Residential Racial Concentration and Birth Outcomes by Nativity: Do Neighbors Matter?

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Objectives: We examined the associations of residential segregation with poor birth outcomes (low birthweight, preterm) and with perinatal risk markers (maternal age, education and marital status, prenatal care and substance use, presence of paternal information on birth certificate) for foreign- and native-born black women in the Minnesota seven-county metropolitan area.

Methods: Data were from 1990–1999 Minnesota birth certificates linked to the 1990 U.S. census. We used multivariable logistic regression to examine the association of perinatal risk markers, low birthweight and preterm birth for foreign- and native-born black women by residential black concentration.

Results: Native-born black women had a higher prevalence of risk markers and were at almost 1.5 times the risk of foreign-born blacks for delivery of low-birthweight or preterm infants. Risk markers and poor birth outcomes were most prevalent in medium and high-black-concentration areas than low-concentration areas. Preterm birth was slightly positively associated with residential black concentration.

Conclusions: Native-born black women were at higher risk than foreign-born women for delivery of preterm and low-birthweight infants. Residential black concentration was associated with risk markers and only slightly associated with preterm birth. Further study of why birth outcome differentials exist by nativity and residential black concentration may identify opportunities for community-based public health interventions.

Key words: race/ethnicity ■ acculturation ■ birth outcomes ■ African Americans

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INTRODUCTION

Despite longstanding public health goals to reduce racial health disparities, the persistent health gap between black and white populations in the United States remains wide.[1,2] Age-adjusted black-white ratios for leading causes of mortality show that in 1998, blacks experienced an elevated risk for most of the leading causes of mortality and for most communicable diseases.[1,3] Risk for poor health begins early—in the United States, blacks are at twice the risk of whites for low birthweight and preterm birth.[4]

The U.S. foreign-born population reached an all-time high in 2000: 31 million or about 11% of the nation's population.[5] In 2002, nearly one in four of all U.S. births were to foreign-born women and 13% of black births in the United States were to foreign-born women.[4] Rates of low birthweight and preterm birth are generally lower for foreign-born blacks and Hispanics than for native-born women despite their comparatively low-income status.[6-12] To explain these differences, studies have examined the effects of individual variables such as parity, maternal age, education, substance use and socioeconomic status as well as the more complex influences of acculturation and racism. For example, Scribner and Dwyer examined acculturation to explain birth outcome differences between native- and foreign-born Hispanic women in the United States.[13] While Hispanic women tend to smoke less, drink less alcohol, eat healthier and hold parental roles in higher regard than non-Hispanic whites,[13,14] Scribner and Dwyer found that as Hispanic women adopted U.S. social norms and became more acculturated into U.S. society, they lost the protective effects of their cultural roots.

In a study of birth outcomes in Washington state, Wasse et al. found that Ethiopian women were more likely to have high birthweight infants than U.S.-born black women.[6] Like Scribner and Dwyer,[13] Wasse et al. speculated that cultural factors might explain birth outcome differences, although they did not measure such variables.[6]

In a study based on Scribner and Dwyer's acculturation

ation hypothesis,[13] Jenny and colleagues hypothesized that mortality in infants born to Mexican-American women would be lower in high-Mexican-concentration counties compared to low-Mexican-concentration counties because culture would be better retained in the high-Mexican-concentration areas.[15] After adjustment for individual confounding factors such as parity and maternal age, Jenny et al. found that mortality rates were significantly lower among infants of Mexican-born and U.S.-born Mexican women who lived in high-Mexican-concentration counties compared with those who lived in low-Mexican-concentration counties.[15]

In contrast to the findings for foreign-born mothers who reside in areas heavily populated by individuals who share their ethnic or racial background,[15] residence in high-black-concentration neighborhoods in the United States is associated with poor health outcomes for blacks.[16,17] It is argued that the "acculturation" experienced by native-born blacks, through generations of exposure to racism in the United States, has had a profound influence on their health.[16,18] Geronimus, for example, proposed a "weathering hypothesis," in which she argued that U.S. black women acquire chronic health conditions at younger ages than white women and thus enter their pregnancies with significant health problems that translate into poor outcomes.[19] To our knowledge, there are no

Table 1. Maternal characteristics for black women by nativity—Minnesota seven-county metropolitan area, 1990–1999

	Black Women	
Demographic	**Foreign-Born (n=4,287) %**	**Native-Born (n=23,649) %**
Residential Concentration of Black Women (Age ≥15)		
Low (0–10%)	89.1	69.3
Medium (11–20%)	8.5	19.5
High (21–33%)	2.5	11.2
Adolescent	6.3	26.5
Single marital status	37.4	77.6
Education Adequate for Age		
Yes	73.0	76.7
No	15.3	18.4
Missing	11.7	4.9
Paternal information present on birth certificate	57.5	34.4
Prenatal Health		
Prenatal Care		
Intensive	13.7	16.5
Adequate	26.0	23.2
Intermediate	24.7	17.6
Inadequate	15.7	19.0
None	0.8	2.3
Missing	19.2	21.5
Prenatal Substance Use (Alcohol or Tobacco)		
Yes	2.8	22.7
No	89.4	69.0
Missing	7.9	8.3
Birth Outcomes		
Low birthweight	7.4	12.8
Preterm birth	9.8	15.4

	Mean (SD)	**Mean (SD)**	**Difference**
Mean gestational age at birth (SD) (weeks)	39.0 (2.9)	38.6 (3.1)	0.48
Mean birthweight (SD) (grams)	3,320.3 (635.0)	3,109.0 (644.4)	211.3
Proportion of black women in neighborhood	4.4 (5.3)	7.9 (8.5)	3.5

Residential black concentration was defined as the number of black women age ≥15 in a census tract divided by the total population in that census tract. Residential black concentration was divided into three categories: low (0–10%), medium (11–20%) and high (21–33%). Data are for singleton births. All Chi-square differences are significant at p≤0.001.

studies that have examined whether residential concentration of black individuals, or segregation, is differentially associated with birth outcomes for foreign- and native-born blacks.

Minnesota has a large concentration of foreign-born black women,[20] and Minnesota blacks experience extreme racial disparities in perinatal health. For example, for the past decade, Minnesota has had one of the lowest rates of teen pregnancy among whites and one of the highest rates among blacks in the United States.[21,22] In this study, we examined nativity differences in birth outcomes and risk markers among black residents of Minnesota and the association of possible differences in these variables by residential segregation. Our study was informed by previous studies in which acculturation was defined by residential density of a specific ethnic or racial group.[15,17,18] Because Minnesota is a deeply segregated state and because it has a very small non-white population, we hypothesized that the experience of being a "minority" race could be socially and politically isolating. We assumed that the extent of this isolation would deepen with years or generations of exposure. We thus hypothesized that acculturation to a racist society could be a maternal stressor of sufficient magnitude to influence prenatal

Table 2. Maternal characteristics for black women by residential black concentration and nativity—Minnesota seven-county metropolitan area, 1990–1999

	Residential Black Concentration Black Women, Age ≥15 Years					
	Foreign-Born (n=4,287)			Native-Born (n=23,649)		
	Low % (n=3,819)	Medium % (n=363)	High % (n=105)	Low % (n=16,386)	Medium % (n=4,610)	High % (n=2,653)
Maternal Characteristics						
Mean maternal age (SD) (years)	28.0 (5.6)	27.2 (5.7)	27.7 (6.4)	24.1 (5.9)	23.4 (5.9)	23.5 (6.1)
Adolescent	6.0*	8.5	10.5	25.0**	29.9	30.1
Single marital status	26.1**	35.8	45.7	75.1**	83.5	82.9
Education Adequate for Age						
Yes	73.7*	66.1	73.3	78.4**	70.7	76.6
No	15	17.6	18.1	16.8	24.5	18.3
Missing	11.3	16.3	8.6	4.9	4.8	5.1
Paternal information present on birth certificate	58.1	53.2	52.4	36.1**	30.3	31.3
Prenatal Care						
Intensive	13.7	13.8	12.4	16.5**	16.1	17.0
Adequate	26.4	20.4	29.5	23.9	20.5	23.3
Intermediate	24.7	24.5	22.9	18.2	16.4	15.9
Inadequate	15.2	19.3	21.0	18.1	22.3	19.2
None	0.8	0.8	1.0	2.1	2.7	2.5
Missing	19.2	21.2	13.3	21.2	22.0	22.1
Prenatal Substance Use (Alcohol or Tobacco)						
Yes	2.5*	4.4	6.7	21.54**	26.7	23.2
No	89.7	86.8	87.6	70.3	64.7	68.6
Missing	7.8	8.8	5.7	8.2	8.6	8.3
Birth Outcomes						
Low birthweight	7.4	7.2	10.5	12.2**	14.1	14.3
Preterm birth	9.8	9.4	11.4	14.7**	17.1	16.7
Mean gestational age at birth (SD), weeks	39.0 (2.9)	39.2 (2.7)	38.9 (2.7)	38.6 (3.1)	38.4 (3.3)	38.5 (3.3)
Mean birthweight (SD) (grams)	3,321.1 (639.8)	3,313.2 (588.2)	3,315.0 (619.8)	3,122.1 (636.0)	3075.8 (659.3)	3,085.3 (666.7)

Residential black concentration was defined as the percentage of black women age ≥15 in a census tract divided by the total population in that census tract. Residential black concentration was divided into three categories: low (0–10%), medium (11–20%) and high (21–33%). Data are for singleton births. P values are for comparisons between the three levels of residential black concentration; these comparisons were done separately for native- and foreign-born women; * p≤0.05, ** p≤0.001

behaviors and health, ultimately leading to poor birth outcomes. We also hypothesized that residence in high-black-concentration areas would affect native- and foreign-born gravidae differently. Such areas may be protective for foreign-born black women, as they may reflect the maintenance of health-promoting community ties and norms from their birth countries. For native-born black women, given the transience of this historically disenfranchised population, we hypothesized that residence in a high-black-concentration area would be associated with perinatal risk, as such areas may be characterized by fragmented social bonds and a disadvantaged environment.[17,23-25]

METHODS

Data Sources

We used 1990–1999 birth certificates for singletons born to black residents of Minnesota's seven-county metropolitan area for data about nativity status, risk markers and birth outcomes. The seven-county area includes Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington counties. We focused on the metro area because this is where almost all of the African immigrants settle and where almost all of the native-born black women live. We merged 1990 U.S. census data[26] with the Minnesota birth certificate data by census tract to create a variable to represent residential concentration of black women. Ninety-seven percent of the observations merged perfectly. Before conducting analyses, we excluded 670 observations missing data on gestational age (n=453) or nativity (n=217). The data set we used for analysis (n=27,936) represented 97.7% of the original sample (n=28,606).

Variables

The primary independent variables were maternal nativity and residential black concentration. Maternal nativity was defined as a coding of foreign- or native-born on the Minnesota birth certificate; this variable was either self-reported or recorded by a hospital employee. All women born outside

Table 3. Preterm and low birthweight births to black women—Minnesota seven-county metropolitan area, 1990–1999

	Odds Ratio (95% Confidence Interval)	
	Preterm (n=27,936)	**Low Birthweight (n=27,936)**
Native-born	1.4 (1.2,1.5)**	1.3 (1.1,1.6)**
Residential Black Concentration (Referent = High Concentration)		
Low (0–10%)	0.9 (0.8,1.0)*	0.9 (0.8,1.1)
Medium (11–20%)	1.0 (0.9,1.1)	0.9 (0.8,1.1)
Adolescent	1.0 (0.9,1.0)	1.0 (0.9,1.1)
Single marital status	1.1 (1.0,1.2)	1.1 (1.0,1.3)*
Education Adequate for Age (Referent = Yes)		
No	1.1 (1.0,1.2)	1.1 (1.0,1.2)
Missing	1.1 (1.0,1.3)	1.1 (0.9,1.3)
Paternal information present on birth certificate	0.9 (0.9,1.0)	1.0 (0.9,1.1)
Prenatal Care (Referent = Adequate or Intermediate Care)		
Intensive	6.5 (5.9,7.1)**	1.0 (0.9,1.1)
Low (inadequate or none)	2.6 (2.3,2.9)**	1.0 (0.8,1.1)
Missing	2.6 (2.4,2.9)**	1.3 (1.1,1.5)**
Prenatal Substance Use (Referent = No)		
Yes	1.4 (1.3,1.6)**	1.8 (1.6,2.1)**
Missing	1.4 (1.2,1.6)**	1.3 (1.1,1.6)**
Gestational age at birth (weeks)	–	0.6 (0.6,0.6)**

Odds ratios and 95% confidence intervals from multivariable logistic regression models included: maternal nativity, maternal education adequate for age, single marital status, adolescent status, prenatal care, residential black concentration, prenatal substance use (alcohol and/or tobacco) and father information present on birth certificate. The model for low birthweight included gestational age. All data are for singleton births. Residential black concentration was defined as the percentage of black women age ≥15 in a census tract divided by the total population in that census tract. Residential black concentration was divided into three categories: low (0–10%), medium (11–20%), and high (21–33%); * p≤0.05, ** p≤0.001

of the United States or in U.S. territories were considered foreign-born.

We used census tract data to determine residential black concentration. Black residential concentration was defined as the proportion of black women aged ≥15 in each census tract relative to the total population (i.e., all races). The minimum residential black concentration was 0%, and the maxi-

Table 4. Low birthweight and preterm births to black women by nativity—Minnesota seven-county metropolitan area, 1990–1999

	Odds Ratio (95% Confidence Interval)	
	Foreign-Born (n=4,287)	**Native-Born (n=23,649)**
Low Birthweight		
Residential Black Concentration (Referent = High Concentration)		
Low (0–10%)	0.8 (0.3,2.0)	0.9 (0.8,1.1)
Medium (11–20%)	0.8 (0.3,2.2)	0.9 (0.8,1.1)
Adolescent	1.6 (1.0,2.8)	1.0 (0.9,1.1)
Single marital status	1.2 (0.8,1.7)	1.1 (1.0,1.3)
Education Adequate for Age (Referent = Yes)		
No	1.2 (0.8,1.9)	1.1 (0.9,1.2)
Missing	1.3 (0.8,2.0)	1.0 (0.8,1.3)
Paternal information present on birth certificate	1.0 (0.7,1.3)	1.0 (0.9,1.1)
Prenatal Care (Referent = Adequate or Intermediate Care)		
Intensive	0.9 (0.6,1.4)	1.1 (1.1,1.2)**
Low (inadequate or none)	1.2 (0.8,2.0)	0.9 (0.8,1.1)
Missing	1.4 (0.9,2.1)	1.3 (1.2,1.5)**
Prenatal Substance Use (Referent = No)		
Yes	2.0 (1.0,4.0)*	1.8 (1.6,2.1)**
Missing	0.9 (0.5,1.7)	1.4 (1.2,1.7)**
Preterm Births		
Residential Black Concentration (Referent = High Concentration)		
Low (0–10%)	0.9 (0.5,1.6)	0.9 (0.8,0.9)*
Medium (11–20%)	0.8 (0.4,1.6)	1.0 (0.9,1.1)
Adolescent	1.2 (0.8,1.8)	1.0 (0.9,1.0)
Single marital status	1.2 (0.9,1.5)	1.0 (0.9,1.1)
Education Adequate for Age (Referent = Yes)		
No	0.8 (0.6,1.2)	1.1 (1.0,1.2)*
Missing	1.0 (0.7,1.3)	1.2 (1.0,1.4)
Paternal information present on birth certificate	0.8 (0.7,1.0)	1.0 (0.9,1.1)
Prenatal Care (Referent = Adequate or Intermediate Care)		
Intensive	7.7 (5.7,10.0)**	6.3 (5.7,7.0)**
Low (inadequate or none)	2.3 (1.6,3.1)**	2.6 (2.4,2.9)**
Missing	1.7 (1.3,2.4)**	2.7 (2.5,3.1)**
Prenatal Substance Use (Referent = No)		
Yes	1.4 (0.8,2.5)	1.4 (1.3,1.5)**
Missing	1.5 (1.1,2.2)*	1.4 (1.2,1.6)**

Odds ratios and 95% confidence intervals from multivariable logistic regression models included: maternal education adequate for age, single marital status, adolescent status, prenatal care, residential black concentration, prenatal substance use (alcohol and/or tobacco) and father information present on birth certificate. All data are for singleton births. Residential black concentration was defined as the percentage of black women age ≥15 in a census tract divided by the total population in that census tract. Residential black concentration has been divided into three categories: low (0–10%), medium (11–20%), and high (21–33%); * p≤0.05, ** p≤0.001

mum was 33%. Because the variable was highly skewed (with most women living in low-concentration areas), we trichotomized residential black concentration. Low black concentration was defined as a tract in which 0–10% of the population was black women aged ≥15, medium black concentration was defined as a tract in which 11–20% of the population was black women aged ≥15 and high black concentration was defined as a tract in which 21–33% of the population was black women aged ≥15.

The outcomes of interest were infant low birthweight (birthweight ≤2,500 g) and preterm birth (gestational age at delivery ≤37 weeks). Gestational age was calculated primarily from the date of the last menstrual period, as reported on the birth certificate. In cases where the date of the last menstrual period was not known, gestational age was determined by clinical estimates.

Categorical risk markers included dichotomous variables for maternal adolescent status (i.e., age at delivery <20 years), maternal marital status at delivery and the presence of paternal information on the birth certificate. The measure of paternal status (and marital status) may be a surrogate measure of partner availability, which could directly or indirectly influence maternal health and thus birth outcomes. A variable for education adequate for age was created using maternal age and years of completed education. For women ≥18 years old at delivery, adequate educational attainment was considered ≥12 years of education completed. For those who were <18 years old at delivery, years of education adequate for age was defined as the numerical equivalent of age in years minus six. Education adequate for age was coded as yes, no or missing. Reports of prenatal alcohol and tobacco use were combined to create a variable for prenatal substance use (coded as yes, no or missing). Prenatal care was derived from the Adequacy of Prenatal Care Index,[27] based on the timing of the first prenatal visit, the number of total visits and the gestational age of the infant at birth. The index is divided into six categories of prenatal care adequacy: intensive, adequate, intermediate, inadequate, none and missing. The intensive category represents women who had more than the adequate number of prenatal care visits and may have had high-risk pregnancies. For multivariable analyses, we collapsed the six categories into four categories of prenatal care: intensive, high (adequate and intermediate), low (inadequate and no prenatal care) and missing.

ANALYSIS

All analyses were generated using Intercooled Stata, version 8.0.[28] We used Chi-square, t tests and one-way ANOVA to describe risk markers and birth outcomes (i.e., preterm birth and low birthweight) for foreign- and native-born black women overall and stratified by residential black concentration levels. We used multivariable logistic regression to model the relationship among birth outcomes, nativity and residential black concentration while adjusting for potentially confounding risk markers. The low-birthweight model also included gestational age of the infant. Two models were run to examine birth outcomes: one stratified by nativity and the other stratified by residential black concentration. In all analyses, statistical significance was defined as $p \leq 0.05$.

RESULTS

Maternal Characteristics

Foreign-born (n=4,287) and native-born (n=23,649) black mothers in the Minnesota seven-county area differed by maternal demographic variables and birth outcomes (Table 1). The mean maternal age at delivery for foreign-born black women was 28 years, compared with 24 years for native-born black women (Table 2). Twenty-seven percent of native-born and 6% of foreign-born black women were adolescents when they gave birth; 22% of native-born and 73% of foreign-born black women were married when they gave birth.

Native-born black women were more likely than foreign-born women to reside in high-black-concentration neighborhoods (11% vs. 3%), defined as neighborhoods where 21–33% of the residential population was black women ≥15 years.

Prenatal health varied by maternal nativity. Reported prenatal substance use was almost eight times greater in native-born compared to foreign-born black women: 1% of foreign-born and 7% of native-born women had reports of alcohol use during pregnancy, and 3% of foreign-born and 23% of native-born women had reported use of cigarettes during pregnancy (data not shown).

Birth outcomes varied by maternal nativity. About half as many foreign-born women had low-birthweight infants (7%) compared to native-born women (13%). Almost 10% of infants born to foreign-born women were preterm, while 15% of infants born to native-born women were preterm. Infants of foreign-born women were about three days older and 211 g heavier than infants of native-born women.

Residential Black Concentration, Risk Markers and Birth Outcomes

The distribution of black mothers varied by nativity in low-, medium- and high-black-concentration areas (data not shown). Of the 20,205 black women who gave birth and resided in low-black concentration areas, 81% were native-born; 93% of the 4,973 black women who gave birth in medium-black-concentration areas were native-born; and 96% of the

2,758 black women who gave birth in high-black-concentration areas were native-born. Some risk markers were more prevalent in medium- and high-black-concentration areas compared with low-black-concentration areas, such as maternal adolescent age, single marital status and reported prenatal substance use. Paternal information on the birth certificate was also most likely to be absent in high-black-concentration residential areas. Mean birthweight differences between low- and medium-, and low- and high-black-concentration areas were 67 g and 66 g, respectively.

Residential Black Concentration and Nativity

When residential black concentration was stratified by nativity, black residential concentration was more strongly associated with risk markers and birth outcomes for native-born black women than for foreign-born black women (Table 2), with risk increasing as black concentration increased for both groups of women. One exception was reported prenatal alcohol or tobacco use. For foreign-born women, reported use increased incrementally across the residential black concentrations, from 3% in low-black- to 7% in high-black-concentration areas. Conversely, for native-born women, the proportion of women with reported alcohol or tobacco use was highest in medium-black-concentration areas (27%) but did not vary much between low- (22%) and high-black-concentration (23%) areas.

The proportion of preterm and low-birthweight births increased from low- to medium-, and from low- to high-black-concentration areas for both native- and foreign-born black women, although these associations were not statistically significant for foreign-born women. For foreign-born women, mean birthweight was similar across residential black concentration strata. For native-born women, mean birthweight differed between low- and medium-black-concentration areas and low- and high-black-concentration areas by 46 g and 37 g, respectively.

Multivariable Correlates of Low Birthweight and Preterm

Nativity was significantly associated with low birthweight and preterm birth in multivariable analyses (Table 3). Native-born black women were 1.4 times more likely to give birth to a preterm infant and 1.3 times more likely to give birth to a low birthweight infant than foreign-born black women. In analyses stratified by birth outcomes, black women living in low-black concentration areas were slightly less likely (OR=0.9; 95% CI=0.8,1.0) to give birth to preterm infants than black women living in high-black-concentration areas.

In analyses stratified by nativity, residential black concentration was not associated with low birthweight (Table 4). For foreign- and native-born women, reported prenatal substance use was a slightly significant and positive correlate of low birthweight.

In analyses stratified by nativity, residential black concentration was also not associated with preterm birth (Table 4), except for a slightly decreased risk for infants of native-born black women in low-black-, compared with high-black-, concentration areas. For both foreign- and native-born black women, risk of preterm delivery was negatively associated with adequate prenatal care and positively associated with missing data on prenatal substance use, compared with reports of no use.

DISCUSSION

Low birthweight and preterm births were higher among infants of native-born compared to foreign-born black Minnesota residents. Further, traditional risk markers for these outcomes varied by nativity and residential black concentration. Inconsistent with our hypotheses was the finding that black residential concentration was not strongly associated with risk for low birthweight or preterm birth for infants of either foreign- or native-born women.

Compared to foreign-born black mothers, native-born black mothers in the Minnesota seven-county area were more likely to be adolescent, to report having used alcohol or tobacco prenatally, and to be unmarried when they gave birth. These findings are consistent with studies of foreign- and native-born mothers in the United States that suggest higher behavioral and social perinatal risks for native-born women.[6-9]

We found that native-born women were more likely than foreign-born women to live in high-black-concentration census tracts. We also found, as hypothesized, that the distribution of risk markers varied by levels of residential black concentration, with generally increased maternal risk markers from low-to-high-black-concentration areas for foreign- and native-born black mothers. The magnitude of the risk marker differences from low-to-high black residential concentration areas was generally greater for native-born than foreign-born women.

The data are insufficient for us to describe residential quality, but we presume that the higher maternal risk factors in high-black-concentration areas generally reflect higher-risk environments. Morland et al.[24] and Scribner et al.[25] found an over-concentration of convenience stores and other outlets for alcohol, tobacco and nonnutritious foods in low-income, high-concentration black neighborhoods. Since consumption of healthy food is positively associated with availability,[29] Scribner suggested that women living in areas with more readily available alcohol, tobacco and unhealthy food are

more likely to consume these items and consequently experience the poor birth outcomes associated with these substances.[14] Furthermore, research shows that the alcohol and tobacco industries target advertising at racial minorities.[30,31]

An acculturation hypothesis suggests that residence in high-black-concentration areas might translate into better birth outcomes for foreign-born women. Our data do not support that, for example, risk markers did not appear to vary by residence as widely for foreign-born black women as they did for native-born black women. We also did not find an association between residential black concentration and low birthweight or preterm birth for infants of native-born and foreign-born women in multivariable analyses. These findings are in contrast to the work of Jenny et al.,[15] who reported that infants of Mexican-American women, especially infants of women born in the United States, experienced lower rates of mortality in high-Mexican-concentration areas. It is assumed, although the data are not provided in their study, that a proportion of those deaths were attributable to preterm and/or low birthweight. This apparent inconsistency is perhaps not surprising, especially for native-born women, given the different histories of black and Hispanic populations. The Hispanic women studied by Jenny et al.[15] were primarily Mexican and shared important cultural roots. In contrast, native-born black populations historically come from *many* African countries, sometimes migrating by way of Central or South America. Additionally, some native-born blacks have historical roots in the experience of slavery, during which period their African cultural heritage was suppressed. The foreign- and native-born Mexican-American women studied by Jenny et al.[15] may have shared strong cultural ties in high-Mexican-concentration residential areas; foreign- and native-born black women in our study may not have shared such ties and, hence, may not have benefited from shared cultural practices within a residential area.

It is thus possible that our definition of acculturation was not specific enough to capture what we intended (i.e., residence in a culturally cohesive and health-promoting community). Despite the fact that Minnesota is one of the largest migration destinations for Africans in the United States, foreign-born black women are a minority among the overall black population in the seven-county area; thus, their concentration in any community may be small and/or diffuse. Because we used census data, we could only identify areas by reported "black" concentration. We were unable to discriminate areas by concentration of foreign- or native-born blacks. Obviously, such specificity would have been preferable for our purposes. Thus, we cannot know if foreign-born women in our sample who resided in high-black-concentration areas lived near native-born women with whom they may not have shared roots or near women from their home countries.

Our findings should be interpreted in light of the population we studied: foreign- and native-born black women living in Minnesota's seven-county metropolitan area from 1990–1999. During our study time period, this population included African Americans and immigrants who came from non-English-speaking eastern Africa—primarily Somalia and Ethiopia.[20] In a 1992 study of birth outcomes by maternal nativity in California, researchers found no significant difference in delivery of low birthweight infants between U.S.- and foreign-born black women.[10] The inconsistent findings between our study and this study may be attributed to the fact that black immigrants in California came from a different area of the world and chose to settle in California for different reasons than the eastern Africans who settled in Minnesota. These inconsistencies make clear that studies of maternal nativity can only be generalized to populations with similar cultural roots. Further, nativity studies such as ours, conducted in a defined and limited geographic area and time period, may be preferable to studies of larger, more varied regions.

Our data were collected for surveillance, not research. We believe that they were appropriate for our analyses of maternal risk markers and birth outcomes by nativity, but birth certificates have important limitations. As is true of any study using birth certificate data over several years, we could not identify women who contributed more than one birth during the study period. Birth certificate data lack socioeconomic indices, with the exception of parental marital status and education; it is plausible that more specific indices of social status could help elucidate nativity differences in maternal and infant characteristics. Importantly, birth certificates measure one potential pregnancy outcome: birth. Fetal death registration is imperfect for research studies, and miscarriages are not always documented in health registries, so these important pregnancy outcomes were excluded from our analyses. Representativeness is a strength of birth certificate data; however, it is plausible that our data are not as representative for foreign-born residents as they are for native-born residents. To our knowledge, differential collection of data by nativity on birth certificates has not been examined, nor is it clear how the results would be biased if this occurred.

Our other data source, the 1990 census, may have been an imprecise measure of acculturation or segregation, as previously discussed. The strength of our linkage depends on our assumptions that the population in a census tract does not change greatly from

one census measure to another and that the women in our study spent a relevant period of time in the census tract in which they resided when they delivered their infants. If our study sample was highly transient, or if transience varied by nativity, this latter assumption would be a poor one. Incorrectly specifying residence would likely bias the results to the null, so our lack of strong associations could be a consequence of misspecification. However, we also note that risk markers in our study varied by residence and varied in the hypothesized direction (i.e., high-black-concentration areas were associated with higher maternal risk factors than low-black-concentration areas).

There is a clear need to better understand the apparently short-lived healthy immigrant effect, the health-defeating effects of acculturation experienced by diverse ethnic and racial groups, and the apparently persistent health disparities associated with minority status in the United States. This study adds to the data that refute genetic arguments for poor birth outcomes for black mothers, as nativity clearly modified birth outcomes. It also signals a need to better understand what it is about environment and community that can promote healthy behaviors and birth outcomes. Ultimately, further study of birth outcome differentials by nativity in segregated areas may help to identify opportunities for community-based public health interventions aimed at improving the birth outcomes of black mothers.

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