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Original Article

The Association of Preterm Birth With Maternal Nativity and Length of Residence Among Non-Hispanic Black Women

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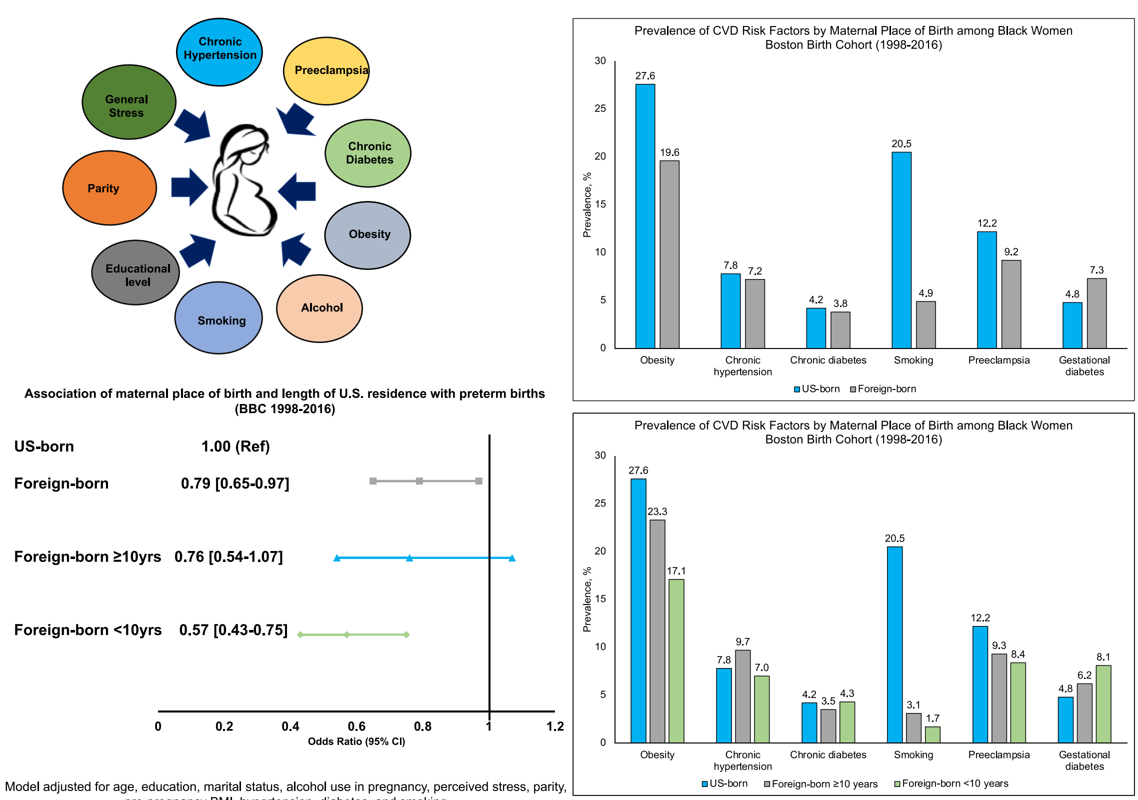

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ABSTRACT

Background: Preterm birth (PTB) is associated with future cardiovascular disease (CVD) risk and disproportionally affects non-Hispanic Black (NHB) women. Limited data exist on the influence of length of US residence on nativity-related disparities in PTB. We examined PTB by maternal nativity (US born vs foreign born) and length of US residence among NHB women.

Methods: We analyzed data from 2699 NHB women (1607 US born; 1092 foreign born) in the Boston Birth Cohort, originally designed as a case-control study. Using multivariable logistic regression, we investigated the association of PTB with maternal nativity and length of US residence.

Results: In the total sample, 29.1% of women delivered preterm (31.4% and 25.6% among US born and foreign born, respectively). Compared with foreign born, US-born women were younger (25.8 vs 29.5 years), had higher prevalence of obesity (27.6% vs 19.6%), smoking (20.5% vs 4.9%), alcohol use (13.2% vs 7.4%), and moderate to severe stress (73.5% vs 59.4%) (all $P < 0.001$). Compared with US-born women, foreign-born women had lower odds of PTB after adjusting for sociodemographic characteristics, alcohol use, stress, parity, smoking, body mass index, chronic hypertension, and diabetes (adjusted odds ratio [aOR], 0.79; 95% confidence interval [CI], 0.65-0.97). Foreign-born NHB women with < 10 years of US residence had 43% lower odds of PTB compared with US-born (aOR, 0.57; 95% CI, 0.43-0.75), whereas those with ≥ 10 years of US residence did not differ significantly from US-born women in their odds of PTB (aOR, 0.76; 95% CI, 0.54-1.07).

Conclusions: The prevalence of CVD risk factors and proportion of women delivering preterm were lower in foreign-born than US-born NHB women. The "foreign-born advantage" was not observed with ≥ 10 years of US residence. Our study highlights the need to intensify public health efforts in exploring and addressing nativity-related disparities in PTB.

RÉSUMÉ

Introduction : L'accouchement avant terme (AAT) est associé à un risque futur de maladie cardiovasculaire (MCV) et touche disproportionnellement les femmes noires non hispaniques (NNH). Les données sur l'influence de la durée de résidence aux É.-U. sur les disparités de l'AAT liées au lieu de naissance sont limitées. Nous avons examiné l'AAT en fonction du lieu de naissance de la mère (née aux É.-U. *vs* née à l'étranger) et la durée de résidence aux É.-U. chez les femmes NNH.

Méthodes : Nous avons analysé les données de 2 699 femmes NNH (1 607 nées aux É.-U.; 1 092 nées à l'étranger) de la Boston Birth Cohort, conçue à l'origine comme une étude cas-témoins. À l'aide de la régression logistique multivariée, nous avons examiné l'association de l'AAT au lieu de naissance de la mère et à la durée de résidence aux É.-U.

Résultats : Dans l'échantillon total, 29,1 % des femmes qui avaient accouché avant terme (soit 31,4 % des femmes nées aux É.-U. et 25,6 % des femmes nées à l'étranger). Comparativement aux femmes nées à l'étranger, les femmes nées aux É.-U. étaient plus jeunes (25,8 *vs* 29,5 ans), montraient une prévalence plus élevée d'obésité (27,6 % *vs* 19,6 %), du tabagisme (20,5 % *vs* 4,9 %), de la consommation d'alcool (13,2 % *vs* 7,4 %) et de stress modéré à important (73,5 % *vs* 59,4 %) (toutes les valeurs $P < 0{,}001$). Comparativement aux femmes nées aux É.-U., les femmes nées à l'étranger avaient un risque inférieur d'AAT après l'ajustement des caractéristiques sociodémographiques, de la consommation d'alcool, du stress, de la parité, du tabagisme, de l'indice de masse corporelle, de l'hypertension chronique et du diabète (ratio d'incidence approché ajusté [RIAa], 0,79; intervalle de confiance [IC] à 95 %, 0,65-0,97). Les femmes NNH nées à l'étranger de < 10 ans de résidence aux É.-U. avaient une probabilité 43 % plus faible d'AAT que les femmes nées aux É.-U. (RIAa, 0,57; IC à 95 %, 0,43-0,75), tandis que les femmes de ≥ 10 ans de résidence aux É.-U. ne montraient pas de différence significative dans leur probabilité d'AAT par rapport aux femmes nées aux É.-U. (RIAa, 0,76; IC à 95 %, 0,54-1,07).

Conclusions : La prévalence des facteurs de risque de MCV et la proportion de femmes qui accouchent avant terme étaient plus faibles chez les femmes NNH nées à l'étranger que chez les femmes NNH nées aux É.-U. L'« avantage d'être nées à l'étranger » n'était pas observé lors de ≥ 10 ans de résidence aux É.-U. Notre étude illustre la nécessité d'intensifier les efforts de santé publique pour explorer et remédier aux disparités liées au lieu de naissance dans l'AAT.

Adverse pregnancy outcomes occur in 15% to 20% of all pregnancies and include preterm birth (PTB), preeclampsia and eclampsia, and intrauterine growth restriction.[1] PTB affects up to 10% of all pregnancies in the United States and is associated with a high risk of neonatal morbidity and mortality and possible lifelong effects.[1-4] Importantly, mothers who deliver preterm infants have an elevated risk of short- and long-term cardiovascular disease (CVD).[5-8] A recently published large meta-analysis demonstrated an increased risk of future maternal CVD (risk ratio [RR], 1.43; 95% confidence interval [CI], 1.18-1.72) in preterm compared with full-term pregnancy.[9]

Although the exact mechanism for the association between PTB and future CVD remains unclear, there are several shared risk factors between PTB and CVD. PTB has been associated with maternal prepregnancy hypertension, obesity,

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Ethics Statement: The original BBC study protocol was approved by the Institutional Review Board (IRB) of Boston University Medical Center. Subsequently, the BBC has received annual continuation approval from the Boston University Medical Center IRB and the Johns Hopkins Bloomberg School of Public Health internal review board (IRB). Our current study is within the scope of the IRB-approved research. We followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines in reporting our findings.

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psychosocial stress, postpartum insulin resistance, and higher blood pressure in later life, which are also risk factors for CVD.[8,10-13] In addition, there are recognized disparities in PTB in the United States,[14-18] with non-Hispanic Black (NHB) women having the highest prevalence of PTB (14.1% in 2018) compared with women of other races and ethnicities.[10] Similarly, NHB women also have a higher prevalence of premature CVD.[19]

It is essential to recognize the heterogeneity in NHB women in the United States, as there are differences in the CVD risks in women of the same race born in different regions. For instance, Africans in industrialized nations typically have higher CVD risk factors than those residing in Africa.[20-23] A previous study also suggests that foreign women of African descent may be more likely to have PTB if exposed to psychosocial stress.[12] Hence, when evaluating cardiovascular and pregnancy outcomes in individual NHB women, place of birth and duration of residence in the United States should be considered. Duration of residence is often used as a proxy for acculturation, implying that longer duration in the United States equates to increased exchanges of cultural experience, adaptations, and integrations.[24] A previous study showed that increased length of US residence in African immigrants was associated with greater odds of CVD risk factors.[24] Similarly, we have previously demonstrated that the prevalence of preeclampsia, which is also associated with subsequent CVD, is lower in foreign-born NHB women, but this foreign-born advantage declines with increased duration of US residence.[25] However, whether this waning advantage of foreign-born women is seen in other adverse pregnancy outcomes, specifically in PTB, is not well studied. In addition, most studies that have examined nativity-related disparities in PTB have not assessed the influence of length of US residence on these disparities.[26-31] Given the association of CVD risk factors with PTB, we aimed to explore the prevalence of CVD risk factors and the odds of PTB by nativity and length of US residence among NHB women.

Methods

Data source, study design, and study population

This study used data from the Boston Birth Cohort (BBC), a US urban, multiracial birth cohort, between 1998 and 2016.[3,32] Data and analytic methods used in this study will be made available upon reasonable request. The BBC comprises 8509 mother-baby dyads recruited from the Boston Medical Center, which serves a diverse, primarily low-income, inner-city population.[3] The BBC represents a high-risk population, originally designed as a case-control study to investigate the association of environmental and genetic factors with adverse pregnancy outcomes such as PTB and low birth weight.[32]

Eligibility criteria for enrollment included all mothers who deliver a live singleton birth at the Boston Medical Center. Each case of PTB (delivery before 37 weeks' gestation) or low birth weight (< 2500 g) was matched to approximately 2 age- and ethnicity-matched controls (term birth with normal birth weight).[32] Exclusion criteria included multiple gestations, pregnancies resulting from in vitro fertilization, and newborns with major congenital disabilities or chromosomal abnormalities.

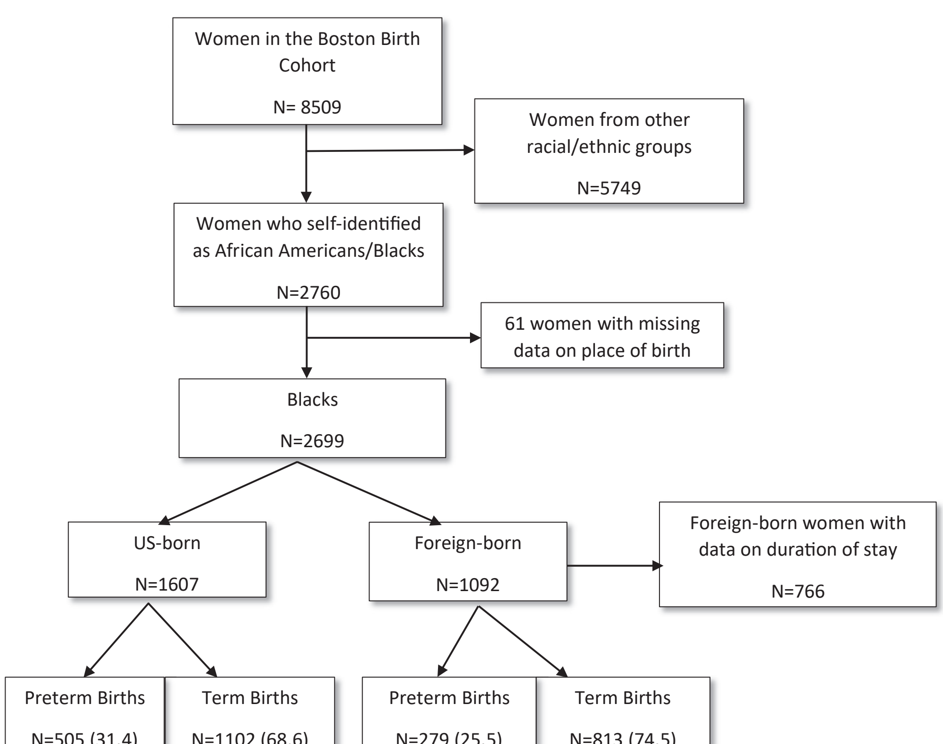

Figure 1. Flowchart describing the selection of analytic sample from the Boston Birth Cohort.

Eligible participants were recruited within 24 to 72 hours after delivery following written informed consent. Standardized questionnaires were used to collect data on maternal sociodemographic characteristics. In addition, information on CVD risk factors and pregnancy outcomes was abstracted from maternal and neonatal electronic medical records.

Our current study focuses on a subset of 2,760 women of the BBC who self-identified as NHB. Of these, 2699 women with data on maternal place of birth were included in our analyses. Of the foreign-born women, only 766 had data on their duration of US residence (Fig. 1).

Definition of preterm birth

The primary outcome of interest, PTB, was defined as delivery before 37 weeks of gestation, per American College of Obstetricians and Gynecologists guidelines.[33] Gestational age was mainly assessed using early prenatal ultrasonography, but when this was unavailable, an algorithm using the first day of the last menstrual period. Both ultrasound and last menstrual period information were obtained from medical record review by our trained and authorized research staff.[32]

Assessment of place of birth and duration of US residence

US-born women were born in any state, the District of Columbia, and other US territories, whereas women born outside these regions were classified as foreign born. Duration of US residence was defined as the number of years between immigration to the US and the index pregnancy. A cutoff of 10 years was used to categorize duration of residence for foreign-born NHB, as immigrants residing in the US for $\geq$ 10 years are regarded as having higher acculturation than those who have stayed $<$ 10 years.[24]

Assessment of covariates

Self-reported maternal sociodemographic characteristics included maternal age at delivery (in years), maternal education (secondary school or less, GED or high school graduate, or college education or degree), marital status (married, single, divorced, separated, widowed), alcohol use in pregnancy (yes/no), and parity (0, 1, or 2+). Data on key CVD risk factors included chronic hypertension (yes/no), preeclampsia (yes/no), diabetes (none, gestational, and chronic), prepregnancy body mass index (BMI) $<$ 25, 25.0 to 29.9, and $\geq$ 30 kg/m^2), smoking in pregnancy (yes/no), and maternal perceived general stress level (mild, moderate, or severe). Maternal stress was assessed with the question, "How would you characterize the amount of stress in your life in general?" BMI was calculated from self-reported prepregnancy weight and height. Chronic hypertension, preeclampsia, chronic and gestational diabetes mellitus status were based on physician diagnoses (per American College of Obstetricians and Gynecologist [ACOG] guidelines) and documentation in the electronic medical record.

Statistical analysis

We used Pearson's χ^2 or analysis of variance (ANOVA) to explore the differences between maternal sociodemographic and health characteristics by maternal place of birth and the duration of residence. Multivariable logistic regression models were used to obtain odds ratios with 95% CIs for PTB by maternal nativity and duration of US residence. Model 1 was unadjusted; Model 2 was age-adjusted; Model 3 was additionally adjusted for education and marital status; Model 4 (fully-adjusted model) was additionally adjusted for risk factors of PTB (parity, alcohol use in pregnancy, perceived stress, prepregnancy BMI, hypertension, diabetes, and smoking). To explore whether the duration of US residence was associated with the risk of PTB for foreign-born NHB women, foreign-born women were classified into those with duration of residence $<$ 10 years and those with $\geq$ 10 years of US residence. In all analyses, US-born NHB women were used as the reference. We then additionally adjusted for duration of US residence to evaluate the association of nativity with preterm birth. All analyses were performed with Stata version 16 (StataCorp, College Station, Texas, USA), and a 2-sided alpha (α) level of $<$ 0.05 was used to assess the statistical significance of the results.

Results

Of the 2699 NHB women, 59.5% were US born and 40.5% were foreign born. The mean age of the women in the sample was 27.3 ($\pm$ 6.5) years. Compared with women who delivered at term, those who delivered preterm were older (28.2 vs 27.0 years, $P < 0.001$) and were in higher proportions multiparous (32.9% vs 28.9%, $P = 0.024$), single (75.9% vs 70.4%, $P = 0.004$), and US born (64.4% vs 57.5%, $P = 0.001$). Women who delivered preterm were also more likely than those who delivered at term to have chronic hypertension (13.5% vs 5.1%, $P < 0.001$), chronic diabetes (6.9% vs 2.0%, $P < 0.001$), and preeclampsia (23.6% vs 5.9%, $P < 0.001$). In addition, they were more likely to report severe stress (16.3% vs 11.6%, $P = 0.007$), alcohol use (13.4% vs 9.9%, $P = 0.008$), and smoking during pregnancy (18.2% vs 12.5%, $P < 0.001$; Table 1).

Maternal characteristics by place of birth

US-born NHB women were younger at the time of delivery (mean age: 25.8 vs 29.5 years, $P < 0.001$) and had a higher prevalence of preeclampsia (12.2% vs 9.2%, $P = 0.016$), moderate to severe self-assessed stress level (73.5% vs 59.4%, $P < 0.001$), alcohol use in pregnancy (13.2% vs 7.4%, $P < 0.001$), lower education (lower than college: 66.2% vs 53.5%, $P < 0.001$), chronic diabetes (4.2% vs 3.8%, $P = 0.034$), smoking in pregnancy (20.5% vs 4.9%, $P < 0.001$), and obesity (BMI $\geq$ 30 kg/m^2: 27.6% vs 19.6%, $P < 0.001$), compared with foreign-born NHB women. US-born NHB women were also more likely to be single compared with foreign-born NHB women (86.3% vs 51.1%, $P < 0.001$). The prevalence of chronic hypertension (7.8% vs 7.2%, $P = 0.54$) and multiparity (30.5% vs 29.3%, $P = 0.07$) did not differ significantly between the 2 groups (Table 2).

Maternal characteristics by duration of US residence

The distribution of maternal characteristics and CVD risk factors differed by duration of US residence. In general, the prevalence of CVD risk factors increased with the duration of residence in the US among foreign-born NHB women

Table 1. Comparison of maternal characteristics by preterm status among non-Hispanic Black women in the Boston Birth Cohort (1998–2016)

Characteristic	Total N = 2699 (%)	Preterm birth No N = 1915 (%)	Preterm birth Yes N = 784 (%)	*P value
Maternal demographics and obstetrical characteristics				
Maternal age in years (SD)	27.3 (6.5)	27.0 (6.3)	28.2 (6.9)	< 0.001
Parity				0.024
0	1123 (41.6)	793 (41.4)	330 (42.1)	
1	765 (28.3)	569 (29.7)	196 (25.0)	
2+	811 (30.1)	553 (28.9)	258 (32.9)	
Preeclampsia				< 0.001
No	2402 (89.0)	1803 (94.2)	599 (76.4)	
Yes	297 (11.0)	112 (5.9)	185 (23.6)	
Social and environmental factors				
General stress				0.007
Mild	847 (31.4)	622 (32.5)	225 (28.7)	
Moderate	1478 (54.8)	1053 (55.0)	425 (54.2)	
Severe	351 (13.0)	223 (11.6)	128 (16.3)	
Missing	23 (0.8)	17 (0.9)	6 (0.8)	
Alcohol use in pregnancy				0.008
No	2285 (84.7)	1632 (85.2)	653 (83.3)	
Yes	294 (10.9)	189 (9.9)	105 (13.4)	
Missing	120 (4.4)	94 (4.9)	26 (3.3)	
Educational level				< 0.001
Secondary or less	640 (23.7)	444 (23.2)	196 (25.0)	
High school graduate	1008 (37.4)	687 (35.9)	321 (40.9)	
College education/higher	995 (36.9)	731 (38.2)	264 (33.7)	
Missing	56 (2.1)	53 (2.8)	3 (0.4)	
Marital status				0.004
Married	657 (24.3)	500 (26.1)	157 (20.0)	
Single	1944 (72.0)	1349 (70.4)	595 (75.9)	
Divorced/separated/widowed	58 (2.2)	42 (2.2)	16 (2.0)	
Missing	40 (1.5)	24 (1.3)	16 (2.1)	
Maternal place of birth				0.001
US born	1607 (59.5)	1102 (57.5)	505 (64.4)	
Foreign born	1092 (40.5)	813 (42.5)	279 (35.6)	
Length of US residence				< 0.001
US born	1607 (67.7)	1102 (65.2)	505 (73.9)	
Foreign born ≥ 10 years	227 (9.6)	165 (9.8)	62 (9.1)	
Foreign born < 10 years	539 (22.7)	423 (25.0)	116 (17.0)	
Cardiovascular disease risk factors				
Chronic hypertension				< 0.001
No	2482 (92.0)	1807 (94.4)	675 (86.1)	
Yes	204 (7.5)	98 (5.1)	106 (13.5)	
Missing	13 (0.5)	10 (0.5)	3 (0.4)	
Diabetes				< 0.001
No	2431 (90.1)	1748 (91.3)	683 (87.1)	
Gestational	158 (5.8)	112 (5.8)	46 (5.9)	
Chronic	108 (4.0)	54 (2.8)	54 (6.9)	
Missing	2 (0.1)	1 (0.1)	1 (0.1)	
Smoking in pregnancy				< 0.001
No	2299 (85.2)	1660 (86.7)	639 (81.5)	
Yes	383 (14.2)	240 (12.5)	143 (18.2)	
Missing	17 (0.6)	15 (0.8)	2 (0.3)	
Body mass index				0.22
< 25	1176 (43.6)	830 (43.3)	346 (44.1)	
25 to 29.9	745 (27.6)	538 (28.1)	207 (26.4)	
≥ 30	658 (24.4)	454 (23.7)	204 (26.0)	
Missing	120 (4.4)	93 (4.9)	27 (3.5)	

SD, standard deviation.
* *P* values for all characteristics obtained from Pearson's χ^2 test except maternal age, which was obtained from analysis of variance test.

(Table 2). US-born NHB women had the highest prevalence of smoking in pregnancy (20.5% vs 3.1% vs 1.7%, $P < 0.001$), alcohol use in pregnancy (13.2% vs 11.5% vs 5.2%, $P < 0.001$), obesity (27.6% vs 23.3% vs 17.1%, $P < 0.001$), preeclampsia (12.2% vs 9.3% vs 8.4%, $P = 0.032$), and moderate/severe self-assessed stress level (73.5% vs 68.7% vs 49.0%, $P < 0.001$), compared with foreign-born women with ≥ 10 and < 10 years of US residence. The prevalence of chronic hypertension, chronic diabetes, and gestational diabetes did not differ significantly among the comparison groups (Table 2).

US-born women were the youngest at the time of delivery, followed by foreign-born NHB with ≥ 10 years of residence

Table 2. Comparison of maternal characteristics by maternal place of birth and length of US residence among non-Hispanic Black women in the Boston Birth Cohort (1998–2016)

Characteristic	US born N = 1607 (%)	Foreign born N = 1092 (%)	*P value	‡Foreign born: Foreign-born ≥ 10 years N = 227 (%)	‡Foreign born: Foreign-born < 10 years N = 539 (%)	†P value
Maternal demographics and obstetrical factors						
Maternal age in years (SD)	25.8 (6.2)	29.5 (6.4)	< 0.001	29.8 (6.7)	30.1 (5.7)	< 0.001
Parity			0.07			0.006
0	687 (42.8)	436 (39.9)		79 (34.8)	234 (43.4)	
1	429 (26.7)	336 (30.8)		69 (30.4)	172 (31.9)	
2+	491 (30.5)	320 (29.3)		79 (34.8)	133 (25.7)	
Preeclampsia			0.016			0.032
No	1411 (87.8)	991 (90.8)		206 (90.8)	494 (91.6)	
Yes	196 (12.2)	101 (9.2)		21 (9.3)	45 (8.4)	
Social and environmental factors						
General stress			< 0.001			< 0.001
Mild	413 (25.7)	434 (39.7)		66 (29.1)	272 (50.4)	
Moderate	950 (59.1)	528 (48.4)		129 (56.8)	217 (40.3)	
Severe	231 (14.4)	120 (11.0)		27 (11.9)	47 (8.7)	
Missing	13 (0.8)	10 (0.9)		5 (2.2)	3 (0.6)	
Alcohol use in pregnancy			< 0.001			< 0.001
No	1337 (83.2)	948 (86.8)		195 (85.9)	493 (91.5)	
Yes	213 (13.2)	81 (7.4)		26 (11.5)	28 (5.2)	
Missing	57 (3.6)	63 (5.8)		6 (2.6)	18 (3.3)	
Educational level			< 0.001			< 0.001
Secondary or less	433 (26.9)	207 (19.0)		34 (15.0)	100 (18.5)	
High school graduate	631 (39.3)	377 (34.5)		83 (36.6)	187 (34.7)	
College education/higher	510 (31.7)	485 (44.4)		110 (48.5)	250 (46.4)	
Missing	33 (2.1)	23 (2.1)		0 (0.0)	2 (0.4)	
Marital status			< 0.001			< 0.001
Married	177 (11.0)	480 (44.0)		92 (40.5)	291 (54.0)	
Single	1386 (86.3)	558 (51.1)		126 (55.5)	227 (42.1)	
Divorced/separated	26 (1.6)	32 (2.9)		6 (2.6)	16 (3.0)	
Missing	18 (1.1)	22 (2.0)		3 (1.3)	5 (0.9)	
Cardiovascular risk factors						
Chronic hypertension			0.54			0.60
No	1476 (91.8)	1006 (92.1)		205 (90.3)	500 (92.7)	
Yes	125 (7.8)	79 (7.2)		22 (9.7)	38 (7.0)	
Missing	6 (0.4)	7 (0.7)		0 (0.0)	1 (0.2)	
Diabetes			0.034			0.15
No	1460 (90.9)	971 (88.9)		205 (90.3)	472 (87.6)	
Gestational	78 (4.8)	80 (7.3)		14 (6.2)	44 (8.1)	
Chronic	67 (4.2)	41 (3.8)		8 (3.5)	23 (4.3)	
Missing	2 (0.1)	0 (0.0)		0 (0.0)	0 (0.0)	
Smoking in pregnancy			< 0.001			< 0.001
No	1270 (79.0)	1029 (94.2)		220 (96.9)	525 (97.4)	
Yes	330 (20.5)	53 (4.9)		7 (3.1)	9 (1.7)	
Missing	7 (0.5)	10 (0.9)		0 (0.0)	5 (0.9)	
Body mass index			< 0.001			< 0.001
< 25	694 (43.2)	482 (44.1)		103 (45.4)	234 (43.4)	
25 to 29.9	418 (26.0)	327 (30.0)		64 (28.2)	170 (31.5)	
≥ 30	444 (27.6)	214 (19.6)		53 (23.3)	92 (17.1)	
Missing	51 (3.2)	69 (6.3)		7 (3.1)	43 (8.0)	

P values for all characteristics obtained from Pearson's χ^2 test, with the exception of maternal age, which was obtained from the analysis of variance test.
SD, standard deviation
* *P* value comparing US born with all foreign born.
† *P* value comparing US born, foreign born < 10 years, and foreign born ≥ 10 years of US residence.
‡ Of the foreign-born women, 766 of 1092 had data on duration of residence.

and then those with < 10 years of US residence (25.8 vs 29.8 vs 30.1 years, $P < 0.001$). Foreign-born women with ≥ 10 years of US residence were the most likely to be multiparous compared with US-born women and foreign-born women with < 10 years of US residence (34.8% vs 30.5% vs 25.7%, $P = 0.006$). Foreign-born with ≥ 10 years of US residence were also most likely to have a college education than those with < 10 years of US residence and US-born women (48.5% vs 46.4% vs 31.7%; Table 2).

Preterm birth by place of birth

The proportion of women delivering preterm was 31.4% among US-born and 25.6% among foreign-born NHB women. Compared with US-born, foreign-born women were less likely to have PTB after accounting for differences in maternal characteristics (aOR, 0.79; 95% CI, 0.65-0.97) (Fig. 2; Supplemental Table S1).

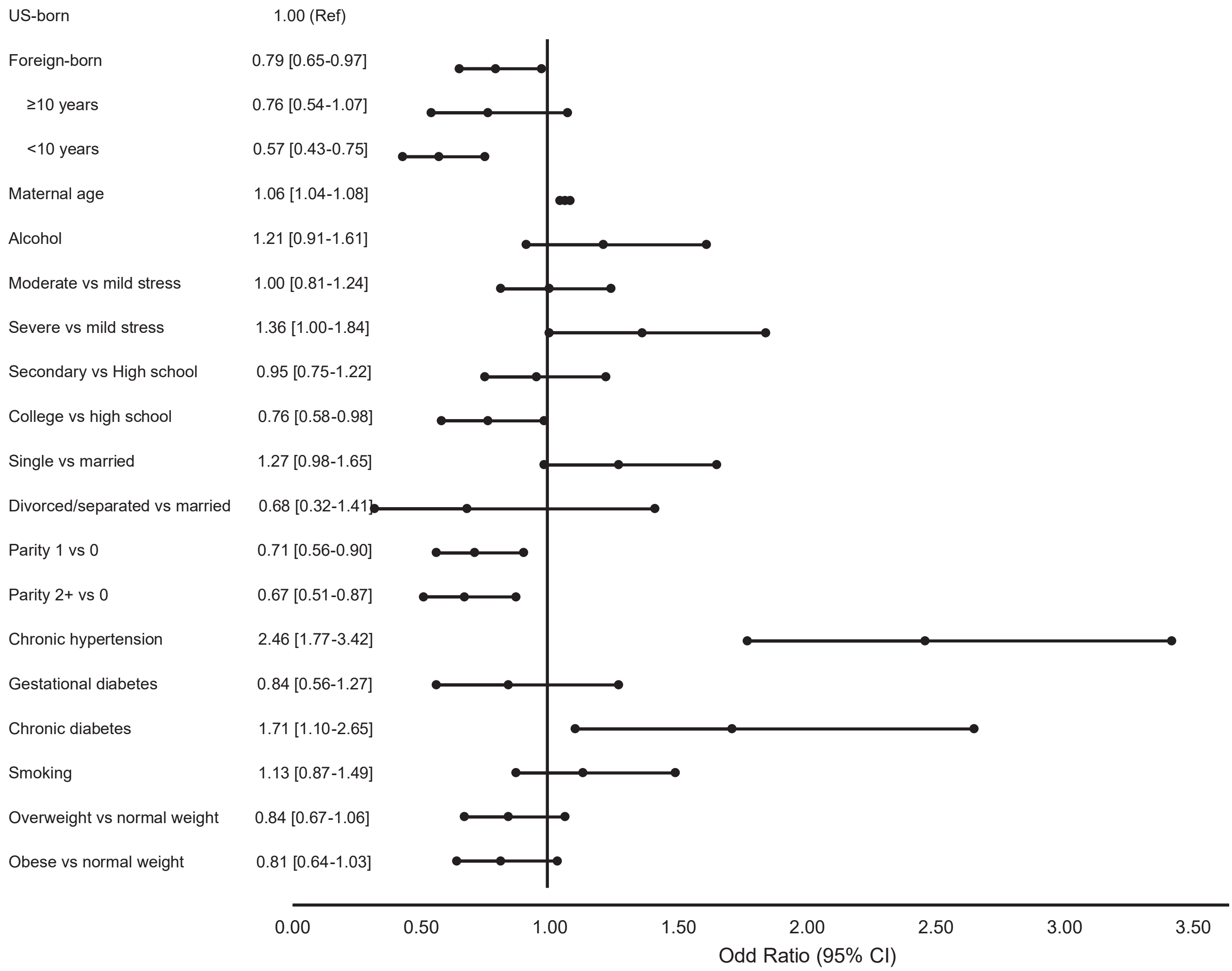

Figure 2. Forest plot showing the association of sociodemographic characteristics, cardiovascular risk factors, maternal place of birth, and duration of US residence with preterm births among non-Hispanic Black women in the Boston Birth Cohort (1998 to 2016)

Preterm birth by duration of US residence

The proportion of women delivering preterm among US-born women, foreign-born women with $\geq$ 10 years, and foreign-born with $<$ 10 years of US residence was 31.4%, 27.3%%, and 21.5%, respectively. Although foreign-born NHB women with $<$ 10 years of US residence had 43% lower odds of PTB compared with US-born women (aOR, 0.57; 95% CI, 0.43-0.75), foreign-born women with $\geq$ 10 years of US residence did not differ significantly in their odds of PTB compared with US-born women (aOR, 0.76; 95% CI, 0.54-1.07) (Fig. 2; Supplemental Table S1).

In addition, in the fully adjusted model including place of birth and length of US residence, increasing maternal age (aOR, 1.06; 95% CI, 1.04-1.08), complaint of severe stress (aOR, 1.36; 95% CI, 1.00-1.84), chronic hypertension (aOR, 2.46; 95% CI, 1.77-3.42), and chronic diabetes (aOR, 1.71; 95% CI, 1.10-2.65) were significantly associated with higher odds of PTB. In contrast, parity of 1 (aOR, 0.71; 95% CI, 0.56-0.90) or 2+ (aOR, 0.67; 95% CI, 0.51-0.87), and college education (aOR, 0.76; 95% CI, 0.58-0.98) were associated with lower odds of PTB (Fig. 2; Supplemental Table S1).

Discussion

In this study among a high-risk cohort of women, we report several important and novel findings. First, US-born NHB women had a higher prevalence of several cardiovascular risk factors including diabetes, obesity, smoking, psychosocial stress, preeclampsia, and lower prevalence of higher education compared with foreign-born women, as previously shown by Boakye et al.[25] Second, the proportion of women who delivered preterm was highest in US-born women, followed by foreign-born women with $\geq$ 10 years, and then with $<$ 10 years of US residence. Third, despite adjusting for differences in maternal characteristics and comorbidities, US-born women continued to have higher odds of PTB than foreign-born women. However, subgroup analyses demonstrated that the relatively lower PTB odds among foreign-born women were only present for women with $<$ 10 years of US residence. Foreign-born women with $\geq$ 10 years' duration of

US residence did not have any reduction in odds of PTB after adjustment compared with US-born women. These findings suggest that the "foreign-born advantage" tends to wane with longer duration of US residence.

These findings are comparable with those from a smaller, previous study of 340 US-born and 107 foreign-born Black women, showing that immigrant Black women had a 60% lower risk of PTB (adjusted RR = 0.4; 95% CI, 0.2-0.8) compared with their US-born counterparts.[34] This may be due to the "healthy migrant effect" or selective immigration of healthier individuals, which seems to decline with time as immigrants may be embracing behaviours from the dominant culture (ie, "the acculturation hypothesis").[34-36] Also, that same study also found higher rates of smoking and alcohol consumption before pregnancy among US-born NHB women compared with immigrant NHB women. In this study, we demonstrate similar findings and explore additional differences in CVD risks, perceived maternal stress, and education level of the women in our study.

We also find that foreign-born women with $\geq$ 10 years compared with $<$ 10 years of US residence had a greater prevalence of chronic hypertension, diabetes, smoking, and self-assessed severe stress level. They also had higher BMI and greater frequency of extremes of maternal age ($<$ 20 or $\geq$ 35 years). These findings indicate that acculturation and unhealthy assimilation—such as changes in eating habits or substance use—may be occurring, possibly leading to an increased prevalence of PTB. Notably, these findings argue against race alone being a determinant of pregnancy outcomes in the United States.

Anxiety and psychological stress can be from perceived or tangible pressures and can induce physiological changes, including elevations in cortisol-releasing hormone, thereby increasing prostaglandins and inflammatory cytokines, which are associated with uterine contractions and spontaneous PTB.[37] In addition, NHB pregnant women, on average, have higher psychosocial stress and unique stressors compared with other racial and ethnic groups.[38] In another study of 268 women with PTB, stress, perceived racism, less interpersonal support, and less self-efficacy of stress management were associated with greater odds of spontaneous PTB.[37] Similarly, our study found that overall, 3 of 4 US-born NHBs reported moderate to severe stress.

Black women in the US have the highest pregnancy-related mortality compared with other racial and ethnic groups (41 deaths per 100,000 for Black women compared with 13 per 100,000 for White women).[39] To a large extent, contributions to this disparity include social determinants of health—including residential racial segregation, concentrated poverty, neighborhood violence, air pollution, lack of access to employment and health care opportunities, exposure to structural racism, and discrimination—all of which are more common for Black women.[40-42] In our study, disparities in PTB persisted between US-and foreign-born NHB women, even after accounting for differences in sociodemographic and CVD risk factors. Thus, other unmeasured confounders, such as experiences of structural racism and neighborhood-level factors, may contribute to these disparities. Racial discrimination and its associated harmful effects, such as chronic stress, increase the risk of PTB.[43] US-born women and foreign-born women with a longer duration of US residence may have a higher allosteric load (accumulated stress) compared with foreign-born women with a shorter duration of stay because of the repeated exposure to interpersonal and structural racism.

Regardless of the cause, the occurrence of PTB can be used as a "failed stress test" to identify high-risk women for CVD. Pregnancy is often considered a stress test for the heart. The development of an adverse pregnancy outcome such as PTB may be regarded as a failed test and may indicate underlying conditions that predispose a woman to future CVD. Recent recommendations from the American Heart Association (AHA) and the European Society of Cardiology (ESC) advocate for obtaining a pregnancy history and assessing specifically for adverse pregnancy outcomes to aid in identifying elevated risk of CVD.[44-47]

Despite the public health efforts to eliminate disparities in PTB over the last several years, the White-Black PTB gap remains very high.[48] Efforts need to be focused on improving preconception care with better identification and control of modifiable cardiac risk factors and reduce unintended pregnancies.[48] In addition, effectively implemented high-quality vital records, surveillance systems, and hospital administrative data are needed to monitor PTB prevalence and associated risk factors at the local, state, and national levels.[48] Finally, as highlighted in our article, societal and racial factors can affect PTB.[49] In response, scientific and advocacy groups such as the Association of Black Cardiologists have proposed a framework to improve Black maternal health and reduce race-based disparities in access to care and outcomes by improving community partnerships, increasing public awareness and education, and improving access to care in underserved areas.[50]

As health disparities persist, future research should examine mechanisms such as exposure to structural racism, residential segregation, poor housing conditions, environmental toxins, quality of medical care, diet, physical activity, and discrimination across women's life courses.

Study strengths and limitations

Our study has several strengths. First, our study sample included heterogeneous groups of NHB women and provided discrimination for the overall CVD disease profile. Second, this cohort was also derived from a primarily low-income inner-city minority population, including a large immigrant group, which enables a deeper investigation of nativity in maternal outcomes. Finally, clinical diagnoses were included based on physician documentation in the medical record, which reduced misclassification.

The limitations include our use of a higher-risk population (oversampling of preterm or low birth weight births), which therefore reduces the generalizability of our results.[32] In this study, we did not differentiate between spontaneous and iatrogenic PTB in the analyses, but this could be explored in the future.[51] Also, details regarding the prevalence of CVD risk factors and pregnancy outcomes in the country of origin for foreign-born women were not available. Maternal self-perceived stress was also included by self-report, and validated assessment methods were not available. Further, a substantial number (29.9%) of foreign-born women were missing duration of residence in the US and were therefore excluded from stratified analyses by duration. Finally, detailed information, such as the experience of racism or structural barriers to health care, was not available, which limits a deeper review of potential contributors to worsening maternal health by increased US residence.

Conclusions

In summary, US-born NHB women have a higher prevalence of underlying CVD risk factors, stress, lower educational level, and PTB than foreign-born women. However, with an increased duration of residence in the United States, foreign-born women also develop a higher prevalence of CVD risk factors and PTB. The reasons underlying these disparities are complex and may be caused by acculturation, structural racism, and unhealthy assimilation. Accumulated stress from structural racism experienced by US-born NHB women as well as foreign-born women who have resided in the United States for a longer duration may contribute significantly to these findings. Further longitudinal cohort studies that incorporate comprehensive discrimination measures are needed to evaluate biological and social determinants of health that may contribute to nativity-related disparities in maternal outcomes.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

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