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Childbearing Postponement and Child Well-being: A Complex and Varied Relationship?

Alice Goisis and Wendy Sigle-Rushton

RUNNING HEAD: Childbearing Postponement and Child Well-being

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Abstract Over the past several decades, U.S. fertility has followed a trend toward the postponement of motherhood. The socioeconomic causes and consequences of this trend have been the focus of attention in the demographic literature. Given the socioeconomic advantages of those who postpone having children, some authors have argued that the disadvantage experienced by certain groups would be reduced if they postponed their births. The weathering hypothesis literature, by integrating a biosocial perspective, complicates this argument and posits that the costs and benefits of postponement may vary systematically across population subgroups. In particular, the literature on the weathering hypothesis argues that as a consequence of their unique experiences of racism and disadvantage, African American women may experience a more rapid deterioration of their health, which could offset or eventually reverse any socioeconomic benefit of postponement. But because very few African American women postpone motherhood, efforts to find compelling evidence to support the arguments of this perspective rely on a strategy of comparison that is problematic because a potentially selected group of older black mothers are used to represent the costs of postponement. This might explain why the weathering hypothesis has played a rather limited role in the way demographers conceptualize postponement and its consequences for well-

being. In order to explore the potential utility of this perspective, we turn our attention to the UK context. Because first-birth fertility schedules are similar for black and white women, we can observe (rather than assume) whether the meaning and consequences of postponement vary across these population subgroups. The results, obtained using linked UK census and birth record data, reveal evidence consistent with the weathering hypothesis in the United Kingdom and lend support to the arguments that the demographic literature would benefit from integrating insights from this biosocial perspective.

Keywords: Childbearing postponement, Maternal age, Weathering hypothesis, Low birth weight, Ethnicity

Introduction

In the United States, as the mean age at first birth has steadily increased since the 1970s (Taylor et al. 2010), a body of evidence showing an association between teenage childbearing and poor outcomes, both for mothers and their children, began to emerge. Seen as more than a symptom of disadvantage and poverty, maternal age was understood to reflect improved socioeconomic status (SES) and parenting capacity (Geronimus and Thompson 2004). The advantages enjoyed by older mothers and their families were conceptualized as a consequence as much as a cause of their fertility postponement (Martin 2004). This socioeconomic or "developmental" perspective permeates much of the demographic literature, in which the heterogeneity in contemporary family patterns is often linked to diverging destinies for the children involved (McLanahan 2004). Mothers of one group of children follow a trajectory characterized by gains in resources derived from childbearing postponement; conversely, another group follows a trajectory characterized by early (often unmarried) childbearing, low education and employment investments, and a heightened risk of family instability (Martin 2004; McLanahan 2004). In particular, the diverging destinies

framework suggests that the disadvantage experienced by the latter group would be reduced if, similar to the more-advantaged population, they delayed the transition to parenthood.

In a separate body of literature, proponents of the weathering hypothesis (Geronimus 1992, 1996) have offered an alternative conceptualization of the relationship between childbearing postponement and well-being. Building on evidence that the health of disadvantaged African American mothers deteriorates faster than that of more-advantaged white women, this literature has argued that the physiological demands of childbearing might mean that at some point, the biological costs dominate any socioeconomic benefits of childbearing postponement for this subgroup of the population (Geronimus and Thompson 2004). Patterns of delay that appear to be beneficial to more-privileged white women who have adopted them, might lead to worse (rather than better) outcomes for African American women and their children.

It is perhaps not surprising that the weathering hypothesis literature has had little influence on the way demographers think about and conceptualize postponement. Given their persistently early fertility schedule, it is difficult to observe and assess how African American women and their children would have fared if those women had postponed their first births. As a consequence, we lack compelling evidence to support or refute the testable predictions of either of these two frameworks. Our aim in this article is to explore these two frameworks in a context where the selection mechanisms are different and therefore potentially informative. By turning our attention to the United Kingdom, where first-birth fertility schedules are similar for black and white women, we can observe rather than assume whether the meaning and consequences of postponement might vary by ethnicity. Although we do not argue that our results provide a test of what would happen in the United States if African American women postponed their first births, the patterns that we observe in the United Kingdom can contribute to debates about whether delays in first-birth fertility schedules can

be expected to be associated with similar levels of well-being for white and black mothers and their children.

Background

The weathering hypothesis was presented and developed during the 1990s to explain why African American women continued to enter parenthood at young ages when overall fertility trends showed evidence of widespread postponement.[1] It adopts a biosocial (in contrast to a socioeconomic or developmental) perspective on maternal age, which is seen as reflecting interactions between biological and social processes. Geronimus (1992), a key proponent of the weathering framework, argued that maternal age variables ". . . need to be seen as reflections of the ways in which socioeconomic inequality, racial discrimination and race bias in exposures to environmental hazards may affect differentially the health of women who will become mothers, not only in absolute terms but also interactively with each other and cumulatively with age." The weathering hypothesis presumes, for a variety of plausible reasons, that social inequality leads disadvantaged ethnic minority populations to experience a more rapid deterioration of their health compared with the more-advantaged white population. Impoverished people often lack access to (high-quality) health care, which is not a universal entitlement in the United States. In addition, patterns of residential segregation—which, in the United States, is also racial segregation—might expose ethnic minorities to environmental hazards (e.g., living in noisy areas; exposure to pollution) that exacerbate existing health problems and lead to new ones (Geronimus and Thompson 2004), which is a process likely to be amplified by behavioral stress responses, such as smoking or drinking (Geronimus et al. 1993). Drawing attention to the cumulative effects of these processes, the weathering hypothesis conceptualizes more-dramatically declining health as more of a cause than a consequence of early childbearing. To the extent that these same processes

[1] A few papers have looked for weathering among other ethnic groups (mainly Mexicans) and report mixed evidence (Khoshnood et al. 2005; Meadows et al. 2009; Wildsmith 2002).

compromise reproductive health and fetal development, an increasing maternal age at birth could be associated with worse (rather than better) birth outcomes—such as low birth weight—earlier in the mother's life course.

In general, a range of empirical evidence is consistent with the key tenets and predictions of the weathering hypothesis. Previous research in the United States shows that compared with white women, the health of African American women deteriorates more rapidly as they age. They are also reported to have higher allostatic loads, which previous research has established as a marker of poverty-related health conditions (Geronimus et al. 2006)[2] at any age, but particularly from age 35 onward (Chyu and Upchurch 2011; Geronimus et al. 2006). These conditions include an elevated risk of developing health conditions, such as hypertension, which can lead to complications that compromise fetal development (Geronimus 1996; Rich-Edwards et al. 2003); indeed, evidence exists that ethnic gaps in neonatal mortality, preterm birth, and low birth weight (LBW)—frequently used as outcome variables in these studies—increase with maternal age at birth (Geronimus 1996; Holzman et al. 2009; Rauh et al. 2001; Reichman and Pagnini 1997; Rich-Edwards et al. 2003; Shmueli and Cullen 1999). Consistent with the hypothesis that social inequality is linked to differential health trajectories, a number of studies have demonstrated that African American mothers exposed (as children and/or adults) to poorer environments experience a more rapid increase in the rates of LBW with increasing maternal age at birth (Geronimus 1996; Loveet al. 2010; Rauh et al. 2001).

The weathering hypothesis was developed with reference to an epidemiological framework linking health deterioration to social processes and in response to the more rapid health deterioration observed among African American women (Mosley and Chen 1984).

[2] The "allostatic load" refers to the price that the body pays for being forced to adapt to adverse psychosocial or physical situations, and it represents either the presence of too much stress or the inefficient operation of the stress hormone response system (McEwen 1998, 2000).

African Americans tend to occupy a marginal socioeconomic position as well, and the weathering hypothesis literature (at least initially) assumed that material deprivation and racism were both relevant but made little effort to evaluate the relative importance of each and the extent to which they might interact. The latter possibility is important. Over and above any direct effect of racism on health trajectories (Williams 1999), ethnic minorities might experience unique obstacles in their access to labor market opportunities, financial institutions, and health care services, all serving to reinforce and amplify the detrimental effects of material disadvantage (Smith et al. 2000; Williams and Mohammed 2009; Johnston and Lordan 2012). To test these ideas empirically, a number of more recent U.S. studies have attempted to conceptualize both dimensions as separate but potentially interactive processes. Geronimus (1996), for example, found no sign of important interactions between SES and maternal age for white mothers. Studies using a range of indicators of psychosocial stress provide further evidence that the combined effect of racism and poverty is particularly detrimental (Pearson 2008). Colen et al. (2006) showed that an increase in family income was significantly associated with decreased odds of LBW for white mothers but not for African American mothers (see also McGrady et al. 1992). Another study, which focused on the stress of living in a low-income neighborhood, found that age gradients in the risk of LBW are similar for white women regardless of where they grew up and live as adults (Love et al. 2010). On the other hand, Rich-Edwards and colleagues (2003) showed that white mothers with a similar set of risk factors (living in a poor neighborhood, smoking behaviors, and receiving health insurance) experience a rise in the risk of LBW with increasing maternal age at birth that is similar to what is observed in the African American population, suggesting that it is disadvantage, rather than its intersection with ethnicity, that plays a decisive role. Although questions remain about how disadvantage leads to poor health outcomes, the extant literature provides good evidence that relative to the overall white population, African

Americans have poorer health outcomes in general, and these ethnic differences tend widen with age. Of particular relevance to this study, black mothers in the United States experience poorer birth outcomes and at younger ages.

The Weathering Hypothesis: Conceptual Considerations

The weathering hypothesis, which focuses on processes linking the timing of childbearing to well-being and suggests that we should be cautious in generalizing the benefits of postponement across population subgroups, might at first glance seem incompatible with the diverging destinies perspective, which is prominent in much of the demographic literature. If we assume that (white) women who already postpone childbearing represent the relevant counterfactual, we might conclude that the destinies of African American women would be less disadvantaged and divergent if they delayed childbearing. The evidence presented by the weathering hypothesis complicates and adds nuance to this assumption. However, given that few African American women postpone parenthood, selection bias is a serious concern. In the U.S. context, both perspectives are based on largely untestable assumptions about the relevant counterfactual: that is, what African American women's outcomes would be if they began to postpone the transition to parenthood.

One way to begin exploring the potential for greater theoretical integration is to turn our attention to the United Kingdom and investigate whether we see evidence consistent with the weathering hypothesis in this context. Similar to the United States, black women in the United Kingdom are subject to discrimination and racism. Researchers have demonstrated that black people in the United Kingdom face substantial discrimination in the labor market (Muennig and Murphy 2011), and Becares et al. (2012) suggested that Caribbean people living in the United Kingdom tend to report more experiences of interpersonal racism (such as physical attacks, property damage, or being the victim of verbal abuses for reasons related to their race or color) than other ethnic groups. Furthermore, blacks are also more likely (than

whites and Asians) to be stopped and searched by the police (Bowling and Phillips 2003). Nonetheless, in the United Kingdom, black and white mothers have similar first-birth fertility schedules (Robson and Berthoud 2006) and, in contrast with the United States, have similar patterns of postponement. The UK context allows us to observe (rather than assume) whether postponement might reflect different processes across population subgroups.

To date, there has been virtually no research on the weathering hypothesis in the United Kingdom. Evidence reveals that UK black women have, on average, worse health profiles than white women and an average black-white gap in LBW that is similar to the gap observed in the United States (Teitler et al. 2007). However, we do not know whether these disparities widen substantially with increasing (maternal) age. Even if the weathering is likely to occur, there are reasons to think that ethnic differences in health and health trajectories might be less marked in the United Kingdom than in the United States. First, the UK health system is universal and free at the point of service, which suggests a more protective health environment than in the United States, particularly for disadvantaged and ethnic minority groups. Second, although previous research has demonstrated health disparities by income levels, the magnitude of the difference does not widen in older age groups, as a broader interpretation of the weathering hypothesis would predict (Martinson 2012). Third, the education and employment profiles of black and white mothers do not differ markedly (Hills et al. 2010; Jayaweera et al. 2007). Employment rates of black Caribbean and white mothers in the United Kingdom are roughly the same (Sigle-Rushton and Perrons 2006); and although they are lower for black African mothers, they are much higher for the latter than for Pakistani and Bangladeshi. But notwithstanding the protective UK context and relatively similar fertility profiles of white and black mothers, we know that the latter are less likely to be married at the time of birth (Kiernan and Mensah 2010), and we expect racism and discrimination to have physiological consequences and to reduce returns to their human

capital investments. Indeed, researchers have documented that despite small black-white differences in investments in education in the United Kingdom, there are persistent ethnic gaps in income, housing quality, and occupational status (Hills et al. 2010; Muennig and Murphy 2011; Peach 2005).

For these reasons, we think that the UK context provides an informative case study. It allows us to contribute to the literature by establishing whether we find evidence consistent with the weathering perspective in a context where black women postpone and—consistent with the logic of the diverging destinies perspective—accumulate resources through investments in education and employment (but not marriage) prior to becoming parents. If the answer is yes, ethnic minority status could represent, as some existing weathering studies seem to suggest, a unique risk to longer-term health and one with implications for birth outcomes. Such findings would also lend support to the hypothesized relationship between racial discrimination and more rapidly declining health.

Method

In this article, we investigate whether patterns consistent with the weathering hypothesis are observed in the United Kingdom. To do so, we analyze maternal age gradients in LBW for children of black and white mothers. Because LBW has been extensively used in the weathering hypothesis literature as a marker of child health as well as mother's health (Geronimus 1996), it seemed to be the most appropriate indicator, given the objectives of this study.

The analyses begin with an examination of overall (i.e., unadjusted) black-white differences in LBW in the UK context. Then, to assess whether ethnic minority status could represent a unique risk in the way maternal age relates to child well-being, we conduct a set of additional analyses isolating and intersecting socioeconomic disadvantage and ethnic minority status. We do so by comparing age gradients for relatively disadvantaged and

advantaged black and white mothers. We examine the extent to which socioeconomic disadvantage within ethnic groups underpins any observed differences in age gradients in LBW and the extent to which, across socioeconomic groups, ethnic minority status reinforces any negative association between exposure to social inequality and health deterioration processes.

Data

Most of the existing weathering hypothesis studies use vital statistics data. Because these data in the United Kingdom do not provide information on the mother's ethnicity, we use data drawn from the ONS Longitudinal Study (LS)—a data set that contains the anonymized census records (containing members' demographic characteristics) for about 1 % of the population of England and Wales, which are linked to vital (e.g., births) registration data (Hattersley and Creeser 1995). Individuals qualify as members of the LS if their birthday coincides with one of the four (confidential) LS "birthdates."[3] Because 85 % of the UK population lives in England and Wales (i.e., only 15 % reside in Northern Ireland and Scotland), we refer to the United Kingdom as the context under study in this article, although strictly speaking, the analyses are limited to the population of England and Wales. Compared with other UK data sources, one of the clear advantages of the LS is that it provides many years of data such that we can obtain a sample that is large enough to carry out the analyses for black and white mothers. Our analyses focus on first births that occurred between 1989 and 2009.[4] To conduct the second set of analyses, which makes use of information about place of residence at the time of the census (as we explain in more detail later), we use a subset of births that took place closer to the enumeration date.

Measures

[3] Losses to the sample occur because of death and out-migration of LS members, but the sample is maintained through addition of immigrants and new births with LS "birthdates."

[4] When this research was conducted, 2009 was the last available year of vital registration data in the ONS LS.

The outcome variable is LBW, a binary indicator that takes the value of 1 when the child's birth weight is less than 2.5 kg. Our analytic sample comprises white and black African and Caribbean mothers.[5] The black Caribbean and African groups are different in some respects that are relevant to our study. Both groups, however, face social and institutional discrimination, and their birth schedules and socioeconomic profiles do not differ substantially from one another or from that of the white population. The prevalence of teenage births in the United Kingdom has been found to be almost identical between white and black African women; the prevalence of teenage births is higher for black Caribbean than for whites, but differences are much smaller (across the entire fertility schedule) than between white and South Asian Muslim (Pakistani or Bangladeshi) women (Robson and Berthoud 2006). In terms of educational attainment and labor market outcomes, black African women are more likely than black Caribbean women to hold degree-level qualifications but also to hold no qualifications at all (Lindley et al. 2006; Sigle-Rushton and Perrons 2006), although black Caribbean mothers have particularly high employment rates. Because black African women who have migrated at adult ages and are more likely to differ from the black Caribbean (mostly UK-born) women, we exclude women who were born abroad and not registered in the LS by age 15.[6]

The analyses focus on first births and exclude higher-order births, consistent with our interest in the costs and benefits of childbearing postponement. Because fertility information in the LS is obtained through birth records, some higher-order births may be misclassified as first births. This is primarily an issue for births to women who have ever lived outside

[10] U.S.-born blacks have a similar lineage to the native-born black Caribbean in the United Kingdom (Muennig and Murphy 2011; Peach 2005), who have a less-recent migration history than the black African population (which is also a demographically mixed group). Sample size issues meant that black African and Caribbean mothers could not be analyzed separately and similarly to other studies (Muennig and Murphy 2011), they are grouped into a single category.

[6] Registration into the LS occurs via registration to NHS.

England and Wales and who are not married at the time of birth. When the child is born within marriage, the birth registration form includes information of whether the mother had any previous birth (live or still). Otherwise, this information is not available (Hattersley and Creeser 1995). Excluding LS members who are having their (apparent) first LS birth outside marriage would cause serious problems of sample selection. Therefore, in addition to reducing differences in the black African and Caribbean group, restricting our attention to England and Wales–born mothers and to those who were born abroad but registered in the LS by age 15 is a strategy that considerably reduces the likelihood of misclassification of higher-order births.

When, in the second set of analyses, we classify mothers as living in relatively advantaged/disadvantaged areas, we rely on both an area- and individual-level measure of advantage/disadvantage, both of which are available only in the census records. To look at area-level advantage/disadvantage, we use the Carstairs Index of mothers' place of residence in either the 1991 or 2001 census, which is a ward-level measure.[7] We categorize mothers as relatively disadvantaged if they live in one of the poorest wards (i.e., in the lowest quintile of the Carstairs Index) of England and Wales and as relatively advantaged if they live in one of the richest wards (i.e., in the highest quintile) of England and Wales. We therefore exclude mothers living in the second, third, and fourth (i.e., middle) quintiles. Because the Carstairs Index describes women's circumstances at the time of enumeration, in the analyses that make use of it, we restrict our sample to first births occurring at about the time the census data were collected (1991 and 2001); however, because of sample size issues, we expand the temporal window a few years before and after 1991 (i.e., 1989–1994) and 2001 (i.e., 1999–2004). Because racial residential segregation means that very few black mothers live in the most-advantaged areas (i.e., highest quintile of the Carstairs Index), we are unable to estimate age

[7] The Carstairs Index is an unweighted combination of four census variables: unemployment, overcrowding, car ownership, and low social (occupational) class (Morgan and Baker 2006).

gradients in LBW for this subgroup. For this reason and to explore whether area-level and individual-level measures operate similarly, we examine age gradients in LBW by mothers' education. We categorize mothers having A-levels[8] (or equivalent professional qualification) as "highly" educated, which would correspond to "some college" in U.S. terms. As for the characteristics of mothers' area of residence, information on mothers' level of education is not available on the birth record but is on the census. We construct the variable based on mothers' level of education in the 2001 census, which is the most recent census data point when this research was conducted. This means that for births that occurred between 1989 and 2000, we categorize mothers based on a measure of education observed after they gave birth. Conversely, for births that occurred from 2002 onward, we classify mothers based on a measure of education that is observed before the time of birth. Details are provided in Online Resource 1. In the absence of an exact measure of the mother's level of education at the time of conception or birth, the results must be interpreted cautiously. Table 1 summarizes the years and samples analyzed.

[Place Table 1 here]

To establish whether we see patterns consistent with weathering in the UK context, we estimate logistic models of LBW, which control for maternal age with a cubic specification (terms for age, age squared, and age cubed). The weathering hypothesis posits that for African American mothers the risk of poor child health, is reduced at young maternal ages, but medical evidence suggests that births at the youngest ages also carry high risk (Amini et al. 1996). A cubic specification allows the age gradient to fall and rise with age

[8] We classify mothers as having low (less than A-levels) or high (A-levels and above) education. A-levels in England and Wales are studied over a two-year period from approximately age 17 to 18. They are the standard for assessing the suitability of students for progressing to higher education and are, under the international ISCED codes, categorized as "above secondary education."

more flexibly than a quadratic.[9] Our results are robust to different specifications of age (e.g., quadratic, discrete age categories, and nonparametric specification). Graphs showing predicted probabilities allow us to assess whether and to what extent we observe a pattern consistent with the predictions of the weathering hypothesis.

Additional logistic models are estimated separately for black and white mothers, by residential area characteristics and educational levels. All models include a control for nativity (reference, England and Wales–born) to account for the fact that mothers have had different length of exposures to the UK context. They also include controls for basic child characteristics: namely, sex and whether the child is a twin. The model analyzing overall black-white age gradients in LBW include five years' time dummy variables (with 2005–2009 as the reference category). The models stratifying mothers as living in relatively advantaged/disadvantaged areas (using births around the 1991 and 2001 censuses) include a control for births occurring between 1989 and 1994 (with births occurring between 1999 and 2004 as the reference category).[10]

Results

Black-White Age Gradients in LBW

To assess whether patterns consistent with the tenets of the weathering hypothesis are observed in the United Kingdom, we analyze age gradients in LBW for black and white mothers having their first birth between 1989 and 2009. Table 2 reports the prevalence of LBW and the distribution of first births across maternal age categories for black (which groups black African and Caribbean) and white mothers. Maternal age is divided into three categories based on the overall distribution of first births in England and Wales between 1999

[9] Model fit tests indicate that adding a cubic term for age significantly improves the model fit when estimating the models for black mothers. For consistency, we estimate the models for white mothers with a cubic specification as well.

[10] We conducted a series of robustness checks, which are discussed (but not shown) in Online Resource 1.

and 2009. The mean age at first birth in England and Wales rose from 25.4 in 1989 to 27.6 in 2009 (ONS 2011). Therefore, we chose age 30 as the lower cutoff for the "older" age category because it is well above the mean age at first birth. Conversely, we chose age 23 as the upper cutoff for births occurring at "younger" ages because it is well below the mean age at childbearing in that period and because previous research has shown that births to women in their early 20s appear to be linked to disadvantaged outcomes (Hobcraft and Kiernan 2001). The middle age group refers to births occurring between ages 23 to 29. The distribution of first births for the two ethnic groups is similar, a pattern consistent with evidence from the UK Labour Force Survey for year 1992–2000 inclusive (Robson and Berthoud 2006). The risk of LBW is considerably higher for black[11] (10 %) than for white (7 %) mothers, which is a pattern in line with existing U.S. and UK evidence (Teitler et al. 2007). In addition, the prevalence of LBW for black mothers shows a marked age gradient; the increase between the young/middle and older age group is almost twofold. In contrast, the pattern for whites is consistent with what we know about age-related pregnancy complications. Although fairly flat, the risk of LBW decreases and then increases with maternal age.

[place Table 2 about here]

Table 3 reports the results of logistic models that compare black-white age gradients for first births in the risk of LBW, while controlling for year dummy variables, basic child characteristics, and maternal nativity. The coefficients for maternal age at first birth are statistically significant (at the 5 % level) in the model estimated on the subsample of black mothers only. For both ethnic groups, twin births are significantly more likely to be LBW; for whites only, girls are significantly more likely to be born with LBW. The foreign-born black

[11] Results not shown here reveal that although the mean prevalence of LBW is higher for black Caribbean than for black Africans, it markedly increases with maternal age for both groups.

mothers in our sample (all of whom migrated prior to age 15) are less likely to have a LBW child than their native-born counterparts (significant at the 1 % level), but maternal nativity is not associated with LBW for white mothers. White foreign-born mothers in our sample are more likely to come from other OECD countries and are more similar (in health status) to native-born whites.

[Place Table 3 about here]

To facilitate interpretation of the age terms, Fig. 1 plots the predicted probabilities of LBW (with 95 % confidence intervals) from ages 16 to 40, using the regression coefficients reported in Table 3. Figure 1 shows that the black-white gap in LBW widens with maternal age from the late 20s onward. Both relative to black mothers and in absolute terms, the age gradient for white mothers is fairly flat, showing slightly higher predicted probabilities at extreme ages. The flatness of the age profile for whites might suggest that, consistent with the diverging destinies perspective, the higher social status associated with fertility postponement (Rendall et al. 2009) compensates for increased risk of health complications that accompany later childbearing (Goisis 2011). The age gradients for black and white mothers differ significantly (at the 1 % level; prob > chi-squared = .002). The age gradient for black mothers falls and rises with maternal age, following an inverse J-shape (supporting the inclusion of a cubic term of maternal age at birth), but that of white mothers follows a mild U-shape. The results suggest that despite their postponement and despite their investments in education and employment, which are facilitated by postponement, evidence exists that in the United Kingdom, the age gradient in LBW of black mothers rises more quickly than that of white mothers. To the extent that LBW can be seen as reflecting something about the mother's health as well, the results suggest that the health of the former deteriorates more quickly relative to the health of the latter group.

[place Figure 1 about here]

Isolating and Intersecting Ethnicity and Disadvantage

The United Kingdom offers the opportunity to explore the role of disadvantage and ethnic minority status because black women in the United Kingdom live in a more protective environment than those in the United States but are still subject to a good deal of discrimination and racism. In order to investigate the extent to which overall black-white age gradients in LBW are related to ethnic minority status or material disadvantage, and whether the two interact to amplify the health deterioration processes, we estimate models separately by area- and individual-level advantage/disadvantage.

We classify women into relatively advantaged (for white mothers) versus disadvantaged (for white and black mothers) areas on the basis of the Carstairs Index. The analyses focus on first births occurring between 1989–1994 and 1999–2004 (as described in detail in the Methods section). Table 4 presents the distribution of first births and the prevalence of LBW for relatively advantaged white and disadvantaged white and black mothers. As we mention earlier, the sample provides an insufficient number of black mothers living in advantaged areas; therefore, we are unable estimate models for this subgroup. There is a marked difference in fertility schedules among white mothers based on their area of residence. The distribution of first births for white mothers living in relatively advantaged areas is highly skewed toward older ages, although that of white mothers living in disadvantaged areas is skewed toward younger ages. In contrast, the distribution of first births for disadvantaged black mothers looks similar to the distribution of the overall black sample in Table 2, which is not surprising given that most black mothers in our sample live in relatively disadvantaged areas.

[place Table 4 about here]

The average proportion of LBW births is higher for white mothers living in relatively disadvantaged areas than for those in relatively advantaged ones. There is almost no evidence

of a widening gap with increasing maternal age, however. In contrast, the differential risk of LBW for relatively disadvantaged black mothers increases markedly with maternal age. Although the mean prevalence of LBW is lower for this subset of disadvantaged black mothers than for the overall mean for black mothers presented in Table 2 (mean LBW 9.9 %), this subsample of disadvantaged black mothers is slightly less likely to give birth after age 30, when the risk of LBW is high. Although the risk of LBW after age 30 is higher for this more-disadvantaged group than for the full sample of black mothers, the sample is considerably smaller (N = 260), and estimates are imprecise.

Table 5 presents the results of logistic models, and Fig. 2 shows predicted probabilities of LBW (with 95 % confidence intervals) only up to age 35 given that there is a small number of black mothers living in disadvantaged areas who give birth after this age.[12] We begin by comparing the age gradients for the relatively advantaged and disadvantaged white sample, and we then continue by comparing those of relatively disadvantaged white and black mothers.

[place Figure 2 and Table 5 about here]

Although the predicted probabilities in Fig. 2 show a very minor widening of the gap in LBW for white mothers residing in relatively disadvantaged and advantaged areas toward older ages (around age 30), differences in the predicted age gradients of advantaged and disadvantaged white mothers are not statistically significant (prob > chi-squared = .324). Because we exclude black mothers from this comparison, the results provide evidence that rejects the hypothesis that the widening of the black-white gap in LBW can be entirely attributed to greater exposure to disadvantage of the former group. Although relatively disadvantaged white mothers are, on average, more likely to give birth to a LBW child, the two groups have quite similar and flat age gradients of LBW. However, interpreting

[12] Specifically, 9.2 % of births to black mothers occur after age 35 (N = 24).

differences (or lack thereof) in age gradients between relatively disadvantaged and advantaged whites is complicated by the fact that the two groups have very different fertility schedules. Indeed, the absence of a widening gap could be at least partly due to the fact that many disadvantaged white mothers conceive their first births at younger ages, when their health is more favorable and before it eventually deteriorates—mirroring the methodological problem that characterizes white-black comparisons in the U.S. setting.

In contrast, the age coefficients for relatively disadvantaged black mothers are statistically significant (at the 5 % level). Notwithstanding the large confidence intervals, which reflect the challenge represented by the small sample of disadvantaged black mothers, the age gradient of LBW for black mothers differs (at a 10 % level of significance; prob > chi-squared = .083)[13] from that observed for the relatively disadvantaged white sample.[14] Table 5 also shows that differences in fertility schedules between disadvantaged white and black mothers are reduced compared with those between relatively advantaged and disadvantaged whites. Figure 2 shows that although the predicted probability (with 95 % confidence intervals) of giving birth to a LBW child is lower for black mothers than it is for (both advantaged and disadvantaged) white mothers until the mid-20s, the gap reverses and increases with maternal age. The shape of the age gradient for black mothers in Fig. 2 is similar to the one presented in Fig. 1.

Finally, we estimate a similar set of models using mothers' educational level. Although our measure of education has some limitations, the results are informative for two main reasons. First, they allow us to estimate age gradients for a relatively advantaged group of black mothers, which we are unable to analyze when looking at area-level

[13] The significant result is driven by group differences at both younger and older ages, although the latter is of greater interest for this study.

[14] Similarly to what we argue in the previous paragraph, the distribution of first births of these two groups is also different, with the black sample placed between the advantaged and disadvantaged white mothers.

disadvantage/advantage. Moreover, they enable us to assess that the findings obtained when looking at area-level measures are robust to the choice of indicator of disadvantage. Table 6 reports the descriptive results. In terms of distribution of first births across the age categories, we see a pattern consistent with that shown in Table 4. Moreover, the distribution of births for highly educated black and white mothers is remarkably similar. In addition, an education gradient in LBW is apparent: within both ethnic groups, the more-educated have a lower risk of LBW than the less-educated. The results reveal that the risk of LBW is particularly high for low-educated black women. In addition, highly educated black mothers experience higher mean LBW than white mothers, regardless of their education level; in addition, they have a higher risk of LBW at older ages than do low-educated white mothers.

[place Figure 3 and Tables 6 and 7 about here]

Table 7 presents logistic models estimated separately by ethnicity and education, and Fig. 3 shows the predicted probabilities of LBW, which are computed for the age range 21–35 given that few births to white and, especially, black highly educated mothers occur before and after these ages.[15] The confidence intervals of the age gradients for both more-educated and less-educated black mothers are wide. Nonetheless, the results are in line with what we observe in Fig. 2. On average, the risk of LBW is higher (this time, significantly; prob > chi-squared = .0081) for low-educated white mothers than for more highly educated white mothers, but there is no evidence of a widening gap with increasing maternal age at first birth. Moreover, similarly to Fig. 2, there is evidence of a significant (prob > chi-squared = .0181) widening of black-white gaps in LBW among less-educated mothers. Ultimately, the analyses by education allow us to look at patterns for more-advantaged black mothers. The confidence intervals are remarkably wide, suggesting that the predicted probability is not precisely estimated; but rather, what emerges is that the risk of LBW at any given age is

[15] 10.7 % (N = 29) and 5.9 % (N = 16) of births to black educated mother occur, respectively, after age 35 and before age 21.

lower for more-educated black mothers than for less-educated black mothers, and the differences widen with age. This is consistent with the extant literature on the weathering hypothesis, showing that the increase in rates of LBW with maternal age is more pronounced among disadvantaged African American mothers than among more-advantaged ones (Geronimus 1996). Compared with more-educated white mothers, the risk of LBW is higher for more-educated black mothers, and the difference appears to increase with age. The parameter estimates are imprecise, however, and differences between highly educated white and black mothers are not significant at conventional levels.

Notwithstanding the fact that we are not able to directly test the process linking ethnicity and health, the results by both area-level and individual-level disadvantage are in line with an argument that ethnic minority status could represent an added and modifying burden in health deterioration processes.

Conclusion

The literature on the weathering hypothesis, which emerged in the United States during the 1990s, posits that the costs and benefits of postponement may vary systematically across population subgroups. This framework, which focuses on important processes linking postponement to well-being, has had limited influence on how the timing of fertility is conceptualized and discussed in the demographic literature. One reason for this may be related to the evidence base. Substantial differences in first-birth fertility schedules between white and African American mothers in the United States mean that efforts to find compelling evidence in support of weathering rely on a potentially problematic counterfactual: namely, the rare and presumably select group of older African American mothers. In this article, we look for evidence of weathering using a sample drawn from the United Kingdom, where first-birth fertility schedules of black and white mothers are relatively similar.

The results reveal a marked widening of the black-white gap in LBW with increasing maternal age at first birth, which is similar to what has been reported in the United States. If LBW is a valid indicator of health, well-being, and subsequent disadvantage (Reichman 2005), the finding that older black mothers are at higher risk of giving birth to a LBW child could indicate that the extent to which socioeconomic resources accumulate with postponement may, in line with the weathering hypothesis, differ for white and black mothers. Patterns of residential disadvantage in the United Kingdom, which show very few black women in the top quintile of the Carstairs' Index despite their fertility patterns (and the investments in education and employment that postponement allows), lend support to this hypothesis. Moreover, our results indicate that being a black mother may confer risks for health deterioration processes that amplify the effect of low SES.

Clearly, substantial differences between the United States and the United Kingdom imply that this finding should not be interpreted as an indication of what the experiences of African American women would look like if they were to postpone childbearing. Indeed, the results can be seen as lending support to the possibility that the association between postponement and well-being may vary not only among subpopulation groups but also across contexts (UK vs. United States). Although a direct comparison with results reported in the U.S. literature is impossible (e.g., because of the different patterns of selection and differences in how maternal age is measured across studies), broadly speaking, evidence suggests that the risk of LBW in the United Stated starts rising beginning in the early 20s (Geronimus 1996), whereas in our study, this seems to occur after the mid-20s. In the United Kingdom, where black women have long had good access to health care, relatively high levels of educational attainment, and strong attachment to the labor market, the "inflection point" (the age at which the rates of LBW start to markedly rise) seems to be observed later (after mid-20s) than in the United States (early 20s). If the interaction between the social and

biological component of maternal age is intertwined with the institutional context and how different groups experience it, this is not just theoretically relevant but also policy-relevant. Conceptual frameworks that incorporate heterogeneity of this kind would make it easier to identify entry points for policy interventions and to assess the potential impact of these interventions.

Although our findings raise some intriguing questions about how postponement is conceptualized and suggest some fruitful avenues for future research, this study has some limitations that must be considered while interpreting the results. First, the sample of black mothers is small, especially for the analyses that include measures of (individual- and area-level) disadvantage/advantage. As a result, some of the parameters in the analyses stratified by disadvantage and the inflection point (the age at which the rates of LBW start to markedly rise) are not precisely estimated. We also had concerns about the quality of information on disadvantage available in our data. First, area-level disadvantage is measured at a single point in time, close to when the mother has her first birth. As a consequence, we were unable to assess whether the age gradient for disadvantaged black mothers rises more rapidly with age because they experience lifelong exposure to poor environmental conditions to a larger extent than disadvantaged whites (Do et al. 2012) and/or live in the more disadvantaged end of the poorer areas. Similarly, our measure of educational attainment was measured at a single point in time and thus provides information on attainment at the time of the 2001 census rather than at the time of birth. Notwithstanding these data limitations, the UK context offers a unique perspective (compared with what is possible in the U.S. context) because its first-birth fertility schedules are similar for black and white women. Moreover, no other UK data source would have enabled the research questions of this study to be addressed with a larger sample and more precise measures of disadvantage.

Taken together, our findings can be read as an effort to stimulate discussion, debate, and further research into how fertility postponement is conceptualized, analyzed, and understood by demographers. In particular, we would like to encourage efforts to integrate and test some insights from the weathering hypothesis to enrich and explore ways that we might add nuance to the diverging destinies framework. Our findings suggest that a framework in which black mothers benefit from postponing their first births up to a point but that allows for the balance of costs and benefits to differ from what is observed in the white population may contribute new and useful knowledge. Although we think that greater efforts to integrate the weathering hypothesis into the diverging destinies framework could be fruitful, more work is needed before we can draw any firm conclusions. The case for theoretical integration will be bolstered by efforts to understand how the two frameworks are related. For example, the weathering literature has tended to focus on measures of birth outcomes (LBW has figured prominently), whereas the diverging destinies literature has tended to focus on children's life chances and thus to use measures of cognitive and social development (McLanahan 2004). It is not clear that evidence of gaps in LBW implies that we would see similar gaps in these other measures of well-being. Future research should examine the life chances of the children of older black mothers using these indicators as outcome variables.[16] Similarly, research exploring the potentially complex (Boardman et al. 2002; Gorman 2002) relationship between LBW and subsequent life chances would aid efforts to bring these two literatures together. Although the relevant indicators are not available in the ONS LS and are thus beyond the scope of the analysis we present here, the new UK Life Study[17] will provide opportunities for this sort of analysis in the near future.

[16] Geronimus et al. (1994) analyzed the association between (young) maternal age and child well-being by looking at children's cognitive and behavioral outcomes. Their analyses controlled for, but were not stratified by, ethnicity.

[17] Details of the study can be found online (http://www.lifestudy.ac.uk/homepage).

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Table 1 Samples of analysis

	Births Years	Birth Sample
Overall Black/White Age Gradients in LBW	First births 1989–2009	Black (*N* = 708) and white (*N* = 45,148) mothers
Age Gradients Stratified by Area-Level Advantage/Disadvantage	First births 1989–1994 and 1999–2004	Living in advantaged-areas white (*N* = 3,037) mothers, Disadvantaged-areas white (*N* = 7,334) and black (*N* = 260) mothers
Age Gradients Stratified by High/Low Education	First births 1989–2009 – excluding births that occur after 2004–2003 to mothers aged 13–14 in 2001	Low educated white (*N* = 26,511) and black (*N* = 329) mothers, high educated white (*N* = 13,713) and black (*N* = 271) mothers

Table 2 Distribution of first births and prevalence of LBW by ethnic group and maternal age (first births 1989–2009)

	White		Black	
	% Births	% LBW	% Births	% LBW
Maternal Age at First Birth				
14–22	28.8	7.4	27.5	7.7
23–29	40.7	6.6	39.1	6.5
30+	30.6	7.5	33.3	15.7
Mean LBW	7.1		9.9	
Migrant	4.2		30.2	
Total *N*	45,148		708	
Pearson Chi-Squared (LBW)	0.001		0.001	

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Table 3 Logistic regression results on LBW for black and white mothers (first births 1989–2009)

	White	Black
Mother's Age	–0.231†	–1.702*
	(0.130)	(0.731)
Mother's Age, Squared	0.005	0.058*
	(0.005)	(0.026)
Mother's Age, Cubed	–0.000	–0.001*
	(0.000)	(0.000)
Girl	0.142**	0.360
	(0.038)	(0.270)
Twin	3.114**	3.073**
	(0.084)	(0.629)
Migrant	–0.115	–0.908**
	(0.099)	(0.348)
1989–1994	0.206**	0.409
	(0.054)	(0.399)
1995–1999	0.165**	–0.211
	(0.057)	(0.444)
2000–2004	0.223**	–0.025
	(0.058)	(0.428)
Constant	–0.150	12.806*
	(1.151)	(6.521)
N	45,148	708
Pseudo-R^2	.106	.057

Note: Standard errors are shown in parentheses.
†$p < .10$; *$p < .05$; **$p < .01$

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Table 4 Distribution of first births and prevalence of LBW for mothers living in relatively disadvantaged/advantaged areas by ethnic group and maternal age (first births 1989–1994 and 1999–2004)

	Advantaged Area, White		Disadvantaged Area, White		Disadvantaged Area, Black	
	% Births	% LBW	% Births	% LBW	% Births	% LBW
Maternal Age at First Birth						
14–22	14.6	7.9	40.9	8.3	30.8	6.1[a]
23–29	42.1	5.9	38.7	7.3	38.5	
30+	43.3	7.4	20.4	8.2	30.8	16.3
Mean LBW	6.8		7.9		9.2	
Migrant	5.2		4.1		29.6	
Total *N*	3,037		7,334		260	
Pearson Chi-Squared (LBW)	0.194		0.328		0.03	

[a]Because of disclosure control on cell size, the first two age categories for disadvantaged black mothers had to be grouped together.

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Table 5 Logistic regression of LBW for mothers living in relatively disadvantaged/advantaged areas by ethnic group and maternal age

	Advantaged Area, White	Disadvantaged Area, White	Disadvantaged Area, Black
Mother's Age	–0.083	–0.131	–3.252*
	(0.584)	(0.305)	(1.367)
Mother's Age, Squared	0.001	0.001	0.121*
	(0.021)	(0.011)	(0.052)
Mother's Age, Cubed	0.000	0.000	–0.001*
	(0.000)	(0.000)	(0.001)
Girl	0.132	0.133	0.389
	(0.152)	(0.089)	(0.470)
Twin	3.192**	3.074**	3.305**
	(0.271)	(0.230)	(1.068)
Migrant	–0.365	–0.040	–0.611
	(0.381)	(0.229)	(0.582)
1989–1994	0.032	–0.004	0.700
	(0.157)	(0.090)	(0.532)
Constant	–1.566	–0.617	24.033*
	(5.370)	(2.633)	(11.422)
N	3,037	7,334	260
Pseudo-R^2	.087	.045	.132

Note: Standard errors are shown in parentheses.
*$p < .05$; **$p < .01$

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Table 6 Distribution of first births and prevalence of LBW for mothers with high/low education by ethnic group and maternal age (first births 1989–2009)

	High Education, White		Low Education, White		High Education, Black		Low Education, Black	
	% Birth	% LBW	% Birth	% LBW	% Birth	% LBW	% Birth	% LBW
Maternal Age at First Birth								
14–22	8.9	5.3[a]	30.5	7.4[a]	12.6	6.5[a]	31.0	7.1[a]
23–29	41.6		44.4		44.3		38.0	
30+	49.5	6.3	25.1	8.5	43.2	11.1	31.0	19.6
Mean LBW	5.8		7.7		10.9		8.5	
Migrant	24.9		3.2		34.0		24.9	
Total *N*	13,713		26,511		271		329	
Pearson Chi-Squared (LBW)	0.004		0.002		0.345		0.003	

[a]Because of disclosure control on cell size, the first two age categories had to be grouped together.

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Table 7 Logistic regression of LBW for mothers living in relatively disadvantaged/advantaged areas by ethnic group and maternal age

	High Education, White	Low Education, White	High Education, Black	Low Education, Black
Mother's Age	–0.334	–0.348*	–2.695	–1.487
	(0.324)	(0.173)	(2.387)	(1.250)
Mother's Age, Squared	0.007	0.011†	0.092	0.054
	(0.011)	(0.006)	(0.082)	(0.044)
Mother's Age, Cubed	–0.000	–0.000	–0.001	–0.001
	(0.000)	(0.000)	(0.001)	(0.000)
Girl	0.152*	0.170**	–0.106	0.278
	(0.076)	(0.048)	(0.470)	(0.366)
Twin	3.137**	3.136**	2.688**	Dropped[a]
	(0.139)	(0.112)	(0.928)	
Migrant	–0.175	–0.016	–0.794	–0.490
	(0.165)	(0.137)	(0.562)	(0.472)
1989–1994	0.236*	0.138†	1.057	–0.123
	(0.107)	(0.082)	(0.799)	(0.600)
1995–1999	0.030	0.110	–0.122	–0.559
	(0.114)	(0.085)	(0.917)	(0.623)
2000–2004	0.189†	0.150†	0.661	–0.267
	(0.105)	(0.089)	(0.798)	(0.619)
Constant	1.009	0.673	21.997	10.246
	(3.123)	(1.535)	(22.476)	(11.552)
N	13,713	26,511	271	329
Pseudo-R^2	.077	.054	.093	.063

Note: Standard errors are shown in parentheses.
[a]The control for twin is dropped because of multicollinearity with LBW.
†$p < .10$; *$p < .05$; **$p < .01$

[TYPESETTER: Align values in each column on the decimal. Per style and consistent with other typeset articles for the journal, values that do not have a decimal point should be left-aligned.]

Fig. 1 Predicted probability of LBW for white and black mothers (first births 1989–2009) with 95 % confidence intervals

Fig. 2 Predicted probabilities of LBW for mothers residing in relatively disadvantaged and advantaged areas (first births 1989–1994 and 1999–2004) with 95 % confidence intervals

Fig. 3 Predicted probabilities of LBW for black and white mothers by education, with 95 % confidence intervals

Online Resource 1

Childbearing Postponement and Child Well-being: A Complex and Varied Relationship?

Alice Goisis and Wendy Sigle-Rushton

Categorizing Mothers Into Educational Groups

The main challenge posed by the ONS Longitudinal Study when constructing an indicator of mother's level of education is that it is not recorded at the time of birth. To categorize mothers as having high (A-levels and above) or low (below A-levels) education, we must rely on information provided in the census. For births that occur in both 1989–2000 and 2001–2009, we rely on the 2001 census. Although information on mothers' level of education is provided in the 1991 census, there are two reasons why we don't rely on education as provided in the 1991 census for births that occur between 1989–2000. First, unlike in the 2001 census, the measure of education collected in the 1991 census provides indication of only whether the mother has completed a degree. Thus, because we wouldn't have any information on the preceding educational steps, we wouldn't know how far those mothers without a degree have gone in the educational system and whether, given their age, they are "on track" educationally Second, relying on the 1991 census for information on education means that we would observe mothers' level of education before the time of birth, which might raise concerns especially for those births that occur well after 1991 and for those who in 1991 were below degree age. To the extent that people in the United Kingdom usually don't exit and re-enter the educational system extensively, although we can't exclude the possibility of errors in our categorization, it is not heavily problematic to rely on a measure of education that is observed after the time of birth.

For births that occurred after the 2001 census, we need to rely on a measure of education measured before the time of birth. Women aged 18 and older in 2001 don't constitute a problem because we know whether they have completed A-levels; the threshold we use to categorize mothers as highly educated. Mothers younger than 18, however, are problematic because there is uncertainty regarding their level of education at the time of birth, especially for those that gave birth further from the 2001 census. Dropping all mothers who were younger than 18 in 2001 would mean reducing the sample size considerably, which is problematic (particularly for black mothers) when running the analyses stratified by educational levels. We therefore choose to drop births to mothers aged 13 or 14 in 2001 that occur after 2004 or 2003, respectively, given the wide time lag between 2001 (i.e., when we observe their level of education) and the year of birth. For births that occur to mothers younger than 18 in 2001, we proceed as summarized in Table S1. We attempt to construct a measure of education that is as reliable as possible, without penalizing the sample size too much. The idea is that for those younger than 18, we categorize women as having high versus low education based on whether they are "on track" in the educational system and whether they are currently enrolled in education full-time.

For both births that occurred before and after 2001, we have done all that we could to mitigate the possibility of categorizing mothers in the educational category they don't belong to (at the time of birth). However, we underscore that the results need to be interpreted with caution.

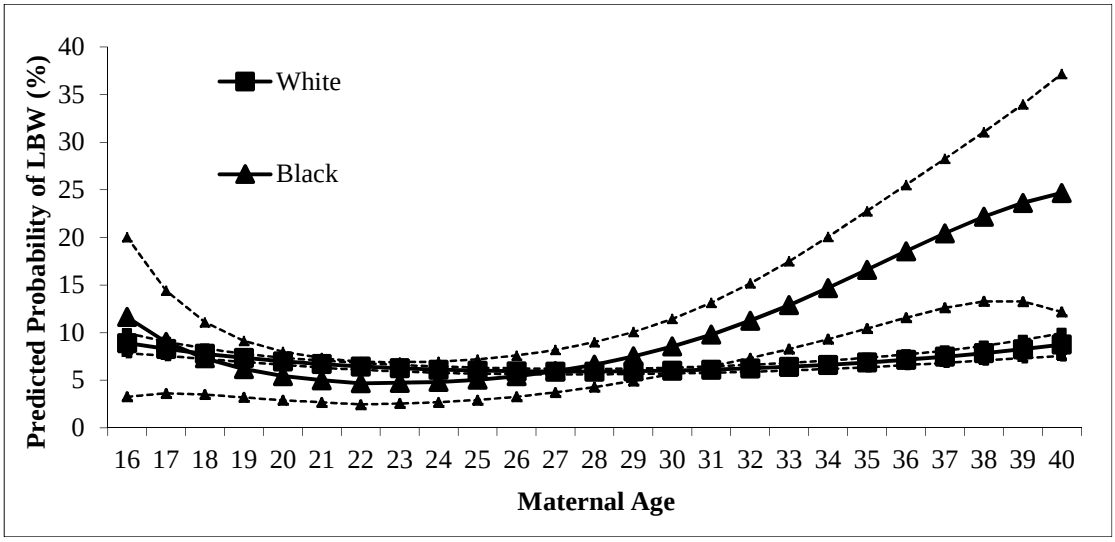
Table S1

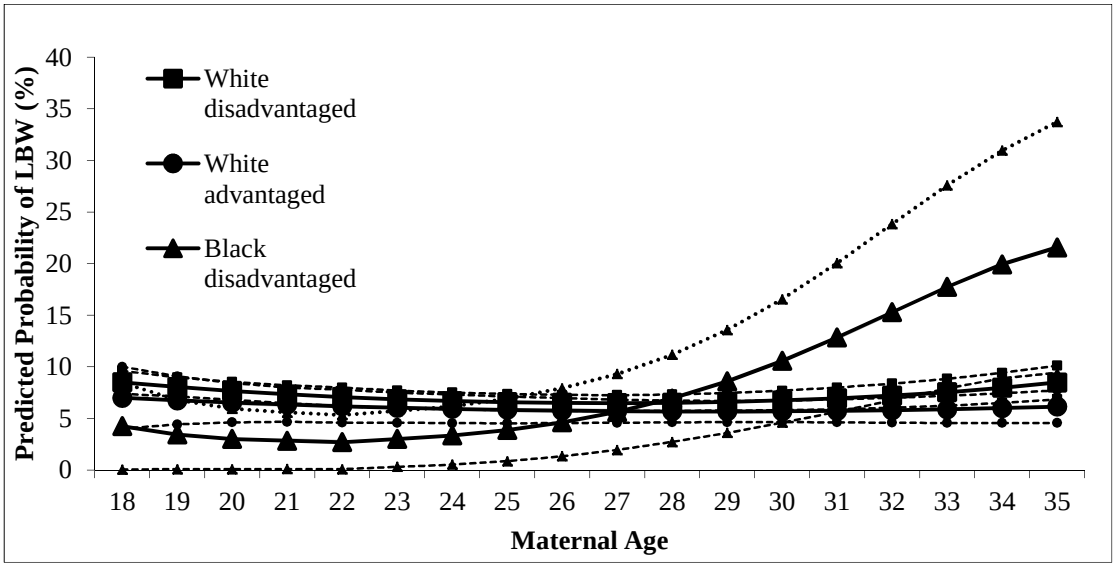
Age in 2001	Categorized as Having Low Education	Categorized as Having High Education	Dropped Births That Occur After
13	If they give birth before 2004	—	2004
14	If they give birth before 2003	—	2003
15	If in the 2001 census they are coded as having less than GCSEs	If in the 2001 census they are coded as having completed GCSEs and are currently enrolled into full-time education	—
16	If in the 2001 census, they are coded as having less than GCSEs	If in the 2001 census they are coded as having completed GCSEs and are currently enrolled in full-time education	—
17	If in the 2001 census, they are coded as having less than GCSEs	If in the 2001 census they are coded as having completed GCSEs and are currently enrolled in full-time education/Or have already completed A-levels	—

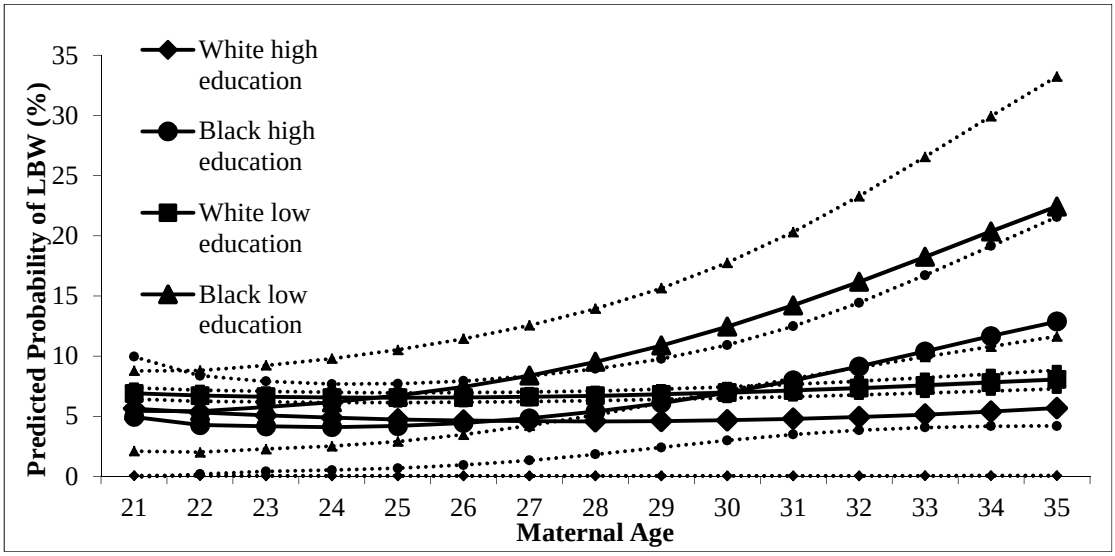
Robustness Checks

A series of robustness checks have been conducted which are not shown here for brevity. All models have included controls for single years, rather than five years, and the results are essentially unchanged. We reran the model presented in Table 3 of the main text but excluded migrants. The results reveal a marked widening of the black-white gap in LBW (significant at the 1 % level). Because approximately 30 % of black mothers are migrants, we cannot run subsequent models excluding migrants; the sample size would not allow. Although it would be ideal to focus on a subsample of mothers who have been exposed to the context under study since birth, we prefer to

rely on the full sample (including a control in the regression model) rather than on a sample of native mothers only because the sample of black mothers would just drop considerably. Finally, we reran models excluding twins. The results were again essentially unchanged; however, as we would expect, the average prevalence of LBW decreased similarly for both black and white mothers.


Predicted Probability of LBW (%)
40
35
30
25
20
15
10
5
0
White
Black
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Maternal Age


Predicted Probability of LBW (%)
40
35
30
25
20
15
10
5
0
White disadvantaged
White advantaged
Black disadvantaged
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
Maternal Age


White high education
Black high education
White low education
Black low education
Predicted Probability of LBW (%)
0
5
10
15
20
25
30
35
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
Maternal Age