Not Always Black and White: Racial Bias for Birth Disparities from Excluding Hispanic Identification

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INTRODUCTION

Despite gains in prenatal care (PNC) usage and birth outcomes for minority women during the past few decades, observed disparities between non-Hispanic Whites, Blacks, and Hispanics persist. Using the National Center for Health Statistics' (NCHS) natality files from 1981 through 1998, Alexander, Kogan, & Nabukera (2002) examined live births of U.S. residents by trimester in which PNC was initiated and the appropriateness of that care based on the Adequacy of Prenatal Care Utilization Index (APNCU) (Kotelchuck, 1994). They found racial disparities between White and Black women in both the trimester of PNC initiation and the number of PNC visits made.

Alexander et al. (2002) noted reductions in racial disparities in PNC; specifically, Blacks were steadily increasing in the number of prenatal visits and in first trimester initiation of PNC. However, a weakness of their study was the exclusivity of racial categories; only White and Black racial groups were analyzed based on the mother's self reported race. Other racial groups were not included because Hispanic data were not identifiable for some states during part of the study period, and other racial groups lacked sufficient numbers to establish trending in the categories of interest (Alexander et al., 2002). Thus Hispanics identified their race as White and their ethnicity as Hispanic. Alexander et al. counted both non-Hispanic Whites and Hispanics as 'Whites' regardless of ethnicity or the availability of ethnicity in their analysis. This created a potential source of bias, as one could speculate that the reported narrowing of racial disparities in the number of PNC visits and earlier initiation of care between Whites and Blacks could be the result of increasing births to Hispanic women included in the ‘White’ birth group. The reported narrowing of disparities could simply be the result of failing to separate Hispanic women in the analysis, a potentially significant portion of the ‘White’ group given their high fertility rates and increased percentage of the total U.S. population. While the expansion of Medicaid-sponsored funding for pregnant women likely contributed to some of the reported increases in earlier PNC initiation and the number of prenatal visits in the late 1980s and early 1990s (Hessol, Vittingoff, & Fuentes-Afflick, 2004; Hueston, Geesey, & Diaz, 2008), it is not clear if this expansion benefited one racial group over another, particularly when Hispanic ethnicity is taken into account.

Therefore, the purpose of this study was to evaluate differentials in birth outcomes for singletons by race for Whites, Blacks, and Hispanics beginning in 1979 (the year when Hispanic identifiers
became available in the natality files) through 2006. Specifically, we examined trends the trimester that PNC was initiated, the number of PNC visits, and birth weight by race and ethnicity. While previous studies have evaluated pregnancy outcomes based on race, the exclusion of Hispanic identifiers in the analysis (Alexander, Kogan, Himes, Mor, & Goldenberg, 1999; Alexander et al., 2002; Alexander, Wingate, Bader, & Kogan, 2008; Cox, Zhang, & Zotti, 2009; Hunsley, Levkoff, Alexander, & Tompkins, 1991) potentially introduced a bias in results reported. We estimated racial disparities between Blacks and Whites with and without Hispanic identification. Hence, we quantified the bias created due to Hispanics being identified as Whites. Although Gavin et al. (Gavin, Adams, Hartmann, Benedict, & Chireau, 2004) attempted to address this gap by including Hispanics in their analysis, only pregnancy-related care among Medicaid recipients in four states (Florida, Georgia, New Jersey, and Texas) was examined, therefore omitting a significant portion of the childbearing population. In this current study, the addition of Hispanics as a separate racial group and the extension of analysis back to 1979 through 2006 provide an additional decade of observations over previous reports. Hence this analysis is unique and more comprehensive than previous reports.

Literature Review

The persistent prevalence of premature births, low birth weight (LBW), and very low birth weight (VLBW) infants are a social as well as public health policy concern. Programs that target the identification and prevention of preterm births (often the precipitating factor for low birth weight) have been underway for decades with little success. Preterm births are a leading cause of infant morbidity and mortality, often related to neurologic and/or respiratory dysfunction. The death rate for a preterm infant is as high as 15 times that of a term infant (Buck & Thiesen, 2006) and Blacks experience almost 3 times the risk of preterm birth compared to non-Hispanic Whites (Hamilton, Martin, & Ventura, 2006). To date, studies on potential relationships between racial disparities and birth outcomes have suggested an interaction among multifaceted, complex factors including, (a) biologic and neuroendocrine dysfunction (Giscombé & Lobel, 2005; Savitz, Dole, & Herring, 2006; Wadhwa, 2005); (b) genetic and epigenetic interactions (Challis, 2000; Lockwood & Kuczynski, 2001); (c) sociodemographic factors such as ethnicity, age, educational attainment, and marital status (Alliance for Health Reform, 2006; Balsa & McGuire, 2003; Betancourt & Maina, 2004; Pickett, Collins JW, Masi, & Wilkinson, 2005; Reagan & Salsberry, 2005); (d) maternal exposure to racism and stress (Lu & Halfon, 2003; Lu & Chen, 2004; Reagan & Salsberry, 2005); (e) one's health status prior to pregnancy (D'Angelo, Williams, & Morrow, 2007); and, (f) differential treatment by providers prior to and during pregnancy (Alliance for Health Reform, 2006; Balsa & McGuire, 2003; Betancourt & Maina, 2004; Buescher & Mittal, 2006). Black women bear the greatest burden in infant mortality, LBW, VLBW, and preterm birth (Dominguez, 2008). Dominguez (2008) reported that “even with comparable levels of access, racial/ethnic minorities receive less intensive and poorer quality health care services than do Whites” (p. 365). Black and Hispanic women have lower rates of initiating PNC in the first trimester and are less likely to access continuing prenatal care when compared to their non-Hispanic White counterparts (Frisbie, Echevarria, & Hummer, 2001).

The overall benefit of PNC has been a topic of great debate, with some arguing that it seems to provide no real benefit to the majority of women (Goldenberg & Rouse, 1998; Guillory, Samuels, Probst, & Sharp, 2003; Reagan & Salsberry, 2005) while others have found PNC utilization reduces unfavorable birth outcomes, particularly infant mortality (Cox et al., 2009), small-for-gestational-age (SGA) term newborns (Kramer, 1987; Paneth, 1995), and LBW infants (Shi, Stevens, Wulu JT, Politzer, & Xu, 2004), and can provide needed access to risk-appropriate care (Alexander et al., 2008).

As one strategy to reduce preterm deliveries and low birth weights among all ethnic groups, Healthy People 2020 recommend increasing the proportion of women who receive early and
adequate prenatal care (U.S. Department of Health and Human Services, 2009). Shi et al. (2004) note that for every 5% increase in first trimester initiation of PNC, the LBW rate decreases by more than 1%. An examination of an ethnically-diverse group in Mississippi (n = 292,776) revealed that women of all races / ethnicities who did not receive PNC or received inadequate care were significantly more likely to experience preterm birth, LBW, and infant mortality; and Black women were more likely to delay PNC, receive fewer visits, and have inadequate or even no PNC compared to their White counterparts (Cox et al., 2009). In addition, risk factors for lack of prenatal care utilization such as low SES, being young, poor, and unmarried are more likely to affect Black and Hispanic women than non-Hispanic Whites (Frisbie et al., 2001).

Hispanics are the fastest growing minority in the United States with the highest fertility rates (Hoyert, Mathews, Menacker, Strobino, & Guyer, 2006). Their LBW rate is less than that of non-Hispanic White women but greater if they are American born, suggesting acculturation as one possible explanation for the difference in birth outcomes (Collins & David, 2009). In one study that evaluated PNC utilization in low income Hispanic women, acculturation increased unintended pregnancies and psychosocial risk factors, e.g., stressful life events. Women with protective factors such as family and other sources of social support were more likely to have an earlier entry into prenatal care (Luecken, Purdom, & Howe, 2009). Conversely, non-Hispanic populations consistently demonstrate a strong correlation between no prenatal care and LBW, although this doesn’t generally apply to certain Hispanic groups and is the basis for the well-documented “Latino paradox” (Callister & Birkhead, 2002; Coonrod, Bay, & Balcazar, 2004).

Increasing access to PNC for all women in an effort to improve birth outcomes has been a national objective since the 1980’s. Healthy People 2000 and 2010 objectives advocated that 90% of U.S. women initiate PNC in the first trimester. While gains have been made in adequacy of PNC, not all ethnic groups have realized improvement in access to and utilization of care (Alexander et al., 2002). The infant mortality rate due to short gestation (<37 weeks), and its link to LBW and VLBW is higher among Black women, and the incidence of LBW has remained stagnant in the Black population (Collins & David, 2009).

Data

We examined singleton births to mothers 50 years of age or younger in the U.S. Natality Data from the National Vital Statistics System of the National Center for Health Statistics (NCHS 1979-2006). Prior to 1979, Hispanics were not separately identified in the NCHS Natality Files (National Bureau of Economic Research, [NBER] Codebook, 1978; 2010). Hispanic identifiers were available in only 22 out of the 50 States and the District of Columbia in 1979, 24 states in 1984, 31 in 1988 (as states began transitioning to the 1989 U.S. Standard Certificate of Live Birth), 48 states in 1989 (all but LA, NH, and OK), and all states and the District of Columbia in 1993. Other authors ignored Hispanic ethnicity when reporting on the White / Black differentials over time (Alexander et al., 1999; Alexander et al., 2002; Alexander et al., 2008; Cox et al., 2009), which could cause significantly biased results when reporting disparate treatment between Black and ‘White’ childbearing women. We dropped all mothers with missing values for race or ethnicity and any mother who was not White, Black, or Hispanic (mothers of “Other” races accounted for 5.06 percent of all births prior to being dropped). Of the women who had the race and ethnicity variables available, 22.2 percent of Whites were identified as Hispanic using ethnicity. After all of the exclusions, over 84 million singleton birth records remained (n = 84,028,005).

All analyses included mothers with non-missing variables of interest for any given year. The availability of demographic and birth outcome variables differed across states, though no variable
was missing to the degree that Hispanic identification was prior to 1989. For example, CA, TX, and WA did not report maternal education prior to 1989 and were therefore not included in any education trends or in any regressions using education as a control until 1989. After 1989, the data availability and consistency across states was unchanged until 2003 when PA and WA began using a “Revised” birth certificate. By 2006, 19 states had adopted the “Revised” birth certificate including CA (partially), DE, FL, ID, KS, KY, NE, NH, NY (excluding New York City), ND, OH, PA, SC, SD, TN, TX, VT, WA and WY. Some variables of interest were not consistent across the “Revised” and “Unrevised” birth certificates due to variation in wording, categorization, or availability. While race and ethnicity were consistent across both birth certificates (important for this analysis), the measure of initiation of prenatal care in the first trimester was not. Therefore, to remain consistent with the longer period of analysis we did not use the “Revised” states in the post-2002 analysis of PNC initiation. It should also be noted that prior to 1985, a few states reported only 50% samples of births. All estimation was weighted to account for the differences across states in the rate of reporting.

METHODS

Figure 1 records the well-known increase in the proportion of Hispanic mothers among all White mothers, growing from less than one in eight in 1980 to more than one in four by 2005. The change in the Hispanic and non-Hispanic White percentage in Figure 1 is due to the adoption of the standardized birth certificate in 1989. Given this doubling of the proportion of Hispanic mothers, their inclusion as Whites in racial comparisons of Black / White maternal outcomes will obviously bias trends in racial convergence if Hispanics differ from non-Hispanic Whites in maternal profile.

Figure 1: Racial Composition of Mothers

Figures 2 and 3 indicate profound differences between Hispanics and non-Hispanic Whites in basic birth outcomes. In the number of PNC visits per mother (Figure available by authors) and in the likelihood of receiving PNC in the first trimester (Figure 2), Hispanics and Blacks are very similar to each other and very different from non-Hispanic Whites. This suggests that measured gains in the reduction of disparities between Blacks and Whites (including both Hispanic and non-Hispanic Whites) will be overstated as the proportion of Hispanics (counted in the White maternal population) increases. This is not to suggest that no gains have been achieved among Black women relative to non-Hispanic White women – clearly in terms of PNC visits and the initiation of first trimester care, there have been significant relative gains particularly since 1990. Rather, the point is that these relative gains have likely been overstated for PNC visits and first trimester care for Black mothers because of the increasing proportion of Hispanic mothers counted as White in previous studies.

The levels and trends in birth weights shown in Figure 3 suggest, however, comparatively less bias in the relative Black birth weight gains than in PNC visits and first trimester care. This is because birth weights among Hispanic children are more similar to non-Hispanic White children than Blacks. As a result, the composition bias should be smaller for birth weights than for PNC visits and first trimester care.

**Figure 2: First Trimester Care**

![Graph showing first trimester care trends](image)

*Notes: White (dashed line), African-American (solid line), Hispanic (dotted line). Includes all mothers for which race and ethnicity could be identified through 2006. Post 2002 includes only those states who did not adopt the revised birth certificate. Source: National Center for Health Statistics, 1979-2006.*
To formally examine the significance of the bias in relative Black maternal gains, we designed a cross-sectional retrospective descriptive design using secondary data from the U. S. Natality Data in order to determine differentials in birth outcomes by race, beginning in 1979. Multiple regression and nonlinear estimation models were used to control for confounding and effect-modifying variables that may influence the relationship between race / ethnicity and our selected birth outcomes; the number of PNC visits, initiation of PNC in the first trimester, and birth weight.

The following reduced form equations were estimated for each birth-related variable of interest occurring for mother $i$ in state $j$ ($Y_{ij}$) separately for each year:

1) $Y_{ij} = \beta_0 + \beta_1 \cdot \text{Black}_i + s_j + e_{ij}$

2) $Y_{ij} = \alpha_0 + \alpha_1 \cdot \text{Black}_i + \alpha_2 \cdot \text{Hispanic}_i + s_j + e_{ij}$

3) $Y_{ij} = \delta_0 + \delta_1 \cdot \text{Black}_i + \delta_2 \cdot \text{Education}_i + \delta_3 \cdot \text{Age}_i + \delta_4 \cdot \text{Married}_i + s_j + e_{ij}$

4) $Y_{ij} = \phi_0 + \phi_1 \cdot \text{Black}_i + \phi_2 \cdot \text{Hispanic}_i + \phi_3 \cdot \text{Education}_i + \phi_4 \cdot \text{Age}_i + \phi_5 \cdot \text{Married}_i + s_j + e_{ij}$
Coefficients on the Black mother (Black) variable are reported in Table 1 for 1979 and 2004. The difference in the interpretation of the Black coefficient between equation 1 and 2 (and also 3 and 4, where other socio-demographic variables are also included) is that equations 1 and 3 compare the birth outcomes of Blacks relative to both non-Hispanic and Hispanic Whites. Hence, 1 and 3 are subject to the composition bias previously discussed in conjunction with Figures 1 through 3. Since the Black coefficient in equations 2 and 4 also include a dummy variable for Hispanics, these coefficients control for the composition bias and consequently the Black coefficient provides racial differences between Blacks and (only) non-Hispanic Whites.

The socio-demographic controls in equation 3 and 4 provide partial control for maternal resources, given race/ethnicity. We use categorical variables for education: high school degree (12 years of completed education), some college (13-15 years of completed education), college (16 years), and graduate school (17 years or more); high school dropouts comprise the omitted category. Age is also controlled for categorically: less than 20 years old (the omitted category), 20-24, 25-29, 30-34, 35-39, 40-44, and 45-50.

The $s_j$ term represents a state fixed effect—with more states included over time as states began collecting additional demographic and outcome data. Because we do this analysis on a year-to-year basis, $s_j$ is actually a state-year fixed effect. State identifiers were only available in the Natality Data through 2004 so while Figures 1-3 present data through 2006, our estimates of equations 1-4 only used data through 2004. The coefficients for age, education and marital status are not reported, but are available upon request, as in Figure 4 (PNC visits by ethnicity).

Within this framework, we estimated the composition bias at any point in time by examining the difference in the Black coefficients estimated both with and without the Hispanic dummy variable. More formally the composition bias at a point in time is measured as the relative percentage change in the Black coefficient from the model without the Hispanic indicator to the model that includes it, for the respective maternal outcome. For comparisons without controls for socio-demographic differences, given in the upper panel of Table 1 this is given by the following formula:

$$5a) \left( \frac{\beta - \alpha}{\alpha} \right)$$

For comparisons with controls for socio-demographic differences, given in the lower panel of Table 1, the formula is the following:

$$5b) \left( \frac{\delta - \phi}{\phi} \right)$$

We defined convergence bias for birth outcomes without socio-demographic controls (upper panel in Table 1) as the change in composition bias from 1979 to 2004

$$6a) \left( \frac{\beta - \alpha}{\alpha} \right)_{2004} - \left( \frac{\beta - \alpha}{\alpha} \right)_{1979}$$

For birth outcomes with maternal socio-demographic controls (lower panel in Table 1) this measure was determined by the following formula:

$$6b) \left( \frac{\delta - \phi}{\phi} \right)_{2004} - \left( \frac{\delta - \phi}{\phi} \right)_{1979}$$

The estimates of the convergence bias are reported in square brackets in the last column of Table 1. All standard errors reported in parentheses were robust.
A priori, we expected racial differences to be greater (the Black coefficient more negative in the respective maternal regression) when differentiating non-Hispanic Whites from Hispanics — i.e., the
Black coefficients in equations 2 and 4 will be more negative than their counterparts in equations 1 and 3. Given the differences with respect to birth weight shown in Figure 3, we expected the composition bias to be smallest for this outcome. With the increasing proportion of Hispanics in the ‘White’ population, we expected the convergence bias to increase over time, i.e. the composition bias will have been worse in 2004 than in 1979.

RESULTS

Table 1 reports the estimated coefficients from equations 1-4 using ordinary least squares (OLS) regression for birth weight and the number of prenatal visits. For the discrete outcome of whether the mother initiated PNC in the first trimester, Table 1 reports the marginal effects from a logistic estimation. OLS linear probability model coefficients for first trimester care yielded similar qualitative results and are available upon request. Robust standard errors are reported below the coefficients in parentheses. The number of observations with non-missing variables used for each estimate is reported under the measure of composition bias in ( ) for each birth outcome and year. For example, in 1979 there were 1,348,899 observations with non-missing values for all estimation variables for first trimester care without controls and 700,751 with controls. Table 1 indicates that Black maternal disparities are understated (negative bias) for all three maternal outcomes, with
respect to both composition bias and convergence bias, both with and without controls for maternal socio-demographic characteristics. The sole exception is convergence bias for birth weights, when controlling for maternal socio-demographic characteristics, which is not surprising given the trends shown in Figure 3. The inclusion of age, education and marital status tends to reduce the effect of composition bias (initiation of care in the first trimester composition bias in 2004 actually increased with controls included).

To illustrate, we will describe the results from PNC visits model. In 1979, the coefficient on PNC visits indicate that Blacks have 1.86 fewer visits than Whites in general when Hispanics are counted as Whites, but 2.08 fewer visits when Blacks are Hispanics are separated from non-Hispanic Whites. Hence, the relative percentage bias in the disparity measure is:

\[
\frac{-1.86 - (-2.08)}{-2.08} = 10.6 \text{ percent}
\]

Following this procedure, the percent bias downward is 19.5 percent for first trimester care and 3.81 percent for birth weights in 1979. As expected, the birth weight bias is smaller than the bias in first trimester care or PNC visits. The convergence bias for PNC from 1979 to 2004 is:

\[
-22.0 - (-10.6) = -11.4 \text{ percent}
\]

This number means that the disparity is 11.4 percent worse than a trend calculation would indicate when the researchers fail to distinguish Hispanics from non-Hispanic Whites, as has been the case in previous studies (Alexander, Kogan, Himes, Mor, & Goldenberg, 1999; Alexander et al., 2002; Alexander, Wingate, Bader, & Kogan, 2008; Cox, Zhang, & Zotti, 2009; Hunsley, Levkoff, Alexander, & Tompkins, 1991).

**DISCUSSION**

Though the Natality files employed in this research are a virtual census of all births, we examined only that subset of births for which there were sufficient controls for race and ethnicity. The exclusion of singleton births was necessitated by differences across states reporting Hispanic identification. However, while our results apply only to a subset of the data, it is nevertheless a very large subset and all of our models include state-year fixed effects to control for cross-state variation. It is important to note that we are only providing a measure of bias due to the exclusion of Hispanic identification in birth outcomes. Other possible sources of bias in estimating racial disparities likely exist.

Differences in PNC utilization among Whites, Blacks, and Hispanics have been studied to determine its relationship to socioeconomic status, insurance status, perceived barriers to care, and previous pregnancy loss (Frisbie et al., 2001). However, studies examining birth outcomes (in particular birth weight and percentages of premature birth by race and ethnicity) have excluded Hispanics as a group separate from Whites due to mothers’ self-reporting of race as White and ethnicity as Hispanic. In this study, the inclusion of Hispanics as a separate racial group allowed a comparison between Whites, Blacks, and Hispanics from 1979 through 2006. During the 1990s, it was reported that the gap in PNC utilization between Whites and Black women narrowed, and the initiation of first trimester care increased for Black childbearing women (Alexander et al., 2002). Despite these gains, and despite Medicaid expansion in the mid-1990s, our study indicates that Black mothers remain at a significant and persistent disadvantage in both prenatal care and birth weight.

The qualitative results of our analysis are consistent with Alexander et al. (Alexander et al., 2002)
After controlling for age, education and marital status, Blacks are still 4.2 percent less likely to initiate care in the first trimester, have 0.6 less prenatal care visits and have birth weights that are 194 grams less than their white counterparts. The quantitative measure of disparities and convergence, however, is sensitive to the exclusion of Hispanic identification. Consistent with composition bias, the degree to which the estimated Black-White gap is biased varies across birth outcomes. Composition bias is as high as 27.6 percent and convergence bias is as high as 11.4 percent. The appearance of a narrowing racial disparity emphasizes that any analysis should include the subset of Hispanics in order to understand the burden of worse birth outcomes for Black women by comparison. As Hispanic mothers form an increasingly large percentage of births, the potential for composition and convergence bias will increase.

CONCLUSION

The evidence provided here illustrates the importance of correctly measuring birth outcomes between non-Hispanic Whites, Hispanics, and Blacks in order to address disparities between racial groups. Being poor and a member of a minority should not preclude women from having adequate prenatal care or from the benefit of delivery of a full-term, healthy newborn. Most particularly, studies correctly measuring disparities between groups further explain the burden of worse birth outcomes falling disproportionately on Black women.

REFERENCES


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