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Racial and ethnic differences in preterm birth: A complex, multifactorial problem

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ABSTRACT

Preterm birth remains the leading cause of morbidity and mortality among nonanomalous neonates, and is a major public health problem. Non-Hispanic black women have a 2-fold greater risk for preterm birth compared with non-Hispanic white race. The reasons for this disparity are poorly understood and cannot be explained solely by sociodemographic factors. Underlying factors including a complex interaction between maternal, paternal, and fetal genetics, epigenetics, the microbiome, and these sociodemographic risk factors likely underlies the differences between racial groups, but these relationships are currently poorly understood. This article reviews the epidemiology of disparities in preterm birth rates and adverse pregnancy outcomes and discuss possible explanations for the racial and ethnic differences, while examining potential solutions to this major public health problem.

Introduction

Preterm birth remains a major public health problem. Babies born prior to 37 weeks' gestation are at increased risk for neonatal morbidity and mortality; preterm birth is the direct cause of 35% of all neonatal deaths worldwide.[1] Survivors remain at high risk for complications in early childhood,[2–4] adolescence,[5–7] and into adulthood[5,8–11]; the full extent of the societal burden is likely not yet realized because until recently, long-term survivors of extreme prematurity were uncommon.[5] Mothers who deliver preterm are at elevated risk for serious morbidities\later in life, including cardiovascular disease and stroke.[12–14] Although the preterm birth rate fell from 2007 to 2014 in the United States, the rate recently increased between 2014 and 2015.[15] Even more alarmingly, the gap in the rate of preterm birth between non-Hispanic white and non-Hispanic black women increased during this time.[15] Non-Hispanic black race (compared with non-Hispanic white race) is a consistent risk factor for preterm birth and adverse pregnancy outcomes in the United States. The risk associated with race is significant; in a large systematic review of 30 studies, black women were found to have a 2-fold increased risk (95% CI: 1.8–2.2; pooled odds ratio) compared with whites.[16] Studies of the association between women of other races and ethnicities and preterm birth have been less consistent and results are more heterogeneous. In this same review, 12 studies of Asian ethnicity were examined and mixed results were found; 5 studies showed no significant increase in preterm birth risk whereas 7 studies showed an increased risk (compared to non-Hispanic white women). Further, there was significant variance in the rate of preterm birth across studies ranging from 2.3% to 16.3%, and a wide range of odds ratios for the association between Asian race and preterm birth was found (0.65–1.78).[16] Similarly, Hispanic ethnicity has also produced less consistent results, with Hispanic ethnicity inconsistently associating with

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preterm birth relative to non-Hispanic white women, with odds ratios ranging from 0.1 to 1.5.[16]

The etiologies underlying the disparities in preterm birth rates are poorly understood. Disparities persist even after accounting for known preterm birth risk factors such as smoking, maternal education level, and socioeconomic status. The aim of this article is to review the epidemiology of disparities in preterm birth rates and adverse pregnancy outcomes, discuss possible explanations for the racial and ethnic differences, and examine potential solutions to this major public health problem. This article will focus on the disparities in preterm birth outcomes between non-Hispanic black and non-Hispanic white women in the United States, because these are the best studied and most consistent risks with regard to disparities in birth outcomes in the United States. Since the best described risks are associated with non-Hispanic black women and findings among women of other races are less consistent, review of women of other races are acknowledged but are beyond the scope of the current review.

Epidemiology of disparities

Defining race and ethnicity

Defining the problem of preterm birth is challenging, because many studies of racial disparity in preterm birth use inconsistent definitions and interchange the terms 'race' and 'ethnicity.' For example, some studies examine only 'white' and 'black' populations within the United States, but do so without further classifying individuals with regard to Hispanic ethnicity. Others studies use the terminology 'European-American' and 'African-American,' whereas still others use 'Caucasian' and 'African-American,' or 'non-Hispanic white' and 'non-Hispanic black.' Both the designations of Caucasian and African-American may include some women who are Hispanic. The inconsistency in defining populations can limit the ability to compare results across studies. For the purposes of this article, when reporting results from previous studies, we will use designations reported in the source paper(s). However, for clarity, we prefer to use definitions that incorporate both race and ethnicity, that is, terminology such as non-Hispanic white, non-Hispanic black, and Hispanic. Finally, the vast majority of studies utilize self-reported race and ethnicity to define groups. Previous studies have shown that self-reported ancestry has a high degree of correlation with ancestry proportions estimated by genotype,[17–19] though self-report is imperfect. Modern studies, in particular, may be fraught with more heterogeneity due to increasing admixture across populations.[20]

Trends in preterm birth rates in the United States

The rate of preterm birth in the United States rose to an all-time high in 2007 (10.44%). Due to multiple initiatives aimed primarily at reducing iatrogenic late preterm birth in the late 2000s, prematurity rates fell between 2007 (10.44%) and 2014 (9.57%) before rising again to 9.63% in 2015.[15] This increase was primarily driven by a rise in the percentage of preterm births in non-Hispanic black and Hispanic women. Furthermore, rates of very preterm birth (prior to 34 weeks' gestation) remained largely unchanged over the last 8 years (2.93% in 2007 compared with 2.81% in 2011 and 2.76% in 2015). Rates of preterm birth prior to 34 weeks' gestation are significantly higher among African-American women[21,22] (3.09% in 2015 compared with 1.27% in 2015 in non-Hispanic white women), Figure 1.[15,21,22] Notably, these rates reflect the new standard (as of 2014) for reporting of gestational age (obstetric estimate) compared with the traditional last menstrual period dating. Data using obstetric estimates are available only for 2007 onward, and rates using these calculations generally are lower than last menstrual period estimates. For example, in 2015, the obstetric estimate preterm birth rate was 9.63%, but the last menstrual period based rate was 11.29%.

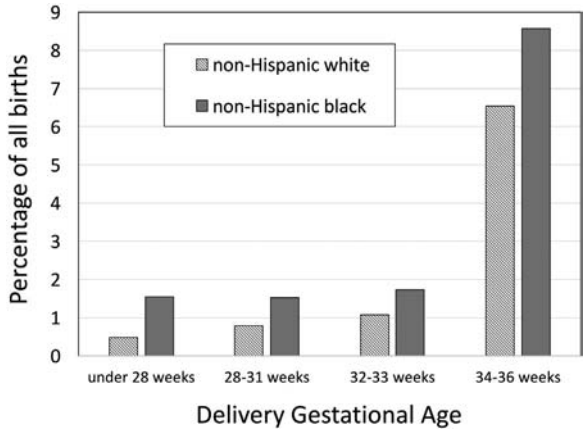

Fig. 1 – Proportion of preterm births, stratified by gestational age at delivery and maternal race, 2015. *Sources*: Martin et al. Final birth data 2015.

Rates of recurrent preterm birth are also higher among non-Hispanic black women. In a population-based study of 644,462 Missouri birth records, black mothers were at higher risk for recurrent preterm birth (aOR = 4.11, 95% CI: 3.78–4.47)[22] and preterm prelabor rupture of membranes (PROM) compared to white mothers (aOR = 6.4, 95% CI: 3.7–11.0).[23]

Preterm birth phenotype

Recently, investigators and clinicians have focused on refining subtypes of preterm birth. Rather than merely designating a birth as spontaneous or medically indicated (e.g., due to pre-eclampsia or fetal growth restriction), additional investigation into the circumstances surrounding delivery can provide information regarding the possible underlying etiology of the preterm birth.[24–26] Phenotype definitions vary between studies, and some studies include variables traditionally considered to be "risk factors" (e.g., maternal stress) with the goal of grouping women who are most likely to have similar underlying preterm birth etiologies.[24] It has been hypothesized that non-Hispanic black women have distinct preterm birth phenotypes compared to non-Hispanic white women. For example, several authors have found that the incidence cervical insufficiency is significantly higher among non-Hispanic black women.[24,27] In one study more broadly evaluating preterm birth phenotypes, African-American