The Role of Socioeconomic Factors in Black–White Disparities in Preterm Birth

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Objectives. We investigated the role of socioeconomic factors in Black–White disparities in preterm birth (PTB).

Methods. We used the population-based California Maternal and Infant Health Assessment survey and birth certificate data on 10 400 US-born Black and White California residents who gave birth during 2003 to 2010 to examine rates and relative likelihoods of PTB among Black versus White women, with adjustment for multiple socioeconomic factors and covariables.

Results. Greater socioeconomic advantage was generally associated with lower PTB rates among White but not Black women. There were no significant Black–White disparities within the most socioeconomically disadvantaged subgroups; Black–White disparities were seen only within more advantaged subgroups.

Conclusions. Socioeconomic factors play an important but complex role in PTB disparities. The absence of Black–White disparities in PTB within certain socioeconomic subgroups, alongside substantial disparities within others, suggests that social factors moderate the disparity. Further research should explore social factors suggested by the literature—including life course socioeconomic experiences and racism-related stress, and the biological pathways through which they operate—as potential contributors to PTB among Black and White women with different levels of social advantage. (*Am J Public Health.* 2015;105:694–702. doi:10.2105/AJPH.2014.302008)

Higher rates of preterm birth (PTB) among Blacks than Whites have been documented in the United States since at least the early 20th century.[1–3] This racial disparity is of great concern because PTB strongly predicts infant mortality[4,5] and adverse health and neurodevelopmental outcomes in childhood,[4,6,7] and has been linked with chronic disease, disability, and premature mortality in adulthood.[8–10]

The underlying reasons for the racial disparity in PTB are not well understood.[4] A range of socioeconomic factors—including income, wealth, and education at the individual, household, and area levels—vary across racial/ethnic groups[11–16] and are biologically plausible underlying causes of PTB.[4,17–20] Socioeconomic effects on health, including PTB, could operate independently of and in concert with the effects of stressful experiences related more directly to racial discrimination.[4,16,21,22] Many studies have observed different PTB risks associated with socioeconomic or socioeconomically linked characteristics of the geographic areas where women reside,[4,11,23–32] including area-level measures of poverty, unemployment,[26] segregation,[24,28] and crime rates.[25] Various individual-, household-, and neighborhood-level socioeconomic factors could plausibly affect PTB through diverse causal pathways, including those involving poor nutrition or prepregnancy health status, adverse health-related behaviors, lack of medical care, social isolation, stress, and hazardous physical exposures in the home, neighborhood, workplace, or in transit.[4] Biological pathways leading from stressful experiences to PTB through neuroendocrine processes have been described.[33–36]

A systematic review[17] of studies examining relationships between adverse birth outcomes and socioeconomic factors found that 93 of 106 studies reported a significant association, overall or within a subgroup, between a socioeconomic measure and a birth outcome; effects varied, however, across racial/ethnic groups and socioeconomic measures. Several birth outcome studies have examined interactions between variables reflecting racial/ethnic group and socioeconomic factors, with inconsistent results. Some studies have found minimal or no Black–White differences in PTB among highly disadvantaged women.[37–39] Others have observed a significant racial disparity among socioeconomically disadvantaged women, but an even greater disparity among more socioeconomically advantaged women.[24,40,41] Some other studies, however, have not reported differences in the racial disparity in PTB across socioeconomic subgroups.[4] Although the biological mechanisms for low birth weight are thought to be distinct from those for PTB,[4] several studies[42–49] have observed relatively smaller—but not necessarily small—racial disparities in low birth weight or infant mortality within socioeconomically disadvantaged versus more advantaged subgroups.

In some studies, the Black–White disparity in PTB has persisted after adjustment for socioeconomic and other known or suspected risk factors,[31,50–52] leading some researchers to conclude that the Black–White disparity in PTB reflects underlying genetic differences.[53–56] Others have challenged this, noting that the disparity may reflect significant unmeasured socioeconomic factors and other social experiences including those related to racial discrimination throughout life, not only during pregnancy.[18,21,57–62] With few exceptions,[30,31,39,63,64] however, most studies of the Black–White disparity in PTB have had limited socioeconomic information, and few have examined systematically how the disparity may vary at different socioeconomic levels.

The goal of this study was to investigate the role of socioeconomic factors in the Black–White disparity in PTB by using a unique population-based data source on California births with more extensive information than

generally available in previous PTB research, including multiple socioeconomic measures at the individual, household, and area levels and a wide range of covariables reflecting potential confounders suggested by the literature. The aim was to assess the combined contribution of multiple socioeconomic factors—representing different dimensions of social advantage and disadvantage—to the racial disparity in PTB, and to examine whether and how these socioeconomic factors might moderate the relationship between racial group and PTB.

METHODS

We used data from the California Maternal and Infant Health Assessment (MIHA), a population-based survey of postpartum women in California conducted annually since 1999 in English and Spanish. Detailed descriptions of the MIHA methodology have been published previously.[65–67] The MIHA survey is mailed to a stratified random sample, drawn from the statewide birth record file, of California residents aged 15 years and older who had a singleton, twin, or triplet birth between February and May of the survey year, with mail and telephone follow-up of nonrespondents; the response rate has been 70% or higher annually. Black women are oversampled to ensure sufficient numbers for analysis. Completed surveys are linked with birth certificate data, and the final sample is weighted to reflect births statewide. The survey covers topics related to pregnancy, birth, the postpartum period, and infant health, including social and economic information. The MIHA survey data are geocoded to the census tracts in which women resided at the time of delivery of the index child; for this analysis, we merged geocoded data with tract-level socioeconomic variables from the 2005–2009 American Community Survey from the US Census Bureau.

We combined data from the 2003–2010 annual MIHA surveys. Among the 31 211 MIHA respondents during this time period, 27 907 had singleton births with complete data on gestational age (4.9% were missing gestational age) and census tract (3.2% were missing geographic information that could be merged with census tract–level socioeconomic variables). Of these eligible women, 3286 were US-born Black women and 7114 were US-born Whites; these groups together constituted the study sample of interest. We focused on US-born women because the birth outcomes of immigrant and US-born Black women vary.[58,68]

Variables

The outcome of interest was PTB, defined as a live birth occurring before 37 weeks' gestation, based on gestational age in the linked birth record (using estimates based on date of last menstrual period because clinical obstetrical estimates of gestational age were unavailable until 2007). The explanatory variables, listed in Table 1, are categorized as racial/ethnic group, socioeconomic factors, and covariables. We selected a comprehensive set of covariables—grouped as sociodemographic characteristics, prenatal care, health-related attitudes or behaviors, stressors during the index pregnancy, social support during the index pregnancy, and health status or conditions—on the basis of their a priori identification in the literature as known (e.g., age, parity, smoking) or suspected and plausible (e.g., social support, stressful experiences during pregnancy) risk factors for adverse birth outcomes.

If data were missing on a variable (e.g., maternal education) in MIHA but available in birth records, we used the latter. When data were missing from both sources (for variables other than gestational age, race/ethnicity and census tract), we imputed the missing information with multiple imputation,[71] which replaces missing values with a set of plausible values, allowing for uncertainty about the correct imputed value; these separate data sets are then combined and analyzed. Using SAS version 9.3 (SAS Institute, Cary, NC) for all analyses, we imputed 5 data sets with PROC MI, and combined analyses with PROC MIANALYZE. For most variables, information was missing for less than 5% of the study sample of 10 400 women; exceptions were family income (5.6%), paternal education (11.2%), paternal occupation (15.4%), and paternal age (9.6%). We assessed variables in models for colinearity by using correlation coefficients and variance inflation factors. Although some results suggested the possibility of mild colinearity between some socioeconomic variables, including or excluding those variables in the models did not significantly affect point estimates; we therefore retained these variables on a priori grounds.

Analyses

We first calculated the prevalence of each socioeconomic variable and the corresponding confidence intervals. We then used logistic regression to examine differences in PTB rates according to socioeconomic characteristics for Black women and White women separately. (We also examined the prevalence of each covariable and the associated PTB rates—not displayed, available on request.) We used survey procedures (PROC SURVEYMEANS, PROC SURVEYLOGISTIC) to account for MIHA's stratified sampling design.

Because prevalence data indicated that the relationships between racial/ethnic group and PTB might vary by socioeconomic characteristics, we tested for interactions between racial/ethnic group and each socioeconomic variable as predictors of PTB. Where interaction terms had P values of less than .1, we stratified the sample by each of these socioeconomic variables (family income, maternal education, paternal occupation, and census tract poverty rate), by using cutpoints suggested by the prevalence data.

We then constructed a series of logistic regression models for PTB separately for women in each socioeconomic subgroup, estimating the odds ratio for PTB among Black versus White women (1) without adjustment for other variables, (2) with adjustment for all socioeconomic variables, and (3) with adjustment for all socioeconomic variables and covariables.

RESULTS

Table 2 displays socioeconomic characteristics (left-hand pair of columns) and PTB prevalence according to these characteristics (right-hand pair of columns) separately for Black and White women. For each socioeconomic factor, Black women appeared at greater disadvantage than White women; for example, 49.3% of Black women and 15.3% of White women had household incomes at or below the poverty level. The PTB rates in the overall sample were 12.8% among Black women and 7.4% among White women (not displayed). We observed significantly higher PTB rates among Black than among White women in most socioeconomic subgroups, except among poor women, women who had not or whose parents had not graduated from high school, women

TABLE 1—Independent Variables Among 10 400 US-Born Black and White Women in California Who Gave Birth During 2003–2010

Variable	Source	Description or Categories
Maternal race, ethnicity, nativity (first listed race, ethnicity, and maternal birthplace)	Birth certificate	The sample for this study consisted of women surveyed in MIHA who were Black or White, were not Latina, and were US-born.
Socioeconomic characteristics		
Family income	MIHA	Total pretax income from all sources during the calendar year before the birth, categorized in relation to the respondent's family size[a]
Maternal educational attainment	MIHA (or birth certificate if MIHA data were missing)	Less than high school, high-school graduate or GED, some college, or college graduate
Paternal educational attainment	Birth certificate	Less than high school, high-school graduate or GED, some college, or college graduate
Mother's parents' educational attainment	MIHA	Highest educational attainment of the respondent's most-educated parent she lived with around age 13: less than high school, high-school graduate or GED, some college, or college graduate
Maternal occupation	Birth certificate	Categorized with Bureau of Labor Statistics job classes[b]
Paternal occupation	Birth certificate	Categorized with Bureau of Labor Statistics job classes[b]
Health insurance coverage before and during pregnancy	MIHA	Private insurance vs uninsured or any other coverage
Census tract–level (neighborhood) poverty	Respondent's geocoded residential address from the birth certificate, linked with information from the 2005–2009 American Community Survey	The percentage of census-tract residents with household incomes below the FPL[c]
Sociodemographic characteristics		
Maternal age	Birth certificate	15–19, 20–34, or ≥ 35 y
Paternal age	Birth certificate	15–19, 20–34, or ≥ 35 y
Parity (total live births including index birth)	Birth certificate	Primiparous, 2–4 births, or ≥ 5 births
Prenatal care		
Trimester of prenatal care initiation	MIHA	First, second, or third trimester or no prenatal care; excluding visits just for a pregnancy test
Inadequate number of prenatal visits	Birth certificate	Based on the Kotelchuck index[69]; received < 50% or ≥ 50% of expected prenatal visits based on gestational age at delivery
Health-related attitudes or behaviors		
Smoking during pregnancy	MIHA	Any smoking or none
Drinking alcohol during pregnancy	MIHA	Any alcohol use during pregnancy or none
Pregnancy intendedness	MIHA	Pregnancy was unintended (wanted to be pregnant later or never) or intended
Stressors during the index pregnancy		
Intimate partner violence	MIHA	Experienced physical violence from a partner or spouse
Homelessness	MIHA	Homeless at some point
Job loss	MIHA	Lost her job despite wanting to continue working
Partner job loss	MIHA	Partner or spouse lost job
Separation or divorce	MIHA	Separated or divorced during pregnancy
Moving	MIHA	Moved during pregnancy
Bills	MIHA	Had a lot of bills that were hard to pay
Incarceration	MIHA	Respondent or her partner went to jail at some point during the pregnancy
Drug or alcohol problem	MIHA	Someone close to the respondent had a serious drug or alcohol problem
Food insecurity, measured with USDA 6-item instrument	MIHA	No food insecurity, food insecurity without hunger, or food insecurity with hunger

Continued

TABLE 1—*Continued*

Social support during the index pregnancy		
Marital status	MIHA	Married, living with a partner, or single, separated, divorced, or widowed
Emotional support	MIHA	Had someone she could talk to who provided emotional support
Practical support	MIHA	Had someone who could help her with practical needs, such as transportation or household tasks
Health status and health conditions		
Prepregnancy health status	MIHA	Excellent, good, or fair or poor
Prepregnancy BMI	MIHA	Obese, overweight, normal, or underweight according to 2009 Institute of Medicine BMI criteria[70]
Gestational weight gain	MIHA	Inadequate, adequate, or excessive, based on 2009 Institute of Medicine criteria adjusted for prepregnancy BMI and gestational age at birth[70]
Gestational diabetes	MIHA	A provider told the respondent during this pregnancy that she had diabetes.
Gestational hypertension	MIHA	A provider told the respondent during this pregnancy that she had high blood pressure.

Notes. BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); GED = general equivalency diploma; MIHA = California Maternal and Infant Health Assessment survey; USDA = US Department of Agriculture. All variables from the MIHA survey were self-reported; unless noted otherwise, they refer to the respondent and the index pregnancy.
[a]≤ 100% of the federal poverty level (FPL; poor), 101%–200% of the FPL, 201%–400% of the FPL, or > 400% of the FPL.
[b]Higher status (professional, executive, or managerial), lower status (all other job titles), student, or unemployed or not working for pay.
[c]Categorized as < 25% or ≥ 25% (cutpoint selected because preterm birth rates rose at 25% tract poverty). "Neighborhood" and "census tract" are used interchangeably in this article, despite the fact that census tracts and recognized neighborhoods do not always correspond.

for whom paternal employment was recorded as unemployed or otherwise not working, and residents of high-poverty census tracts.

Table 2 also shows that for each socioeconomic factor except maternal and paternal occupation, more favorable socioeconomic characteristics were generally associated with lower PTB rates among White but not Black women. Tests of interaction indicated interactions of racial/ethnic group with family income, maternal education, paternal occupation, and census tract poverty as predictors of PTB. We accordingly stratified the sample in 4 different ways, by (1) family income (at or below poverty vs higher incomes), (2) maternal education (less than high-school graduate vs greater educational attainment), (3) paternal occupation (unemployed or not working for pay vs lower- and higher-status occupations), and (4) census tract poverty rate (at or above 25% vs below 25%). Stratifying in this way, the majority of Black women (61.8%) and nearly 1 in 4 White women (23.7%) were included in at least 1 of the most disadvantaged subgroups.

Table 3 displays the logistic regression results estimating the Black–White disparity in PTB within each socioeconomic subgroup. Among women in each of the relatively more advantaged subgroups, the adjusted odds ratios for Black relative to White women were significantly elevated (ranging from 1.61 to 1.90). Within each of the most disadvantaged subgroups, however, we found no significant difference in the likelihood of PTB between Black and White women, either before or after adjustment for the other socioeconomic factors and covariables.

DISCUSSION

The patterns observed in this study suggest an important but complex role for socioeconomic and potentially other social factors in the Black–White disparity in PTB. Within the most socioeconomically disadvantaged subgroups, which included nearly 1 in 4 White and most Black women, we found no significant Black–White disparity in PTB, reflecting similarly high rates of PTB among Black and White women in those subgroups. At the same time, we saw significant Black–White disparities within the socioeconomically less disadvantaged groups, among whom PTB rates improved with greater socioeconomic advantage for White but not for Black women. These disparities persisted after we controlled for several socioeconomic factors and covariables that have not, to our knowledge, been included in previous studies of PTB. These patterns suggest a moderating role for socioeconomic factors in the racial disparity in PTB. They indicate strong socioeconomic influences on PTB among White women. They also suggest a role for unmeasured dimensions of disadvantage affecting Black women across socioeconomic levels; a body of previous research cited earlier[18,21–23,59,62] suggests the need to consider factors such as lifetime experiences of more adverse socioeconomic conditions and racism-related stress that were not captured in this study.

This study does not identify the specific causes of the high PTB rates among both White and Black women in the most socioeconomically disadvantaged subgroups or of the racial disparity in PTB among women in more advantaged subgroups. It adds to previous evidence indicating a role for social factors in PTB, including favorable birth outcomes among Black women who are immigrants to the United States,[68,72,73] members of the military,[44] or receiving a psychosocially oriented, group-based

TABLE 2—Socioeconomic Characteristics and Preterm Birth Rates by Socioeconomic Characteristics Among US-Born Black and White Women Delivering in California: Maternal and Infant Health Assessment, 2003–2010

Socioeconomic Factors	Distribution of Characteristics,[a] % (95% CI)		Preterm Birth Prevalence,[b] % (95% CI)	
	Black (n = 3286)	White (n = 7114)	Black (n = 3286)	White (n = 7114)
Family income				
≤ 100% poverty	49.3 (47.0, 51.5)	15.3 (14.4, 16.3)	12.5 (10.4, 14.6)	10.4 (8.4, 12.5)
101%–200% poverty	23.4 (21.5, 25.2)	16.2 (15.2, 17.1)	12.7 (9.2, 16.3)	7.5 (5.8, 9.1)
201%–400% poverty	15.9 (14.4, 17.5)	25.9 (24.8, 27.1)	11.4 (7.9, 14.8)	7.9 (6.6, 9.2)
> 400% poverty	11.4 (10.2,12.7)	42.5 (41.3, 43.8)	15.8 (11.6, 19.9)	6.0 (5.1, 6.9)
Maternal education				
Not a high-school graduate	14.6 (13.0, 16.2)	5.8 (5.2, 6.3)	11.9 (8.8, 15.0)	12.7 (9.3, 16.1)
High-school graduate or GED	25.6 (23.9, 27.4)	14.3 (13.4, 15.2)	14.9 (11.5, 18.3)	9.2 (7.3, 11.2)
Some college	42.4 (40.2, 44.5)	34.5 (33.3, 35.7)	12.6 (10.6, 14.6)	7.8 (6.6, 9.0)
College graduate or more	17.5 (15.9, 19.0)	45.4 (44.2, 46.7)	10.7 (7.8, 13.6)	5.9 (5.0, 6.7)
Paternal education				
Not a high-school graduate	17.2 (15.4, 19.1)	7.6 (6.9, 8.3)	14.1 (10.9, 17.4)	8.6 (5.8, 11.5)
High-school graduate or GED	43.5 (41.1, 45.8)	26.6 (25.5, 27.8)	12.6 (10.2, 15.0)	8.6 (7.1, 10.1)
Some college	26.9 (24.8, 29.0)	26.2 (25.1, 27.3)	11.7 (9.2, 14.3)	7.1 (5.8, 8.4)
College graduate or more	12.4 (10.9, 13.8)	39.6 (38.4, 40.8)	13.5 (9.7, 17.3)	6.6 (5.6, 7.6)
Mother's parents' education				
Not a high-school graduate	11.6 (9.9, 13.3)	5.4 (4.7, 6.0)	14.3 (10.0, 18.6)	10.8 (7.4, 14.2)
High-school graduate or GED	29.5 (27.3, 31.6)	22.6 (21.5, 23.7)	12.7 (9.6, 15.7)	7.6 (6.1, 9.1)
Some college	34.7 (32.6, 36.8)	30.0 (28.8, 31.2)	13.2 (10.9, 15.6)	7.4 (6.2, 8.6)
College graduate or more	24.3 (22.4, 26.2)	42.1 (40.8, 43.3)	11.5 (8.9, 14.0)	6.9 (5.9, 7.9)
Maternal occupation				
Student	11.5 (10.1, 12.9)	3.5 (3.0, 3.9)	12.8 (8.9, 16.7)	6.2 (2.7, 9.7)
Not working	31.2 (29.2, 33.3)	27.6 (26.5, 28.7)	12.5 (10.2, 14.8)	7.8 (6.5, 9.1)
Lower status	34.5 (32.5, 36.5)	24.3 (23.2, 25.4)	12.7 (10.0, 15.4)	8.0 (6.6, 9.5)
Higher status	22.7 (20.9, 24.6)	44.6 (43.4, 45.9)	13.1 (10.4, 15.9)	6.9 (6.0, 7.9)
Paternal occupation				
Student	5.2 (4.2, 6.3)	2.0 (1.6, 2.4)	18.5 (11.7, 25.2)	4.4 (1.1, 7.6)
Not working	6.2 (4.6, 7.8)	1.3 (1.0, 1.6)	11.2 (4.9, 17.4)	13.2 (5.7, 20.6)
Lower status	60.2 (57.5, 63.0)	43.5 (42.3, 44.8)	12.4 (10.6, 14.2)	8.5 (7.4, 9.6)
Higher status	28.3 (25.4, 31.3)	53.1 (51.8, 54.4)	12.8 (9.9, 15.6)	6.5 (5.6, 7.3)
Private health insurance before and during pregnancy				
No	64.4 (62.4, 66.4)	30.3 (29.1, 31.5)	13.1 (11.3, 14.9)	8.8 (7.4, 10.2)
Yes	35.6 (33.6, 37.6)	69.7 (68.5, 70.9)	12.2 (10.0, 14.3)	6.8 (6.0, 7.6)
Percentage below poverty in census tract of residence				
≥ 25% poverty	27.2 (25.2, 29.2)	6.4 (5.8, 7.0)	12.5 (9.3, 15.7)	10.7 (7.3, 14.1)
< 25% poverty	72.8 (70.8, 74.8)	93.6 (93.0, 94.2)	12.9 (11.4, 14.4)	7.2 (6.5, 7.8)

Note. CI = confidence interval; GED = general equivalency diploma.
[a]Estimates of the percentage of women with the specified socioeconomic characteristic.
[b]Estimates of the percentage of women with a preterm birth.

form of prenatal care.[74] The findings do not rule out a role for genetic or epigenetic phenomena, but the observed social patterning indicates the need to identify and address health-damaging factors in the social and physical environments that are tightly linked with race and social class in the United States.

Among Black and White women who were poor, who had not completed high school, whose babies' fathers were not working, or who lived in high-poverty census tracts, we found no significant racial disparity in PTB either before or after adjustment for socioeconomic and other variables. This finding reflects equally adverse outcomes among both Black and White women in these most socioeconomically disadvantaged subgroups. In

TABLE 3—Odds Ratios for Preterm Birth for US-Born Black Relative to White Women Delivering in California, Stratified by Socioeconomic Characteristics: Maternal and Infant Health Assessment, 2003–2010

Variables Included in the Model Predicting Preterm Birth	Model 1,[a] OR (95% CI)	Model 2,[b] OR (95% CI)	Model 3,[c] OR (95% CI)
Family income			
≤ 100% poverty	1.23 (0.91, 1.65)	1.19 (0.86, 1.63)	1.14 (0.78, 1.65)
> 100% poverty	2.03 (1.64, 2.50)	1.85 (1.48, 2.32)	1.82 (1.42, 2.34)
Maternal education			
< high-school graduate	0.93 (0.61, 1.42)	0.94 (0.58, 1.52)	0.91 (0.51, 1.61)
≥ high-school graduate	1.95 (1.64, 2.31)	1.69 (1.38, 2.08)	1.63 (1.29, 2.05)
Paternal occupation, excluding students			
Not working	0.82 (0.29, 2.31)	0.84 (0.22, 3.18)	0.97 (0.15, 6.09)
Lower status	1.52 (1.22, 1.89)	1.37 (1.07, 1.76)	1.25 (0.93, 1.69)
Higher status	2.12 (1.58, 2.85)	1.85 (1.30, 2.62)	1.90 (1.25, 2.88)
Census tract–level poverty			
≥ 25%	1.19 (0.75, 1.89)	1.16 (0.70, 1. 93)	0.99 (0.55, 1.76)
< 25%	1.91 (1.62, 2.26)	1.68 (1.39, 2.04)	1.61 (1.30, 1.99)

Note. CI = confidence interval; OR = odds ratio.
[a]Race only (unadjusted), comparing Blacks to Whites.
[b]Race + socioeconomic variables (family income [only for the > 100% poverty group], maternal education, paternal education, mother's parents' education, maternal occupation, paternal occupation, private insurance before and during pregnancy, census tract poverty [< 25% or ≥ 25%]), comparing Blacks to Whites.
[c]Race + socioeconomic variables + all other variables (maternal age, paternal age, parity, trimester of prenatal care initiation, adequacy of prenatal care visits, smoking during pregnancy, alcohol consumption during pregnancy, pregnancy intendedness, intimate partner violence, homelessness, job loss of respondent, job loss of partner, separation or divorce, moving, trouble paying bills, incarceration of respondent or partner, drug or alcohol problem in someone close, food insecurity, marital status, emotional support, practical support, prepregnancy health status, body mass index, adequacy of weight gain during pregnancy, gestational diabetes, gestational hypertension), comparing Blacks to Whites.

contrast, we consistently observed a significant Black–White disparity in PTB—before and after adjustment for the wide array of covariables suggested by previous literature as potential confounders—among women in the relatively more advantaged subgroups. These patterns are consistent with previous work on birth outcomes cited earlier in this article[23,24,39,45–47] and with findings on other health outcomes demonstrating that racial differences in obesity,[75] hypertension,[76,77] and diabetes[78] observed overall in populations may be less evident or not observed among individuals in socioeconomically disadvantaged groups.

What could explain the large Black–White disparities among the women in the more socioeconomically advantaged subgroups, even after adjustment for multiple socioeconomic factors and covariables reflecting sociodemographic factors, receipt of prenatal care, behaviors, stressors and social support during pregnancy, and health status? Despite the broad array of variables included in this study, unmeasured socioeconomic differences known to vary by race could also have contributed to the residual Black–White disparity observed within the more advantaged subgroups.

Accumulated wealth was not measured in this study, but varies markedly by race even at similar income levels,[11,13–15,79] and is more likely than income to reflect socioeconomic circumstances experienced during and since childhood. Black women of a given income level are likely to live in more socioeconomically disadvantaged neighborhoods than similar-income White women,[11] which could be associated with adverse physical and social environmental exposures; our measure of neighborhood poverty rates was unlikely to have captured all dimensions of neighborhood environmental disadvantage—including levels of crime or racial segregation or composition, which have been associated with PTB in some studies.[24,25,28,80,81] In addition, there is likely to be substantial socioeconomic variation along racial lines within the broad income categories we used, with Blacks tending to be at the lower end and Whites at the higher end of a given broad income category. Black and White women who are socioeconomically better off may be more different from each other on unmeasured social characteristics, than are Black and White women in the most disadvantaged subgroups. This hypothesis is supported by supplementary analyses (not shown; available on request) revealing that within each socioeconomically advantaged subgroup, Black women generally appeared to be more disadvantaged than Whites. For example, Black women with family incomes greater than 100% of the poverty level had lower levels of education, and their babies' fathers had lower levels of education and occupation than White women in the same income category; within the most disadvantaged subgroups, however, the socioeconomic characteristics of Black and White women generally appeared to be similar.

Stress, particularly chronic stress, related to economic—or other social—adversity experienced throughout a woman's life before pregnancy, particularly in early childhood, could have physiologic consequences that could result in PTB, independent of conditions during pregnancy.[18,62] We could not adequately measure women's lifetime experiences of economic or other social adversity; the mother's parents' educational level when she was a child is a crude measure of childhood socioeconomic circumstances, and we lacked other measures of childhood hardship or trauma.

Our data set also lacked information on several additional social factors, which, according to the literature, could play an important role in the patterns of disparity we observed. Most notably, we had no measures of experiences of racial discrimination, a potential source of chronic stress for Black women from childhood on, that could plausibly affect their likelihood of adverse birth outcomes,[22,59,62] including PTB.[21,82,83] In addition to overtly racist incidents, Black women's potentially subtle but repeated experiences of feeling judged or treated unfairly or anticipating unfair treatment[84] because of their race could contribute to increased PTB risk through physiologic pathways involved in stress.[4,35,59] The potential health costs of upward mobility among Blacks are another biologically plausible

explanation for the disparity patterns we observed, although not all studies have found worse birth outcomes with upward economic mobility.[42,85]

Findings from several studies suggest that Blacks with greater socioeconomic resources or position may experience paradoxically negative health consequences mediated by the physiologic effects of racism-related stress. For example, compared with Whites of similar incomes and with poor Blacks, higher-income Blacks may work in settings where they are greatly in the minority, which may expose them to stressful race-related experiences.[84,86,87] They may have had to work exceptionally hard to overcome racial barriers to higher status, may feel they must perform exceptionally well to disprove racist assumptions about them at work, and may confront "racialized glass ceilings"[88] to further advancement.[84,87] Higher-income Blacks also may experience greater pressures to support needy relatives.[86] (Although we were unable to measure drug use, research on illicit drug use overall[89,90] and in pregnancy[91–93] has not consistently found higher prevalence rates for Blacks or clear effects on gestational age.[4])

Our findings do not indicate whether the similar likelihoods of PTB among Black and White women who were poor, who had low levels of education, whose babies had unemployed fathers, or who resided in high-poverty areas can be attributed to those specific socioeconomic factors. The similarity of results across socioeconomic subgroups defined by different socioeconomic measures suggests that multiple dimensions of disadvantage, and therefore potentially multiple causal pathways, are likely to be involved.

This study adds to knowledge by demonstrating the striking socioeconomic patterning of racial disparities in PTB in a large, statewide-representative sample of US-born Black and White women in California, with more information on both socioeconomic factors and covariables than has generally been available. The results have national significance given that more than 1 in every 8 US births occurs in California; although overall PTB rates are somewhat lower in California than nationally, the relative disparity in PTB among Black versus White women in California is similar to that observed in US data.[94] The findings demonstrate that, in the most disadvantaged subgroups, Black and White women are at similar risk for PTB, and that among more socioeconomically advantaged women, Black women are at higher risk for PTB than White women. The observance of a racial disparity only within certain socioeconomic groups and not others suggests the need to consider social causes. The observed socioeconomic and racial patterning indicates the need for further research to investigate social conditions—and the biological pathways through which they operate—as likely influences on PTB and racial disparities in PTB. Further research is needed to understand, in both social and biological terms, how socioeconomic advantage and disadvantage are linked with PTB among both Black and White women, and why greater socioeconomic advantage is linked with reduced PTB among White but not Black women. On the basis of this study's results and previous research, studies should explore a range of race-related social advantages and disadvantages, including diverse socioeconomic factors and experiences of racial discrimination throughout women's lives. ■

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Contributors

P. A. Braveman originated the study, guided analyses, wrote the Introduction and Discussion, and revised all drafts. K. Heck carried out all of the analyses, reviewed the literature, drafted text on Methods and Results, and reviewed and revised drafts. S. Egerter reviewed and revised multiple drafts. All authors participated in guiding analyses and reviewing and revising text.

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Human Participant Protection

The California Maternal and Infant Health Assessment survey data collection and analyses were approved by the State of California, Committee for the Protection of Human Subjects and the Committee on Human Research at University of California, San Francisco.

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