0	52.6	56.5	57.7	58.4
32	48.8	49.5	50.5	54.2	58.2	59.4	60.2
33	50.2	50.9	51.9	55.7	59.8	61.1	61.9
34	51.5	52.2	53.2	57.2	61.4	62.7	63.5
35	52.7	53.4	54.5	58.6	62.9	64.2	65.1
36	53.9	54.6	55.8	59.9	64.4	65.7	66.6
37	55.0	55.7	56.9	61.1	65.7	67.0	67.9
38	56.0	56.7	57.9	62.2	66.9	68.3	69.2
39	56.8	57.6	58.8	63.2	67.9	69.3	70.2
40	57.4	58.2	59.4	63.9	68.7	70.2	71.1

Gestational age, weeks	Estimated Fetal Weight (grams) – White						
	3rd	5th	10th	50th	90th	95th	97th
10	23	23	25	29	35	37	38

Gestational age, weeks	Estimated Fetal Weight (grams) – White								
	3rd	5th	10th	50th	90th	95th	97th		
11	31	32	33	39	46	48	49		
12	42	43	45	52	60	63	65		
13	55	57	59	68	78	82	84		
14	72	73	76	88	101	105	108		
15	92	94	98	113	129	135	138		
16	116	119	124	143	164	170	175		
17	146	150	156	179	205	213	219		
18	181	186	193	222	255	265	272		
19	222	228	237	273	313	325	334		
20	271	278	289	332	381	396	407		
21	327	335	349	401	460	479	491		
22	391	401	417	479	551	573	588		
23	464	476	495	569	654	681	698		
24	546	560	583	671	771	803	824		
25	638	655	682	785	903	940	964		
26	741	760	791	911	1050	1092	1121		
27	854	876	912	1052	1212	1262	1295		
28	977	1003	1045	1205	1391	1449	1487		
29	1111	1141	1188	1373	1587	1653	1697		
30	1255	1289	1343	1555	1799	1875	1926		
31	1409	1447	1509	1750	2029	2116	2174		
32	1571	1615	1686	1958	2276	2374	2441		
33	1741	1790	1869	2178	2537	2649	2724		
34	1914	1969	2058	2404	2809	2936	3021		
35	2086	2148	2247	2634	3088	3230	3326		
36	2254	2323	2432	2862	3368	3527	3635		
37	2413	2489	2609	3084	3645	3822	3942		
38	2562	2645	2777	3299	3918	4114	4246		
39	2701	2790	2934	3505	4186	4402	4548		

Gestational age, weeks	Estimated Fetal Weight (grams) – White						
	3rd	5th	10th	50th	90th	95th	97th
40	2826	2924	3080	3702	4450	4688	4850

Gestational age, weeks	Head Circumference / Abdominal Circumference – White						
	3rd	5th	10th	50th	90th	95th	97th
10	1.219	1.231	1.250	1.317	1.388	1.409	1.422
11	1.209	1.220	1.238	1.304	1.373	1.393	1.406
12	1.194	1.206	1.223	1.287	1.354	1.374	1.387
13	1.177	1.188	1.205	1.267	1.333	1.352	1.365
14	1.158	1.168	1.185	1.246	1.310	1.329	1.341
15	1.138	1.148	1.165	1.224	1.286	1.305	1.317
16	1.118	1.128	1.144	1.202	1.263	1.281	1.293
17	1.099	1.109	1.125	1.182	1.241	1.259	1.270
18	1.083	1.092	1.108	1.163	1.222	1.239	1.250
19	1.068	1.078	1.093	1.148	1.205	1.222	1.233
20	1.057	1.066	1.081	1.135	1.192	1.209	1.220
21	1.047	1.057	1.072	1.126	1.182	1.199	1.210
22	1.040	1.049	1.064	1.118	1.174	1.191	1.202
23	1.034	1.043	1.058	1.112	1.168	1.185	1.196
24	1.028	1.037	1.052	1.106	1.163	1.180	1.190
25	1.023	1.032	1.047	1.101	1.158	1.175	1.186
26	1.017	1.027	1.042	1.096	1.154	1.171	1.182
27	1.011	1.021	1.036	1.091	1.149	1.166	1.177
28	1.004	1.013	1.029	1.084	1.143	1.160	1.171
29	0.995	1.004	1.020	1.076	1.135	1.152	1.164
30	0.984	0.994	1.009	1.066	1.126	1.143	1.155
31	0.972	0.982	0.997	1.055	1.115	1.133	1.144
32	0.958	0.968	0.984	1.042	1.103	1.121	1.133
33	0.944	0.954	0.970	1.028	1.090	1.109	1.121
34	0.928	0.938	0.955	1.014	1.077	1.095	1.108

Gestational age, weeks	Head Circumference / Abdominal Circumference – White						
	3rd	5th	10th	50th	90th	95th	97th
35	0.912	0.922	0.939	0.999	1.063	1.082	1.094
36	0.896	0.906	0.923	0.984	1.049	1.068	1.081
37	0.880	0.890	0.907	0.969	1.036	1.055	1.068
38	0.865	0.876	0.893	0.956	1.024	1.044	1.057
39	0.851	0.862	0.880	0.945	1.014	1.035	1.048
40	0.839	0.851	0.869	0.935	1.007	1.029	1.043

Gestational age, weeks	Bi-parietal Diameter (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	10.3	10.5	10.8	11.9	13.3	13.7	13.9
11	13.3	13.5	13.9	15.4	17.0	17.5	17.8
12	16.5	16.8	17.3	19.1	21.0	21.6	22.0
13	19.9	20.3	20.8	22.8	25.1	25.7	26.2
14	23.3	23.7	24.3	26.6	29.1	29.8	30.3
15	26.5	27.0	27.6	30.2	32.9	33.7	34.3
16	29.7	30.1	30.9	33.6	36.5	37.4	38.0
17	32.7	33.1	33.9	36.8	39.9	40.8	41.5
18	35.6	36.1	36.9	39.9	43.2	44.2	44.8
19	38.5	39.0	39.9	43.0	46.5	47.5	48.1
20	41.4	42.0	42.9	46.2	49.7	50.8	51.5
21	44.4	45.0	45.9	49.3	53.0	54.1	54.8
22	47.3	47.9	48.9	52.5	56.3	57.4	58.2
23	50.2	50.8	51.8	55.5	59.5	60.7	61.5
24	53.1	53.7	54.8	58.6	62.7	63.9	64.7
25	55.9	56.6	57.6	61.6	65.8	67.0	67.9
26	58.6	59.3	60.4	64.5	68.8	70.1	71.0
27	61.3	62.0	63.1	67.3	71.8	73.1	74.0
28	63.8	64.6	65.8	70.1	74.7	76.1	77.0
29	66.4	67.1	68.3	72.8	77.5	78.9	79.9

Gestational age, weeks	Bi-parietal Diameter (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
30	68.8	69.6	70.8	75.4	80.2	81.7	82.6
31	71.0	71.8	73.1	77.8	82.8	84.3	85.3
32	73.1	74.0	75.3	80.1	85.2	86.7	87.7
33	75.0	75.9	77.2	82.1	87.4	88.9	89.9
34	76.7	77.6	79.0	84.0	89.3	90.8	91.9
35	78.2	79.1	80.4	85.5	90.9	92.5	93.6
36	79.4	80.3	81.7	86.8	92.3	93.9	95.0
37	80.5	81.4	82.8	88.0	93.5	95.2	96.2
38	81.4	82.3	83.8	89.1	94.7	96.3	97.4
39	82.4	83.3	84.7	90.1	95.8	97.4	98.5
40	83.3	84.2	85.7	91.2	97.0	98.7	99.8

Gestational age, weeks	Head Circumference (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	40.6	41.2	42.2	46.1	50.3	51.6	52.4
11	51.7	52.5	53.7	58.4	63.6	65.1	66.1
12	63.6	64.5	66.0	71.6	77.6	79.4	80.6
13	75.9	77.0	78.7	85.1	92.0	94.0	95.4
14	88.3	89.5	91.4	98.5	106.2	108.5	110.0
15	100.5	101.8	103.9	111.6	120.0	122.4	124.1
16	112.3	113.7	116.0	124.2	133.1	135.7	137.5
17	123.7	125.3	127.6	136.4	145.7	148.5	150.3
18	135.0	136.6	139.1	148.2	157.9	160.8	162.7
19	146.3	148.0	150.6	160.0	170.1	173.1	175.0
20	157.7	159.4	162.1	171.9	182.3	185.3	187.3
21	169.1	170.9	173.6	183.7	194.3	197.4	199.5
22	180.4	182.2	185.0	195.3	206.2	209.4	211.5
23	191.5	193.3	196.2	206.8	217.9	221.2	223.3
24	202.3	204.2	207.2	218.0	229.3	232.7	234.8

Gestational age, weeks	Head Circumference (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
25	212.8	214.8	217.8	228.9	240.4	243.8	246.1
26	223.0	225.0	228.1	239.4	251.2	254.7	257.0
27	232.8	234.8	238.0	249.6	261.7	265.2	267.5
28	242.2	244.3	247.5	259.4	271.7	275.4	277.7
29	251.1	253.3	256.6	268.8	281.5	285.2	287.6
30	259.6	261.8	265.2	277.7	290.8	294.6	297.1
31	267.4	269.7	273.2	286.1	299.6	303.5	306.1
32	274.6	276.9	280.6	293.9	307.8	311.9	314.6
33	280.9	283.4	287.2	300.9	315.3	319.5	322.3
34	286.5	289.0	292.9	307.1	322.0	326.3	329.2
35	291.1	293.7	297.7	312.4	327.8	332.3	335.2
36	294.9	297.6	301.7	316.9	332.8	337.5	340.5
37	298.1	300.9	305.2	320.8	337.3	342.1	345.3
38	300.9	303.8	308.2	324.4	341.4	346.4	349.7
39	303.5	306.5	311.1	327.8	345.4	350.6	354.0
40	306.1	309.2	313.9	331.3	349.7	355.1	358.6

Gestational age, weeks	Abdominal Circumference (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	30.8	31.4	32.4	35.9	39.7	40.9	41.7
11	39.2	39.9	41.1	45.3	50.0	51.4	52.4
12	48.5	49.3	50.6	55.7	61.2	62.9	64.0
13	58.4	59.4	60.9	66.8	73.1	75.1	76.3
14	68.8	69.9	71.6	78.2	85.5	87.6	89.0
15	79.4	80.7	82.6	89.9	97.9	100.3	101.9
16	90.1	91.5	93.7	101.7	110.4	113.0	114.7
17	100.9	102.3	104.7	113.3	122.7	125.5	127.3
18	111.5	113.1	115.6	124.9	134.8	137.8	139.8
19	122.2	123.9	126.6	136.4	146.9	150.1	152.2

Gestational age, weeks	Abdominal Circumference (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
20	132.8	134.6	137.4	147.8	158.9	162.2	164.4
21	143.2	145.1	148.1	159.0	170.7	174.2	176.5
22	153.5	155.4	158.5	170.0	182.3	185.9	188.3
23	163.4	165.5	168.8	180.8	193.6	197.4	199.9
24	173.1	175.3	178.7	191.3	204.7	208.7	211.4
25	182.6	184.9	188.5	201.6	215.7	219.9	222.6
26	191.9	194.3	198.1	211.8	226.6	230.9	233.8
27	201.2	203.7	207.6	222.0	237.5	242.0	245.1
28	210.4	213.0	217.2	232.3	248.5	253.3	256.5
29	219.8	222.6	226.9	242.8	259.9	264.9	268.3
30	229.4	232.3	236.8	253.6	271.6	276.9	280.4
31	239.0	242.1	246.8	264.5	283.5	289.1	292.8
32	248.5	251.7	256.8	275.4	295.4	301.3	305.3
33	257.8	261.2	266.5	286.1	307.2	313.4	317.6
34	266.6	270.2	275.8	296.4	318.6	325.2	329.5
35	274.9	278.6	284.5	306.1	329.4	336.4	340.9
36	282.7	286.6	292.7	315.4	339.8	347.1	351.9
37	290.1	294.2	300.6	324.3	349.9	357.5	362.5
38	297.3	301.6	308.3	333.1	359.9	367.9	373.1
39	304.6	309.1	316.0	342.0	370.1	378.5	384.0
40	312.0	316.7	324.0	351.3	380.9	389.7	395.6

Gestational age, weeks	Femur Length (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	1.7	1.8	1.9	2.4	3.1	3.3	3.4
11	3.1	3.2	3.4	4.2	5.3	5.7	5.9
12	4.9	5.1	5.4	6.7	8.3	8.8	9.2
13	7.3	7.6	8.0	9.8	12.0	12.7	13.1
14	10.0	10.4	10.9	13.2	16.0	16.9	17.4

Gestational age, weeks	Femur Length (mm) – Black								
	3rd	5th	10th	50th	90th	95th	97th		
15	12.9	13.3	14.0	16.8	20.0	21.1	21.8		
16	15.8	16.3	17.1	20.2	23.9	25.1	25.8		
17	18.6	19.2	20.0	23.4	27.4	28.7	29.5		
18	21.3	21.9	22.8	26.4	30.6	31.9	32.8		
19	24.0	24.6	25.6	29.4	33.7	35.0	35.9		
20	26.7	27.4	28.4	32.3	36.7	38.0	38.9		
21	29.5	30.1	31.2	35.1	39.6	40.9	41.8		
22	32.2	32.8	33.9	37.9	42.3	43.7	44.6		
23	34.8	35.5	36.6	40.6	45.0	46.3	47.2		
24	37.4	38.1	39.2	43.2	47.6	48.9	49.8		
25	39.9	40.6	41.7	45.6	50.0	51.3	52.2		
26	42.3	43.0	44.1	48.0	52.3	53.6	54.5		
27	44.6	45.3	46.4	50.3	54.6	55.9	56.7		
28	46.8	47.5	48.6	52.5	56.8	58.1	58.9		
29	49.0	49.7	50.7	54.7	59.0	60.3	61.1		
30	51.1	51.8	52.9	56.9	61.2	62.5	63.4		
31	53.1	53.8	54.9	59.0	63.4	64.7	65.6		
32	55.0	55.7	56.9	61.1	65.6	66.9	67.8		
33	56.8	57.6	58.7	63.0	67.7	69.0	69.9		
34	58.5	59.3	60.5	64.9	69.6	71.0	72.0		
35	60.0	60.8	62.1	66.6	71.5	72.9	73.9		
36	61.4	62.2	63.5	68.2	73.2	74.7	75.6		
37	62.8	63.6	64.9	69.7	74.8	76.3	77.3		
38	64.0	64.9	66.2	71.1	76.4	77.9	79.0		
39	65.3	66.2	67.5	72.6	78.0	79.6	80.6		
40	66.5	67.4	68.8	74.1	79.7	81.4	82.5		

Gestational age, weeks	Humerus Length (mm) – Black									
	3rd	5th	10th	50th	90th	95th	97th			
10	2.0	2.1	2.2	2.6	3.1	3.2	3.3
11	3.6	3.7	3.9	4.5	5.3	5.6	5.7
12	5.7	5.9	6.1	7.1	8.3	8.6	8.9
13	8.3	8.6	8.9	10.3	11.8	12.3	12.6
14	11.3	11.6	12.0	13.7	15.7	16.3	16.7
15	14.4	14.7	15.2	17.2	19.5	20.2	20.7
16	17.3	17.7	18.3	20.6	23.1	23.9	24.4
17	20.1	20.5	21.1	23.6	26.3	27.1	27.7
18	22.6	23.1	23.7	26.3	29.2	30.0	30.6
19	25.1	25.5	26.2	28.9	31.9	32.8	33.4
20	27.5	28.0	28.7	31.5	34.5	35.4	36.0
21	29.8	30.3	31.1	33.9	37.0	38.0	38.6
22	32.0	32.5	33.3	36.3	39.5	40.4	41.1
23	34.2	34.7	35.5	38.5	41.8	42.8	43.5
24	36.1	36.7	37.5	40.7	44.0	45.1	45.7
25	38.0	38.6	39.4	42.7	46.2	47.2	47.9
26	39.7	40.3	41.2	44.6	48.2	49.3	50.0
27	41.4	42.0	42.9	46.4	50.1	51.2	52.0
28	42.9	43.6	44.5	48.1	52.0	53.2	53.9
29	44.4	45.1	46.1	49.8	53.9	55.1	55.9
30	45.9	46.6	47.6	51.5	55.7	56.9	57.8
31	47.4	48.1	49.2	53.2	57.5	58.8	59.6
32	48.8	49.5	50.6	54.7	59.2	60.5	61.4
33	50.1	50.9	52.0	56.2	60.8	62.2	63.1
34	51.4	52.2	53.3	57.7	62.3	63.7	64.7
35	52.6	53.3	54.5	59.0	63.7	65.2	66.1
36	53.7	54.5	55.7	60.2	65.0	66.5	67.5
37	54.8	55.5	56.8	61.4	66.3	67.8	68.8
38	55.8	56.6	57.9	62.6	67.7	69.2	70.2

Gestational age, weeks	Humerus Length (mm) – Black						
	3rd	5th	10th	50th	90th	95th	97th
39	56.9	57.8	59.1	63.9	69.1	70.7	71.7
40	58.1	59.0	60.3	65.4	70.9	72.5	73.6

Gestational age, weeks	Estimated Fetal Weight (grams) – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	22	22	24	28	34	35	37
11	30	31	33	38	45	47	48
12	42	43	45	52	60	62	64
13	56	57	59	68	78	81	83
14	73	74	77	89	101	105	108
15	93	96	99	114	130	135	138
16	118	121	126	144	164	171	175
17	147	151	157	180	206	214	219
18	182	186	194	222	254	264	271
19	222	228	236	271	311	323	331
20	268	275	286	328	376	391	401
21	321	329	342	393	451	469	481
22	381	390	406	467	536	558	572
23	448	460	478	550	633	658	676
24	524	538	559	644	742	772	792
25	609	625	650	749	864	899	923
26	703	722	751	867	1000	1041	1069
27	807	828	863	996	1151	1199	1231
28	921	946	985	1139	1317	1372	1409
29	1044	1073	1118	1294	1498	1562	1604
30	1178	1210	1262	1463	1695	1768	1816
31	1321	1358	1416	1644	1908	1990	2045
32	1472	1513	1579	1836	2135	2228	2290
33	1629	1676	1749	2038	2373	2478	2548

Gestational age, weeks	Estimated Fetal Weight (grams) – Black						
	3rd	5th	10th	50th	90th	95th	97th
34	1789	1841	1923	2244	2619	2737	2816
35	1948	2005	2096	2452	2868	2999	3087
36	2101	2164	2264	2655	3115	3259	3356
37	2249	2317	2427	2855	3359	3517	3624
38	2394	2468	2587	3054	3605	3779	3896
39	2541	2621	2751	3260	3863	4053	4182
40	2693	2781	2922	3479	4142	4352	4494

Gestational age, weeks	Head Circumference / Abdominal Circumference – Black						
	3rd	5th	10th	50th	90th	95th	97th
10	1.182	1.195	1.215	1.291	1.372	1.395	1.411
11	1.183	1.196	1.217	1.291	1.371	1.394	1.409
12	1.178	1.191	1.211	1.285	1.363	1.386	1.401
13	1.167	1.180	1.200	1.273	1.350	1.372	1.387
14	1.153	1.166	1.185	1.257	1.332	1.355	1.369
15	1.137	1.149	1.169	1.239	1.313	1.335	1.350
16	1.120	1.132	1.151	1.220	1.293	1.315	1.329
17	1.104	1.116	1.134	1.202	1.274	1.295	1.309
18	1.089	1.101	1.119	1.186	1.257	1.278	1.292
19	1.077	1.088	1.107	1.173	1.244	1.265	1.278
20	1.067	1.079	1.097	1.163	1.233	1.254	1.268
21	1.060	1.071	1.089	1.155	1.226	1.246	1.260
22	1.053	1.065	1.083	1.149	1.219	1.240	1.254
23	1.048	1.060	1.078	1.144	1.215	1.235	1.249
24	1.043	1.055	1.073	1.140	1.210	1.231	1.245
25	1.038	1.050	1.068	1.135	1.206	1.227	1.241
26	1.033	1.045	1.063	1.130	1.201	1.223	1.236
27	1.026	1.038	1.056	1.124	1.196	1.217	1.231
28	1.018	1.030	1.048	1.116	1.188	1.210	1.224

Gestational age, weeks	Head Circumference / Abdominal Circumference – Black						
	3rd	5th	10th	50th	90th	95th	97th
29	1.008	1.020	1.038	1.106	1.179	1.200	1.214
30	0.996	1.008	1.026	1.095	1.167	1.189	1.203
31	0.982	0.994	1.013	1.081	1.154	1.176	1.190
32	0.968	0.980	0.998	1.067	1.140	1.162	1.176
33	0.952	0.964	0.983	1.052	1.125	1.147	1.161
34	0.937	0.949	0.967	1.036	1.110	1.131	1.146
35	0.921	0.933	0.951	1.020	1.094	1.116	1.130
36	0.905	0.917	0.935	1.005	1.079	1.101	1.115
37	0.889	0.901	0.919	0.989	1.064	1.086	1.101
38	0.873	0.885	0.904	0.974	1.049	1.072	1.087
39	0.857	0.869	0.888	0.959	1.035	1.058	1.073
40	0.841	0.854	0.873	0.945	1.022	1.045	1.060

Gestational age, weeks	Bi-parietal Diameter (mm) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
10	10.2	10.4	10.7	12.0	13.5	13.9	14.2
11	13.1	13.3	13.8	15.4	17.1	17.7	18.0
12	16.2	16.5	17.0	18.9	21.1	21.7	22.1
13	19.5	19.8	20.4	22.6	25.1	25.8	26.3
14	22.7	23.2	23.8	26.3	29.1	29.9	30.4
15	26.0	26.4	27.2	29.9	32.9	33.8	34.4
16	29.1	29.6	30.4	33.3	36.6	37.5	38.2
17	32.1	32.6	33.4	36.6	40.0	41.0	41.7
18	35.0	35.5	36.4	39.7	43.3	44.4	45.1
19	37.8	38.4	39.4	42.8	46.5	47.6	48.4
20	40.8	41.4	42.3	45.9	49.8	50.9	51.7
21	43.7	44.4	45.4	49.1	53.1	54.2	55.0
22	46.7	47.4	48.4	52.2	56.3	57.5	58.4
23	49.7	50.4	51.4	55.3	59.6	60.8	61.7

Gestational age, weeks	Bi-parietal Diameter (mm) – Hispanic							
	3rd	5th	10th	50th	90th	95th	97th	
24	52.6	53.3	54.4	58.5	62.8	64.1	64.9
25	55.6	56.3	57.4	61.5	65.9	67.3	68.1
26	58.4	59.1	60.3	64.5	69.0	70.4	71.3
27	61.2	62.0	63.1	67.5	72.1	73.4	74.3
28	63.9	64.7	65.9	70.3	75.0	76.4	77.3
29	66.5	67.3	68.5	73.0	77.8	79.3	80.2
30	69.0	69.8	71.0	75.7	80.6	82.0	83.0
31	71.3	72.2	73.4	78.1	83.1	84.6	85.6
32	73.5	74.4	75.7	80.4	85.5	87.0	88.0
33	75.5	76.4	77.7	82.6	87.8	89.3	90.3
34	77.3	78.2	79.5	84.5	89.8	91.3	92.3
35	78.8	79.7	81.1	86.1	91.5	93.1	94.1
36	80.2	81.1	82.5	87.6	93.0	94.6	95.7
37	81.3	82.2	83.6	88.8	94.4	96.0	97.1
38	82.4	83.3	84.7	90.0	95.6	97.3	98.4
39	83.3	84.3	85.7	91.1	96.8	98.5	99.6
40	84.3	85.3	86.8	92.2	98.0	99.8	100.9

Gestational age, weeks	Head Circumference (mm) – Hispanic							
	3rd	5th	10th	50th	90th	95th	97th	
10	38.7	39.5	40.7	45.5	50.8	52.4	53.5
11	49.2	50.2	51.7	57.5	64.0	65.9	67.2
12	60.7	61.8	63.6	70.5	78.0	80.3	81.8
13	72.7	74.0	76.1	83.9	92.5	95.1	96.8
14	84.9	86.4	88.7	97.4	106.9	109.8	111.7
15	97.0	98.6	101.2	110.6	121.0	124.1	126.2
16	108.9	110.6	113.3	123.5	134.5	137.8	140.0
17	120.4	122.2	125.1	135.8	147.4	150.9	153.2
18	131.7	133.6	136.6	147.7	159.8	163.3	165.7

Gestational age, weeks	Head Circumference (mm) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
19	142.9	144.9	148.0	159.5	171.9	175.6	178.0
20	154.2	156.2	159.4	171.3	184.0	187.8	190.2
21	165.6	167.7	170.9	183.1	196.1	199.9	202.4
22	176.9	179.0	182.4	194.8	208.0	211.9	214.5
23	188.1	190.3	193.8	206.4	219.8	223.8	226.4
24	199.2	201.4	204.9	217.7	231.3	235.4	238.0
25	209.9	212.2	215.8	228.8	242.6	246.7	249.4
26	220.4	222.7	226.3	239.6	253.6	257.7	260.4
27	230.5	232.8	236.5	250.0	264.2	268.4	271.1
28	240.1	242.5	246.3	260.0	274.4	278.7	281.4
29	249.3	251.8	255.6	269.5	284.3	288.6	291.4
30	258.0	260.5	264.4	278.7	293.7	298.1	301.0
31	266.1	268.6	272.6	287.2	302.6	307.1	310.1
32	273.5	276.1	280.2	295.2	310.9	315.6	318.6
33	280.2	282.9	287.1	302.5	318.6	323.4	326.5
34	286.1	288.9	293.2	309.0	325.6	330.4	333.6
35	291.2	294.1	298.5	314.6	331.7	336.7	339.9
36	295.5	298.4	302.9	319.5	337.0	342.1	345.5
37	299.0	302.0	306.6	323.6	341.6	346.8	350.3
38	301.9	305.0	309.7	327.1	345.5	350.9	354.4
39	304.3	307.4	312.3	330.1	348.9	354.5	358.1
40	306.2	309.4	314.4	332.7	352.0	357.7	361.4

Gestational age, weeks	Abdominal Circumference (mm) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
10	30.5	31.2	32.2	35.9	40.1	41.3	42.2
11	38.7	39.4	40.6	45.2	50.3	51.8	52.8
12	47.7	48.6	50.1	55.5	61.5	63.4	64.6
13	57.5	58.5	60.2	66.6	73.6	75.7	77.1

Gestational age, weeks	Abdominal Circumference (mm) – Hispanic								
	3rd	5th	10th	50th	90th	95th	97th		
14	67.8	69.0	70.9	78.2	86.2	88.6	90.2		
15	78.5	79.8	82.0	90.1	99.1	101.8	103.5		
16	89.3	90.8	93.2	102.2	112.0	115.0	116.9		
17	100.2	101.9	104.5	114.2	124.9	128.1	130.2		
18	111.1	112.9	115.7	126.2	137.6	141.0	143.3		
19	121.9	123.8	126.8	138.0	150.2	153.8	156.2		
20	132.8	134.8	138.0	149.8	162.6	166.4	169.0		
21	143.5	145.6	149.0	161.4	174.9	178.9	181.6		
22	154.0	156.3	159.8	172.8	186.9	191.1	193.9		
23	164.4	166.7	170.4	184.0	198.7	203.1	206.0		
24	174.5	177.0	180.8	195.0	210.2	214.8	217.8		
25	184.5	187.0	191.0	205.7	221.6	226.3	229.4		
26	194.2	196.9	201.0	216.3	232.8	237.7	240.9		
27	203.9	206.6	211.0	226.9	244.0	249.1	252.4		
28	213.5	216.4	220.9	237.5	255.3	260.5	264.0		
29	223.3	226.3	231.0	248.2	266.8	272.3	275.9		
30	233.2	236.3	241.2	259.3	278.7	284.4	288.2		
31	243.1	246.4	251.5	270.4	290.8	296.8	300.8		
32	253.0	256.4	261.8	281.6	303.0	309.3	313.5		
33	262.5	266.1	271.8	292.6	315.0	321.7	326.1		
34	271.7	275.5	281.4	303.2	326.8	333.8	338.5		
35	280.2	284.2	290.4	313.3	338.1	345.4	350.3		
36	288.0	292.2	298.7	322.7	348.8	356.5	361.6		
37	295.2	299.6	306.4	331.6	358.9	367.1	372.5		
38	301.9	306.4	313.6	340.0	368.7	377.2	382.9		
39	308.1	312.9	320.3	348.0	378.1	387.1	393.1		
40	313.9	318.9	326.7	355.8	387.5	397.0	403.3		

Gestational age, weeks	Femur Length (mm) – Hispanic								
	3rd	5th	10th	50th	90th	95th	97th		
10	1.7	1.7	1.9	2.4	3.0	3.2	3.4
11	2.9	3.0	3.2	4.0	5.1	5.4	5.6
12	4.6	4.8	5.1	6.3	7.9	8.3	8.7
13	6.8	7.1	7.5	9.2	11.2	11.9	12.3
14	9.4	9.7	10.2	12.4	15.0	15.8	16.4
15	12.2	12.6	13.2	15.8	18.9	19.9	20.6
16	15.0	15.5	16.3	19.2	22.8	23.9	24.6
17	17.9	18.4	19.2	22.5	26.3	27.6	28.4
18	20.6	21.2	22.1	25.6	29.6	30.9	31.7
19	23.3	23.9	24.9	28.5	32.7	34.0	34.9
20	26.1	26.7	27.7	31.4	35.7	37.0	37.9
21	28.9	29.5	30.5	34.3	38.6	39.9	40.8
22	31.6	32.2	33.2	37.1	41.4	42.7	43.5
23	34.3	34.9	35.9	39.8	44.0	45.3	46.1
24	36.9	37.5	38.5	42.3	46.5	47.8	48.6
25	39.4	40.0	41.0	44.8	48.9	50.1	51.0
26	41.7	42.4	43.4	47.1	51.2	52.4	53.2
27	44.0	44.7	45.7	49.4	53.4	54.6	55.4
28	46.2	46.9	47.9	51.6	55.5	56.7	57.5
29	48.3	49.0	50.0	53.7	57.7	58.9	59.7
30	50.4	51.1	52.1	55.8	59.9	61.1	61.9
31	52.4	53.1	54.1	58.0	62.1	63.3	64.1
32	54.3	55.0	56.1	60.0	64.2	65.4	66.3
33	56.1	56.8	57.9	62.0	66.3	67.6	68.4
34	57.8	58.5	59.6	63.8	68.2	69.6	70.4
35	59.3	60.0	61.2	65.5	70.1	71.4	72.3
36	60.7	61.4	62.6	67.0	71.7	73.1	74.0
37	61.9	62.7	63.9	68.5	73.3	74.7	75.7
38	63.1	63.9	65.2	69.8	74.8	76.2	77.2

Femur Length (mm) – Hispanic

Gestational age, weeks	3rd	5th	10th	50th	90th	95th	97th
39	64.3	65.1	66.4	71.2	76.2	77.7	78.7
40	65.5	66.3	67.6	72.5	77.8	79.3	80.4

Humerus Length (mm) – Hispanic

Gestational age, weeks	3rd	5th	10th	50th	90th	95th	97th
10	1.7	1.8	1.9	2.4	3.0	3.2	3.3
11	3.1	3.2	3.4	4.2	5.1	5.5	5.7
12	4.9	5.1	5.4	6.6	8.1	8.5	8.8
13	7.3	7.5	8.0	9.6	11.6	12.2	12.6
14	10.0	10.3	10.9	12.9	15.4	16.2	16.8
15	12.9	13.3	13.9	16.4	19.3	20.2	20.9
16	15.7	16.1	16.9	19.7	23.0	24.0	24.7
17	18.4	18.9	19.7	22.7	26.2	27.3	28.0
18	20.9	21.4	22.2	25.4	29.1	30.2	30.9
19	23.3	23.8	24.7	28.0	31.7	32.8	33.6
20	25.7	26.3	27.1	30.5	34.2	35.3	36.1
21	28.1	28.7	29.5	32.9	36.6	37.8	38.5
22	30.4	31.0	31.9	35.2	39.0	40.1	40.8
23	32.7	33.2	34.1	37.5	41.2	42.3	43.0
24	34.8	35.4	36.3	39.6	43.3	44.4	45.1
25	36.9	37.4	38.3	41.6	45.2	46.3	47.0
26	38.8	39.4	40.2	43.6	47.1	48.2	48.9
27	40.6	41.2	42.1	45.4	49.0	50.0	50.7
28	42.3	42.9	43.8	47.1	50.7	51.8	52.5
29	43.9	44.5	45.4	48.8	52.5	53.6	54.3
30	45.4	46.0	47.0	50.4	54.2	55.3	56.0
31	46.9	47.5	48.5	52.0	55.9	57.0	57.8
32	48.2	48.9	49.9	53.6	57.5	58.7	59.5
33	49.5	50.2	51.2	55.0	59.1	60.3	61.1

Gestational age, weeks	Humerus Length (mm) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
34	50.8	51.5	52.5	56.4	60.6	61.9	62.7
35	51.9	52.6	53.7	57.7	62.1	63.3	64.2
36	53.0	53.7	54.8	58.9	63.4	64.7	65.6
37	54.0	54.7	55.9	60.1	64.6	66.0	66.9
38	54.9	55.7	56.8	61.1	65.8	67.2	68.1
39	55.8	56.6	57.8	62.2	66.9	68.3	69.2
40	56.6	57.4	58.6	63.1	68.0	69.4	70.4

Gestational age, weeks	Estimated Fetal Weight (grams) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
10	19	20	21	26	31	33	34
11	28	28	30	36	42	44	46
12	38	39	41	48	57	59	61
13	51	53	55	64	75	79	81
14	68	70	73	85	98	103	106
15	88	90	94	109	127	133	136
16	112	115	120	140	162	169	174
17	141	145	151	176	204	213	219
18	175	180	188	218	254	265	272
19	215	221	230	268	312	325	334
20	260	268	279	325	379	395	407
21	313	322	336	391	456	476	489
22	372	383	400	466	544	568	584
23	440	453	473	551	643	672	691
24	516	531	555	647	755	789	812
25	601	619	646	755	882	921	948
26	696	716	749	875	1023	1069	1100
27	801	825	862	1009	1180	1234	1270
28	917	944	987	1156	1353	1415	1457

Gestational age, weeks	Estimated Fetal Weight (grams) – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
29	1043	1074	1123	1316	1543	1614	1662
30	1178	1214	1270	1490	1749	1830	1885
31	1324	1364	1428	1677	1971	2063	2126
32	1478	1523	1595	1877	2209	2313	2384
33	1638	1688	1769	2086	2460	2577	2657
34	1801	1857	1947	2301	2719	2851	2940
35	1963	2025	2125	2518	2983	3130	3229
36	2120	2189	2298	2731	3245	3408	3517
37	2269	2344	2463	2937	3502	3681	3802
38	2410	2491	2621	3138	3756	3953	4086
39	2545	2633	2774	3336	4011	4226	4372
40	2675	2770	2923	3534	4273	4510	4670

Gestational age, weeks	Head Circumference / Abdominal Circumference – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
10	1.142	1.158	1.184	1.278	1.379	1.409	1.429
11	1.148	1.163	1.188	1.278	1.375	1.404	1.424
12	1.146	1.161	1.184	1.272	1.365	1.393	1.412
13	1.138	1.153	1.176	1.260	1.350	1.377	1.394
14	1.127	1.141	1.163	1.244	1.331	1.356	1.373
15	1.113	1.127	1.148	1.226	1.309	1.333	1.350
16	1.098	1.111	1.132	1.206	1.286	1.310	1.325
17	1.083	1.096	1.115	1.187	1.264	1.287	1.301
18	1.069	1.081	1.100	1.170	1.244	1.265	1.280
19	1.057	1.069	1.088	1.155	1.227	1.248	1.262
20	1.048	1.060	1.078	1.143	1.213	1.234	1.247
21	1.041	1.052	1.070	1.134	1.203	1.223	1.236
22	1.035	1.046	1.064	1.127	1.195	1.215	1.228
23	1.031	1.042	1.059	1.122	1.188	1.208	1.221

Gestational age, weeks	Head Circumference / Abdominal Circumference – Hispanic						
	3rd	5th	10th	50th	90th	95th	97th
24	1.026	1.037	1.054	1.117	1.183	1.203	1.216
25	1.022	1.033	1.050	1.112	1.179	1.198	1.211
26	1.017	1.028	1.045	1.108	1.174	1.194	1.206
27	1.011	1.022	1.039	1.102	1.169	1.188	1.201
28	1.003	1.014	1.031	1.095	1.162	1.182	1.195
29	0.993	1.004	1.022	1.086	1.154	1.174	1.187
30	0.981	0.992	1.010	1.074	1.143	1.163	1.177
31	0.968	0.979	0.997	1.062	1.131	1.152	1.165
32	0.953	0.964	0.982	1.048	1.118	1.139	1.153
33	0.937	0.949	0.967	1.034	1.105	1.126	1.140
34	0.921	0.933	0.951	1.019	1.091	1.113	1.127
35	0.905	0.917	0.936	1.004	1.078	1.100	1.114
36	0.890	0.902	0.920	0.990	1.065	1.087	1.102
37	0.874	0.886	0.905	0.976	1.052	1.075	1.090
38	0.859	0.871	0.891	0.963	1.041	1.064	1.079
39	0.844	0.857	0.877	0.950	1.030	1.053	1.069
40	0.830	0.842	0.863	0.938	1.019	1.044	1.060

Gestational age, weeks	Bi-parietal Diameter (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	10.0	10.2	10.5	11.8	13.3	13.8	14.1
11	12.9	13.2	13.6	15.2	17.0	17.6	17.9
12	16.1	16.4	16.9	18.9	21.0	21.7	22.1
13	19.4	19.8	20.4	22.6	25.1	25.9	26.4
14	22.8	23.2	23.9	26.4	29.2	30.1	30.6
15	26.1	26.6	27.3	30.1	33.1	34.1	34.7
16	29.3	29.8	30.6	33.6	36.9	37.8	38.5
17	32.4	32.9	33.7	36.9	40.3	41.4	42.1
18	35.3	35.8	36.7	40.0	43.6	44.7	45.4

Gestational age, weeks	Bi-parietal Diameter (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
19	38.1	38.7	39.6	43.1	46.8	47.9	48.6
20	41.0	41.6	42.6	46.1	49.9	51.1	51.8
21	44.0	44.6	45.6	49.2	53.1	54.3	55.1
22	47.0	47.6	48.6	52.3	56.4	57.6	58.4
23	49.9	50.6	51.6	55.5	59.6	60.8	61.6
24	52.9	53.6	54.7	58.6	62.8	64.1	64.9
25	55.9	56.6	57.7	61.7	66.0	67.3	68.1
26	58.8	59.5	60.6	64.7	69.1	70.4	71.3
27	61.6	62.4	63.5	67.7	72.2	73.5	74.3
28	64.4	65.1	66.3	70.6	75.1	76.5	77.3
29	67.0	67.8	69.0	73.3	78.0	79.3	80.2
30	69.5	70.3	71.5	76.0	80.7	82.1	83.0
31	71.9	72.7	73.9	78.5	83.3	84.7	85.6
32	74.1	74.9	76.2	80.8	85.7	87.2	88.1
33	76.2	77.0	78.3	83.0	88.0	89.5	90.4
34	78.0	78.9	80.2	85.0	90.1	91.6	92.6
35	79.7	80.6	81.9	86.8	92.0	93.5	94.5
36	81.2	82.1	83.5	88.5	93.7	95.3	96.3
37	82.6	83.5	84.8	89.9	95.3	96.8	97.9
38	83.7	84.6	86.0	91.1	96.6	98.2	99.2
39	84.6	85.5	87.0	92.1	97.7	99.3	100.3
40	85.3	86.2	87.7	93.0	98.6	100.2	101.3

Gestational age, weeks	Head Circumference (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	39.9	40.6	41.7	45.9	50.4	51.8	52.7
11	50.6	51.5	52.8	57.8	63.3	64.9	66.0
12	62.2	63.2	64.8	70.6	77.0	78.9	80.2
13	74.3	75.4	77.2	83.9	91.1	93.3	94.7

Gestational age, weeks	Head Circumference (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
14	86.6	87.9	89.9	97.3	105.3	107.7	109.3
15	98.9	100.3	102.5	110.5	119.2	121.8	123.5
16	110.9	112.4	114.7	123.3	132.6	135.3	137.1
17	122.6	124.2	126.6	135.6	145.3	148.1	150.0
18	133.9	135.6	138.1	147.5	157.4	160.4	162.3
19	145.1	146.8	149.4	159.0	169.3	172.3	174.3
20	156.4	158.1	160.8	170.7	181.1	184.2	186.2
21	167.8	169.6	172.3	182.4	193.0	196.1	198.1
22	179.3	181.1	183.9	194.0	204.8	208.0	210.0
23	190.7	192.5	195.3	205.7	216.6	219.7	221.8
24	201.9	203.8	206.6	217.1	228.1	231.3	233.5
25	212.9	214.8	217.7	228.3	239.5	242.7	244.9
26	223.6	225.5	228.4	239.2	250.5	253.8	256.0
27	233.8	235.8	238.8	249.7	261.2	264.5	266.7
28	243.6	245.6	248.6	259.8	271.5	274.9	277.1
29	252.8	254.8	257.9	269.3	281.3	284.7	287.0
30	261.3	263.4	266.6	278.3	290.6	294.1	296.5
31	269.2	271.3	274.7	286.7	299.3	303.0	305.4
32	276.4	278.6	282.1	294.5	307.5	311.3	313.8
33	282.9	285.2	288.8	301.7	315.2	319.1	321.7
34	288.8	291.2	294.9	308.3	322.3	326.4	329.0
35	294.0	296.5	300.3	314.2	328.8	333.0	335.8
36	298.5	301.1	305.0	319.5	334.7	339.1	342.0
37	302.3	304.9	309.0	324.1	339.8	344.4	347.5
38	305.2	308.0	312.2	327.8	344.2	349.0	352.1
39	307.3	310.1	314.5	330.7	347.7	352.7	355.9
40	308.3	311.3	315.9	332.6	350.3	355.4	358.8

Gestational age, weeks	Abdominal Circumference (mm) – Asian								
	3rd	5th	10th	50th	90th	95th	97th		
10	30.9	31.5	32.4	36.0	40.0	41.2	42.0		
11	39.2	39.9	41.1	45.4	50.1	51.6	52.5		
12	48.4	49.2	50.6	55.7	61.3	63.0	64.1		
13	58.3	59.3	60.9	66.8	73.3	75.2	76.5		
14	68.8	70.0	71.8	78.4	85.7	87.9	89.4		
15	79.7	81.0	83.0	90.4	98.5	100.9	102.5		
16	90.8	92.2	94.3	102.5	111.3	113.9	115.6		
17	101.8	103.3	105.7	114.5	123.9	126.8	128.6		
18	112.9	114.5	117.0	126.3	136.4	139.4	141.4		
19	123.8	125.5	128.1	138.0	148.7	151.8	153.9		
20	134.6	136.4	139.2	149.6	160.8	164.1	166.3		
21	145.3	147.2	150.2	161.1	172.8	176.3	178.6		
22	155.9	157.9	161.0	172.4	184.6	188.2	190.6		
23	166.2	168.3	171.5	183.4	196.2	200.0	202.5		
24	176.3	178.4	181.8	194.3	207.6	211.5	214.1		
25	186.1	188.4	191.9	204.9	218.8	222.9	225.6		
26	195.7	198.1	201.8	215.4	229.9	234.2	237.0		
27	205.2	207.6	211.5	225.8	241.0	245.5	248.4		
28	214.5	217.1	221.2	236.1	252.1	256.8	259.9		
29	223.9	226.7	230.9	246.7	263.4	268.4	271.7		
30	233.4	236.3	240.8	257.3	275.0	280.3	283.7		
31	242.8	245.8	250.5	268.0	286.7	292.3	295.9		
32	252.0	255.2	260.2	278.7	298.5	304.3	308.2		
33	260.9	264.3	269.6	289.1	310.1	316.3	320.4		
34	269.5	273.1	278.7	299.3	321.4	328.0	332.3		
35	277.6	281.4	287.3	309.0	332.4	339.3	343.9		
36	285.2	289.2	295.4	318.3	342.9	350.3	355.1		
37	292.4	296.6	303.1	327.2	353.2	360.9	366.0		
38	299.4	303.7	310.6	335.9	363.2	371.4	376.8		

Gestational age, weeks	Abdominal Circumference (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
39	306.2	310.7	317.9	344.5	373.4	382.0	387.7
40	312.9	317.7	325.2	353.3	383.8	392.9	398.9

Gestational age, weeks	Femur Length (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	1.6	1.7	1.8	2.2	2.6	2.8	2.9
11	2.9	3.0	3.2	3.8	4.6	4.8	5.0
12	4.7	4.9	5.1	6.1	7.2	7.6	7.8
13	7.0	7.3	7.6	8.9	10.5	11.0	11.3
14	9.8	10.0	10.5	12.2	14.2	14.8	15.3
15	12.7	13.1	13.6	15.7	18.1	18.8	19.3
16	15.7	16.1	16.8	19.1	21.9	22.7	23.3
17	18.7	19.1	19.8	22.4	25.4	26.3	26.9
18	21.4	21.9	22.6	25.4	28.5	29.5	30.1
19	24.1	24.6	25.3	28.2	31.5	32.4	33.1
20	26.7	27.2	28.0	31.0	34.3	35.3	36.0
21	29.4	29.9	30.7	33.8	37.1	38.1	38.8
22	32.1	32.6	33.4	36.5	39.9	40.9	41.5
23	34.7	35.2	36.0	39.1	42.5	43.6	44.2
24	37.2	37.7	38.6	41.7	45.1	46.2	46.8
25	39.6	40.2	41.0	44.2	47.7	48.7	49.4
26	42.0	42.5	43.4	46.6	50.1	51.2	51.8
27	44.2	44.8	45.7	49.0	52.5	53.5	54.2
28	46.3	46.9	47.8	51.2	54.8	55.9	56.6
29	48.4	49.0	49.9	53.4	57.1	58.2	58.9
30	50.4	51.0	51.9	55.5	59.3	60.4	61.1
31	52.3	52.9	53.9	57.5	61.4	62.6	63.4
32	54.1	54.7	55.7	59.5	63.5	64.7	65.5
33	55.8	56.5	57.5	61.4	65.6	66.8	67.6
34	57.5	58.1	59.2	63.2	67.5	68.8	69.6

Gestational age, weeks	Femur Length (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
35	59.0	59.8	60.9	65.0	69.4	70.7	71.5
36	60.6	61.3	62.4	66.7	71.2	72.5	73.4
37	62.0	62.7	63.9	68.3	72.9	74.2	75.1
38	63.3	64.1	65.3	69.7	74.5	75.9	76.8
39	64.5	65.3	66.6	71.1	76.0	77.4	78.3
40	65.6	66.4	67.7	72.4	77.4	78.9	79.9

Gestational age, weeks	Humerus Length (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	1.8	1.8	1.9	2.3	2.8	3.0	3.1
11	3.2	3.3	3.4	4.1	4.8	5.1	5.2
12	5.1	5.2	5.5	6.4	7.6	7.9	8.2
13	7.5	7.7	8.1	9.4	10.9	11.4	11.7
14	10.3	10.6	11.0	12.7	14.6	15.2	15.6
15	13.3	13.6	14.1	16.1	18.4	19.1	19.6
16	16.2	16.6	17.2	19.4	22.0	22.8	23.3
17	19.0	19.4	20.0	22.5	25.3	26.1	26.7
18	21.5	22.0	22.6	25.2	28.1	29.0	29.5
19	23.9	24.3	25.0	27.7	30.6	31.5	32.1
20	26.2	26.6	27.4	30.0	33.0	33.9	34.5
21	28.5	28.9	29.7	32.4	35.4	36.3	36.9
22	30.7	31.2	31.9	34.7	37.7	38.6	39.2
23	32.9	33.4	34.1	36.9	39.9	40.8	41.4
24	35.0	35.5	36.3	39.1	42.1	43.0	43.6
25	37.0	37.5	38.3	41.2	44.2	45.2	45.8
26	38.9	39.4	40.2	43.1	46.3	47.2	47.8
27	40.6	41.2	42.0	45.0	48.3	49.2	49.9
28	42.3	42.8	43.7	46.8	50.1	51.1	51.8
29	43.8	44.4	45.3	48.5	52.0	53.0	53.7
30	45.3	45.8	46.8	50.1	53.7	54.8	55.5

Gestational age, weeks	Humerus Length (mm) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
31	46.6	47.2	48.2	51.6	55.4	56.5	57.2
32	47.9	48.5	49.5	53.1	57.0	58.2	58.9
33	49.1	49.8	50.8	54.5	58.6	59.7	60.5
34	50.3	51.0	52.0	55.9	60.1	61.3	62.1
35	51.5	52.2	53.3	57.3	61.5	62.8	63.6
36	52.7	53.4	54.5	58.6	63.0	64.3	65.1
37	53.8	54.5	55.6	59.8	64.3	65.6	66.5
38	54.8	55.5	56.7	60.9	65.5	66.9	67.8
39	55.7	56.4	57.6	61.9	66.6	68.0	68.9
40	56.4	57.1	58.3	62.7	67.5	68.9	69.8

Gestational age, weeks	Estimated Fetal Weight (grams) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	18	19	20	24	30	31	33
11	26	27	28	34	41	43	44
12	36	38	39	47	55	58	60
13	50	51	53	63	74	77	79
14	66	68	71	83	97	101	104
15	86	88	92	108	125	131	135
16	110	113	118	138	160	167	172
17	139	143	149	173	202	211	216
18	172	177	185	215	250	261	269
19	211	217	227	264	307	321	330
20	257	264	275	320	373	389	400
21	308	317	331	385	447	467	480
22	367	378	394	458	532	556	571
23	434	446	466	541	628	656	674
24	509	524	546	634	737	769	790
25	594	611	637	740	859	896	921
26	690	709	740	859	997	1040	1069

Gestational age, weeks	Estimated Fetal Weight (grams) – Asian						
	3rd	5th	10th	50th	90th	95th	97th
27	796	818	853	990	1149	1199	1232
28	913	938	978	1136	1318	1375	1413
29	1039	1068	1114	1293	1501	1566	1609
30	1175	1208	1260	1463	1698	1772	1821
31	1318	1355	1414	1642	1908	1991	2047
32	1467	1508	1574	1830	2129	2222	2284
33	1620	1667	1740	2026	2360	2464	2534
34	1778	1829	1911	2229	2600	2717	2795
35	1938	1995	2085	2438	2851	2980	3067
36	2100	2162	2262	2653	3111	3255	3352
37	2259	2327	2437	2869	3376	3536	3644
38	2408	2483	2604	3077	3637	3814	3933
39	2539	2621	2752	3269	3884	4078	4210
40	2643	2731	2873	3434	4105	4318	4462

Gestational age, weeks	Head Circumference / Abdominal Circumference – Asian						
	3rd	5th	10th	50th	90th	95th	97th
10	1.198	1.209	1.227	1.293	1.362	1.382	1.395
11	1.192	1.203	1.221	1.284	1.350	1.370	1.383
12	1.181	1.192	1.209	1.271	1.336	1.355	1.368
13	1.167	1.178	1.194	1.255	1.319	1.338	1.351
14	1.150	1.161	1.177	1.238	1.301	1.319	1.332
15	1.132	1.143	1.159	1.219	1.281	1.300	1.312
16	1.115	1.125	1.141	1.200	1.262	1.280	1.292
17	1.098	1.108	1.124	1.182	1.243	1.261	1.273
18	1.082	1.092	1.108	1.166	1.226	1.244	1.256
19	1.068	1.078	1.094	1.152	1.212	1.230	1.242
20	1.057	1.068	1.083	1.141	1.201	1.219	1.231
21	1.049	1.059	1.075	1.133	1.194	1.211	1.223
22	1.042	1.053	1.069	1.127	1.188	1.206	1.218

Gestational age, weeks	Head Circumference / Abdominal Circumference – Asian								
	3rd	5th	10th	50th	90th	95th	97th
23	1.037	1.047	1.063	1.122	1.184	1.202	1.214
24	1.032	1.043	1.059	1.118	1.181	1.199	1.211
25	1.028	1.038	1.055	1.115	1.178	1.197	1.209
26	1.023	1.033	1.050	1.111	1.175	1.194	1.207
27	1.017	1.028	1.044	1.106	1.171	1.191	1.203
28	1.009	1.020	1.037	1.100	1.166	1.185	1.198
29	1.000	1.011	1.028	1.091	1.159	1.178	1.191
30	0.989	1.000	1.017	1.081	1.149	1.169	1.182
31	0.976	0.987	1.005	1.069	1.138	1.158	1.172
32	0.962	0.974	0.991	1.057	1.126	1.147	1.160
33	0.948	0.959	0.977	1.043	1.114	1.135	1.148
34	0.933	0.945	0.963	1.030	1.101	1.123	1.136
35	0.919	0.931	0.949	1.017	1.089	1.111	1.125
36	0.905	0.916	0.935	1.004	1.077	1.099	1.114
37	0.890	0.902	0.921	0.990	1.065	1.087	1.102
38	0.874	0.886	0.905	0.976	1.052	1.075	1.090
39	0.857	0.870	0.889	0.960	1.038	1.061	1.076
40	0.839	0.851	0.871	0.943	1.022	1.046	1.061

Table 3

Global testing p-values for all pairwise race/ethnic comparisons of fetal anthropometric measurements by gestational age, NICHD Fetal Growth Studies.

Gestational age, weeks	Bi-parietal Diameter (mm)						
	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	0.6478	0.5336	0.3542	0.1080	0.6458	0.1616	0.4485
11	0.1934	0.2479	0.3766	0.0322	0.8037	0.1716	0.1484
12	0.0568	0.0966	0.5858	0.0095	0.2209	0.2576	0.0229
13	0.0556	0.1349	0.8547	0.0253	0.0712	0.4173	0.0093
14	0.0680	0.3779	0.4264	0.1315	0.0643	0.4828	0.0113
15	0.0846	0.7686	0.2316	0.3303	0.0875	0.4288	0.0141
16	0.0884	0.8398	0.1354	0.5280	0.1279	0.3246	0.0147
17	0.0892	0.5860	0.0912	0.6596	0.1758	0.2489	0.0149
18	0.1061	0.5816	0.0904	0.6735	0.1904	0.2674	0.0177
19	0.1499	0.9265	0.1576	0.5326	0.1437	0.4244	0.0250
20	0.2060	0.7383	0.2889	0.3806	0.1266	0.5473	0.0343
21	0.2504	0.5970	0.4106	0.2981	0.1381	0.5669	0.0417
22	0.2688	0.6047	0.4881	0.2553	0.1815	0.4837	0.0448
23	0.2623	0.7488	0.5122	0.2389	0.2784	0.3313	0.0437
24	0.2416	0.9724	0.4900	0.2438	0.4620	0.1752	0.0403
25	0.2153	0.6245	0.4382	0.2657	0.7432	0.0710	0.0359
26	0.1359	0.3308	0.3756	0.2932	0.9313	0.0226	0.0304
27	0.0337	0.1526	0.3141	0.3065	0.6430	0.0056	0.0227
28	0.0058	0.0656	0.2590	0.2833	0.4325	0.0010	0.0131
29	0.0006	0.0288	0.2139	0.2121	0.2969	<0.0001	0.0049
30	<0.0001	0.0146	0.1847	0.1240	0.2117	<0.0001	0.0012
31	<0.0001	0.0097	0.1709	0.0661	0.1661	<0.0001	0.0003
32	<0.0001	0.0068	0.1581	0.0399	0.1390	<0.0001	<0.0001
33	<0.0001	0.0030	0.1225	0.0285	0.1032	<0.0001	<0.0001
34	<0.0001	0.0003	0.0606	0.0227	0.0519	<0.0001	<0.0001
35	<0.0001	<0.0001	0.0135	0.0244	0.0151	<0.0001	<0.0001

Gestational age, weeks	Bi-parietal Diameter (mm)						
	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
36	<0.0001	<0.0001	0.0023	0.0595	0.0057	<0.0001	<0.0001
37	<0.0001	<0.0001	0.0006	0.1863	0.0034	<0.0001	<0.0001
38	<0.0001	<0.0001	0.0001	0.4402	0.0014	<0.0001	<0.0001
39	<0.0001	<0.0001	0.0005	0.8639	0.0032	<0.0001	<0.0001
40	0.0023	0.0011	0.0652	0.8451	0.0995	0.0004	0.0536

Gestational age, weeks	Head Circumference (mm)						
	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	0.0179	0.6158	0.5720	0.0320	0.2222	0.0262	0.0030
11	0.0016	0.1371	0.6235	0.0046	0.0290	0.0785	0.0003
12	0.0004	0.0120	0.7535	0.0008	0.0023	0.3876	<0.0001
13	0.0054	0.0054	0.9479	0.0025	0.0024	0.9358	0.0009
14	0.0755	0.0148	0.9222	0.0179	0.0126	0.8264	0.0150
15	0.2956	0.0493	0.8631	0.0577	0.0546	0.8583	0.0638
16	0.5909	0.1240	0.8292	0.0985	0.1556	0.9548	0.1223
17	0.6540	0.2144	0.7825	0.1090	0.3035	0.7273	0.1566
18	0.4855	0.2162	0.6851	0.0809	0.3847	0.6248	0.1626
19	0.2154	0.1040	0.5081	0.0359	0.3236	0.6939	0.1493
20	0.0731	0.0500	0.3597	0.0122	0.2934	0.6550	0.1190
21	0.0252	0.0370	0.2925	0.0042	0.3037	0.4845	0.0771
22	0.0084	0.0428	0.2755	0.0014	0.3553	0.2518	0.0381
23	0.0027	0.0741	0.2993	0.0005	0.4631	0.0768	0.0138
24	0.0010	0.1679	0.3671	0.0002	0.6453	0.0119	0.0039
25	0.0004	0.3946	0.4820	<0.0001	0.8976	0.0010	0.0010
26	0.0003	0.7753	0.6273	<0.0001	0.8263	<0.0001	0.0003
27	<0.0001	0.8167	0.7614	<0.0001	0.5819	<0.0001	<0.0001
28	<0.0001	0.5254	0.8351	<0.0001	0.3941	<0.0001	<0.0001
29	<0.0001	0.3846	0.8027	<0.0001	0.2604	<0.0001	<0.0001
30	<0.0001	0.3491	0.6596	<0.0001	0.1656	<0.0001	<0.0001

Head Circumference (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
31	<0.0001	0.3697	0.4909	<0.0001	0.1112	<0.0001	<0.0001
32	<0.0001	0.3787	0.3825	<0.0001	0.0801	<0.0001	<0.0001
33	<0.0001	0.2980	0.3517	<0.0001	0.0502	<0.0001	<0.0001
34	<0.0001	0.1257	0.4061	<0.0001	0.0194	<0.0001	<0.0001
35	<0.0001	0.0153	0.6342	<0.0001	0.0040	<0.0001	<0.0001
36	<0.0001	0.0013	0.9344	<0.0001	0.0018	<0.0001	<0.0001
37	<0.0001	0.0003	0.5906	<0.0001	0.0023	<0.0001	<0.0001
38	<0.0001	0.0003	0.4468	<0.0001	0.0039	<0.0001	<0.0001
39	<0.0001	0.0115	0.6021	<0.0001	0.0405	<0.0001	<0.0001
40	0.0011	0.5597	0.9566	0.0024	0.5282	0.0002	0.0033

Abdominal Circumference (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	1.0000	0.9770	0.9027	0.8361	0.9037	0.8087	0.9306
11	1.0000	0.9096	0.8155	0.9285	0.6651	0.9710	0.6769
12	1.0000	0.8683	0.6791	0.5433	0.4942	0.5958	0.2245
13	0.4343	0.9662	0.5999	0.2891	0.5988	0.2276	0.0724
14	0.2700	0.6877	0.6124	0.2137	0.9175	0.0670	0.0450
15	0.0688	0.4114	0.6390	0.1720	0.6796	0.0115	0.0323
16	0.0048	0.1927	0.6686	0.1236	0.3082	0.0008	0.0206
17	0.0001	0.0714	0.7220	0.0715	0.0947	<0.0001	0.0118
18	<0.0001	0.0290	0.8307	0.0312	0.0264	<0.0001	0.0069
19	<0.0001	0.0192	0.9854	0.0096	0.0093	<0.0001	0.0042
20	<0.0001	0.0131	0.7930	0.0021	0.0028	<0.0001	0.0019
21	<0.0001	0.0068	0.6416	0.0003	0.0005	<0.0001	0.0005
22	<0.0001	0.0026	0.5211	<0.0001	<0.0001	<0.0001	<0.0001
23	<0.0001	0.0008	0.4244	<0.0001	<0.0001	<0.0001	<0.0001
24	<0.0001	0.0002	0.3489	<0.0001	<0.0001	<0.0001	<0.0001
25	<0.0001	<0.0001	0.2918	<0.0001	<0.0001	<0.0001	<0.0001
26	<0.0001	<0.0001	0.2458	<0.0001	<0.0001	<0.0001	<0.0001

Abdominal Circumference (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
27	<0.0001	<0.0001	0.1998	<0.0001	<0.0001	<0.0001	<0.0001
28	<0.0001	<0.0001	0.1454	<0.0001	<0.0001	<0.0001	<0.0001
29	<0.0001	<0.0001	0.0843	<0.0001	<0.0001	<0.0001	<0.0001
30	<0.0001	<0.0001	0.0340	<0.0001	<0.0001	<0.0001	<0.0001
31	<0.0001	0.0005	0.0117	<0.0001	<0.0001	<0.0001	<0.0001
32	<0.0001	0.0029	0.0046	<0.0001	<0.0001	<0.0001	<0.0001
33	<0.0001	0.0106	0.0020	<0.0001	<0.0001	<0.0001	<0.0001
34	<0.0001	0.0193	0.0008	<0.0001	<0.0001	<0.0001	<0.0001
35	<0.0001	0.0226	0.0004	<0.0001	<0.0001	<0.0001	<0.0001
36	<0.0001	0.0342	0.0006	<0.0001	<0.0001	<0.0001	<0.0001
37	<0.0001	0.0595	0.0019	<0.0001	<0.0001	<0.0001	<0.0001
38	<0.0001	0.0956	0.0051	<0.0001	<0.0001	<0.0001	<0.0001
39	<0.0001	0.2415	0.0301	<0.0001	0.0005	<0.0001	<0.0001
40	0.0025	0.6743	0.2866	0.0027	0.1266	0.0004	0.0451

Femur Length (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	0.0009	0.0002	0.0035	0.0030	0.3644	0.2278	0.8549
11	<0.0001	<0.0001	0.0008	0.0014	0.0045	0.0003	0.6592
12	<0.0001	<0.0001	0.0004	0.0023	<0.0001	<0.0001	0.5039
13	<0.0001	<0.0001	0.0068	0.0380	<0.0001	<0.0001	0.5203
14	<0.0001	<0.0001	0.1226	0.2598	<0.0001	<0.0001	0.6721
15	<0.0001	<0.0001	0.4046	0.4860	<0.0001	<0.0001	0.8855
16	<0.0001	<0.0001	0.6005	0.4947	<0.0001	<0.0001	0.8631
17	<0.0001	<0.0001	0.5919	0.3072	<0.0001	<0.0001	0.6029
18	<0.0001	<0.0001	0.3824	0.0934	<0.0001	0.0004	0.4017
19	<0.0001	<0.0001	0.1287	0.0121	<0.0001	0.0023	0.3155
20	<0.0001	<0.0001	0.0299	0.0011	0.0002	0.0063	0.2734
21	<0.0001	<0.0001	0.0085	0.0001	0.0003	0.0125	0.2173
22	<0.0001	<0.0001	0.0032	<0.0001	0.0003	0.0185	0.1522

Femur Length (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
23	<0.0001	<0.0001	0.0018	<0.0001	0.0001	0.0221	0.0919
24	<0.0001	<0.0001	0.0019	<0.0001	<0.0001	0.0234	0.0498
25	<0.0001	<0.0001	0.0041	<0.0001	<0.0001	0.0240	0.0283
26	<0.0001	<0.0001	0.0141	<0.0001	<0.0001	0.0240	0.0201
27	<0.0001	<0.0001	0.0439	<0.0001	<0.0001	0.0210	0.0179
28	<0.0001	<0.0001	0.0880	<0.0001	<0.0001	0.0131	0.0170
29	<0.0001	<0.0001	0.0991	<0.0001	<0.0001	0.0043	0.0152
30	<0.0001	<0.0001	0.0609	<0.0001	<0.0001	0.0009	0.0142
31	<0.0001	<0.0001	0.0323	<0.0001	<0.0001	0.0004	0.0223
32	<0.0001	<0.0001	0.0251	<0.0001	<0.0001	0.0011	0.0483
33	<0.0001	<0.0001	0.0254	<0.0001	<0.0001	0.0037	0.0699
34	<0.0001	<0.0001	0.0274	<0.0001	<0.0001	0.0083	0.0466
35	<0.0001	<0.0001	0.0450	<0.0001	<0.0001	0.0183	0.0090
36	<0.0001	<0.0001	0.1840	<0.0001	<0.0001	0.0787	0.0018
37	<0.0001	<0.0001	0.5024	0.0003	<0.0001	0.1858	0.0018
38	<0.0001	<0.0001	0.6892	0.0014	<0.0001	0.1197	0.0025
39	0.0002	<0.0001	0.6291	0.0204	<0.0001	0.0304	0.0409
40	0.0744	0.0124	0.5654	0.3856	0.0314	0.0654	0.7426

Humerus Length (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	0.0007	0.0001	0.3050	0.0118	0.0017	0.0552	0.1135
11	<0.0001	<0.0001	0.1046	0.0046	<0.0001	<0.0001	0.2253
12	<0.0001	<0.0001	0.0246	0.0043	<0.0001	<0.0001	0.5783
13	<0.0001	<0.0001	0.0226	0.0265	<0.0001	<0.0001	0.9238
14	<0.0001	<0.0001	0.0720	0.1308	<0.0001	<0.0001	0.7343
15	<0.0001	<0.0001	0.1840	0.2559	<0.0001	<0.0001	0.8105
16	<0.0001	<0.0001	0.3227	0.2789	<0.0001	<0.0001	0.9286
17	<0.0001	<0.0001	0.4181	0.1856	<0.0001	<0.0001	0.5617
18	<0.0001	<0.0001	0.3786	0.0642	<0.0001	0.0001	0.2720

Humerus Length (mm)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
19	<0.0001	<0.0001	0.1751	0.0090	<0.0001	0.0003	0.1636
20	<0.0001	<0.0001	0.0469	0.0007	<0.0001	0.0004	0.1222
21	<0.0001	<0.0001	0.0151	<0.0001	<0.0001	0.0005	0.0845
22	<0.0001	<0.0001	0.0066	<0.0001	<0.0001	0.0006	0.0511
23	<0.0001	<0.0001	0.0042	<0.0001	<0.0001	0.0007	0.0265
24	<0.0001	<0.0001	0.0046	<0.0001	<0.0001	0.0008	0.0126
25	<0.0001	<0.0001	0.0090	<0.0001	<0.0001	0.0014	0.0066
26	<0.0001	<0.0001	0.0250	<0.0001	<0.0001	0.0030	0.0044
27	<0.0001	<0.0001	0.0636	<0.0001	<0.0001	0.0057	0.0035
28	<0.0001	<0.0001	0.1106	<0.0001	<0.0001	0.0075	0.0026
29	<0.0001	<0.0001	0.1115	<0.0001	<0.0001	0.0056	0.0013
30	<0.0001	<0.0001	0.0618	<0.0001	<0.0001	0.0033	0.0005
31	<0.0001	<0.0001	0.0278	<0.0001	<0.0001	0.0035	0.0003
32	<0.0001	<0.0001	0.0178	<0.0001	<0.0001	0.0080	0.0005
33	<0.0001	<0.0001	0.0157	<0.0001	<0.0001	0.0195	0.0006
34	<0.0001	<0.0001	0.0154	<0.0001	<0.0001	0.0352	0.0002
35	<0.0001	<0.0001	0.0244	<0.0001	<0.0001	0.0613	<0.0001
36	<0.0001	<0.0001	0.1041	<0.0001	<0.0001	0.1504	<0.0001
37	<0.0001	<0.0001	0.2970	<0.0001	<0.0001	0.2502	<0.0001
38	<0.0001	<0.0001	0.3486	<0.0001	<0.0001	0.1655	<0.0001
39	<0.0001	<0.0001	0.2385	<0.0001	<0.0001	0.0528	0.0005
40	0.0010	0.0002	0.2598	0.0169	0.0042	0.0922	0.1843

Estimated Fetal Weight (grams)

Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	1.0000	0.3084	0.7343	0.1847	0.4963	0.7921	0.3296
11	1.0000	0.2628	0.7234	0.1774	0.4422	0.8548	0.3248
12	0.9829	0.2065	0.7042	0.1638	0.3742	0.9360	0.3148
13	0.8412	0.1404	0.6705	0.1402	0.2896	0.9570	0.2954
14	0.4326	0.0721	0.6109	0.1029	0.1896	0.8158	0.2597

Estimated Fetal Weight (grams)							
Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
15	0.1263	0.0210	0.5075	0.0544	0.0899	0.6397	0.1991
16	0.0147	0.0025	0.3502	0.0152	0.0265	0.4743	0.1180
17	0.0021	0.0003	0.1990	0.0025	0.0123	0.4884	0.0607
18	0.0043	0.0007	0.1356	0.0008	0.0391	0.8609	0.0484
19	0.0022	0.0034	0.1134	0.0004	0.1477	0.5780	0.0382
20	0.0003	0.0086	0.0852	<0.0001	0.3389	0.1549	0.0163
21	<0.0001	0.0141	0.0540	<0.0001	0.5910	0.0143	0.0031
22	<0.0001	0.0223	0.0335	<0.0001	0.8883	0.0005	0.0003
23	<0.0001	0.0407	0.0256	<0.0001	0.8280	<0.0001	<0.0001
24	<0.0001	0.0768	0.0248	<0.0001	0.6036	<0.0001	<0.0001
25	<0.0001	0.1369	0.0253	<0.0001	0.4146	<0.0001	<0.0001
26	<0.0001	0.2427	0.0257	<0.0001	0.2483	<0.0001	<0.0001
27	<0.0001	0.4195	0.0269	<0.0001	0.1298	<0.0001	<0.0001
28	<0.0001	0.6555	0.0299	<0.0001	0.0661	<0.0001	<0.0001
29	<0.0001	0.8639	0.0314	<0.0001	0.0369	<0.0001	<0.0001
30	<0.0001	0.9530	0.0243	<0.0001	0.0217	<0.0001	<0.0001
31	<0.0001	0.8719	0.0100	<0.0001	0.0116	<0.0001	<0.0001
32	<0.0001	0.6618	0.0022	<0.0001	0.0060	<0.0001	<0.0001
33	<0.0001	0.4761	0.0005	<0.0001	0.0042	<0.0001	<0.0001
34	<0.0001	0.4090	0.0003	<0.0001	0.0036	<0.0001	<0.0001
35	<0.0001	0.5004	0.0003	<0.0001	0.0023	<0.0001	<0.0001
36	<0.0001	0.8874	0.0010	<0.0001	0.0012	<0.0001	<0.0001
37	<0.0001	0.6290	0.0107	<0.0001	0.0019	<0.0001	<0.0001
38	<0.0001	0.4717	0.0455	<0.0001	0.0054	<0.0001	<0.0001
39	<0.0001	0.8218	0.0574	<0.0001	0.0280	<0.0001	<0.0001
40	<0.0001	0.4323	0.0950	<0.0001	0.3742	0.0001	0.0039

Head Circumference / Abdominal Circumference							
Gestational age, weeks	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
10	0.0810	0.9395	0.5800	0.0905	0.5563	0.0158	0.0135

Gestational age, weeks	Head Circumference / Abdominal Circumference						
	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
11	0.0212	0.4358	0.7315	0.0167	0.2224	0.0293	0.0035
12	0.0031	0.0093	0.8516	0.0005	0.0185	0.4434	0.0014
13	0.0002	<0.0001	0.3211	0.0013	0.0029	0.1823	0.0490
14	0.0002	<0.0001	0.2279	0.0657	0.0042	0.0085	0.6104
15	0.0003	<0.0001	0.2327	0.3345	0.0035	0.0003	0.7185
16	<0.0001	<0.0001	0.2483	0.7299	0.0012	<0.0001	0.3311
17	<0.0001	<0.0001	0.2801	0.8286	0.0002	<0.0001	0.1413
18	<0.0001	<0.0001	0.3478	0.4557	<0.0001	<0.0001	0.0671
19	<0.0001	<0.0001	0.4348	0.2438	<0.0001	<0.0001	0.0391
20	<0.0001	<0.0001	0.5324	0.1175	<0.0001	<0.0001	0.0208
21	<0.0001	<0.0001	0.6657	0.0397	<0.0001	<0.0001	0.0084
22	<0.0001	<0.0001	0.8427	0.0083	<0.0001	<0.0001	0.0025
23	<0.0001	<0.0001	0.9334	0.0011	<0.0001	<0.0001	0.0006
24	<0.0001	<0.0001	0.6907	0.0001	<0.0001	<0.0001	0.0002
25	<0.0001	<0.0001	0.4810	<0.0001	<0.0001	<0.0001	0.0002
26	<0.0001	<0.0001	0.3289	<0.0001	<0.0001	<0.0001	0.0003
27	<0.0001	<0.0001	0.2224	<0.0001	<0.0001	<0.0001	0.0005
28	<0.0001	<0.0001	0.1429	<0.0001	<0.0001	<0.0001	0.0008
29	<0.0001	<0.0001	0.0823	<0.0001	<0.0001	<0.0001	0.0015
30	<0.0001	0.0002	0.0432	<0.0001	<0.0001	<0.0001	0.0038
31	<0.0001	0.0014	0.0259	<0.0001	<0.0001	<0.0001	0.0153
32	<0.0001	0.0093	0.0183	<0.0001	<0.0001	<0.0001	0.0548
33	<0.0001	0.0424	0.0114	<0.0001	<0.0001	<0.0001	0.1141
34	<0.0001	0.1360	0.0045	<0.0001	<0.0001	<0.0001	0.1381
35	<0.0001	0.3874	0.0011	<0.0001	<0.0001	<0.0001	0.1042
36	<0.0001	0.8472	0.0006	<0.0001	0.0002	<0.0001	0.0766
37	<0.0001	0.7790	0.0011	<0.0001	0.0020	<0.0001	0.0730
38	<0.0001	0.6257	0.0028	<0.0001	0.0090	<0.0001	0.0845
39	0.0047	0.7582	0.0368	0.0008	0.0630	0.0014	0.2236

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Gestational age, weeks		Head Circumference / Abdominal Circumference				
	Global P-value	Asian vs. Black	Asian vs. Hispanic	Asian vs. White	Black vs. Hispanic	Black vs. White	Hispanic vs. White
40	1.0000	0.9065	0.5004	0.3059	0.4175	0.2365	0.7599

P-values obtained by the Wald test with adjustment for maternal age, height, weight, parity, job, marital status, income, education, and infant sex.