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Variation in Birth Outcomes by Mother's Country of Birth Among Non-Hispanic Black Women in the United States

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Abstract Rates of prematurity (PTB) and small-for-gestational age (SGA) were compared between US-born and foreign-born non-Hispanic black women. Comparisons were also made between Sub-Saharan African-born and Caribbean-born black women and by maternal country of birth within the two regions. Comparisons were adjusted for sociodemographic, health behavioral and medical risk factors available on the birth record. Birth record data (2008) from all states (n = 27) where mother's country of birth was recorded were used. These data comprised 58 % of all singleton births to non-Hispanic black women in that year. Pearson Chi square and logistic regression were used to investigate variation in the rates of PTB and SGA by maternal nativity. Foreign-born non-Hispanic black women had significantly lower rates of PTB (OR 0.727; CI 0. 726, 0.727) and SGA (OR 0.742; CI 0.739–0.745) compared to US-born non-Hispanic black women in a fully adjusted model. Sub-Saharan African-born black women compared to Caribbean-born black women had significantly lower rates of PTB and SGA. Within each region, the rates of PTB and SGA varied by mother's country of birth. These differences could not be explained by adjustment for known risk factors obtained from vital records. Considerable heterogeneity in rates of PTB and SGA among non-Hispanic black women in the US by maternal nativity was documented and remained unexplained after adjustment for known risk factors.

Keywords Preterm · Small-for-gestational-age · Nativity · Black

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Introduction

In the United States there is a pronounced and persistent racial/ethnic disparity in the rates of preterm (PTB) and small for gestational age (SGA) births with the highest rates among non-Hispanic black women. For example, in 2010 non-Hispanic black women had a PTB rate of 17.1 % compared to 10.8 % for their 'non-Hispanic white' counterparts [1]. According to the Centers for Disease Control and Prevention, in 2005 17 % of non-Hispanic black women gave birth to infants weighing less than the 10th percentile of the gestational-age-specific birth weight distribution compared to approximately 10 % of non-Hispanic whites [2]. Even after decades of research and public health initiatives this black disadvantage is relatively unchanged even against the backdrop of overall decreasing rates of infant mortality [3]. In addition to their association with infant death, PTB and SGA can confer increased risk of long-term medical, developmental, and economic disadvantage for children and their families [4, 5]. What drives these racial disparities remains unknown as traditional measures of maternal socioeconomic status, health behaviors, and medical risk factors fail to account for them [6–8].

Some research has explored the contribution of maternal nativity to the risk of adverse birth outcomes. Much research in this area compares birth outcomes between

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Mexican-born and US-born Mexican–American women residing in the United States. Some of these studies document significant differences in birth outcomes across these two groups with Mexican-born women having significantly *better* birth outcomes and rates of infant mortality compared to their US-born counterparts [9–11]. Similarly, recent research shows significant differences in birth outcomes by place of birth for Asian Americans such that some Asian-born subgroups have significantly better birth outcomes compared to Asian women born in the US [12, 13].

Foreign-born non-Hispanic black women also have a significantly lower risk of PTB, low birth weight (LBW) and infant mortality compared to US-born non-Hispanic black women [14–16], but relatively little is known about variation in these outcomes by mothers' place of birth among the foreign-born blacks. To our knowledge no study has examined variation in SGA between US-born non-Hispanic black women and foreign-born non-Hispanic black women. Exploring variation between foreign-born and US-born black women may be increasingly important because census data shows growing diversity in the sending countries of black foreign-born US residents. Early waves of black immigrants came mainly from the Caribbean with a recent increase in migration from Africa [17–19]. Foreign-born blacks comprise a growing proportion of the total US black population with an increase from less than 1 % in 1960 [17] to about 8 % in 2010 based on the American Community Survey [20].

Most studies where health outcomes between white and black populations are explored do not distinguish between foreign-born blacks and their US-born counterparts or the foreign-born by country of birth [14–16, 22], and those that have, have focused on select cities or states [21–26]. Nevertheless, even if the data are limited, prior studies show substantial variation in birth outcomes by mothers' place of birth among black women. David and Collins [22], for example, documented significantly higher birth weights and lower incidence of LBW for African-born compared to US-born black women in Chicago in 1980–1995. Caribbean-born black women also exhibited a lower LBW rate but a similar very low birth weight (VLBW) rate than US-born black women in Chicago in 1985–1990 [23]. Similarly, Wasse et al. [21]. documented a lower rate of LBW among Ethiopian-born women compared to US-born black women in Washington State in 1980–1990. Based on more recent data for New York City, several studies showed significant variation in birth outcomes among black women by mother's place of birth [24–26]. Mason et al. [26], for example, found that African-born women had a lower PTB rate (7.5 %) than Caribbean-born black women (9.9 %), who in turn had a lower rate than US-born black women (11.9 %) in 1995–2003. Similarly, Howard et al. [24]. showed considerable variation in LBW and PTB among black women residing in New York City in 1998–2003 by self-reported maternal ancestry.

This paper contributes to the literature on birth outcomes by investigating differentials in the rates of PTB and SGA among foreign-born non-Hispanic blacks by the mother's country of birth in comparison to US-born non-Hispanic black women. We distinguish foreign-born non-Hispanic blacks by the mothers' region and country of birth and include data from a wider set of states (birth registration areas) than in prior studies. We focus on PTB and SGA that have overlapping yet distinct etiologies [27, 28]. We include births to women who migrated to the United States from two main sending regions of black immigrants—Sub-Saharan Africa and the Caribbean—and distinguish among the major sending countries within each region. These regions were selected because women from these regions comprise 87.7 % of the 2008 births to foreign-born non-Hispanic black women for whom information on country of birth was available.

Methods

We used 2008 vital statistics birth record data from 27 states that have implemented the 2003 revision of the US birth certificate, [29] which include information on the mother's country of birth. Birth records for states that had not yet implemented the 2003 revision of the birth certificate did not have detailed information on the mother's country of birth. These data also contain information on birth weight and gestational length (both clinical and LMP estimates), maternal race, Hispanic origin, age, education, marital status, reproductive history, medical risk factors, prenatal care use, and smoking status. We obtained IRB approval from the Institutional Review Board of the University of Pennsylvania, and approval from the National Association for Public Health Statistics and Information Systems (NAPHSIS) to use mother's country of birth.

In 2008, births from the 27 states comprised 58 % of all *singleton* births to non-Hispanic black women, 57 % of the births to US-born non-Hispanic black women and 65 % of the births to foreign-born non-Hispanic women. To identify non-Hispanic black women we use the "bridge" race category available in the data file, which is based on the same procedure used to bridge multiracial population estimates. Of the 348,722 births to non-Hispanic black women in the 27 states, we excluded 1.1 % of the births when the mothers' country of birth was missing (n = 3,878) and in addition <0.1 % when the mother was born in US territories (n = 723). Of the remaining 344,121 infants, 86.2 % (n = 296,787) were born to US-born non-Hispanic black mothers and 13.8 % (n = 47,334) to foreign-born

non-Hispanic black mothers. Among the foreign-born, 48.5 % (n = 22,952) were to Caribbean-born women and 39.2 % (n = 18,549) to Sub-Saharan African-born (SSA-born) women, accounting for 87.7 % of all foreign-born births to non-Hispanic black women. The remaining 12 % of births to foreign-born non-Hispanic black women (n = 5,833) were excluded from the analysis because these women were born in over 100 different countries resulting in small sample sizes and representing very heterogeneous countries of origin.

In addition, we excluded 0.01 % of births with missing information on birth weight and gestational length and gestations below 20 or above 44 weeks (n = 2,166). We dropped 1.6 % of births (n = 5,410) due to a suspect combination of gestational age and birth weight. In addition information was missing on explanatory variables for 4.0 % of the births (n = 13,775). Finally, we excluded births to women <18 years of age (5.5 %, n = 18,936) because only about one percent of the foreign-born women delivered below this age. Our final data set consists of 298,001 births; 259,481 births to US-born non-Hispanic black women, 21,583 births to Caribbean-born black women and 16,937 births to SSA-born black women.

Birth Outcomes

We examined two birth outcomes: PTB [7, 26] and SGA [30, 31]. We defined PTB using the clinical estimate of gestational age between 20 and <37 weeks. Recent research suggests that the clinical estimate is more accurate when compared to assignment of gestational week based upon last menstrual period [32, 33]. When analyses were repeated using last menstrual period to define gestational age, the main conclusions of this report remained unchanged. Births were considered SGA, if the newborn weighed less than the 10th percentile of the birth weight distribution for a given gestational week. Birth weight cut points for SGA assignment were based upon recently constructed infant sex- and parity-specific reference curves [30].

Mother's Place of Birth

We compared rates of PTB and SGA between US-born non-Hispanic black women and all foreign-born non-Hispanic black women. Additionally, we examined if these outcomes differed between Caribbean-born and SSA-born black women. Finally, we assessed the variation in these outcomes within each of our two sending regions by country of birth. For Sub-Saharan Africa, we included seven countries and combined all other records into a composite variable: Ethiopia, Ghana, Kenya, Liberia, Nigeria, Somalia, Sudan, and All Other. The all other category consisted of 30 % (n = 5,145) of all births to SSA-born black women from over 30 other SSA countries with less than 500 births from any one country. Among the Caribbean-born black women, we differentiated among women born in the Bahamas, Haiti, Jamaica, Trinidad and Tobago and combined all other Caribbean countries into a composite variable. These births made up 9.8 % (n = 2,130) all births to Caribbean-born black women from over 10 countries with less than 500 births from any one country. US-born non-Hispanic black women include those born in the 50 states and the District of Columbia.

Individual-Level Characteristics

We examined maternal sociodemographic characteristics: maternal age (<30 and 30+ years), education (high school and below, some college or greater) and marital status (married vs. not currently married). We included two health behaviors—prenatal care use (PNC) and smoking during pregnancy. Smoking status was missing for about a third of the records because some states did not report smoking status. Therefore, we include smoking only in comparisons of individual-level characteristics but not in the regression models. PNC use was evaluated as beginning care in the 1st trimester, after the 1st trimester, received no care, or prenatal care information was missing/not stated. Of the medical risk factors on the birth certificate we included dichotomous indicators for chronic or pregnancy-induced diabetes and chronic or pregnancy-induced hypertension and for whether the mother had any of these conditions.

Statistical Analysis

First we examined differences in the explanatory variables and birth outcomes between foreign-born non-Hispanic black women and US-born non-Hispanic black women. Next we compared these characteristics between Caribbean-born and SSA-born black women. We ended with a comparison of characteristics by country of birth within each region. Group differences were tested by the Pearson Chi square test.

Logistic regression models to derive maximum likelihood estimates of the odds ratios for the mother's place of birth with their 95 % confidence intervals (95 % CIs) for PTB and SGA were then estimated. Standard errors were corrected for clustering by mother's country of birth. All models were estimated in STATA 11. We fit two models for each outcome. Model 1 provided the unadjusted estimates for the comparison of PTB and SGA by the mothers' place of birth defined in three ways. In Model 2 we controlled for maternal age, education, marital status, hypertension and/or diabetes and PNC use. Parallel to our

Table 1 Comparison of maternal characteristics between U.S.-born non-Hispanic black women and foreign-born non-Hispanic black women and between non-Hispanic black women born in the Caribbean and Sub-Saharan Africa, 2008 vital statistics birth record data

Maternal characteristic	US-born (N = 259,481)	Foreign-born (N = 38,520)	*p* value[a]	Caribbean (21,583)	Sub-Saharan African (16,937)	*p* value[b]
Sociodemographic characteristics						
Maternal age						
<30 years	76.3	46.0	0.000	48.2	43.2	0.000
30+ years	23.7	54.0		51.8	56.8	
Mother's education						
<High school and high school	55.6	49.1	0.000	49.9	48.0	0.000
Some college and higher	44.4	50.9		50.1	52.0	
Marital status						
Married	24.8	60.1	0.000	51.7	70.8	0.000
Region of residence						
Northeast	14.4	34.9		41.8	26.1	
Midwest	19.5	7.9		1.2	16.5	
South	54.2	46.8		55.4	35.8	
West	12.0	10.4	0.000	1.6	21.5	0.000
Health behaviors						
Smoked during pregnancy[c]						
Yes	10.5	0.5	0.000	0.7	0.4	0.000
Prenatal care						
Yes, began in 1st trimester	56.7	55.9	0.000	57.9	53.3	0.000
Yes, began after 1st trimester	32.1	35.1		33.9	36.6	
No prenatal care and missing	11.2	9.1		8.2	10.1	
Medical risk factors						
Hypertension—yes	7.3	6.1	0.000	7.0	4.8	0.000
Diabetes—yes	4.1	6.2	0.000	6.5	5.8	0.004
Hypertension and/or diabetes—yes	10.5	11.4	0.000	12.4	9.9	0.000

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[a] *p* values refer to a Pearson Chi square test for the differences between US-born and foreign-born women

[b] *p* values refer to a Pearson Chi square test for the differences between women born in the Caribbean and Sub-Saharan Africa

[c] Among those for whom smoking information was reported

descriptive analysis, our three definitions for the comparisons for mothers' place of birth were the following. We began by modeling differences between foreign-born non-Hispanic black women and US-born non-Hispanic black women. Second, we examined differences between non-Hispanic black women born in the Caribbean and Sub-Saharan Africa. Third, we investigated differences in PTB and SGA separately within region by maternal country of birth.

Results

Table 1 shows the distribution of sociodemographic characteristics, health behaviors and medical risk factors for US-born, all foreign-born, Caribbean-born and SSA-born non-Hispanic black women. Results of two comparisons are also presented; US-born non-Hispanic black women versus all foreign-born non-Hispanic black women and Caribbean-born black women versus SSA-born black women. For all sociodemographic and health behavioral variables shown in Table 1, all foreign-born non-Hispanic black women show significantly lower risk profiles when compared to US-born non-Hispanic black women. Interestingly, the only variable where all foreign-born non-Hispanic black women show an increased risk compared to the US-born group is diabetes with all foreign-born non-Hispanic black women showing a prevalence of 6.2 % compared to 4.1 % among US-born non-Hispanic black women. When Caribbean-born black women are compared to SSA-born black women results indicate that on all measures Caribbean-born black women are at higher risk.

Table 2 Comparison of maternal characteristics by the mother's country of birth among non-Hispanic black women from the Caribbean, 2008 vital statistics birth record data

Maternal characteristic	The Bahamas (N = 780)	Haiti (N = 8,998)	Jamaica (7,572)	Trinidad and Tobago (N = 2,103)	All other Caribbean (2,130)	*p* value[a]
Sociodemographic characteristics						
Maternal age						
<30 years	55.1	44.6	49.7	56.0	48.1	0.000
30+ years	44.9	55.4	50.3	44.0	51.9	
Mother's education						
<High school and high school	48.3	59.7	41.0	46.2	44.9	0.000
Some college and higher	51.7	40.3	59.0	53.8	55.1	
Marital status						
Married	46.9	59.1	45.5	51.4	44.8	0.000
Region of residence						
Northeast	5.0	24.4	50.9	70.7	67.6	0.000
Midwest	1.2	0.7	1.7	1.1	1.5	
South	92.2	74.1	45.2	26.0	28.2	
West	1.7	0.8	2.3	2.2	2.7	
Health behaviors						
Smoked during pregnancy[b]						
Yes	3.6	0.5	0.8	0.9	0.4	0.005
Prenatal care						
Yes, began in 1st trimester	54.7	52.2	62.8	63.1	60.4	0.000
Yes, began after 1st trimester	33.1	37.8	30.0	31.0	34.3	
No prenatal care and missing	12.2	10.0	7.2	5.9	5.3	
Medical risk factors						
Hypertension—yes	10.0	7.2	6.6	5.8	8.1	0.000
Diabetes—yes	4.2	6.4	6.3	7.8	7.4	0.003
Hypertension and/or diabetes—yes	13.3	12.4	11.9	12.4	14.4	0.039

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[a] *p* values refer to a Pearson Chi square test for the differences by the mother's country of birth

[b] Among those for whom smoking information was reported

For example, Caribbean-born black women are significantly more likely to be unmarried (48.3 vs. 29.2 %), have hypertension (7.0 vs. 4.8 %) and diabetes (6.5 vs. 5.8 %).

When country of birth was considered within the Caribbean-born group no consistent pattern of risk for a given country was observed (Table 2). For example, Jamaican-born black women are most likely to have attended college (59.0 %), whereas the Haitian women are least like to have done so (40.3 %). In contrast, Haitian women were most likely to be married (59.1 %) with all other Caribbean-born black women (55.2 %) most likely to be unmarried. The prevalence of medical risk factors also varied such that the non-Hispanic black women born in the Bahamas had the highest prevalence of hypertension (10.0 %) and lowest prevalence of diabetes (4.2 %). The Bahamians also stand out in their smoking behavior compared to all other Caribbean subgroups. Although their rate of antenatal smoking is low (3.6 %), it is four times greater than the group demonstrating the next highest rate (Trinidad and Tobago 0.9 %). Non-Hispanic black women born in Trinidad and Tobago in turn have the highest prevalence of diabetes (7.8 %) and lowest prevalence of hypertension (5.8 %).

Similar comparisons also reveal significant variation by country of birth among SSA-born black women (Table 3). For example, women born in Liberia show a fairly consistent pattern of risk on the sociodemographic variables. They are comparatively poorly educated and less likely to be married or start PNC in the first trimester. At the same time, medical risk factors are not consistently high among these women; they have the lowest prevalence of diabetes (3.9 %), but the second highest prevalence of hypertension (5.6 %). In contrast, Kenyan-born black women have a relatively low risk profile based on sociodemographic

Table 3 Comparison of maternal characteristics by the mother's country of birth among non-Hispanic black women from Sub-Saharan Africa, 2008 vital statistics birth record data

Maternal characteristics	Ethiopia (N = 2,049)	Ghana (N = 1,473)	Kenya (N = 979)	Liberia (N = 1,018)	Nigeria (N = 3,360)	Somalia (N = 2,041)	Sudan (N = 872)	All other SSA (N = 5,145)	*p* value[a]
Sociodemographic characteristics									
Maternal age									
<30 years	39.1	35.9	38.4	63.9	30.7	62.0	51.5	43.0	0.000
30+ years	60.9	64.1	61.6	36.1	69.3	38.0	48.5	57.0	
Mother's education									
<High school and high school	56.8	41.1	18.1	63.9	17.7	85.7	64.9	51.0	0.000
Some college and higher	43.2	58.9	81.9	36.1	82.3	14.3	35.1	49.0	
Marital status									
Married	69.1	60.0	70.9	41.4	84.8	78.3	78.6	67.1	0.000
Region of residence									
Northeast	6.3	47.2	9.5	46.3	21.6	8.3	18.1	38.6	0.000
Midwest	11.5	14.6	19.5	14.9	8.6	28.7	36.2	15.7	
South	37.2	27.8	51.0	31.2	53.2	26.2	25.7	29.8	
West	45.0	10.4	20.0	7.6	16.6	36.8	20.0	15.9	
Health behaviors									
Smoked during pregnancy[b]									
Yes	0.8	0.0	0.6	0.6	0.2	0.5	0.5	0.3	0.003
Prenatal care									
Yes, began in 1st trimester	55.3	58.3	57.0	47.5	54.3	47.3	52.4	53.5	0.000
Yes, began after 1st trimester	34.9	31.6	35.3	39.1	35.1	42.2	39.9	36.5	
No prenatal care and missing	9.8	10.1	7.7	13.4	10.6	10.5	7.7	10.0	
Medical risk factors									
Hypertension—yes	4.2	6.8	3.9	5.6	5.5	3.2	3.3	5.0	0.000
Diabetes—yes	6.0	7.7	4.6	3.9	5.2	6.1	4.4	6.2	0.000
Hypertension and/or diabetes—yes	9.6	13.3	7.9	9.0	10.1	8.7	7.5	10.5	0.000

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[a] *p* values refer to a Pearson Chi square test for the differences by the mother's country of birth

[b] Among women for whom information for smoking was reported

variables with over 80 % having at least some college, over 70 % are married and they also have a relatively high rate of first trimester PNC initiation. They also have relatively low prevalence of hypertension (3.9 %) and diabetes (4.6 %). A mixed profile of risk is evident among Ethiopian-born black women with low educational attainment, high marriage rates, moderate PNC initiation in the first trimester and moderate rates of hypertension and diabetes. Although Ghanaian-born black women also have a mixed pattern of risk, it is important to note that Ghanaian women have the highest rates of both hypertension and diabetes.

Moving from the descriptive analyses of the individual-level characteristics, we compare the rates of PTB and SGA by maternal nativity (Table 4). US-born non-Hispanic black women compared to all foreign-born non-Hispanic black women show increased rates for PTB and SGA. For example, US-born non-Hispanic black women had a PTB rate of 12.4 % compared to 9.4 % among all foreign-born

Table 4 Distribution of preterm birth and small for gestational age birth by mother's region and country of birth among non-Hispanic black women in the United States, 2008 (N = 298,001)

Mother's place of birth	Preterm birth			SGA birth		
	%	#	*p* value	%	#	*p* value
U.S.-born	12.4	32,241	0.000[a]	16.7	43,211	0.000[a]
Foreign-born	9.4	3,622		12.0	4,634	
Caribbean-born	11.0	2,379	0.000[b]	12.8	2,767	0.000[b]
Sub-Saharan Africa-born	7.3	1,243		11.0	1,867	
Caribbean-born						
The bahamas	13.9	108	0.071[c]	11.5	90	0.000[c]
Haiti	10.7	966		13.6	1,225	
Jamaica	10.8	817		11.6	875	
Trinidad and Tobago	11.6	243		14.9	313	
All other Caribbean	11.5	245		12.4	264	
Sub-Saharan African-born						
Ethiopia	5.3	109	0.000[d]	7.9	162	0.000[d]
Ghana	10.3	152		11.9	175	
Kenya	6.1	60		9.2	90	
Liberia	9.6	98		11.4	116	
Nigeria	7.8	261		8.3	280	
Somalia	6.0	122		12.4	254	
Sudan	6.7	58		13.8	120	
All other Sub-Saharan Africa	7.4	383		13.0	670	

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[a] Pearson Chi square test for the difference in the distribution among U.S.-born and foreign-born non-Hispanic black women

[b] Pearson Chi square test for the difference in the distribution among the Caribbean-born non-Hispanic black women and non-Hispanic black women born in Sub-Saharan Africa

[c] Pearson Chi square test for the difference in the distribution among the Caribbean-born non-Hispanic black women

[d] Pearson Chi square test for difference in the distribution among non-Hispanic black women born in Sub-Saharan Africa

non-Hispanic black women, or a 30 % increase in the rate. The same pattern is evident for SGA with a rate of 16.7 % among US-born non-Hispanic black women compared to 12.0 % among all foreign-born non-Hispanic black women, a 40 % increase in the rate. When Caribbean-born blacks are compared to SSA-born blacks, Caribbean women have higher rates of both adverse outcomes (PTB 11.0 vs. 7.3; SGA 12.8 vs. 11.0). This pattern is consistent with the elevated risk profile of Caribbean-born women compared to the SSA-born women (see Table 1).

Within the Caribbean-born group the rate of PTB is highest among black-women born in the Bahamas (13.9 %), a rate higher than among US-born non-Hispanic black women. Among the Caribbean subgroup, women born in Trinidad and Tobago (11.6 %) have the second highest rate followed by all other Caribbean countries (11.5 %), other than Haiti and Jamaica. The rate of PTB is similar for the Haitians (10.7 %) and the Jamaicans (10.8 %). Similarly, there is variation in the rate of SGA, but the pattern is somewhat different. The highest rate of SGA is documented for non-Hispanic black women born in Trinidad and Tobago (14.9 %) and the lowest rate for non-Hispanic black women born in the Bahamas (11.5 %), a rate that is similar to that among Jamaican women (11.6 %).

Comparisons among Sub-Saharan African women also show considerable variation in rates of both PTB and SGA. Ethiopian-born women have the lowest rate of both PTB (5.3 %) and SGA (7.9 %) even though women born in this country demonstrated a mixed risk profile with regard to individual attributes. Ghanaian-born women showed the highest rate of PTB (10.3 %). Recall that this group had the worst medical risk profile and mixed risk with respect to sociodemographic characteristics. Black women born in Sudan had the highest rate of SGA (13.8 %), followed by black women from All Other Sub-Saharan African countries (13.0 %), and women born in Somalia (12.4 %). Both the Sudanese and Somali women showed a mixed risk profile when individual characteristics were evaluated.

Table 5 presents results from the multivariate analysis. Controlling for the available explanatory variables does not help to explain the foreign-born advantage relative to the US-born in either PTB or SGA. All foreign-born non-Hispanic black women had significantly lower odds of PTB (OR 0.727; CI 0. 726, 0.727) and SGA (OR 0.742; CI 0.739–0.745) compared to US-born non-Hispanic black women in a fully adjusted model. Similarly, the Sub-Saharan African advantage in PTB (OR 0.683; CI 0.661–0.705) and SGA (OR: 0.865; 0.861–0.869) relative to the Caribbean-born subgroup cannot be explained by the individual-level attributes. Finally, the variation in PTB and SGA by the mother's country of birth within the Caribbean-born and SSA-born subgroups remains largely unchanged. In fact, in all cases the available explanatory variables do little to change the unadjusted odds ratios.

Discussion

Our results are consistent with previous findings showing that foreign-born non-Hispanic black women have a lower rate of PTB than US-born non-Hispanic black women and that this advantage cannot be explained by individual-level sociodemographic characteristics, health behaviors and medical risk factors available on the birth certificate [12, 16, 26]. We documented a similar foreign-born advantage

Table 5 Odd Ratios with 95 % confidence intervals from logistic regression models for preterm and small-for-gestational-age birth for foreign-born, Caribbean-born, sub-Saharan African-born non-Hispanic black women, United States 2008

Place of birth (US-born)	Preterm birth—odds ratios and 95 % confidence intervals		SGA birth—odds ratios and 95 % confidence intervals	
	Unadjusted (N = 298,001)	Fully adjusted (N = 298,001)	Unadjusted (N = 298,001)	Fully adjusted (N = 298,001)
Foreign-born (US-born)	0.732 [0.732; 0.732]	0.727 [0.726; 0.727]	0.684 [0.684; 0.684]	0.742 [0.739; 0.745]
Sub-Saharan Africa (Caribbean)	0.639 [0.639; 0.639]	0.683 [0.661; 0.705]	0.842 [0.842; 0.842]	0.865 [0.861; 0.869]
Caribbean (other Caribbean)				
The Bahamas	0.925 [0.925; 0.925]	0.979 [0.952; 1.007]	1.114 [1.114; 1.114]	1.145 [1.112; 1.178]
Haiti	0.931 [0.931; 0.931]	0.961 [0.947; 0.975]	0.923 [0.923; 0.923]	0.935 [0.912; 0.958]
Jamaica	1.005 [1.005; 1.005]	1.059 [1.051; 1.067]	1.236 [1.236; 1.236]	1.246 [1.225; 1.266]
Trinidad and Tobago	1.237 [1.237; 1.237]	1.295 [1.249; 1.343]	0.922 [0.922; 0.922]	0.932 [0.883; 0.985]
Sub-Saharan Africa (All other SSA)				
Ethiopia	0.699 [0.699; 0.699]	0.681 [0.658; 0.705]	0.573 [0.573; 0.573]	0.583 [0.556; 0.611]
Ghana	1.431 [1.431; 1.431]	1.346 [1.335; 1.357]	0.900 [0.900; 0.900]	0.908 [0.892; 0.924]
Kenya	0.812 [0.812; 0.812]	0.822 [0.776; 0.871]	0.676 [0.676; 0.676]	0.750 [0.701; 0.801]
Liberia	1.324 [1.324; 1.324]	1.376 [1.300; 1.456]	0.859 [0.859; 0.859]	0.789 [0.759; 0.819]
Nigeria	1.047 [1.047; 1.047]	1.026 [0.958; 1.098]	0.607 [0.607; 0.607]	0.687 [0.654; 0.722]
Somalia	0.790 [0.790; 0.790]	0.847 [0.810; 0.885]	0.949 [0.949; 0.949]	0.889 [0.852; 0.929]
Sudan	0.886 [0.886; 0.886]	0.968 [0.935; 1.003]	1.066 [1.066; 1.066]	1.050 [1.029; 1.072]

The fully adjusted model controls for the following explanatory variables: maternal age, education, marital status, region of residence, prenatal care use and whether the mother had hypertension and/or diabetes

2003 Revision of the US Standard Birth Certificate. For each comparison the omitted category is given in parentheses

for SGA. We further found that the rates of PTB and SGA varied among the foreign-born such that women born in Sub-Saharan Africa had significantly lower rates of both outcomes than women born in the Caribbean. Other studies have also documented similar variation in birth outcomes between black women born in the Caribbean and black women born in Sub-Saharan Africa [26]. We also documented significant variation in the rates of PTB and SGA among the Caribbean and Sub-Saharan African women by country of birth, a variation that remained robust to controls for explanatory variables.

The reproductive health status of foreign-born non-Hispanic black women is an important public health issue. Black immigrants are growing rapidly as a proportion of the overall US black population [17]. In addition to their overall increase, foreign-born blacks are becoming increasingly diverse with the rapid growth of immigration from Sub-Saharan Africa in the last 20 years [18, 34], a group of black immigrants with the lowest rates of PTB and SGA. Thus without regard to nativity, black-white disparities in birth outcomes could appear to be narrowing even if no change in such disparities has occurred among US-born black women. Whether the favorable birth outcomes among the foreign-born non-Hispanic black women compared to the US-born non-Hispanic black women can be sustained over time is not known. There is some evidence to suggest that this might not be the case. For example, an analysis of intergenerational transmission of birth weight using birth records data from Illinois showed that the expected intergenerational rise in birth weight did not occur among the direct descendants of foreign-born black women, instead the reverse was true. This worsening birth weight of the decedents of foreign-born black women was not explained by maternal age or marital status, rather the authors speculated that unidentified aspects of US society could be harmful to the reproductive health of African American women [35].

Prior research on the health of immigrants in the United States has further shown that the foreign-born health advantage diminishes with increasing duration of residence in the United States as the foreign-born "acculturate" to the US society. It is hypothesized that immigrants bring with them cultural norms and values that initially promote healthier life styles, encourage strong familial ties and thus provide social support and buffer against the health eroding effects of stress [36–38]. In addition, for black immigrants the negative health consequences of longer duration of US residence stems not only from possible erosion of health-promoting cultural values but also exposure to racial discrimination and its associated disadvantages [38]. Attachment to healthier traditional culture may account for some of the variation we observed between the SSA-born and Caribbean-born black women. A much higher proportion of SSA-born women ages 15–49 when compared to the

Caribbean-born women immigrated to the United States in the last 5 years. Approximately 25 % of the SSA-born women ages 15–49 came to the US in the last 5 years (e.g., 21 % of the Ghanaians and 31 % of the Somalis) compared to between 8 % (Trinidad and Tobago) and 15 % (the Bahamians) of the Caribbean women. Furthermore, close to three-quarters of the Caribbean-born women came to the US over 10 years ago compared to less than half of the SSA-born women (tabulations based on the 2005–2010 waves of the American Community Survey (ACS)) [20]. These data suggest that black SSA-born women have, on average, a shorter tenure in the US and thus possibly less erosion in their attachment to traditional values and less cumulative exposure to discrimination. They also have a shorter duration of exposure to the racially stratified US society. This speculation is consistent with prior studies that have documented lower levels of hypertension [39] and functional and self-care limitations [40], better self-rated health [41] and less adverse health behaviors among African-born compared to Caribbean-born US residents, including pregnant women [42].

In addition, a much larger percentage of the Caribbean-born black women than the SSA-born black women are likely to have arrived in the United States at an early age. Based on the 2005–2010 ACS, for example, the percentage of black women ages 15–49 who came to the US before age 10 ranged from 15 % of the Haitians to 33 % of the Bahamians compared to 6 % of the Ethiopians to 15 % of the Sudanese. There is evidence that early life exposures influence adult health outcomes, and possibly reproductive health, through multiple pathways [43, 44]. Thus if growing up in the US exposes black women to adverse experiences and conditions from an early age, it could have some bearing on variation in birth outcomes among the foreign-born. Especially important may be experiences of racial discrimination. For example, a recent study of self-reported experiences with racism among US-born and foreign-born black pregnant women in Boston, MA reported that self-reported prevalence of racism was significantly higher among US-born than foreign-born black pregnant women [45]. In addition, reports of discrimination by US-born black women more closely resembled those of foreign-born black women from the Caribbean than from Africa. Furthermore, foreign-born black women who moved to the United States before age 18 were more similar in their self-reports of racism to those of the US-born women than women who immigrated at ages 18 or above [45].

Thus far we have described what might account for variation in the risk of PTB and SGA among the foreign-born. In addition, we cannot rule out the possible role of selection. It is reasonable to assume that health selectivity may be higher among immigrants from Sub-Saharan Africa than from the Caribbean. African immigrants are more likely to enter on diversity visas and on employment-based references, although they are also more likely to enter as refugees [17]. Among the Sub-Saharan Africans a large percentage of the women from Liberia, Sudan and Somalia are likely to have entered the United States as refugees, yet their birth outcomes are also superior to those of the Caribbean-born and US-born women.

The limited information on socioeconomic status, health behaviors and biomedical risk factors available on the birth certificate preclude a thorough examination of factors that may contribute to the observe differences. The shortcomings of the birth record data are well known and we recognize their limited validity to capture important variation in maternal biomedical risks, behaviors and the family's socioeconomic status. At the same time, birth record data are the most widely used data available to examine population-level variation in birth outcomes. In addition, because not all states had implemented the 2003 revision of the US birth certificate by 2008, information on the mother's country of birth was available only for about 57 % of births to US-born non-Hispanic black women and 65 % of the births to foreign-born non-Hispanic black women. Thus our findings may not be generalizable to all births of non-Hispanic black women in the United States.

Conclusions

Further studies are needed to gain a better understanding of the factors contributing to the foreign-born black reproductive advantage, including migrant selectivity, duration of residence in the United States, socioeconomic status, the role of racial discrimination, and possible gene and environment interactions. There are two broad ways to conceptualize the premier factors underpinning the health disadvantage of US-born non-Hispanic black women. First, some assume that US-born non-Hispanic black women are genetically predisposed to adverse birth outcomes especially when compared to their white counterparts. Alternatively, a more social explanation focuses on life–time exposures to disadvantage and the historical legacy of slavery in the production of poor health among US-born non-Hispanic black women, perhaps in part through epigenetic changes. The observed variation in the rates of PTB and SGA by region and country of birth and the strong disadvantage of US-born non-Hispanic black women indicate to us that the more likely fundamental cause lies more firmly within the social domain. Comparisons with countries of origin and longitudinal follow-up of immigrants and life course approaches to the study of racial/ethnic disparities in birth outcomes are needed to improve our understanding of the causal mechanisms involved [43–47].

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