

# The “Hispanic paradox”: an investigation of racial disparity in pregnancy outcomes at a tertiary care medical center

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**OBJECTIVE:** The purpose of this study was to examine racial disparities and the “Hispanic paradox” in pregnancy outcomes at a tertiary-care medical center.

**STUDY DESIGN:** A cross-sectional study of pregnancy events was performed with information from the Duke University birth database. The latter includes data on birth outcomes, cost, and health services factors. The final sample included 10,755 women with Medicaid insurance, who gave birth during calendar years 1994–2004. Pregnancy comorbidities and outcome measures were identified by International Classification of Diseases, 9th revision, and Current Procedural Terminology (CPT) codes. Univariate and multivariate analyses were performed to compare racial/ethnic groups.

**RESULTS:** African-American women were younger and more likely to be employed, to have a medical comorbidity, to remain in the hospital for >4 days, and to have hospital charges of >\$7500. African-American

women had higher rates of preterm birth, small-for-gestational-age infants, preeclampsia, and stillbirths. There were no differences by race for gestational diabetes mellitus. With the use of white women as the reference group, Hispanic women had lower odds for preterm birth (odds ratio, 0.66; 95% CI, 0.54–0.80), and African-American women had greater odds for preeclampsia (odds ratio, 1.30; 95% CI, 1.07–1.58) and small-for-gestational-age infants (odds ratio, 1.74; 95% CI, 1.29–2.36). With the use of African-American women as the reference, Hispanic women were less likely than African-American women to experience any adverse pregnancy event, with the exception of gestational diabetes mellitus.

**CONCLUSION:** Poverty and insurance status does not explain differences in adverse pregnancy outcomes between African-American women and Hispanic women with Medicaid insurance.

**Key words:** Hispanic paradox, perinatal outcome, racial disparity

Cite this article as: Brown HL, Chireau MV, Jallah Y, Howard D. The “Hispanic paradox”: an investigation of racial disparity in pregnancy outcomes at a tertiary-care medical center. *Am J Obstet Gynecol* 2007;197:197.e1–197.e9.

The racial disparity in perinatal outcomes between African-American and white women has been recognized for decades and remains a major public health concern. One of the more consistent outcome variables, the percentage of low-birthweight infants, demonstrates these differences; 13.8% of African-American infants vs 7.0% of white infants were born with low birthweight in 2002.<sup>1</sup> Low-birthweight infants have a higher risk for morbidity and death,

which translates into significant disparity in infant mortality rates between African-American and non-Hispanic white women.

Minority race and socioeconomic disadvantage have long been associated with ethnic differences in health outcomes and, in particular, an increased risk for delivery of a low-birthweight infant.<sup>2,3</sup> Because demographic patterns in the United States have changed, the Hispanic population has become the second

largest ethnic minority. By comparison with the white population, Hispanic women are disadvantaged socioeconomically.<sup>3</sup> The US female Hispanic population is socioeconomically more similar to the African-American female population. Both Hispanic and African-American families are more than twice as likely as white families to live in poverty; 21.9% of Hispanic families and 24.7% of African-American families live below the federal poverty level, compared with 8.7% of non-Hispanic white families.<sup>4</sup> However, minority race and socioeconomic disadvantage for Hispanic women in the United States have not translated into rates of low birthweight that are comparable with those for African-American women. Rather, birth outcomes for Hispanic women are similar to or better than those for white women.<sup>5–9</sup> This “Hispanic paradox” has been noted in several studies.<sup>8–10</sup>

Trends in population growth over the last 2 decades have led to a change in racial demographics in the southeastern region of the United States, with an increase in Hispanic immigration. Access

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Presented at the 69th Annual Meeting of the South Atlantic Association of Obstetricians and Gynecologists, Hot Springs, VA, Jan. 27–30, 2007.

Received Nov. 3, 2006; revised Mar. 6, 2007; accepted Apr. 19, 2007.

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Supported by the Centers for Medicare and Medicaid Services Grant 110CMS300040 and, in part, by National Institutes of Health National Center for Minority Health and Health Disparities Grant R24 MD000167 and DHHS AHRQ Grant R24 HS013353 (D.H., Y.J.).

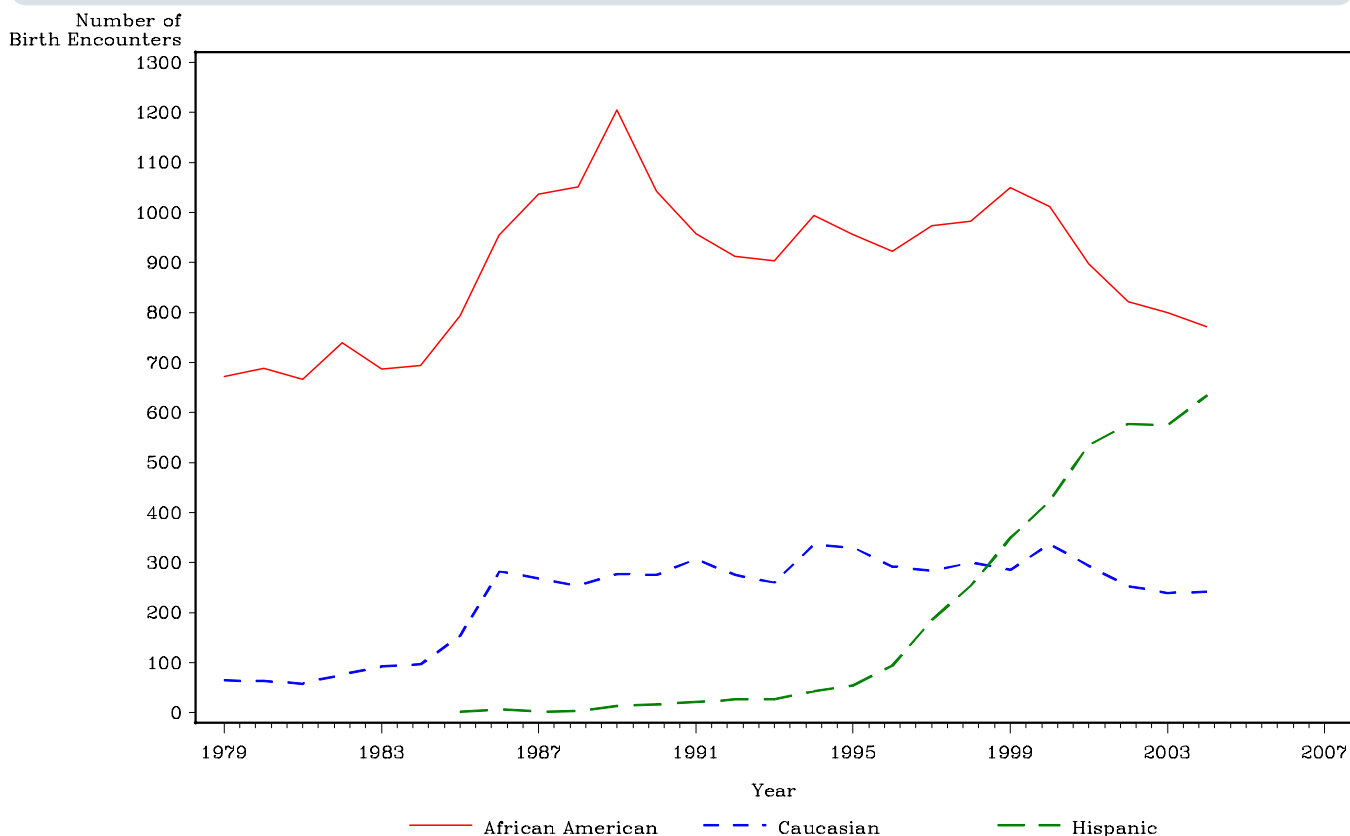
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doi: 10.1016/j.ajog.2007.04.036

## FIGURE

## Birth encounters by year and race of Medicaid recipients giving birth at Duke Medical Center (1979-2004)\*



\*Some women had multiple births during this period.

to affordable prenatal care, particularly in rural communities of the southeastern region, likely would equate into more pregnancy complications and poorer birth outcomes. In fact, a report on pregnant Medicaid beneficiaries in South Carolina showed that young Hispanic mothers have a higher risk for potentially avoidable pregnancy complications.<sup>11</sup> That report is somewhat contradictory to other findings that associate Hispanic ethnicity with birth outcomes comparable with those of white women, irrespective of lower use of health services such as prenatal care.<sup>6,12</sup>

The purpose of this study was to examine the Hispanic paradox in perinatal outcomes in an ethnically diverse population that received care at a southeastern tertiary medical center.

### STUDY DESIGN

A cross-sectional study of pregnancy events was performed with the use of the

Duke University birth database. This database contains detailed demographic, cost, health service, and outcomes data for all admissions for women who gave birth at Duke University Medical Center (DUMC) in Durham, NC, from December 1978-January 2005 ( $n = 42,263$  births). DUMC Institutional Review Board approval was obtained to conduct exempt human studies. Hospital administrative data were converted into SAS datasets (SAS Institute, Cary, NC), and analyses were conducted with SAS software. The study population included African American, white, and Hispanic women who used Medicaid as the source of payment for delivery costs. The Figure shows birth encounters by year and race for Medicaid recipients and demonstrates the threshold for growth of Hispanic births in the mid 1990s, at which time  $>50$  Hispanic women per year gave birth at DUMC. As such, our sampling frame included only the period 1994-2004. There

appears to be a new immigrant population of Mexican-born women, which has not yet had time to acculturate.

We restricted the sample of 21,381 women who received Medicaid to 10,755 women who gave birth in calendar years 1994-2004. Non-Medicaid recipients were excluded to control for insurance status. Women were excluded if medical data were missing, they had  $>1$  delivery in a calendar year, were classified as unknown race/ethnicity, or their recorded age of delivery was  $<11$  years. Chart review indicated that, for several of these women, their own birth admission and delivery admission data were conflated. For women who had  $>1$  birth in the cohort, only the first birth for that woman was included in the analysis. Women who had a medical comorbidity and women who experienced a pregnancy complication or adverse pregnancy event were identified by the International Classification of Diseases, 9th re-

vision (ICD-9), and Current Procedural Terminology (CPT) codes. Outcomes that were studied included preeclampsia (ICD-9 codes 642.4-642.7), gestational diabetes mellitus (GDM; ICD-9 code 648.0 and 648.8), placental abruption (ICD-9 code 641.2), preterm birth (ICD-9 code 644.2), small for gestation age (SGA; ICD-9 code 656.5), fetal death/stillbirth (ICD-9 codes 656.4, 768.0, 768.1, V27.1, V27.3, and V27.4), and maternal death (ICD-9 codes 674.9 and 761.6). Additionally, diagnosis-related group ICD-9 code was used to indicate fetal death, and hospital discharge status codes for in-hospital death were used to identify maternal deaths. Preterm birth was defined as delivery age of <37 completed weeks' gestation, and SGA was defined as a birthweight below the 10th percentile for gestational age.

### Statistical analysis

Differences in frequency of adverse pregnancy outcomes by race/ethnicity were tested initially with the use of  $\chi^2$  tests. Logistic regression models that used race/ethnicity as a single explanatory variable were then used to estimate unadjusted odds ratios (ORs) for the risk of adverse pregnancy outcomes for African-American and Hispanic women, with white women as the reference group. Because of the complexity of the tertiary-care delivery population, multiple covariates that were related to adverse pregnancy outcomes were identified a priori. Logistic regression was repeated with adjustment for multiple covariates that were identified a priori. These included maternal age, employment status, residence (city of Durham, Durham County, NC, outside Durham County), medical comorbidity, substance abuse, psychologic comorbidity, length of hospital stay, and total hospital charges. Subsequent logistic regression was performed to compare African-American and Hispanic women, with African-American women as the reference group. Individuals who lived outside of North Carolina were not included in regression analysis.

### RESULTS

Table 1 shows the distribution of characteristics by race/ethnicity for the study population. Of the 10,755 women, 5555 (51.7%) were African-American; 2263 (21%) were white; and 2937 (27.3%) were Hispanic. African-American women were younger, more likely to be employed, have a medical comorbidity, have a hospital stay of >4 days, and incur hospital charges of >\$7500. Hispanic women tended to be unemployed, to live within the city of Durham, and have fewer medical comorbidities. White women had higher rates of psychologic comorbidities and substance abuse.

Table 2 shows the distribution of pregnancy outcomes by race/ethnicity. African-American women had significantly higher rates of preterm birth (19.1%), preeclampsia (10.2%), SGA infants (4.3%), placental abruption (2.0%), fetal death/stillbirth (1.7%), and maternal death (0.3%). There were no differences in the percentage of GDM between the racial/ethnic groups.

Table 3 shows the adjusted ORs that compare outcomes for Hispanic and African-American women, with white women as the reference group. Hispanic women had lower odds for preterm birth (OR, 0.66; 95% CI, 0.54-0.80). African-American women had higher odds for preeclampsia (OR, 1.31; 95% CI, 1.07-1.58) and SGA (OR, 1.74; 95% CI, 1.29-2.36).

In our logistic regression model, we found that for all racial/ethnic groups, younger age (11-17 years) was associated with higher odds for preterm birth and preeclampsia but with lower odds for abruption and GDM (data not shown). Older age (>35 years) was associated with higher odds for GDM and fetal death. Residence outside the city and county of Durham was associated with higher odds for all adverse pregnancy outcomes. This reflects the tertiary-care referral patterns of DUMC. The presence of medical comorbidity was associated with preterm delivery (OR, 1.22; 95% CI, 1.01-1.48), preeclampsia (OR, 2.01; 95% CI, 1.64-2.46), SGA (OR, 1.79; 95% CI, 1.32-2.42), substance abuse (OR, 2.16; 95% CI, 1.51-3.08), and GDM

(OR, 7.91; 95% CI, 6.34-9.87). Increased odds for preterm birth, abruption, and SGA, but decreased odds for preeclampsia, were associated with substance abuse. The presence of psychiatric comorbidity was associated with increased odds for fetal death. Not surprisingly, an increased length of maternal hospital stay was associated with preterm delivery because of antepartum admissions for preterm labor and premature rupture of membranes; increased hospital charges were associated with preterm birth, preeclampsia, abruption, SGA, and GDM. For example, the odds of having hospital charges of >\$5,000 were 3.98 for preeclampsia and 4.76 for placental abruption. The latter is a reflection of the complexity and cost of maternity care for women with these pregnancy complications.

Table 4 shows logistic regression results for risk factors for adverse pregnancy outcomes for Hispanic vs African-American women. For these groups, younger age was associated with decreased odds for abruption and GDM but with increased odds for preeclampsia. Older age was associated with increased odds for GDM and fetal death. As was the case for all racial groups, residence in North Carolina but outside Durham city and county was associated with increased odds for preterm birth. The presence of medical comorbidity was associated with increased odds for preeclampsia, SGA, and GDM, although the presence of psychiatric comorbidity, substance abuse, length of stay, and hospital charges was consistent with the findings for all racial/ethnic comparisons.

Table 5 shows adjusted ORs for Hispanic vs African-American women for adverse pregnancy outcomes, with African-American women as the reference group. With the exception of GDM, Hispanic women were less likely than African-American women to experience any adverse pregnancy outcomes.

### COMMENT

Socioeconomic disadvantage in the United States has been linked with poorer health outcomes, which include perinatal morbidity and death. For the most recent reporting year, the infant

TABLE 1

**Distribution of characteristics of African American (n = 5555), white (n = 2263), and Hispanic women (n = 2937) who received Medicaid and gave birth at Duke University Medical Center (1994-2004)\***

Characteristic	Overall (n)	African American (n)	White (n)	Hispanic (n)	P value <sup>†</sup>
Mean age at delivery (y)	23	23	24	25	<.0001
11-17	1561 (14.5%)	1057 (19.0%)	251 (11.1%)	253 (8.6%)	<.0001
18-24	5846 (54.4%)	3099 (55.8%)	1265 (55.9%)	1482 (50.5%)	
25-34	2851 (26.5%)	1171 (21.1%)	622 (27.5%)	1058 (36.0%)	
35+	497 (4.6%)	228 (4.1%)	125 (5.5%)	144 (4.9%)	
Unemployed	3980 (37.0%)	1603 (28.9%)	811 (35.8%)	1566 (53.3%)	<.0001
Location of residence					
Durham city	6680 (62.1%)	3609 (65.0%)	752 (33.2%)	2319 (79.0%)	<.0001
Durham County, excluding Durham city	70 (0.7%)	16 (0.3%)	40 (1.8%)	14 (0.5%)	
North Carolina address outside Durham city and county	3880 (36.1%)	1876 (33.8%)	1409 (62.3%)	595 (20.3%)	
US address outside North Carolina	123 (1.1%)	54 (1.0%)	62 (2.7%)	7 (0.2%)	
Medical comorbidity <sup>‡</sup>	833 (7.7%)	556 (10.0%)	200 (8.8%)	77 (2.6%)	<.0001
Substance abuse <sup>§</sup>	601 (5.6%)	351 (6.3%)	242 (10.7%)	8 (0.3%)	<.0001
Psychologic abnormality <sup>  </sup>	134 (1.2%)	43 (0.8%)	77 (3.4%)	14 (0.5%)	<.0001
Mean length of hospital stay (d)	3	3	4	2	<.0001
≤3	8722 (81.1%)	4287 (77.2%)	1809 (79.9%)	2626 (89.4%)	<.0001
4-7	1620 (15.1%)	988 (17.8%)	354 (15.6%)	278 (9.5%)	
≥8	413 (3.8%)	280 (5.0%)	100 (4.4%)	33 (1.1%)	
Charges for hospital stay (mean)	5541	5699	5889	4945	<.0001
≤\$2000	495 (4.6%)	244 (4.4%)	81 (3.6%)	170 (5.8%)	<.0001
\$2001-\$5000	5545 (51.6%)	2826 (50.9%)	1157 (51.1%)	1562 (53.2%)	
\$5001-\$7500	2527 (23.5%)	1285 (23.1%)	576 (25.5%)	666 (22.7%)	
≥\$7501	1667 (15.5%)	1012 (18.2%)	361 (16.0%)	294 (10.0%)	

\* First birth encounter during study period.

<sup>†</sup>  $\chi^2$  tests of differences between characteristics for African-American, white, and Hispanic race; tests for means were obtained from generalized linear models.

<sup>‡</sup> Includes extrinsic asthma, chronic pulmonary disease, diabetes mellitus, and hypertension.

<sup>§</sup> Includes alcoholism, drunkenness, cocaine abuse, marijuana abuse, opioid abuse, and other drug abuse.

<sup>||</sup> Includes anxiety, depression, posttraumatic stress disorder, and schizophrenia.

mortality rate per 1000 births for non-Hispanic black women was 13.6, compared with 5.7 for white women and 5.49 for Mexican women.<sup>13</sup> In 2002, the low-birthweight incidence in the US Latina population was 6.5%, compared with 6.95 for non-Latina white women and 13.4% for African-American women.<sup>14</sup> The reason that socioeconomic disadvantage has not translated into poorer perinatal outcome in Hispanic women is unclear. The healthy migrant theory suggests that it is the healthiest Latinas who immigrate to the United States. This

translates into more positive birth outcomes.<sup>15</sup> This birth outcome advantage for Hispanic women transcends barriers to health care, including language difficulty.<sup>8,16</sup> However, the social and cultural protective factors that lead to positive birth outcomes among new immigrant Latin-American women appear to erode in subsequent generations.<sup>17</sup> For example, in a study among low-income women, Mexican-born mothers had low-birthweight rates of 3%, compared with a 14% low birthweight for US-born Mexican-

American mothers.<sup>17</sup> A similar relationship has been seen when African-American women are compared with foreign-born women of African descent.<sup>18</sup>

This study was designed to examine racial disparities in perinatal outcomes at a tertiary-care referral center in the southeastern region of the United States, which, over the last decade, has seen a significant increase in births to immigrants. The goal was to look beyond preterm birth and low birthweight and to examine the Hispanic paradox in preg-

**TABLE 2**  
**Distribution of adverse outcomes by race**

Adverse outcomes	African American (n)	White (n)	Hispanic (n)	P value*
N	5555	2263	2937	
Preterm birth	1059 (19.1%)	400 (17.7%)	246 (8.4%)	<.0001
Abruption	109 (2.0%)	40 (1.8%)	31 (1.1%)	.0076
Preeclampsia	564 (10.2%)	182 (8.0%)	183 (6.2%)	<.0001
GDM	260 (4.7%)	118 (5.2%)	148 (5.0%)	.5553
SGA infant	239 (4.3%)	70 (3.1%)	62 (2.1%)	<.0001
Fetal death	93 (1.7%)	31 (1.4%)	24 (0.8%)	.0055
Maternal death	14 (0.3%)	3 (0.1%)	0	.0077
Maternal death within 6 wk	3 (0.1%)	1 (<.1%)	0	.5461
Maternal death within 1 y	2 (0.0%)	0	0	.7179

\*  $\chi^2$  tests of differences between outcomes by race; probability values for maternal death were obtained with the Fisher's exact test to accommodate small counts.

nancy outcomes in a diverse pregnancy population. In comparison with African-American women, Hispanic women had significantly lower rates for preterm birth, SGA infants, fetal death, and other outcome measures, except for GDM. The percentages of medical comorbidities such as asthma, chronic pulmonary disease, GDM, and hypertension were lower for Hispanic women at 2.6%, in comparison with white women at 8.8% and African-American women at 10.0%. Increased rates of medical comorbidities among African-American women, relative to Hispanic women, is a likely factor in the significantly higher percentage of African-American women having a longer hospital stay and hospital charges of >\$7500.

As a tertiary-care referral center, a number of births at DUMC are transfers from outside the city and county. We therefore examined the racial/ethnic disparity paradox for women with city/county residence vs women who lived outside the city and county. In this comparison of African-American and Hispanic women for preterm birth, residence was only a significant covariate for those African-American women who lived outside the city and county (OR, 1.54; 95% CI, 1.35-1.77; Table 4). In contrast, in the comparison of all races, all pregnancy outcomes, including preterm birth, were higher for African-American women who lived outside the city/county.

Disparity in pregnancy-related maternal mortality rates between African-

American women and other racial/ethnic groups also speaks to obstetric comorbidity being more prevalent in African-American women (Table 1).<sup>19</sup> Our research shows no maternal deaths among Hispanic women at our institution, whereas there were 14 deaths among African-American women over the decade that was under review. Higher maternal mortality rates for African-American women appear to be the case, even though there were fewer Hispanic women giving birth. This is consistent with a report on preventability of pregnancy-related death in North Carolina, where 54% of maternal deaths were experienced by African-American women, compared with only 5% for women who were classified as other races.<sup>19</sup> If poverty

**TABLE 3**  
**Results of logistic regression analysis of adverse outcomes by race for women in North Carolina who received Medicaid and gave birth at Duke University Medical Center (1994-2004)\***

Adverse outcomes	African American			Hispanic		
	P value	OR	95% CI	P value	OR	95% CI
Preterm birth	.0591	1.15	0.99-1.33	<.0001	0.66	0.54-0.80
Abruption	.3137	1.23	0.83-1.82	.3919	0.79	0.47-1.35
Preeclampsia	.0074	1.30	1.07-1.58	.5954	0.94	0.74-1.19
GDM	.4627	0.91	0.70-1.17	.0104	1.47	1.09-1.98
SGA infant	.0003	1.74	1.29-2.36	.6230	1.10	0.74-1.64
Fetal death	.1303	1.41	0.90-2.20	.3579	0.76	0.42-1.37

Analysis excludes patients who reside outside of North Carolina (n = 123 women).

\* Reference group is white; results were adjusted for age at delivery (11-17 years,  $\geq 35$  years, with 18-34 years as reference), location of residence (outside Durham, with Durham as reference), medical comorbidity, substance abuse, psychologic abnormality, length of hospital stay, and total hospital charges ( $\geq \$5000$ , with  $\leq \$4999$  as reference).

TABLE 4

**Results of logistic regression analysis\* to determine the risk factors for adverse outcomes for Hispanic vs African American women in North Carolina who received Medicaid and gave birth at Duke University Medical Center (1994-2004)**

Characteristic	Preterm birth		Preeclampsia		Abrupton		SGA		GDM		Fetal death	
	OR <sup>†</sup>	95% CI	OR <sup>†</sup>	95% CI	OR <sup>†</sup>	95% CI	OR <sup>†</sup>	95% CI	OR <sup>†</sup>	95% CI	OR <sup>†</sup>	95% CI
Age 11-17 y at delivery	1.14	0.96-1.36	1.43 <sup>‡</sup>	1.16-1.76	0.40 <sup>†</sup>	0.19-0.82	1.21	0.88-1.68	0.22 <sup>§</sup>	0.12-0.40	0.81	0.46-1.45
Age ≥35 y at delivery	1.31	0.98-1.75	1.21	0.85-1.71	1.15	0.57-2.33	1.04	0.62-1.76	4.07 <sup>§</sup>	2.94-5.62	3.14 <sup>‡</sup>	1.73-5.70
Lives in NC outside Durham city and county	1.54 <sup>‡</sup>	1.35-1.77	1.17	0.99-1.39	1.28	0.88-1.86	1.24	0.97-1.60	1.20	0.95-1.52	1.22	0.81-1.82
Medical comorbidity	1.18	0.95-1.48	1.95 <sup>§</sup>	1.54-2.46	0.95	0.53-1.69	1.78 <sup>‡</sup>	1.27-2.50	8.19 <sup>§</sup>	6.33-10.59	1.48	0.82-2.68
Substance abuse	1.44 <sup>‡</sup>	1.08-1.91	0.68	0.45-1.04	1.51	0.76-2.97	1.99 <sup>‡</sup>	1.29-3.07	0.57	0.32-1.01	0.86	0.36-2.02
Psychologic abnormality	0.77	0.32-1.84	0.85	0.34-2.10	0.74	0.10-5.56	1.25	0.42-3.74	0.35	0.08-1.55	3.63 <sup>‡</sup>	1.06-12.46
Length of hospital stay	1.29 <sup>§</sup>	1.25-1.33	1.05 <sup>§</sup>	1.03-1.07	1.03	0.99-1.06	1.06 <sup>§</sup>	1.04-1.08	1.02	0.99-1.05	0.99	0.93-1.06
Hospital charges ≥\$5000	1.34 <sup>‡</sup>	1.15-1.56	3.33 <sup>§</sup>	2.78-3.99	4.28 <sup>§</sup>	2.77-6.62	2.33 <sup>§</sup>	1.78-3.05	1.90 <sup>§</sup>	1.49-2.42	1.00	0.65-1.53

\* Excludes patients who reside outside of North Carolina (n = 61 women).

<sup>†</sup> Adjusted for all other covariates and race.

<sup>‡</sup> P < .05.

<sup>§</sup> P < .0001.

and access to care are major factors in obstetric mortality rates, I might have expected to see a higher rate of maternal mortality in Hispanic women. However, maternal death, at least in our study population, is yet another paradoxical finding.

The finding in this study of no statistically significant difference in the overall prevalence of GDM across racial/ethnic groups was unexpected. Logistic regres-

sion that compared all races (Table 4) indicated that older age and the presence of medical comorbidities increased the unadjusted odds for GDM (Table 5). The association was even stronger when only African-American and Hispanic women were included. In the adjusted model, increased odds for GDM for Hispanic women compared with African American and white women were noted. This finding is consistent with other reports

on GDM prevalence in the Hispanic population. Maternal GDM, not specific to type, was reported in 2.3% of singleton live births to US-born Mexican-American women residents from 1994-1996.<sup>20</sup> Maternal overweight, GDM, and impaired glucose tolerance are common among Mexican-American people and may provide some protection for the low birthweight that might be anticipated as a result of poverty and access to care.<sup>20</sup>

In summary, the Hispanic paradox was demonstrated in the new immigrant population that received care at our tertiary center. The odds for all measures of birth outcomes and pregnancy complications, except for GDM, were lower for Hispanic than for African-American women of similar socioeconomic status. Follow-up studies over the next several decades will determine whether acculturation in this region of the United States will lead to the loss of this perinatal advantage in birth outcomes in the underprivileged Hispanic community. ■

TABLE 5

**Results of logistic regression analysis\* of adverse outcomes for Hispanic and African American women in North Carolina who received Medicaid and gave birth at Duke University Medical Center (1994-2004)<sup>†</sup>**

Adverse outcomes	P value	Odds of outcomes in Hispanic vs African-American women	
		OR	95% CI
Preterm birth	<.0001	0.57	0.48-0.67
Abrupton	.0399	0.63	0.40-0.98
Preeclampsia	.0040	0.76	0.62-0.91
GDM	.0002	1.60	1.25-2.04
SGA infant	.0058	0.65	0.47-0.88
Fetal death	.0079	0.52	0.32-0.84

\* Excludes patients who resided outside of North Carolina (n = 61 women).

<sup>†</sup> Reference group is African American; results were adjusted for age at delivery (11-17 years, ≥35 years, with 18-34 years as reference), location of residence (outside Durham, with Durham as reference), medical comorbidity, substance abuse, psychologic abnormality, length of hospital stay, and total hospital charges (≥\$5000, with ≤\$4999 as reference).

## REFERENCES

1. USDHHS, CDC, NCHS. National vital statistics reports, vol 52, no. 10. Births: final data for 2002. Hyattsville, MD: Public Health Service; 2003.

2. Committee to Study the Prevention of Low Birthweight. Preventing low birthweight. Washington, DC: National Academy Press; 1985.
3. Ginzbert E. Access to health care for Hispanics. *JAMA* 1991;265:238-41.
4. US Census Bureau. Poverty status of families (table 4); revised Oct. 30, 2002. Available at: [www.census.gov/hhes/www/poverty/poverty05.html](http://www.census.gov/hhes/www/poverty/poverty05.html). Accessed July 6, 2007.
5. Ventura S, Martin J, Mathews T, Clarke S. Advance report of final natality statistics, 1994. *Monthly Vital Stat Rep* 1996;44(suppl):1-88.
6. Fuentes-Afflick E, Lurie P. Low birth weight and Latino ethnicity; examining the epidemiologic paradox. *Arch Pediatr Adolesc Med* 1997;151:665-74.
7. Beukens P, Notzon F, Kotelchuck M, Wilcox A. Why do Mexican Americans give birth to few low birth weight infants? *Am J Epidemiol* 2000;152:347-51.
8. Hessel NA, Fuentes-Afflick E. The perinatal advantage of Mexican-origin Latina women. *Ann Epidemiol* 2000;10:516-23.
9. Chung JH, Boscardin WJ, Garite TJ, Lagrew DC, Porto M. Ethnic difference in birth weight by gestational age: at least a partial explanation for the Hispanic epidemiologic paradox? *Am J Obstet Gynecol* 2003;189:1058-62.
10. McGlade MS, Saha S, Dahlstrom ME. The Latina paradox: an opportunity for restructuring prenatal care delivery. *Am J Public Health* 2004;94:2062-5.
11. Laditka SB, Laditka HN, Probst JC. Racial and ethnic disparities in potentially avoidable delivery complications among pregnant Medicaid beneficiaries in South Carolina. *Matern Child Health J* 2006;10:339-50.
12. Fuentes-Afflick E, Hessel NA, Perez-Stable EJ. Testing the epidemiologic paradox of low birth weight in Latinos. *Arch Pediatr Adolesc Med* 1999;153:147-53.
13. Mathews J, MacDorman MF. Infant mortality statistics from 2003 period linked birth/infant death data set. *National Vital Statistics Reports*, vol 54, no. 16. Hyattsville, MD: National Center for Health Statistics; 2006.
14. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Menacker F, Munson ML. *National Vital Statistics Report: births: final data for 2002*; vol 52, no. 10. Hyattsville, MD: National Center for Health Statistics; 2003.
15. Landale NS, Oropesa RS, Gorman BK. Migration and infant death: assimilation or selective migration among Puerto Ricans? *Am Soc Rev* 2000;65:888-909.
16. Markides KS, Coreil J. The health of Hispanics in the southwestern United States: an epidemiologic paradox. *Public Health Rep* 1986;101:253-65.
17. Collins JW Jr, Shay DK. Prevalence of low birth weight among Hispanic infants with United States-born and foreign born mothers: the effect of urban poverty. *Am J Epidemiol* 1994;139:184-92.
18. David RJ, Collins JW. Differing birth weight among infants of US born black, African born

blacks and US born whites. *N Engl J Med* 1997;337:1209-14.

19. Berg CJ, Harper MA, Atkinson SM, et al. Preventability of pregnancy related deaths: results of a state wide review. *Obstet Gynecol* 2005;106:1228-34.

20. Kieffer EC, Martin JA, Herman WH. The impact of maternal nativity on the prevalence of diabetes during pregnancy among US ethnic groups. *Diabetes Care* 1999;22:729-35.

## DISCUSSION

**John Edwin Nichols Jr, MD.** This article is an investigation of racial differences in pregnancy outcomes from a Medicaid population who were seen at DUMC in North Carolina during a 10-year time span beginning in 1994 and also confirms an already well-documented epidemiologic phenomenon of a lower incidence of low-birthweight infants born to Hispanic women as compared with African-American women of similar socioeconomic means.<sup>1,2</sup>

This study reviewed 10,755 women who received Medicaid and used ICD-9 and CPT codes to look at pregnancy outcomes and comorbidities between 3 racial populations that consisted of white (21%), Hispanic (27.3%), and African-American (51.7%) women. These findings revealed that African-American women were more likely to experience a higher incidence of pregnancy comorbidities that resulted in longer hospital stays and charges and had higher rates of preterm birth, SGA infants, preeclampsia, and stillbirths. When comparing African-American and Hispanic women, with white women as a reference group, African-American women had higher odds for preterm birth and SGA infants. With African-American women as a reference group compared with Hispanic women, African-American women were more likely to experience adverse pregnancy outcomes in all measurements, except for GDM, the incidence of which was higher in the Hispanic women. However, when comparing all 3 racial groups unadjusted, the overall prevalence of GDM was not seen to be significantly different among the 3 groups.

This article from a southeastern tertiary medical center again reveals the paradoxical finding that Hispanic women, especially foreign-born, have lower inci-

dences of low-birthweight infants and similar pregnancy outcomes to white women, compared with African-American women. Even by using a Medicaid population for all 3 racial groups to possibly control for certain economic factors, this Hispanic paradox of better pregnancy outcomes for Hispanic women, compared with African-American women of similar economic status, continues to exist.

Although age and race were captured as variables, other important data such as parity (only the first birth data were used for each patient who was encountered during the 10-year period), previous pregnancy data and outcomes, birthweights, gestational age at delivery, and maternal body mass index would have provided even more influencing factors as related to possible adverse pregnancy outcomes or lack thereof. Because only certain specific codes were used to capture data, this could severely limit other potential confounding factors. For example, African-American women tended to be younger at the time of delivery than both white and Hispanic women, which possibly could account for a higher incidence of prima gravidity and its related pregnancy complications in this group. Although African-American and white women had a higher incidence of pregnancy comorbidities, this could also reflect the lower use by Hispanic women of both prenatal care and the US health care system to document and track some of these variables, not to mention possible language barriers and coding biases. In addition, previous studies have shown that this Hispanic paradox of better pregnancy outcomes seems to exist mostly in foreign-born Hispanic women and tends to be less of an effect on subsequent generations of Mexican-American women as they acculturate to the way of life in the United States.<sup>3,4</sup> It is unclear in this article whether specific resident status is known for the represented group of Hispanic women, but it most likely can be inferred that this is an immigrant population based on the graph data in the [Figure](#).

In [Table 1](#), are the presented probability values significant when compared among all 3 groups or just Hispanic vs

African-American women or Hispanic and white women vs African-American women or vs the whole overall group of women? White women had lower odds of being a Durham resident, which would suggest that they had a higher incidence of pregnancy-related problems and a need for referral to a tertiary medical center for delivery. In addition, the mean length of hospital stay was longer (4 days) and higher mean hospital charges were seen for white women than for the other groups as well. Because white women had a higher incidence of substance abuse, psychologic abnormalities, and possible medical comorbidities, would this account for this discrepancy? It is certainly clear that Hispanic women were older at the time of these recorded deliveries (but could also have been more parous than the other groups); were more likely to live in Durham (not a referral or transfer patient); had a lower length of hospital stay and charges; and had coexisting medical, substance abuse, and psychologic problems, which make it a much less high-risk population than the other 2 groups. Also, Hispanic women were more likely to be unemployed, but this variable could be misleading because of issues of self-underreporting of employment, illegal employment, or fear of revealing immigration status.

In Table 2, were the probability values significant when comparing groups and which groups?

In Table 3, African-American women had higher OR of preeclampsia and SGA infants. Hispanic women had lower odds of preterm birth but had higher odds of GDM, which could account for higher birthweights (macrosomia?) and decrease in SGA infants. Because GDM was seen more in the older women and in the Hispanic group, who tend to have a higher prevalence of GDM, glucose intolerance, maternal obesity, and pregnancy weight gain,<sup>5,6</sup> the reason that the Hispanic women continue to enjoy less adverse perinatal outcomes, despite this comorbidity, is still not clear.

Regarding Tables 4 and 5, I am not sure either table is needed. Discussion should note that African-American women have higher risk factors for all

outcomes except GDM. Most of the other data are self-explanatory and need not be broken down for all 3 groups and a comparison of Hispanic and African-American women.

The meat of the statistics of this article is in Table 6 and essentially does away with Tables 4 and 5.

Is this epidemiologic paradox truly a Hispanic phenomenon, or is it that the previous theories brought forth that immigrants (not just Hispanic women) who come to this country usually are healthier than their own fellow countrypersons?<sup>7</sup> Likewise, these immigrants may tend to be more family oriented, more likely to have a supportive partner, to have a stronger religious background, and to have healthier diets and lifestyles with less substance abuse (alcohol, tobacco, illegal drugs), which could equate to a lower incidence of adverse perinatal outcomes.<sup>8,9</sup> In addition, the Hispanic culture tends to view pregnancy as a natural and celebrated state, which is generally well-supported by family members and others in the surroundings.<sup>10</sup> Possibly less stressful environments, nonemployment, living within a more desirable economic status with access to better housing, utilities, food sources, and a health care system than their previous residence could also play a part in healthier pregnancies and outcomes. Certainly, socioeconomic status is relative to the country and environment in which one lives at present vs previous surroundings. So what might be generally considered a lower socioeconomic status in this country could well be a significant improvement in economic advantages for a foreign-born immigrant. What is more concerning is that acculturation to the way of life in the United States appears to attenuate or erase this perinatal advantage for not only Hispanic women but also for other foreign-born immigrants from other countries and over time.<sup>11-14</sup> This may speak more for the effects of Western environment, diet, lifestyle, stresses, vices, and modernization of our society on reproductive health issues, despite having access to 1 of the best health care systems in the world.

More concerning is that African-American women, even at a younger age, still have a higher incidence of medical comorbidities and adverse perinatal outcomes. What is it that forms the basis of this paradox? Why are hypertension, renal diseases, cardiovascular diseases, and morbidity higher in the African-American population in general?<sup>15-18</sup> Lifestyle, diet, and obesity can explain some of these issues; but further work is needed to determine the causes of the predisposition of the African-American race to multiple medical comorbidities, compared with their non-African-american counterparts.

## REFERENCES

- Hessol NA, Fuentes-Afflick E. The perinatal advantage of Mexican-origin Latina women. *Ann Epidemiol* 2000;10:516-32.
- McGlade MS, Saha S, Dahlstrom ME. The Latina paradox: an opportunity for restructuring prenatal care delivery. *Am J Public Health* 2004;94:2062-5.
- Cervantes A, Keith L, Wyshak G. Adverse birth outcomes among native-born and immigrant women: replicating national evidence regarding Mexicans at the local level. *Matern Child Health J* 1999;3:99-109.
- Rosenberg TJ, Raggio TP, Chiasson MA. A further examination of the "epidemiologic paradox": birth outcomes among Latinas. *J Natl Med Assoc* 2005;97:550-6.
- Kieffer EC. The influence of maternal weight and glucose tolerance on infant birthweight in Latino mother-infant pairs. *Am J Public Health* 2006;96:2201-8.
- Kieffer EC. Maternal obesity and glucose intolerance during pregnancy among Mexican-Americans. *Paediatr Perinat Epidemiol* 2000;14:141-9.
- Wingate MS, Alexander GR. The healthy migrant theory: variations in pregnancy outcomes among US-born migrants. *Soc Sci Med* 2006;62:491-8.
- Page RL. Positive pregnancy outcomes in Mexican immigrants: what can we learn? *J Obstet Gynecol Neonatal Nurs* 2004;33:783-90.
- Magana A, Clark NM. Examining a paradox: does religiosity contribute to positive birth outcomes in Mexican American populations? *Health Educ Q* 1995;22:96-109.
- Smith PB. Sociologic aspects of adolescent fertility and childbearing among Hispanics. *J Dev Behav Pediatr* 1986;7:346-9.
- Collins JW Jr, Shay DK. Prevalence of low birth weight among Hispanic infants with United States-born and foreign born mothers: the effect of urban poverty. *N Engl J Med* 1997;337:1209-14.
- Collins JW Jr, David RJ. Pregnancy outcome of Mexican-American women: the effect

of generational residence in the United States. *Ethn Dis* 2004;14:317-21.

**13.** Cobas JA, Balcazar H, Benin MB, Keith VM, Chong Y. Acculturation and low-birth-weight of infants among Latino women: a re-analysis of HHANES data with structural equation models. *Am J Public Health* 1996;86:394-6.

**14.** Acevedo-Garcia D, Soobader MJ, Berkman LF. The differential effect of foreign-born status on low birth weight by race/ethnicity and education. *Pediatrics* 2005;115:20-30.

**15.** Clark LT. Issues in minority health: atherosclerosis and coronary heart disease in African Americans. *Med Clin North Am* 2005;89:977-1001.

**16.** Budoff MJ, Nasir K, Mao S, et al. Ethnic differences of the presence and severity of cor-

onary atherosclerosis. *Atherosclerosis* 2006;187:343-50.

**17.** Boone CA. End-stage renal disease in African Americans. *Nephrol Nurs J* 2000;27:597-600.

**18.** Ferdinand KC, Saunders E. Hypertension-related morbidity and mortality in African Americans: why we need to do better. *J Clin Hypertens* 2006;8:21-30.

**Dr Brown (Closing).** The discussant raises a good point in asking whether the epidemiologic paradox is truly a Hispanic phenomenon. This is a critical question. The “healthy immigrant” theory does not take into account 1 important question: Could the health of migrant women from Mexico

who live under adverse socioeconomic conditions in the United States be better than the health of African-American US citizens?

We agree that it is concerning that African-American women, even at a younger age, still have a higher incidence of medical comorbidities and adverse perinatal outcomes. We believe the basis of this paradox does lie in the comorbidities (such as hypertension) and lifestyle (including obesity). However, these factors alone certainly do not totally account for the differences in disparity in outcomes.