Racial/Ethnic Differences in Low Birth Weight in the United States:

An Examination of Maternal Age and Parity

Jeff A. Dennis

University of Texas of the Permian Basin

Dennis_J@utpb.edu

Draft - 09/17/2010

Abstract

This study examines parity in order to understand how normative timing of first childbearing may impact birth outcomes. Given that average age at first childbirth varies relatively widely by race/ethnicity in the United States, it is important to consider how these norms may be related to disparities in birth outcomes. Data for this study are derived from the Early Childhood Longitudinal Study-Birth Cohort and the 2001 U.S. Birth Data File. Findings indicate that LBW prevalence increases with maternal age for first births among African American and Native American mothers, but does not increase with maternal age for second or later births. Similar, but far less pronounced patterns are present for U.S.-born Hispanic mothers. White, foreign-born Hispanic and Asian American mothers exhibit no differences in LBW by parity. Thus, parity and normative timing of first childbearing represents a major aspect of interest in the understanding of LBW risk by maternal age.

Disparities in birth outcomes by maternal age have been studied in substantial detail in the past, with some of the more striking results finding noticeable differences in birth risk by race/ethnicity. This study focuses upon disparities in low birth weight (LBW) considering maternal age and race/ethnicity, with the added aspect of parity, i.e., first versus second or later births, to improve understanding of the differences. Mothers under age 20 have been shown to be at increased risk for having a LBW infant (Chen et al. 2007; Fraser, Brockert, and Ward 1995), although research examining LBW prevalence by racial/ethnic group has found that African American mothers, for example, may have higher risk in their 20s than in their later teenage years (Geronimus 1992, 1996; Reichman and Pagnini 1997; Rich-Edwards et al. 2003). This phenomenon has come to be known as the "weathering hypothesis," and while the exact factors that produce the observed effect have not been fully explained, the results have been replicated with a number of data sources (Geronimus 1992, 1996; Rauh et al. 2001; Rich-Edwards et al. 2003). Less research is available regarding the patterns of LBW risk by maternal age for racial/ethnic groups other than whites, although limited work has been done addressing the topic for Mexican Americans and Native Americans (Palacios and Portillo 2009; Wildsmith 2002).

Research Question: *How do maternal age patterns in LBW risk differ by race/ethnicity among first versus second or later births?*

National vital statistics for the United States show that mean age at first birth for all women in the United States was 21.4 in 1970, had risen to 24.9 in 2000, and has since stayed fairly stable, registering at 25.0 in 2006 (Martin et al. 2009; Mathews and Hamilton 2002). The 2006 mean ages further vary substantially by racial/ethnic group, from 28.5 and 26.0 in

Asian/Pacific Islanders and non-Hispanic whites, respectively, to 23.1, 22.7, and 21.9 for Hispanics, non-Hispanic blacks, and Native Americans, respectively (Martin et al. 2009). These norms are of particular interest as they relate to birth weight outcomes, as one must consider the reasons why a woman would have a child substantially earlier or later than is the norm for her specific racial/ethnic group.

In groups where early childbearing (e.g., a birth before age 20), is highly non-normative, such mothers may face more stigma on account of their being pregnant. About 21% of mothers in the United States in 2006 had their first birth before age 20 (Mathews and Hamilton 2009). These statistics differ widely by race/ethnicity for 2006, as 11% of NH white and 7% of Asian American mothers will have a birth before age 20, while 21% of Native American, 25% of African American, and 33% of Hispanic women will have a teenage birth (The National Campaign 2009). This examination of norms focuses specifically upon statistical norms measured by prevalence of teenage pregnancy and average age at first birth among different racial/ethnic groups, and acknowledges that the social processes that convene to create such norms are complex and diverse (Settersten 2004). In this case, statistical norms in timing of childbearing by racial/ethnic group deserve strong consideration because they signal potential important differences in life course processes, even if the effects of social expectations and pressures cannot be specifically measured (Mollborn 2010).

Birth order has typically been found to have a positive association with birth weight. A mother's first birth is on average at the highest risk for LBW (Malik et al. 1997; Phung et al. 2003). Of the many studies that have examined LBW risk by race/ethnicity and maternal age, some have used analysis samples of only first births (Chen et al. 2007; Fraser et al. 1995; Geronimus 1996), while others have used all single births with controls added for parity

(Reichman and Pagnini 1997; Rich-Edwards et al. 2003).   The current analysis intends to determine the extent to which accounting for parity may or may not have substantial implications for the results that are produced.

A number of previous studies that found evidence of the weathering hypothesis among African American women examined only first births (Geronimus 1996; Nabukera et al. 2009). Rauh, Andrews, and Garfinkel (2001) found evidence of weathering among African Americans' first and second births separately, although the positive association between unfavorable birth weight and maternal age was much stronger among first births. In a study of preterm birth prevalence, Schempf and colleagues (2007) found differing and complex associations between maternal age and parity among white, African American, and Hispanic mothers. However, similar comparisons have not been done for birth weight beyond that of Rauh and colleagues (2001), who did not include teenage births in their analysis and did not include Hispanic mothers.

While it is difficult to determine at exactly what age African American mothers having a first birth have compromised birth outcomes, Nabukera and colleagues (2009) found a widening gap between African American and white mothers in LBW prevalence after age 30. The authors note that African American women were much less likely to delay their first birth until age 30, with only approximately 7% of African American mother childbearing after age 30 compared to 13% of white mothers. Khoshnood, Wall and Lee (2005) found that African American and Mexican American mothers age 35 and over had higher LBW risk compared to their 20-34 year-old counterparts than did whites in the respective age groups. Overall, LBW levels were larger for first compared to second or later births, although the relative age disparities were similar between the two age groups.

In regard to maternal age, mothers under age 20 having a multiparous (second or later) birth have been found to have increased risk of unfavorable birth outcomes compared to primiparous (first birth) teenage mothers, while mothers over age 35 having a primiparous birth have increased risk of unfavorable birth outcomes compared to their multiparous age peers (Blankston et al. 1993; Hellerstedt et al. 1995; Kramer 1987; Nabukera et al. 2006; Schempf et al. 2007). However, despite the more unfavorable birth outcomes for second or later teenage births, multiparous teenage mothers have higher birth weight children, on average, than teenage mothers having their first child (Blankston et al. 1993). A study of Scottish mothers found primiparous teenage mothers to have similar birth outcomes to primiparous mothers in their 20s, while multiparous teenage mothers had poorer birth outcomes than multiparous mothers in their 20s (Smith and Pell 2001).

Hypothesis 1A: First births among African American mothers will show a positive relationship between maternal age and LBW, while second or later births will have a flat or U-shaped association.

Hypothesis 1B: First births among African American mothers will have similar patterns of LBW and maternal age compared to second or later births, with first births having a higher LBW prevalence at each age.

Hypothesis 2A: White, U.S.-born and foreign-born Hispanic, Asian American, and Native American mothers will have higher LBW prevalence for multiparous compared to primiparous teenage mothers, but higher LBW prevalence for primiparous compared to multiparous mothers at older ages.

Hypothesis 2B: White, U.S.-born and foreign-born Hispanic, Asian American, and Native American mothers will have similar age patterns in LBW prevalence with a generally uniform effect of parity, specifically with first births having higher LBW prevalence at all ages.

Data and Methods

Data. This study uses the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative sample of about 10,700[1] births in the United States in 2001. The data set includes four waves, conducted when the child was 9, 24, and 52 months old, and starting kindergarten, although this study uses only Wave 1 data, collected at 9 months postpartum, as it provides information from the birth certificate as well as retrospective reports from the mother regarding events before and during the pregnancy. From the initial sample, 1,800 cases are excluded because the child was a twin, triplet, or other higher order birth. Approximately 100 more cases were then excluded because the biological mother was not the respondent at Wave 1, a critical component of the analysis, given that many of the Wave 1 variables are retrospective measures that require direct maternal reporting for accuracy. From this sample, approximately 250 more cases were excluded because the mother identified as mixed race or reported no race at all. Finally, another 300 cases were excluded because they were foreign-born white or African American mothers, leaving an eligible sample of approximately 8,200 mothers.

From the eligible sample of 8,200 singleton births, a trivial number (less than 50, or <1%) are dropped due to having incomplete information on smoking during pregnancy or marital status at birth, leaving 8,150 eligible cases for analysis. Approximately 1,700 (21%) cases are dropped with the exclusion of Asian American and Native American mothers, each on account of their inadequate sample sizes by maternal age group. While Asian American mothers comprise a relatively sizeable portion of the eligible sample, the rarity of teenage births when

[1] In accordance with data security restrictions, all N's reported for ECLS-B are presented rounded to the nearest 50.

analyses are split by first births versus second or late births makes the group unsuitable to include in regression models. The resulting analysis samples are approximately 2,700 first births and 3,800 second or later births.

Data are also used from the 2001 United States Birth Data File, using only singleton births that directly correspond to the racial/ethnic and age categories in the ECLS-B analyses. Given that identification of parity in the ECLS-B was derived from birth certificate information, the selection criteria were the same in the Birth Data File, with first births identified as those with no previous births, either living or who subsequently died, and second or higher order births identified as those mothers with any reported past birth on her child's birth certificate. First births in the Birth Data File included 1,465,523 births, while second or later births included 2,185,634 births. Given that divisions by parity in ECLS-B do not provide sufficient numbers for regression analysis of Asian and Native American mothers, the use of the Birth Data File provides a highly useful resource in including these groups in the analysis.

Variables. The primary birth outcome measure used in this work is a dichotomous indicator of LBW, measured as any birth weight recorded as less than 2500 grams, or 5.5 lbs, which has been the standard cutoff for LBW used by the World Health Organization since 1976 (Kramer 1987). Maternal age at the study child's birth is derived primarily from birth certificate reports, although a few cases with no birth certificate data are retained for analysis by using approximations from the child's age in months and the mother's age at the Wave 1 interview.

Mother's race/ethnicity is one of the key variables of analysis and is obtained from the mother's self reported racial identification. This analysis examines U.S.-born non-Hispanic whites, African Americans, and Native Americans, excluding foreign-born mothers in the first two groups to avoid potential bias from immigrant effects. Additionally, an adequate sample is available to analyze foreign- and U.S.-born Hispanic mothers, who are divided into two separate groups, because foreign-born mothers from other racial/ethnic groups are excluded. Given the heterogeneity of the Hispanic ethnicity, supplementary analyses were performed on Mexican American mothers only, finding that rates of LBW were very similar to the broader category of Hispanic. Given that the sample size for Mexican Americans was inadequate to examine maternal age patterns in all analyses, I use the category of all Hispanic mothers throughout this study. Finally, Asian/Pacific Islander-origin mothers are included, although they are aggregated to include both foreign- and U.S.-born because of insufficient numbers to use as separate groups for analysis. Asian American and Native American mothers are excluded from regression analyses for ECLS-B, although they are included in analyses using the 2001 U.S. Birth Data File.

Parity is defined in this data set using information obtained from the birth certificate that identifies whether the mother has had any prior births, and whether those infants are currently living or dead. Given that timing of first childbirth compared to subsequent births is the primary comparison of interest, parity is constructed as a dichotomous variable and identifies mothers for whom the study child is their first childbirth (1) or second or later childbirth (0). To elaborate, the central idea of this analysis is that the transition from having zero children to having one child is qualitatively different than having a second or higher order birth. Further, this distinction also assumes that having a third or fourth child does not differ from having a second child in the way that all second or later births differ from the first.

In the ECLS-B data, a basic indicator of smoking during pregnancy is obtained from both the birth certificate and retrospective reports by the mother at 9 months, and provides the most complete measure of prenatal smoking available in the data. Marital status at birth is coded as it is provided from the birth certificate, which is as a dichotomous variable indicating whether the mother was married or not married at the child's birth. Controls are also added to control for some indicators of background SES, including maternal grandmother's education and whether the mother's family was on welfare when she was between 5 and 16 years old.

Analysis Plan. As indicated above, the analyses are conducted using split logistic regression models, divided between first and second or later births. The dichotomy of parity also produces the most ideal sample size for these split models, as further divisions would leave some racial/ethnic groups with insufficient numbers for analysis in some age groups. Interactions between maternal age at birth and race/ethnicity provide us with an understanding of whether the maternal age patterns of LBW differ by parity, and whether age patterns differ in any meaningful way by race/ethnicity. Most important to this analysis is to understand how different average age at first childbearing may affect birth outcomes between women of different racial/ethnic groups.

Results

Table 6.1 shows percentages of first births by race/ethnicity and maternal age in the ECLS-B. African American and U.S.-born Hispanic mothers have significantly lower percentages of first births than whites at ages 15-19 and 25-29, which reflects the higher rates of multiparous teenage childbearing. While nearly one-third of white mothers age 30-34 were having their first birth, approximately one-fifth of African American, foreign-born Hispanic, and Native American mothers at that age were having their first birth. Further, Asian American mothers were much more likely to be having their first birth at older ages, with nearly one-third of Asian mothers age 35 and older having their first birth. These percentages reflect the need to determine if parity has a substantial impact on LBW by race/ethnicity and maternal age, as the differing levels of first births in each group could potentially influence LBW prevalence.

Tables 6.2 and 6.3 provide percentages of LBW among mothers in the ECLS-B who are having their first or second or later births, respectively. Few comparisons are statistically significant among these mean percentages. Since some disparities within racial/ethnic group are indicated by both absolute and relative differences between age groups, the lack of significance may be a function of small sample sizes. Because of the lack of significant differences found in these tables, which likely are partially a result of small sample sizes, the hypotheses will largely address differences found in the 2001 Birth Data File, followed by regression analyses using ECLS-B.

Hypotheses 1A and 1B: Tables 6.4 and 6.5 show LBW prevalence by race/ethnicity and maternal age from the 2001 U.S. Birth Data File for first births and second or later births, respectively. Further, Figures 6.1 and 6.2 provide visual representation of these LBW levels. Among African American mothers, a distinct difference is found by parity. That is, while LBW prevalence is 12% for both first and second or later births to African American mothers age 15-19, the age pattern changes from that point forward. Among first births, increased age among African American mothers does not show reduced LBW prevalence, but rather, stays level and begins to increase at ages 30-34 to approximately 15% and subsequently to 18% at ages 35 and older. Among second or later births, however, LBW prevalence drops after ages 15-19 to 10% at ages 20-24 and 25-29, and increases to 11% at ages 30-34 and 14% at ages 35 and older. Since LBW prevalence among African American mothers is constant between 15-19 and 20-24 among first births, but drops for second or later births, one conclusion is that teenage mothers are better off delaying their second birth. However, increasing age for first births produces a more rapid increase in LBW than among second or later births, indicating that initiation of childbearing after age 25 among African American mothers is linked more strongly to unfavorable birth outcomes.

Table 6.6 provides logistic regression coefficients from models predicting LBW among African American mothers in the ECLS-B with interactions between maternal age and parity. No significant main effects or interaction terms for maternal age or parity emerge in the table, although it is useful to compare a visual representation of the predicted probabilities of LBW in this table with the previous findings from the 2001 Birth Data File. Figure 6.3 shows the predicted probabilities of LBW among African American mothers in the ECLS-B, derived from Table 6.6, Models 2 and 6, which estimate LBW without controls and then controlling for background SES, smoking during pregnancy, and marital status, respectively. The findings from these regression models roughly mirror the patterns found in the 2001 Birth Data File. That is, first births among African American mothers show a strong positive association between maternal age and LBW prevalence, whereas among second or later births, increasing age has a minimal effect on LBW. The findings for African American mothers age 35 and older should be interpreted with caution here due to small sample size for first births in this group, although the trend in ECLS-B is not unlike that found in the vital statistics data. Another important observation from the figure is that African American mothers age 20-24 have identical risk of LBW for both first and second or later births. Thus, in this case, the group that represents the most statistically normative ages for African American mothers to have their first child has the lowest risk of LBW, and is at no increased risk of LBW on account of parity. The findings from the two data sets provide relatively clear evidence in support of Hypothesis 1A, which stated that increasing age among African American first births would be positively related to LBW prevalence, while increasing age among second or later births would not be related to LBW. Hypothesis 1B, which expected the effects of parity to be uniform at all ages, was not supported.

Hypothesis 2A and 2B: Figure 6.1 shows that LBW prevalence for white mothers in the 2001 Birth Data File is very similar between ages 15 and 29, regardless of parity. However, after age 30, the risk of LBW increases for first births, but stays relatively low for second or later births.

Figure 6.4 shows the predicted probabilities of LBW among white mothers in the ECLS-B, derived from Table 6.7, first without controls and then controlling for background SES, smoking during pregnancy, and marital status. The figure demonstrates that the effect of parity for whites fluctuates somewhat with age with no controls added into the model, although the effect does not appear to vary widely. When controls are added, the association between age and LBW becomes slightly more positive for first births, but changes only minimally among second or later births. Thus, before controls, Hypothesis 2B, which expected no varying LBW prevalence by parity, was supported. With controls added, Hypothesis 2A is partially supported, in that LBW prevalence increases disproportionately for first births with age compared to second or later births.

Figure 6.1 shows that U.S.- and foreign-born Hispanic mothers demonstrate somewhat similar patterns to white mothers, although the LBW prevalence for teenage births in these groups is less than a full percentage point higher than their respective 20-24 and 25-29 year-old counterparts. Table 6.8 provides logistic regression coefficients for models predicting LBW among U.S.-born Hispanic mothers, with interaction terms between parity and maternal age. While the variables of interest do not have statistically significant effects, some of the effects are similar in magnitude to those found among whites, and thus, may not be significant due to smaller sample size. For this reason, it is useful to illustrate the LBW prevalence by parity and maternal age visually. Figure 6.5 provides the predicted probabilities of LBW among U.S.-Born

Hispanic mothers in the ECLS-B, first without controls (Table 6.8, Model 2) and then controlling for background SES, smoking during pregnancy, and marital status (Model 6). Between the ages of 15-24, the effect of parity is negligible, although beginning with ages 25-29, first births demonstrate a somewhat increased LBW risk compared to second or later births. While these differences do not reach statistical significance, the patterns follow those found in the 2001 Birth Data File. After age 25, U.S.-Born Hispanic mothers experience a slightly increased LBW risk with first births compared to second or later births, although the disparity stays relatively constant with increased age, with the gap closing slightly after age 35. While not nearly as large a disparity as found among African American mothers, this figure suggests that having a first birth after the normative time of first birth may be associated with a slight increased risk for LBW. Thus, Hypothesis 2B was not supported, while Hypothesis 2A was partially supported, in that first births among older mothers had higher LBW prevalence than mothers having second or later births. Table 6.9 shows logistic regression coefficients predicting LBW among foreign-born Hispanic mothers, with interaction terms between parity and maternal age. While the models lack significant effects for any variables of interest, further illustration of the relationships is provided in Figure 6.6, which shows the predicted probabilities of LBW among foreign-born Hispanic mothers in the ECLS-B, first without controls (Model 2); and then controlling for background SES, smoking during pregnancy, and marital status (Model 6). Interestingly, this graph indicates that the effect of parity on LBW is virtually nil, with the only increased risk of LBW coming at ages 35 and older, where sample size is inadequate for a sound comparison of first versus second or later births. Ignoring this anomaly in the oldest age group, Hypothesis 2A, which expected a constant effect of parity on LBW at each maternal age group, is supported. It should be noted, however, that the constant effect of parity is virtually zero, as first and second births among foreign-born Hispanics exhibit very similar LBW profiles.

Figure 6.1 shows that the LBW prevalence for Asian American mothers having their first birth follows a largely U-shaped pattern by maternal age, with higher risk at teenage years and at later ages. Given that Asian American mothers do not have adequate sample size in ECLS-B for regression analysis, the findings from the 2001 Birth Data File are the primary source for testing Hypothesis 2 in this group. The comparison of LBW prevalence among primiparous and multiparous Asian American mothers in Figures 6.1 and 6.2 indicate that parity has a relatively uniform effect by maternal age. Thus, Hypothesis 2B, which stated that age patterns would be similar by parity, with parity having a constant effect across ages, is supported for Asian American mothers.

Similar to Asian Americans, sample sizes in ECLS-B do not allow for regression analyses of LBW by parity and maternal age among Native Americans, and thus, the vital statistics figures from the 2001 Birth Data File provide the best picture of their profile. Figures 6.1 and 6.2 show age patterns of LBW prevalence among Native Americans resemble those of African Americans more than other racial/ethnic groups. That is, first births among Native Americans after age 30 are associated with dramatic increases in LBW prevalence, while for second or later births this increase is present, but rather small. The findings among Native American mothers do not fully support Hypothesis 2A or 2B, although Hypothesis 2A is supported for older ages, in that primiparous mothers at ages over 30 appear to have substantially increased risk of LBW compared to their multiparous age peers.

Discussion

The findings provided some useful insights into the understanding of how racial/ethnic groups differ based on parity. The results reinforce the need to take into account characteristics such as average age at first birth in the understanding of LBW disparities, especially as they differ by race/ethnicity.

The increased LBW prevalence of primiparous teenage births among white and Asian American mothers compared to their respective older counterparts lends some support to the fact that the stigma of teenage childbearing may lead to compromised birth outcomes. That is, these two groups have the highest age at first birth and lowest teenage birth rate of the six groups examined in this analysis, and similarly are the most likely to have delayed childbearing until their late 20s or 30s. The pathways through which stigma may function in these two racial groups are likely varied, although the regression analyses provided some insight for white mothers, while Asian mothers were excluded from the regressions due to insufficient sample size. Marital status at birth appears to attenuate some of the negative effect of young maternal age among white mothers, and stigma may be lesser for married white teenage mothers.

Findings among African American and Native American mothers from the 2001 U.S. Birth Data File indicated that increased age at first birth was associated with higher LBW risk than among other racial/ethnic groups. However, similar findings did not arise in the examination of second or later births, which calls into question the explanations provided by the weathering hypothesis. That is, Geronimus (1996) maintains that exposure to various forms of disadvantage among African American women leads to accelerated aging, which would lead one to assume that similar processes would be going on regardless of parity. Taken more broadly, these findings support the weathering hypothesis, in that delayed initiation of childbearing does not result in more favorable birth outcomes among African American and Native American mothers as it does for other racial/ethnic groups. That said, the lack of a pattern indicative of weathering among second or later births suggests that processes associated with parity may play a vital role in the understanding of birth outcomes, such that parity may explain this disparity more clearly than controls for SES.

Additionally, these findings may lend support to an alternative theory. For example, Stevens-Simon, Roghmann, and McAnarney (1990) asserted that populations with lower average age at first birth may have a somewhat different birth outcome profile at later ages than groups with older average age at first birth. They detail that mothers in early childbearing groups may not be choosing to delay childbearing, but rather, their delayed childbearing is a result of subfecundity, which duly is a risk for unfavorable birth outcomes. In fact, some pregnancy risk factors may be associated with delayed fertility. For example, smoking among African American adolescents has been shown to be associated with a delay in pregnancy of almost two years, net of contraception and other factors (Fiscella et al. 1998). Further, concurrent negative lifestyle factors may have a cumulative positive association with time to pregnancy (Hassan and Killick 2004). Thus, implications from this theoretical approach would indicate that women who engage in risky behaviors or maintain unhealthy lifestyles may not only put themselves at risk for unfavorable birth outcomes, but similarly may have resulting delayed childbearing from those factors, which taken together may lead to increased cumulative exposure to risk that puts them at further disadvantage for their birth outcomes.

Timing of childbearing is thus an important element to keep in mind in regard to birth outcome profiles of different groups of women. Among the groups for whom teenage childbearing is somewhat more common, the effect of teenage motherhood on LBW is minimal for first births, and slightly higher for second or later births. Thus, African American, Native American, and U.S.- and foreign-born Hispanic mothers who have their first teenage birth are not at a substantially higher risk for LBW than their 20-29 year-old counterparts. The increased LBW risk among second teenage births in these groups may be due to various factors. The mothers in these populations who have a second birth while still a teenager may be substantially more disadvantaged and have poor access to birth control, or alternatively, have little incentive to prevent a second birth.

Ideally, future research might study birth weights of first and later children among the same mothers. Since ECLS-B includes births from only one time period, it is not possible to estimate how past birth outcomes may explain birth weight in subsequent births. However, given the cost of collecting data such as ECLS-B for only one birth year, the collection of longitudinal birth data of similar quality over multiple years would be both time and cost prohibitive. However, data sets that provide information on multiple births may prove useful in the future for measuring how parity and age at first birth factor into birth outcomes.

Policy implications are somewhat difficult to derive from research such as this that finds benefits in childbearing at statistically normative ages. Policies directed at changing birth timing, mostly in the form of attempting to reduce teenage childbearing, have largely been unsuccessful (Furstenberg 2007). Further, LBW serves as one broad indicator of birth outcomes, and just because a group has good or bad rates of LBW does not necessarily foreordain infants and children to compromised outcomes.

The understanding of how maternal characteristics are associated with birth outcomes is but one small piece in a larger puzzle attempting to understand how health and socioeconomic disadvantage may be passed on intergenerationally. The examination of LBW based on parity has proved useful in facilitating the understanding of how timing of childbearing may impact birth outcomes, although results also clearly indicate that maternal age patterns differ substantially by race/ethnicity, and disparities remain quite complex, fostering the need for continued research on the subject.

REFERENCES

Blankston, Mary L., Suzanne P. Cliver, Robert L. Goldenberg, Carol A. Hickey, Jin Jin, Mary B. Dubard. 1993. “Health Behavior and Outcomes in Sequential Pregnancies of Black and White Adolescents.” *Journal of the American Medical Association* 269:1401–3.

Chen, Xi-Kuan, Shi Wu Wen, Nathalie Fleming, Kitaw Demissie, George G. Rhoads, and Mark Walker. 2007. “Teenage Pregnancy and Adverse Birth Outcomes: A Large Population Based Retrospective Cohort Study.” *International Journal of Epidemiology* 36: 368–73.

ECLS-B 9-month-Kindergarten 2007 Longitudinal Restricted-Use File. 2007. National Center for Education Statistics. Version 5.0.7.0.

Fiscella, Kevin, Harriet J. Kitzman, Robert E. Cole, Kimberly Sidora, and David Olds. 1998. “Delayed First Pregnancy Among African-American Adolescent Smokers.” *Journal of Adolescent Health* 23:232–37.

Fraser, Alison M., John E. Brockert, and R. H. Ward. 1995. “Association of Young Maternal Age With Adverse Reproductive Outcomes.” *New England Journal of Medicine* 32:1113–17.

Geronimus, Arline T. 1992. “The Weathering Hypothesis and the Health of African-American Women and Infants: Evidence and Speculations.” *Ethnicity & Disease* 2(3):207–21.

------. 1996. “Black/White Differences in the Relationship of Maternal Age to Birthweight: A Population-Based Test of the Weathering Hypothesis.” *Social Science and Medicine* 42:589–97.

Hassan, Mohamed A.M. and Stephen R. Killick. 2004. “Negative Lifestyle Is Associated With A Significant Reduction In Fecundity.” *Fertility and Sterility* 81:384–92.

Hellerstedt, Wendy L. Phyllis L. Pirie, and Greg R. Alexander. 1995. "Adolescent Parity and Infant Mortality, Minnesota, 1980 through 1988." *American Journal of Public Health* 85:1139–42.

Khoshnood, Babak, Stephen Wall, and Kwang-sun Lee. 2005. "Risk of Low Birth Weight Associated With Advanced Maternal Age Among Four Ethnic Groups in the United States." *Maternal and Child Health Journal* 9:3–9.

Kramer, Michael S. 1987. "Determinants of Low Birth Weight: Methodological Assessment and Meta-analysis." *Bulletin of the World Health Organization* 65:663–737.

Malik, Sushma, Radha G. Ghidyal, Rekha Udani, and Prasad Wainganker. 1997. "Maternal Biosocial Factors Affecting Low Birth Weight." *Indian Journal of Pediatrics* 64:373–77.

Martin, J.A., B.E. Hamilton, P.D. Sutton, S.J. Ventura, F. Menacker, S. Kimeyer, and T.J. Mathews. 2009. "Births: Final Data for 2006." *National Vital Statistics Reports* 57(7): 1–102. Hyattsville, MD: National Center for Health Statistics.

Mathews, T.J. and B.E. Hamilton. 2002. "Mean Age of Mother, 1970-2000." *National Vital Statistics Reports* 51(1):1–14. Hyattsville, MD: National Center for Health Statistics.

Mathews, T.J., and B.E. Hamilton. 2009. "Delayed Childbearing: More Women Are Having Their First Child Later in Life." *NCHS Data Brief* 21:1–8. Hyattsville, MD: National Center for Health Statistics.

Mollborn, Stefanie. 2010. "Predictors and Consequences of Adolescents' Norms Against Teenage Pregnancy." *The Sociological Quarterly* 51:303–28.

Nabukera, Sarah K., Martha Slay Wingate, Greg R. Alexander, and Hamisu M. Salihu. 2006. "First-Time Births Among Women 30 Years and Older in the United States: Patterns and Risk of Adverse Outcomes." *Journal of Reproductive Medicine* 51:676–82.

Nabukera, Sarah K., Martha Slay Wingate, John Owen, Hamisu M. Salihu, Shallender Swaminathan, Greg R. Alexander, and Russell S. Kirby. 2009. "Racial Disparities in Perinatal Outcomes and Pregnancy Spacing Among Women Delaying Initiation of Childbearing." *Maternal and Child Health Journal* 13:81–89.

National Campaign, The. 2009. "Policy Brief: Racial and Ethnic Disparities in Teen Pregnancy." Retrieved June 8, 2010 (http://www.thenationalcampaign.org/resources/pdf/Briefly_PolicyBrief_RacialEthnicDisparities.pdf)

National Center for Health Statistics. 2003a. Birth Data Files for 2001. Retrieved May 12, 2010 (http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm).

National Center for Health Statistics. 2003b. *Documentation of the Detailed Natality Tape File for 2001 Data*. Retrieved May 12, 2010 (http://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm).

Nord, Christine, Brad Edwards, Richard Hilpert, Laura Branden, Carol Andreassen, Anne Elmore, et al. 2004. Early Childhood Longitudinal Study, Birth Cohort (ELCS-B): User's manual for the ECLS-B nine-month restricted-use data file and electronic code book (NCES 2004-092). Washington, DC:U.S. Department of Education, National Center for Education Statistics.

Palacios, Janelle F. and Carmen J. Portillo. 2009. "Understanding Native Women's Health." *Journal of Transcultural Nursing* 20:15–27.

Phung, Hai, Adrian Bauman, Tuan V. Nguyen, Lis Young, Mai Tran, and Ken Hillman. 2003. "Risk Factors for Low Birth Weight in a Socio-economically Disadvantaged Population:

Parity, Marital Status, Ethnicity and Cigarette Smoking." *European Journal of Epidemiology* 18:235–43.

Rauh, Virginia A., Howard F. Andrews, and Robin S. Garfinkel. 2001. "The Contribution of Maternal Age to Racial Disparities in Birthweight: A Multilevel Perspective." *American Journal of Public Health* 91:1815–24.

Reichman, Nancy E. and Deanna L. Pagnini. 1997. "Maternal Age and Birth Outcomes: Data From New Jersey." *Family Planning Perspectives* 29:268–72+295.

Rich-Edwards, Janet W., Stephen L. Buka, Robert T. Brennan, and Felton Earls. 2003. Diverging Associations of Maternal Age With Low Birthweight for Black and White Mothers." *International Journal of Epidemiology* 32:83–90.

Schempf, Ashley H., Amy M. Branum, Susan L. Lukacs, and Kenneth C. Schoendorf. 2007. "Maternal Age and Parity-Associated Risks of Preterm Birth: Differences by Race/Ethnicity." *Paediatric and Perinatal Epidemiology* 21:34–43.

Settersten, Richard A. 2004. "Age Structuring and the Rhythm of the Life Course." Pp 81–98 in *Handbook of the Life Course*, edited by Jeylan T. Mortimer and Michael J. Shanahan. New York: Springer.

Smith, Gordon C. and Jill P. Pell. 2001. "Teenage pregnancy and risk of adverse perinatal outcomes associated with first and second births: population based retrospective cohort study." *British Medical Journal* 323:476.

Stevens-Simon, Catherine, Klaus J. Roghmann, and Elizabeth R. McAnarney. 1990. "Subfecundity: A Prenatal Risk Factor For Adults But Not Adolescents." *Journal of Adolescent Health Care* 11:432–36.

U.S. Department of Education, National Center for Education Statistics. 2007. "Early Childhood Longitudinal Study, Birth Cohort." Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Wildsmith, Elizabeth. M. 2002. “Testing the Weathering Hypothesis Among Mexican-Origin Women.” *Ethnicity & Disease* 12:470–79.

Table 6.1. Weighted Proportion of Mothers For Whom the Study Child is Their First Birth, by Race/Ethnicity and Maternal Age at Birth

	15-19	20-24	25-29	30-34	35+	Total
African American	0.75	0.39	0.24	0.18	0.14	0.38
White	0.86 [a]	0.50 [a]	0.39 [a]	0.32 [a]	0.24 [a]	0.41
U.S.-born Hispanic	0.73 [b]	0.45	0.26 [b]	0.27	0.18	0.41
Foreign-born Hispanic	0.81	0.52 [a]	0.31	0.21 [b]	0.15 [b]	0.39
Asian/Pacific Islander	0.88 [ac]	0.52 [a]	0.59 [abcd]	0.39 [abcd]	0.31 [ad]	0.48 [abcd]
Native American	0.83	0.47	0.22 [be]	0.15 [be]	0.12 [be]	0.40

Source: ECLS-B

[a] Different from African American at $p<0.05$

[b] Different from White at $p<0.05$

[c] Different from U.S.-born Hispanic at $p<0.05$

[d] Different from Foreign-born Hispanic at $p<0.05$

[e] from Asian at $p<0.05$

Table 6.2. Weighted Proportion of LBW Among Mothers For Whom the Study Child is Their First Birth, By Race/Ethnicity and Maternal Age[1,2]

Maternal age at birth	White	African American	U.S.-born Hispanic	Foreign-born Hispanic	Asian/Pacific Islander	Native American	Total
15-19	0.10	0.13	0.11	0.06	0.11	0.07	0.10
20-24	0.07	0.10	0.05	0.08	0.07	0.01	0.07 [a]
25-29	0.07	0.16	0.11	0.05	0.08	0.06	0.08
30-34	0.06	0.14	0.09	0.06	0.08	0.15	0.07 [a]

Source: ECLS-B

a Different from 15-19 at $p<0.05$

b Different from 20-24 at $p<0.05$

c Different from 25-29 at $p<0.05$

[1] Age differences within race/ethnicity largely non-significant, except between White 15-19 & White 20-24

[2] Mothers age 35 and older excluded from this table due to small sample size for a number of racial/ethnic groups

Table 6.3. Weighted Proportion of LBW Among Mothers For Whom the Study Child Was a Second or Later Birth, By Race/Ethnicity and Maternal Age[1]

Maternal age at birth	White	African American	U.S.-born Hispanic	Foreign-born Hispanic	Asian/Pacific Islander	Native American	Total
15-19	0.06	0.10	0.12	0.04	0.10	0.03	0.08
20-24	0.06	0.10	0.07	0.08	0.10	0.06	0.07
25-29	0.04	0.12	0.05	0.06	0.06	0.06	0.05 [b]
30-34	0.04	0.10	0.05	0.07	0.04	0.03	0.05 [b]
35+	0.05	0.12	0.08	0.08	0.12	0.31	0.06

Source: ECLS-B

[a] Different from 15-19 at $p<0.05$

[b] Different from 20-24 at $p<0.05$

[c] Different from 25-29 at $p<0.05$

[d] Different from 30-34 at $p<0.05$

[1] Age differences within race/ethnicity largely non-significant, except Asian/Pacific Islander 30-34 & 35+

Table 6.4. Proportions of LBW By Race/Ethnicity and Maternal Age Among First Births in the United States in 2001

	White	African American	U.S.-born Hispanic	Foreign-born Hispanic	Asian American	Native American	Total
15-19	0.08	0.12	0.08	0.07	0.10	0.06	0.09
20-24	0.06	0.12	0.07	0.06	0.08	0.06	0.07
25-29	0.05	0.13	0.07	0.06	0.07	0.07	0.06
30-34	0.06	0.15	0.08	0.07	0.07	0.10	0.07
35+	0.08	0.18	0.10	0.09	0.09	0.13	0.09

Source: 2001 United States Birth Data File

Table 6.5. Proportions of LBW By Race/Ethnicity and Maternal Age Among Second or Later Births in the United States in 2001

	White	African American	U.S.-born Hispanic	Foreign-born Hispanic	Asian American	Native American	Total
15-19	0.07	0.12	0.06	0.05	0.08	0.06	0.08
20-24	0.05	0.10	0.05	0.04	0.06	0.05	0.06
25-29	0.04	0.10	0.05	0.04	0.05	0.05	0.05
30-34	0.03	0.11	0.05	0.04	0.05	0.06	0.04
35+	0.04	0.14	0.07	0.06	0.06	0.07	0.06

Source: 2001 United States Birth Data File

Table 6.6. Logistic Regression Coefficients Predicting LBW Among African American Mothers By Maternal Age and Parity

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Maternal age (25-29=ref)						
15-19	-0.18	-0.21	-0.37	-0.46	-0.34	-0.42
20-24	-0.30	-0.13	-0.23	-0.30	-0.21	-0.27
30-34	-0.20	-0.21	-0.30	-0.29	-0.24	-0.23
35+	0.14	0.04	-0.06	-0.03	-0.09	-0.06
First child	0.25	0.38	0.36	0.33	0.44	0.41
First child X 15-19		-0.05	0.09	0.13	0.05	0.08
First child X 20-24		-0.46	-0.35	-0.34	-0.42	-0.41
First child X 30-34		0.08	0.25	0.27	0.17	0.20
First child X 35+		0.56	0.81	0.85	0.80	0.83
Maternal grandmother's education						
<HS (HS diploma=ref)			-0.11	-0.12	-0.12	-0.13
Some college			-0.56 *	-0.56 **	-0.55 *	-0.55 *
College degree			-0.32	-0.29	-0.32	-0.30
Education missing			0.23	0.22	0.18	0.17
Mother on welfare as a child			0.31 †	0.30 †	0.31 †	0.30 †
Maternal welfare status missing			0.73 †	0.71	0.78 †	0.76 †
Married at birth				-0.24		-0.19
Smoked during pregnancy					0.47 *	0.44 *
Constant	-1.99 ***	-2.03 ***	-1.96 ***	-1.85 ***	-2.04 ***	-1.95 ***

N=1300, †p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests

Source ECLS-B

Table 6.7. Logistic Regression Coefficients Predicting LBW Among White Mothers By Maternal Age and Parity

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Maternal age (25-29=ref)						
15-19	0.44 *	0.52	0.26	0.09	0.22	0.11
20-24	0.11	0.40 †	0.29	0.15	0.20	0.11
30-34	-0.04	0.09	0.13	0.15	0.24	0.24
35+	0.16	0.20	0.32	0.34	0.44 †	0.46 †
First child	0.46 ***	0.68 **	0.78 **	0.78 **	0.93 ***	0.93 ***
First child X 15-19		-0.19	-0.10	-0.23	-0.26	-0.34
First child X 20-24		-0.53 †	-0.52	-0.54 †	-0.56 †	-0.56 †
First child X 30-34		-0.27	-0.26	-0.23	-0.38	-0.35
First child X 35+		-0.01	-0.07	-0.08	-0.22	-0.22
Maternal grandmother's education						
<HS (HS diploma=ref)			-0.07	0.16	0.12	0.11
Some college			-0.07 *	-0.37 *	-0.34 *	-0.33 *
College degree			-0.07 ***	-0.58 **	-0.53 **	-0.52 **
Education missing			-0.07 **	0.80 **	0.73 *	0.72 *
Mother on welfare as a child			-0.07	0.14	0.10	0.06
Maternal welfare status missing			-0.07	0.31	0.29	0.26
Married at birth				-0.48 ***		-0.35 *
Smoked during pregnancy					0.77 ***	0.71 ***
Constant	-3.08 ***	-3.20 ***	-3.15 ***	-2.74 ***	-3.39 ***	-3.08 ***

N=3550, †p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests

Source ECLS-B

Table 6.8. Logistic Regression Coefficients Predicting LBW Among U.S.-Born Hispanic Mothers By Maternal Age and Parity

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Maternal age (25-29=ref)						
15-19	0.50	0.92	1.04	1.09	0.95	1.05
20-24	-0.17	0.27	0.30	0.33	0.21	0.27
30-34	-0.08	0.00	0.02	0.03	-0.01	0.00
35+	0.26	0.46	0.49	0.50	0.37	0.38
First child	0.10	0.79	0.83	0.85	0.81	0.85
First child X 15-19		-0.95	-1.09	-1.11	-1.04	-1.07
First child X 20-24		-1.20	-1.12	-1.14	-1.14	-1.17
First child X 30-34		-0.22	0.00	-0.04	0.10	0.03
First child X 35+		-0.50	-0.48	-0.51	-0.31	-0.36
Maternal grandmother's education						
<HS (HS diploma=ref)			0.01	0.00	0.04	0.04
Some college			-0.62	-0.63	-0.62	-0.64
College degree			-0.39	-0.40	-0.41	-0.45
Education missing			1.08 *	1.08 *	1.09 *	1.10 *
Mother on welfare as a child			0.20	0.21	0.17	0.20
Maternal welfare status missing			0.90	0.90	1.01	1.02
Married at birth				0.08		0.18
Smoked during pregnancy					0.91 **	0.94 **
Constant	-2.65 ***	-2.89 ***	-2.99 ***	-3.06 ***	-3.07 ***	-3.21 ***

N=700, †p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests

Source ECLS-B

Table 6.9. Logistic Regression Coefficients Predicting LBW Among Foreign-Born Hispanic Mothers By Maternal Age and Parity

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Maternal age (25-29=ref)						
15-19	-0.10	-0.28	-0.27	-0.31	-0.39	-0.43
20-24	0.37	0.39	0.40	0.37	0.39	0.36
30-34	0.19	0.19	0.20	0.22	0.18	0.19
35+	0.69 †	0.30	0.36	0.36	0.35	0.36
First child	0.15	-0.07	-0.03	-0.03	-0.04	-0.03
First child X 15-19		0.35	0.29	0.27	0.32	0.31
First child X 20-24		0.04	0.00	-0.01	0.00	0.00
First child X 30-34		-0.15	-0.22	-0.23	-0.20	-0.21
First child X 35+		1.53 †	1.45 †	1.42 †	1.46 †	1.44 †
Maternal grandmother's education						
<HS (HS diploma=ref)			-0.31	-0.30	-0.26	-0.26
Some college			-0.28	-0.26	-0.21	-0.19
College degree			0.31	0.31	0.36	0.36
Education missing			-0.05	-0.04	0.00	0.00
Mother on welfare as a child			0.39	0.37	0.29	0.28
Maternal welfare status missing			0.78	0.78	0.80	0.80
Married at birth				-0.16		-0.15
Smoked during pregnancy					1.56 *	1.53 *
Constant	-2.85 ***	-2.78 ***	-2.60 ***	-2.50 ***	-2.64 ***	-2.55 ***

N=950, †p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests

Source ECLS-B

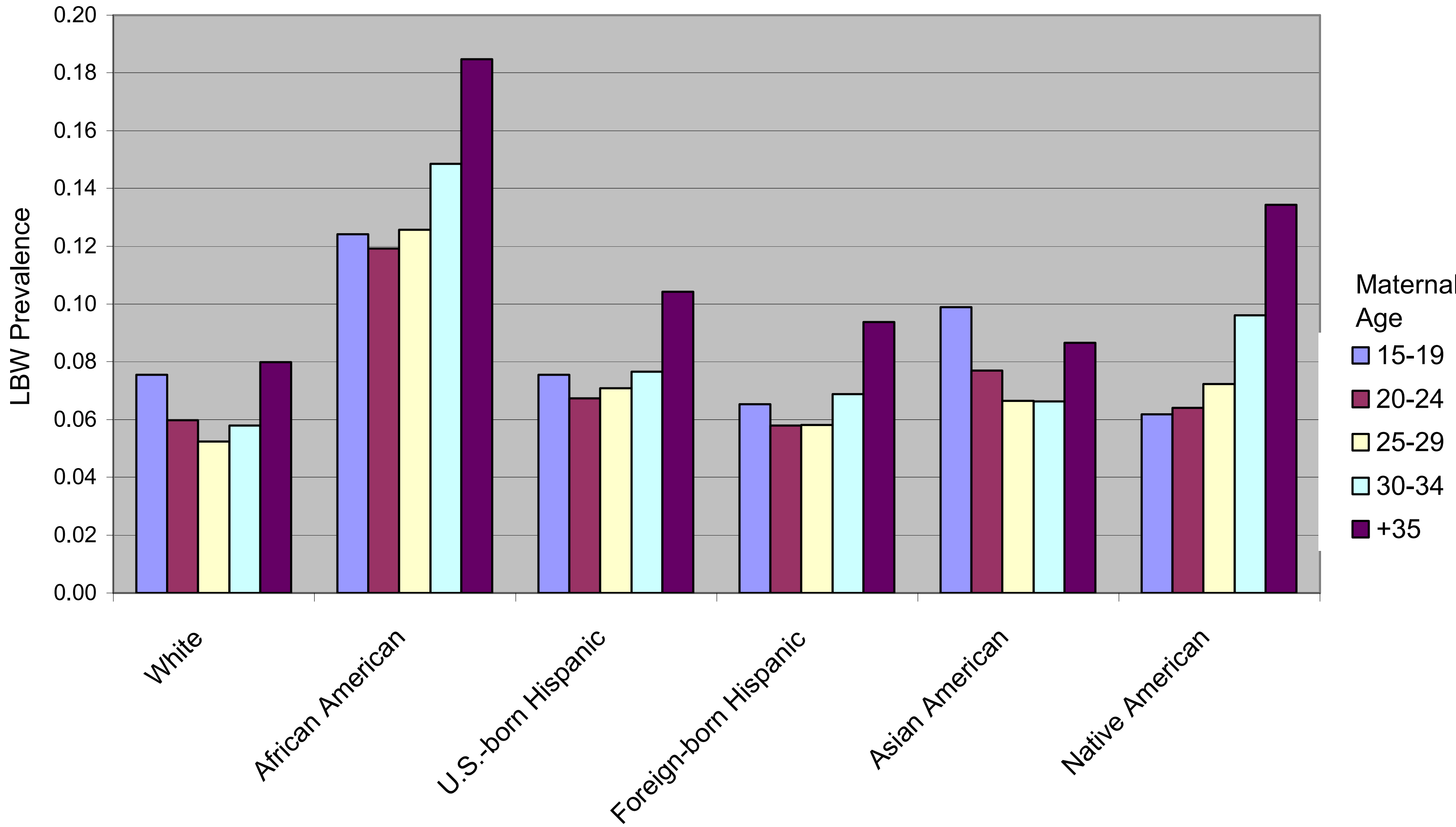

Figure 6.1. LBW Prevalence By Race/Ethnicity and Maternal Age For All First Births in the United States in 2001
Source: NCHS 2001 Birth Data File

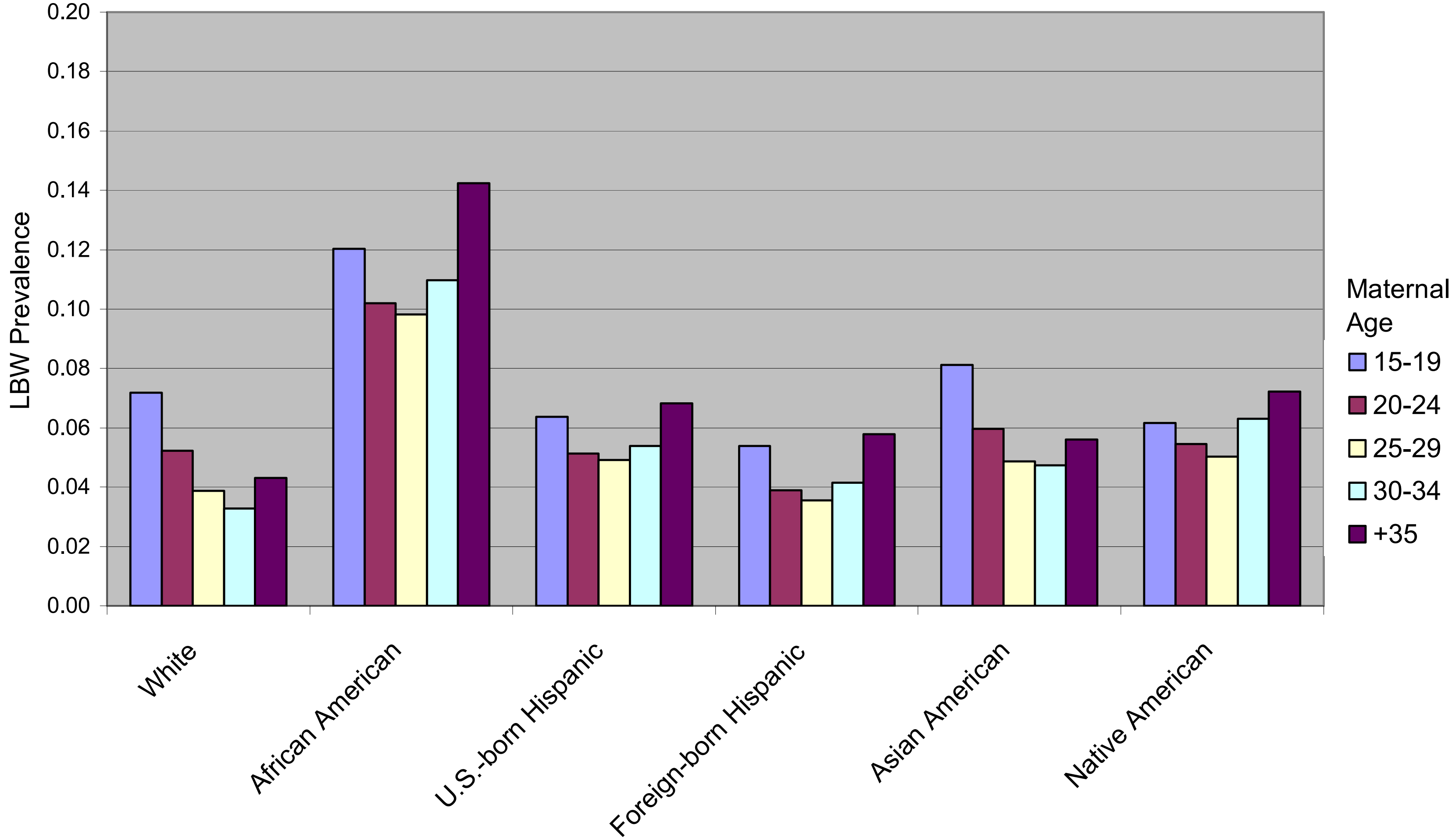

Figure 6.2. LBW Prevalence By Race/Ethnicity and Maternal Age For All Second or Later Births in the United States in 2001
Source: NCHS 2001 Birth Data File

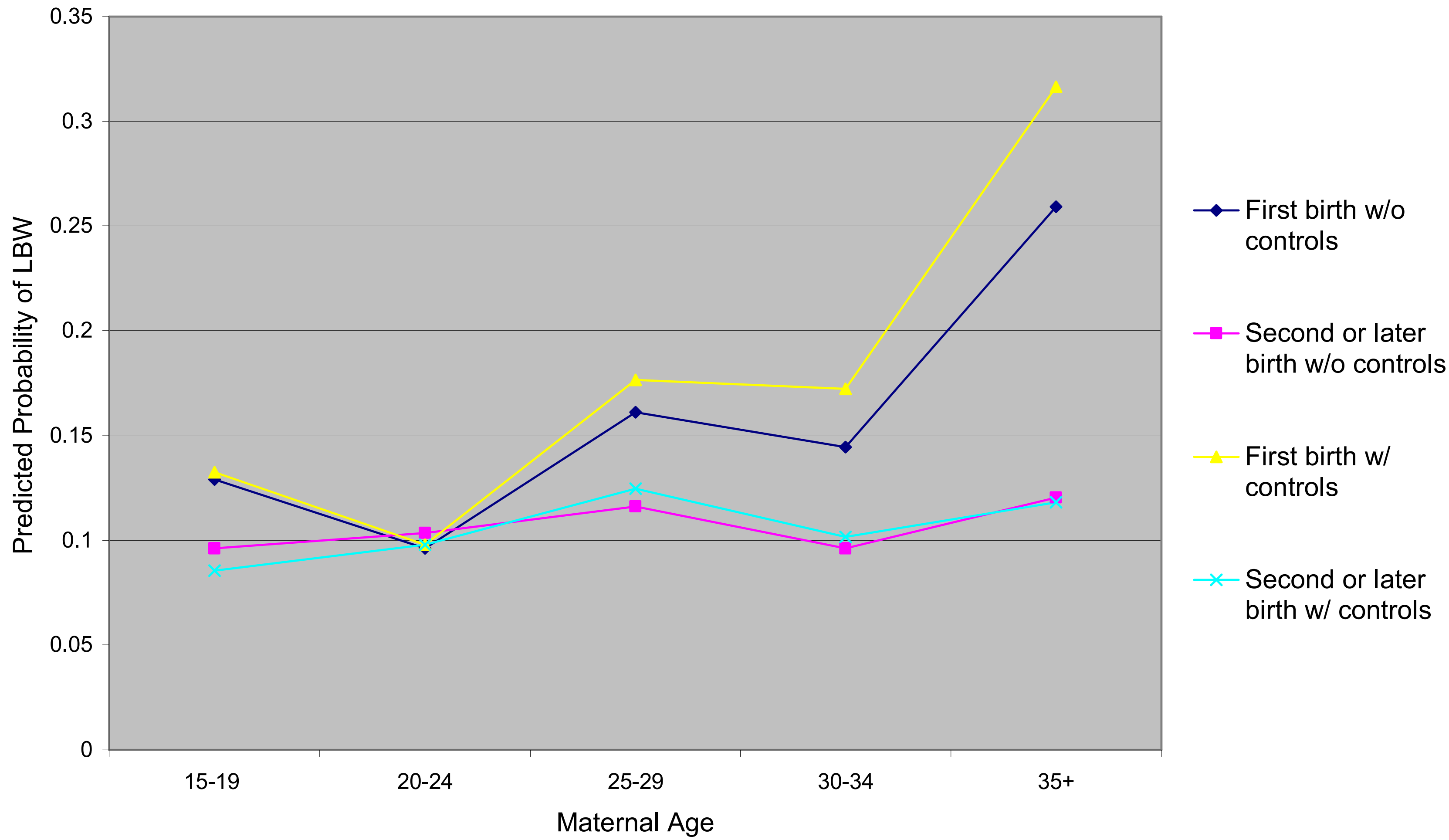

Figure 6.3. Predicted Probabilities of LBW Among African American Mothers by Maternal Age and Parity
Source: ECLS-B

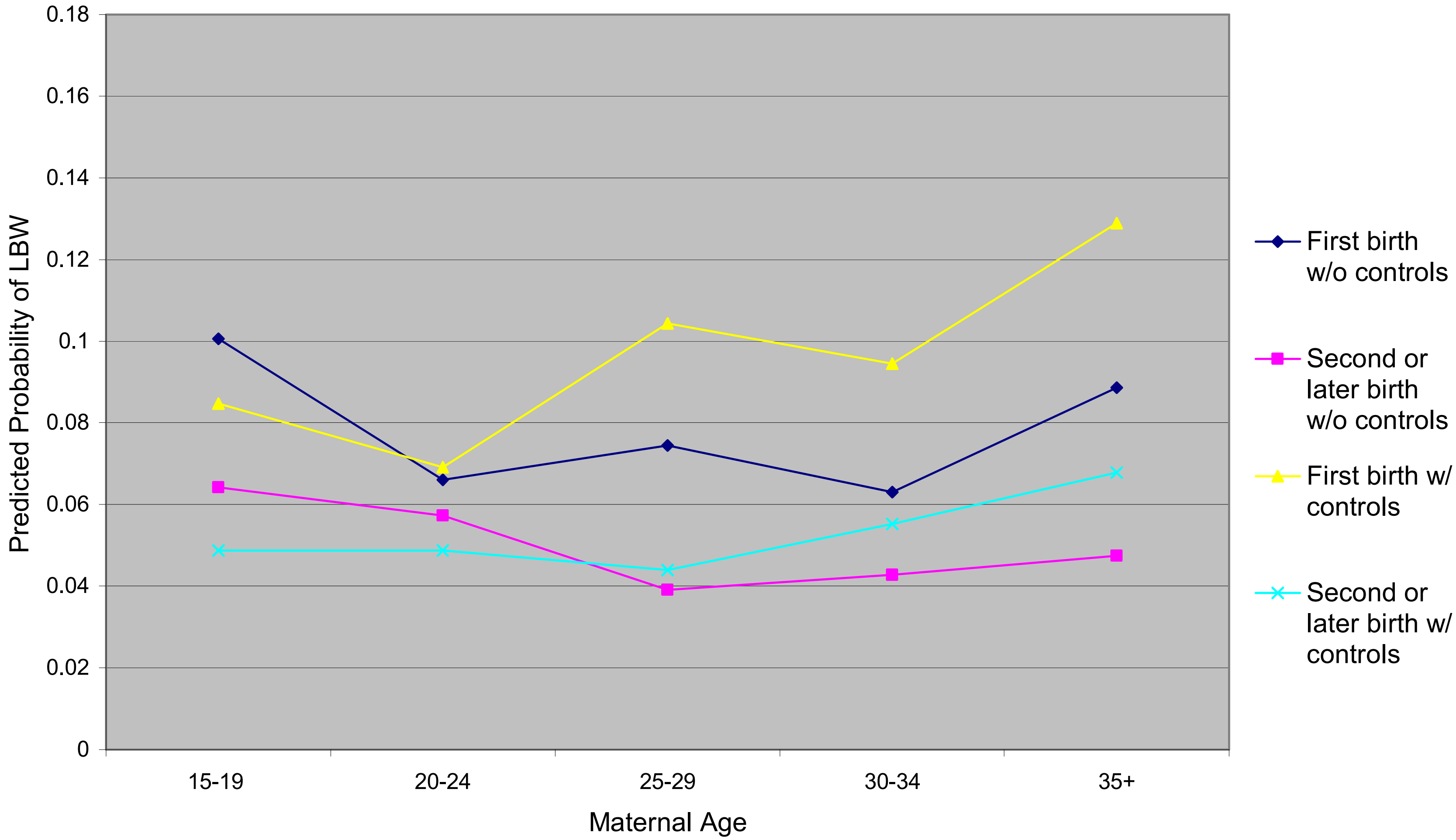

Figure 6.4. Predicted Probabilities of LBW Among White Mothers by Maternal Age and Parity
Source: ECLS-B

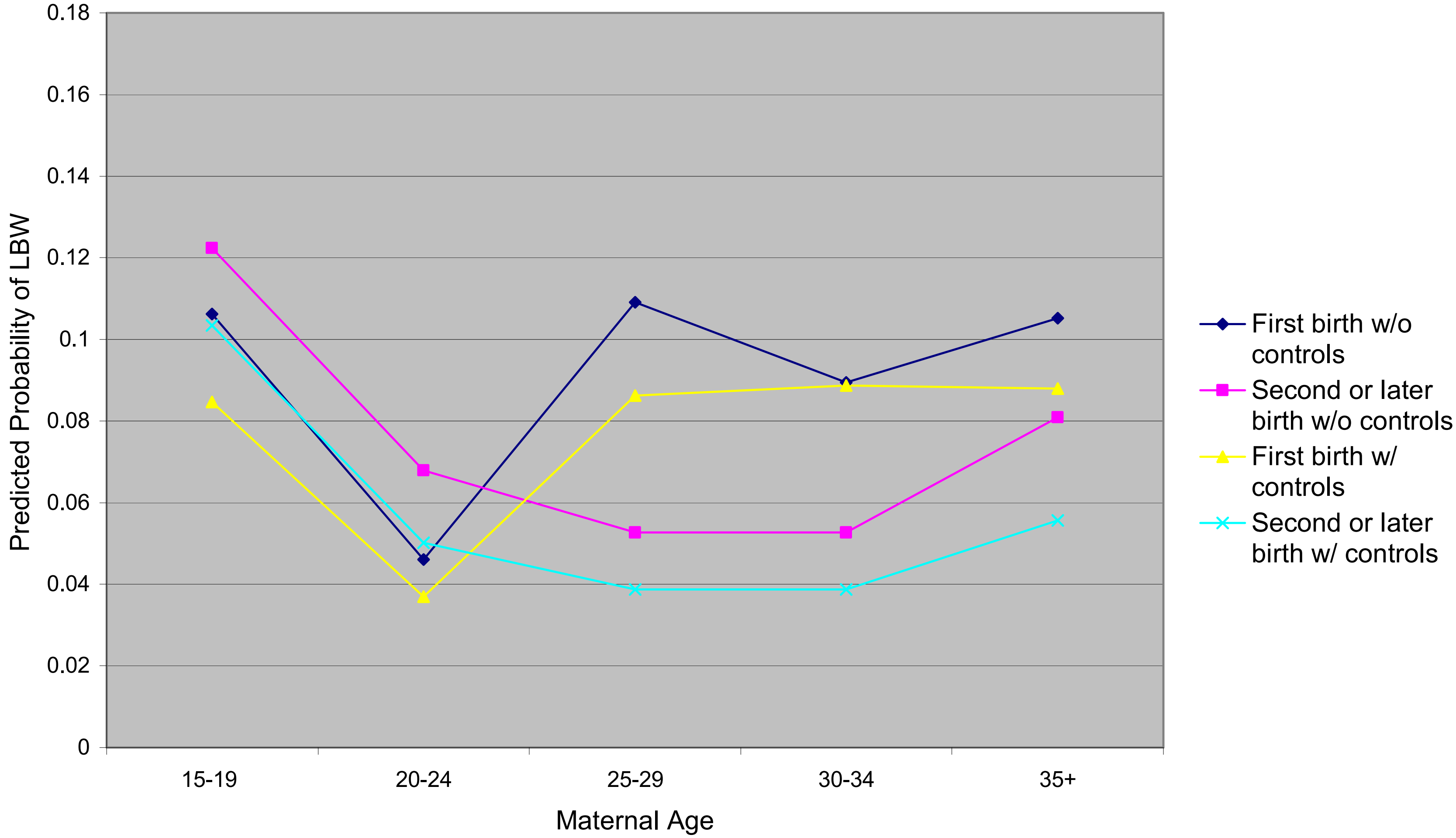

Figure 6.5. Predicted Probabilities of LBW Among U.S.-Born Hispanic Mothers by Maternal Age and Parity

Source: ECLS-B

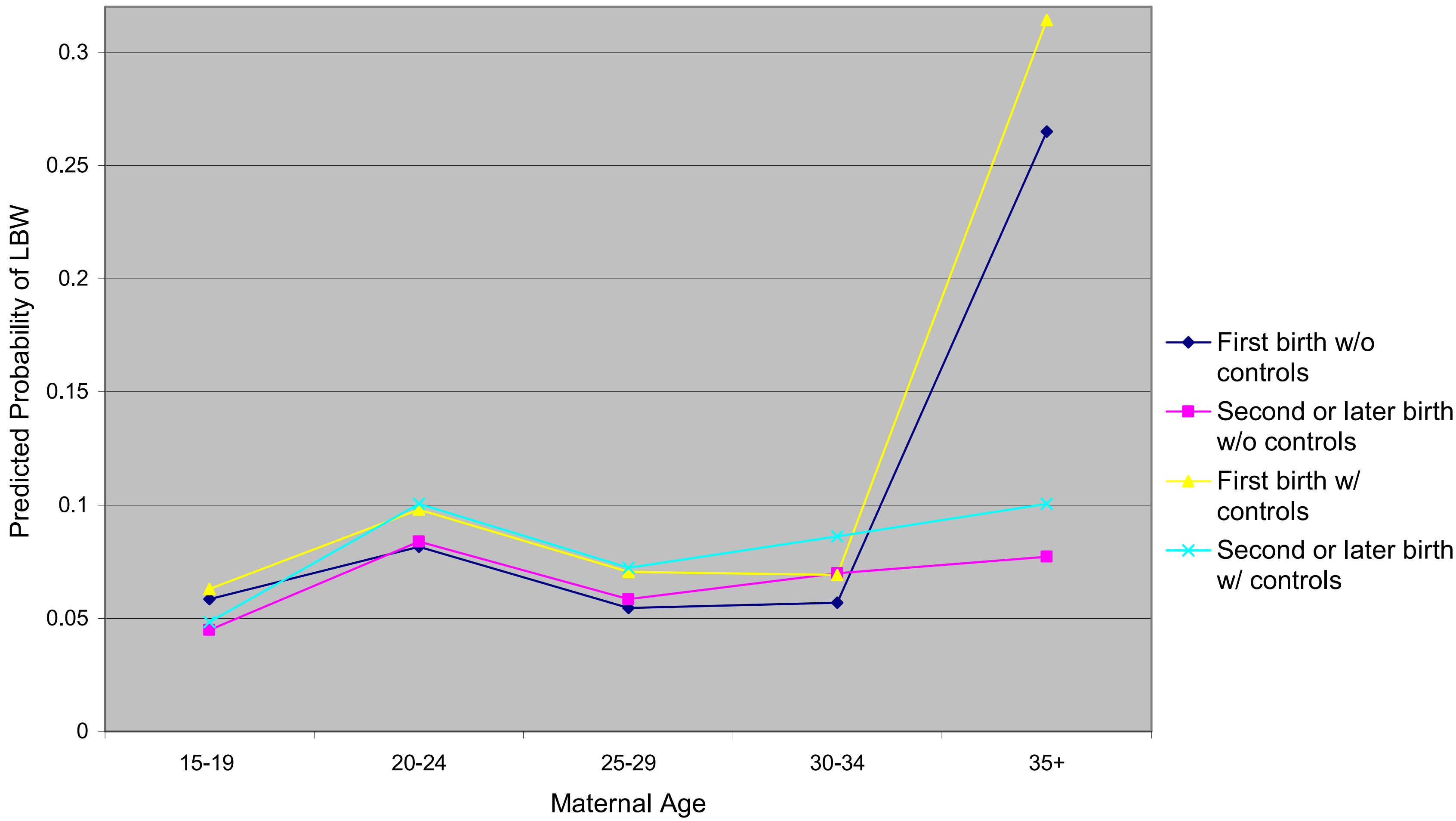

Figure 6.6. Predicted Probabilities of LBW Among Foreign-Born Hispanic Mothers by Maternal Age and Parity
Source: ECLS-B