



## Invited Commentary

### Invited Commentary: The Socioeconomic Causes of Adverse Birth Outcomes

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Initially submitted July 6, 2009; accepted for publication December 10, 2009.

Weathering—the cumulative burden of adverse psychosocial and economic circumstances on the bodies of minority women—has been repeatedly described in epidemiologic studies. The most common application has been the documentation of rapidly increasing risks of adverse birth outcomes as African-American women age. Previous work has been based largely on cross-sectional data that aggregate women across a variety of socioeconomic circumstances. When more specific information about women's life-course socioeconomic status is taken into account, however, heterogeneity in the weathering experience of African-American women becomes more readily apparent. Adverse birth outcome risk trajectories with advancing age for African-American women who reside in wealthier neighborhoods look much more similar to those of white women. The accompanying article by Love et al. (*Am J Epidemiol.* 2010;172(2):127–134) provides a more nuanced investigation of the social conditions that contribute to the weathering of African-American women and points to the critical role played by social and economic conditions over the life course in producing adverse birth outcome disparities.

African Americans; infant, premature; infant, small for gestational age; maternal age; poverty; preterm birth; residence characteristics

Abbreviation: SGA, small for gestational age.

Once upon a time, epidemiologists thought that newborn babies were “blank slates,” full of genetic potential but blissfully protected in the nurturing womb from the environmental insults associated with poverty, racism, and violence. Then, thanks to several interesting and creative research programs, we came to understand that the womb itself is an environment, which can be more or less hospitable to its resident, depending on maternal diet, levels of stress, exposure to environmental contaminants, or any number of other possible factors during pregnancy. Later, we reached back even further into developmental trajectories, long before the moment of conception, to the distal roots of inequality in the mother's life and perhaps her own gestation and birth. What we found was that rather than being a renewal, gestation actually functions as a period of reinscription, with the birth event being just the first of many outcomes. A life of deprivation takes a toll on the body of a woman, and—as jarring as it might be to our egalitarian sensibilities—her baby will also bear the burden of that

debt. Ultimately, this child may pass it on to her future children, too.

In his book, *The Emperor's New Clothes*, evolutionary biologist Joseph Graves, Jr., writes about experiments with fruit flies to demonstrate the biologic plausibility of this dramatic causal hypothesis (1). Environment has a clear effect on *Drosophila* life expectancy, and fruit flies kept at 20°C live significantly longer than genetically identical flies kept at 25°C. The remarkable thing about this experiment, however, is that the longevity effect persists for multiple generations with no detectable changes in the genetic stock. This surprisingly Lamarckian result has broad implications for the epidemiologic study of racial disparities in human beings. Americans are a mere 5 or 6 generations separated from the end of slavery, and children born prior to the 1964 Civil Rights Act are just starting to have their first grandchildren. Setting aside the obvious differences between insects and human beings, if a change of 5°C can truncate the lifespan of the great-great-great-grandchild of a fruit fly, just

consider how slavery and its successor institutions might still be affecting African Americans. All this is above and beyond the effects of the many severe inequalities that still persist today.

In further development of this impressive research paradigm on the “heritability of environmental conditions,” one of the key advantages of the new study by Love et al. (2) is the availability of parental life-course socioeconomic status trajectory data for analysis. The data set is wonderfully unique in this regard, and its continued exploitation will likely yield new and important information on how prior life experiences are associated with subsequent birth outcomes. The authors acknowledge that their categorization of socioeconomic environment is quite crude, but we concur that even a limited snapshot of historic data makes for an extraordinary conceptual and analytical advance. Clearly, it would be very interesting to have been able to consider the fuller life-course trajectories. Hopefully, future efforts by these authors or others will move the field in this direction.

According to the “weathering hypothesis” of Geronimus (3) and Geronimus et al. (4), not only do African Americans experience poor health at earlier ages than do whites, but deteriorating health is predicted to accumulate over time, resulting in ever-increasing health inequalities with age. Love et al. (2) explore whether maternal weathering is transmitted to the offspring’s pregnancy outcomes. To do so, they make excellent use of figures to illustrate the different patterns of adverse birth outcomes associated with lifetime socioeconomic exposure (upper half vs. lower half of the median income distribution). We were interested to recast the estimates contained in their figures to illustrate some important weathering-related findings not highlighted by the authors.

The overall estimates for low birth weight are about what one would expect for a racially and economically segregated midwestern US city (Table 1), with whites experiencing the outcome at dramatically lower rates than African Americans, and the disparity increasing with advancing maternal age. Among the women who currently live in poor neighborhoods, whose mothers also lived in a poor neighborhood, however, there is virtually no difference in risk of low birth weight among younger mothers (<20 years of age). Although weathering is apparent as African-American women age, as predicted by the weathering hypothesis, it appears that being a chronically poor young mother results in approximately equal low birth weight rates (per 100 livebirths) of 12.2 and 12.5 for white women and black women, respectively. In what is a truly surprising finding, the low birth weight rate decreased from 11.9 to 6.3 with age for African-American women who have always experienced relative affluence, resulting in the smallest rate difference of 2.3 between black mothers and white mothers at older ages. Prior work also found a reduction in low birth weight with increasing maternal socioeconomic position, but the effect was modest (5).

Love et al. (2) defined small for gestational age (SGA) using race-specific standards. We will not weigh in on the appropriateness of this particular approach, although it is not the approach we took when faced with defining SGA (6). Rather, we note that the race-specific definitions pose no

**Table 1.** Summary of Selected Adverse Birth Outcome Rates per Hundred Livebirths, as Reported by Love et al.,<sup>a</sup> in Cook County, Illinois (1989–1991). Overall, by Lower-Lower Income Neighborhood Status, and by Upper-Upper Income Neighborhood Status

	Overall			Lower-Lower Income Neighborhood Status			Upper-Upper Income Neighborhood Status		
	White Non-Hispanic	Black Non-Hispanic	Risk Difference (White – Black)	White Non-Hispanic	Black Non-Hispanic	Risk Difference (White – Black)	White Non-Hispanic	Black Non-Hispanic	Risk Difference (White – Black)
Low birth weight, proportion									
<20 years	6.9	11.9	-5.0	12.2	12.5	-0.3	7.0	11.9	-4.9
30–35 years	4.5	15.6	-11.1	7.9	17.0	-9.1	4.0	6.3	-2.3
Risk difference (<20 vs. 30–35 years)	2.4	-3.7		4.3	-4.5		3.0	5.6	
Small for gestational age, proportion									
<20 years	15.3	10.7	4.6	18.3	11.1	7.2	13.2	10.9	2.3
30–35 years	9.0	13.0	-4.0	16.1	14.5	1.6	8.2	6.9	1.3
Risk difference (<20 vs. 30–35 years)	6.3	-2.3		2.2	-3.4		5.0	4.0	
Preterm birth, proportion									
<20 years	10.8	17.7	-6.9	16.8	18.4	-1.6	10.6	15.7	-5.1
30–35 years	6.5	17.0	-10.5	8.2	17.6	-9.4	6.1	13.2	-7.1
Risk difference (<20 vs. 30–35 years)	4.3	0.7		8.6	0.8		4.5	2.5	

<sup>a</sup> Love C, David RJ, Rankin KM, et al. *Am J Epidemiol.* 2010;172(2):127–134.

great challenge to the within-race comparisons as presented by the authors. However, race-specific standards can make cross-race comparisons difficult. If we focus on SGA as a ranking tool, the specific within-race birth weight values become irrelevant. Rather, one can compare the proportion of race-specific livebirths weighing in at less than the 10th percentile for a given gestational age, and from an absolute ranking perspective, it doesn't particularly matter if the white and black birth weight values are identical or not. Regardless of one's position on the race-specific standards, this interpretation may still serve as a framework within which the cross-race comparisons for SGA can be viewed in light of the race-specific standards used to generate the specific birth weights that became classified as SGA. In exploring the SGA results (Table 1), weathering is apparent for the African-American women currently and historically resident in low socioeconomic status neighborhoods; however, both the chronically poor and the relatively affluent African-American women have lower SGA rates than their white age-aligned counterparts. The overall SGA pattern, driven by the large numbers of affluent white women and the large numbers of poor black women, respectively, masks this surprising pattern.

Finally, in what is by now a well-established and disheartening finding, the frequencies of preterm birth are very high for African-American women. Moreover, the disparity between black women and white women increases with advancing maternal age (Table 1). The findings illustrated by Love et al. (2) allow readers to develop a more nuanced understanding of these racial disparities vis-à-vis weathering by showing the substantial preterm birth risk reduction for older African-American women, compared with the younger cohort of mothers, who were currently and historically resident in upper socioeconomic status neighborhoods. A more modest risk reduction was also noted for African-American women who experienced chronically poor neighborhoods. Although the rate decline with advancing maternal age is substantially less than that observed for white women, the presence of any rate reduction at all is noteworthy and contrary to previously published preterm birth work.

Clearly, a more complete accounting of social context helps to explain a lot of the birth outcome disparities we've become accustomed to find. The frequency of adverse birth outcomes in white women is relatively low and follows from the overwhelming numbers of white women living in more affluent neighborhoods. Some black women's low birth weight and small for gestational age rates are also relatively low—specifically, for those African-American women living in more affluent neighborhoods—but these better outcomes among more affluent black women are obscured by the considerably higher risks experienced by the much larger numbers of black women chronically resident in poor neighborhood conditions. All of this makes sense given the established role of socioeconomic conditions in patterning reproductive risks, and makes even more sense when the historical socioeconomic data are added to the analysis. Apparently, black risk for adverse birth outcomes need not increase so dramatically with advancing maternal age. Rather, risk patterns among African American women can

look a lot like the patterns observed for white women, especially when their residential and socioeconomic experiences are similarly patterned as well.

The epidemiologic literature is blighted by numerous articles arguing that excess black risk is evident, even after adjustment for some socioeconomic measures and insisting therefore that the explanation must lie in some racial or genetic predisposition (7, 8). Love et al. illustrate most impressively that our common socioeconomic status measures are but the tip of the explanatory iceberg, and that much work still needs to be done before existing racial disparities can be said to persist even for women on an equal socioeconomic footing. In light of the lifecourse perspective applied here, limited though it may be, such adjustments still have a lot of history to account for. "The past is not dead," wrote Faulkner, "It's not even past." Likewise, the history of race in America may be overlooked by some researchers, but it is not so easily forgotten in the bodies of black women weathered by it.

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#### ACKNOWLEDGMENTS

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Conflict of interest: none declared.

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