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Birth Mode after Primary Cesarean among Hispanic and non-Hispanic Women at One U.S. Institution

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A B S T R A C T

Background: Despite a lower percentage of primary cesareans than non-Hispanic White and Black women, Hispanic women in the United States had the highest rate of repeat cesarean deliveries (RCD) in 2016; it is unclear if reasons for differences are due to known risk factors. Our study examined the association between ethnicity/race and RCD among women with one previous cesarean and whether demographic (age, marital status, education, language, and delivery year), anthropomorphic (height, prepregnancy body mass index), obstetrical/medical (parity, gestational age, infant birth weight, gestational diabetes, labor induction or augmentation, vaginal birth after cesarean delivery history), or health system (delivery day/time, payer source, provider gender) factors accounted for any observed differences by ethnicity/race.

Methods: Our retrospective cohort study used logistic regression to evaluate the relationship between ethnicity/race and RCD based on data from electronic delivery and prenatal records from 2010 to 2016, including 1800 births to Hispanic and non-Hispanic women with one previous cesarean at a District of Columbia hospital.

Results: Statistically significant differences by ethnicity/race were noted after adjustment for obstetric/medical factors, particularly parity and use of induction or augmentation methods. Hispanic (adjusted odds ratio, 2.48; 95% confidence interval, 1.03–6.01) and Black women (adjusted odds ratio, 2.83; 95% confidence interval, 1.67–4.81) had higher odds of RCD than White women.

Conclusions: Adjustment for parity and use of induction or augmentation methods revealed higher odds of RCD for Hispanic and Black women than White women. Demographic and anthropometric factors did not alter these results. Our work is a first step in creating effective public health policy and programs that target potentially preventable RCD by highlighting the need to evaluate risk factors beyond those included in the literature to date.

Repeat cesarean deliveries (RCDs) account for one-third of all cesarean deliveries (Hehir et al., 2018) and present greater overall health risks and health care costs to women than primary cesarean deliveries (Creanga et al., 2014; Cunningham et al., 2010; Fawsitt et al., 2013; Gilbert et al., 2013; Grobman et al., 2007; Guise et al., 2010; Marshall, Fu, & Guise, 2011; Quinlan & Murphy, 2015; Wiklund, Andolf, Lilja, & Hildingsson, 2012). Despite a lower percentage of primary cesarean delivery than non-Hispanic Black and White women, Hispanic women in the United States had the highest rate of RCD in 2016 (Bryant, Washington, Kuppermann, Cheng, & Caughey, 2009; Colomar et al., 2014; Cunningham et al., 2010; Gonzalez-Mendez et al., 2012; Guise et al., 2010; Hollard et al., 2006; National Center for Health Statistics, 2015). The percentage of vaginal birth after cesarean (VBAC) was lower among Hispanic women than non-Hispanic Black or White women based on 2016 U.S. data (11.5 vs. 12.4 and 12.8 per 100 live births, respectively) (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018).

Although studies of ethnic differences in RCD show variation in the risk of cesarean, the direction and magnitude of this risk has been inconsistent across studies, in part owing to limited

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adjustment for factors related to cesarean delivery and variation in data sources and study designs (Braveman, Egerter, Edmonston, & Verdon, 1995; Bryant et al., 2009; Chung et al., 2006; Edmonds, Hawkins, & Cohen, 2016; Janevic et al., 2014; Washington, Caughey, Cheng, & Bryant, 2012; Zlot, Jackson, & Korenbrot, 2005). There also is limited empirical evidence about the reasons for differences, particularly if they are due to demographic, anthropomorphic, obstetrical/medical, or health system risk factors. Studies have also excluded or underrepresented U.S. Hispanic women with previous cesarean births, resulting in limited understanding about their risk for RCD (Colomar et al., 2014; Dweik et al., 2014; Gamble & Creedy, 2001; Hildingsson, 2008; Johansson, Hildingsson, & Fenwick, 2014; Kolip, 2008; Kudish, Mehta, Kruger, Russell, & Sokol, 2010; Loke, Davies, & Li, 2015; Mazzoni et al., 2016; Regan, McElroy, & Moore, 2013; Wu et al., 2014). The current state of the literature on this topic requires rigorous examination of a variety of factors to understand potential interventions for this population.

The current study used electronic medical records data to examine the association between ethnicity/race and RCD among women with one previous cesarean and to evaluate whether known risk factors accounted for any observed differences. Assessing these associations, particularly related to modifiable risk factors, is important in understanding possible maternal health disparities among the growing population of U.S. women of Hispanic origin who may be disproportionately affected by RCD.

Methods

This retrospective epidemiologic cohort study was based on electronic medical data for women with one previous cesarean birth who delivered at Medstar Washington Hospital Center (Hospital Center) in Washington, DC between January 1, 2010 and October 31, 2016. The Hospital Center is a public, urban, Neonatal Intensive Care level III nursery, 912-bed general medical and surgical teaching hospital with an in-house staff of neonatologists and high-risk practitioners, including maternal–fetal medicine physicians, serving a diverse patient population. It also meets the American College of Obstetricians and Gynecologists (2010) recommendation for providing safe VBAC: having immediate availability to surgeons and anesthesiologist. The Hospital Center uses an electronic obstetrics database and links prenatal records with delivery records, allowing for standardized electronic medical data. In 2016, 3,564 births occurred at the Hospital Center.

A total of 21,587 births occurred at the Hospital Center during the study period. The study sample was limited, however, to women over 18 years of age with births at over 37 weeks gestation who had a history of a prior cesarean delivery (Figure 1). Births of multiples, with fetal demise, or that took place outside of the hospital were excluded. Only the first birth at the Hospital Center after the primary cesarean was included for women who had more than one Hospital Center delivery during the study period. These initial inclusion/exclusion criteria

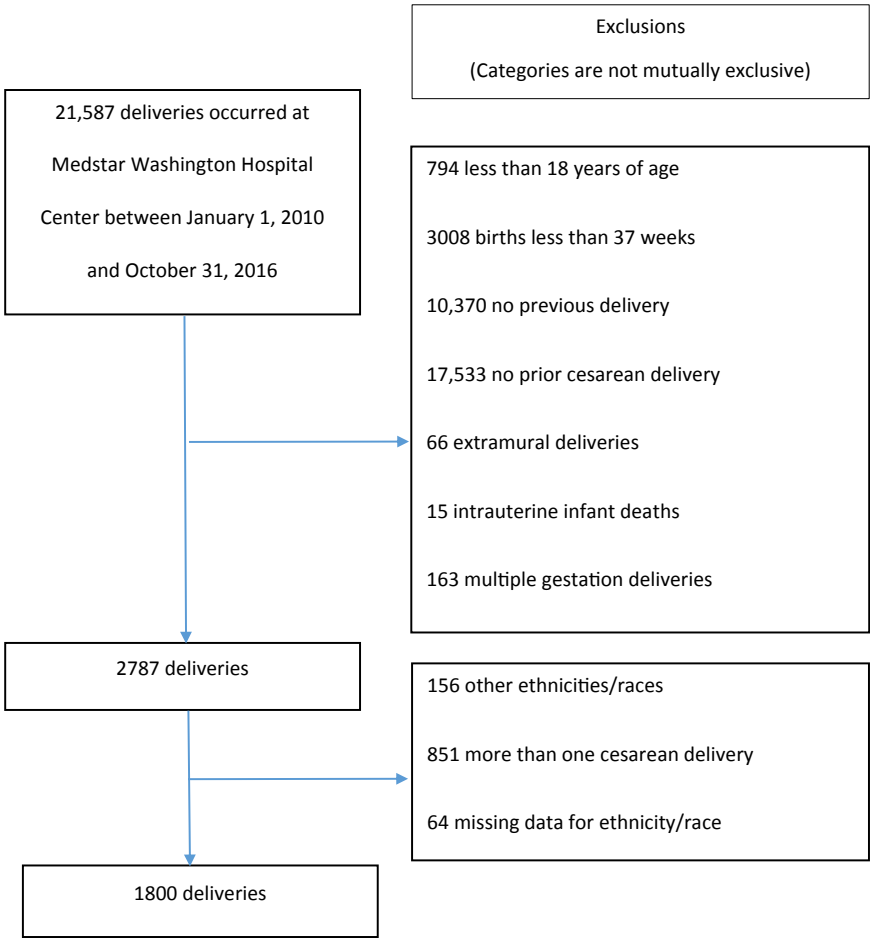

Figure 1. Flow diagram of sample. The application of inclusion and exclusion criteria resulted in 1,800 deliveries for analysis.

Table 1
Characteristics of the Sample (January 1, 2010 through October 31, 2016)

Characteristic	Distribution, *n* (%)			
	Hispanic (n = 337; 18.7%)	Non-Hispanic Black (n = 1,342; 74.6%)	Non-Hispanic White (n = 121; 6.7%)	Total (N = 1,800; 100.0%)
Demographic factors				
Maternal age, y				
Mean	30.9	29.5	33.6	30.0
18–24	47 (14.0)	317 (23.6)	4 (3.3)	368 (20.4)
25–29	90 (26.7)	380 (28.3)	18 (14.9)	488 (27.1)
30–34	107 (31.8)	357 (26.6)	48 (39.7)	512 (28.4)
35–55	93 (27.6)	288 (21.5)	51 (42.2)	432 (24.0)
Marital status				
Single	234 (69.6)	1,009 (75.3)	37 (30.6)	1,280 (71.2)
Married	102 (30.4)	331 (24.7)	84 (69.4)	517 (28.8)
Maternal education				
Elementary	113 (37.3)	57 (4.7)	0 (0.0)	170 (10.5)
Secondary	155 (51.2)	743 (61.3)	24 (22.4)	922 (56.8)
College or above	35 (11.6)	413 (34.1)	83 (77.6)	531 (32.7)
Maternal language				
English	54 (16.6)	1,287 (96.3)	120 (100.0)	1,461 (81.9)
Spanish	272 (83.4)	0 (0.0)	0 (0.0)	272 (15.3)
Other	0 (0.0)	50 (3.7)	0 (0.0)	50 (2.8)
Year of delivery				
2010	65 (19.3)	294 (21.9)	20 (16.5)	379 (21.0)
2011	58 (17.2)	239 (17.8)	24 (19.8)	321 (17.8)
2012	45 (13.4)	206 (15.4)	12 (9.9)	263 (14.6)
2013	59 (17.5)	193 (14.4)	10 (8.3)	262 (14.6)
2014	29 (8.6)	151 (11.3)	18 (14.9)	198 (11.0)
2015	42 (12.5)	131 (9.8)	16 (13.2)	189 (10.5)
2016	39 (11.6)	128 (9.5)	21 (17.4)	188 (10.4)
Anthropomorphic factors				
Maternal height, cm				
<145.0	10 (3.1)	10 (0.8)	1 (0.8)	21 (1.2)
145.0–149.9	33 (10.1)	46 (3.4)	2 (1.7)	81 (4.5)
150.0–154.9	91 (27.9)	159 (11.9)	18 (15.0)	268 (15.0)
155.0–160.0	99 (30.4)	321 (24.0)	20 (16.7)	440 (24.7)
>160.0	93 (28.5)	802 (60.0)	79 (65.8)	974 (54.6)
Prepregnancy BMI, kg/m^2				
Mean	28.0	30.5	26.1	29.7
<25.0	106 (33.8)	341 (27.0)	58 (49.6)	505 (29.8)
25.0–29.9	118 (37.6)	355 (28.1)	38 (32.5)	511 (30.2)
≥30.0	90 (28.7)	566 (44.9)	21 (18.0)	677 (40.0)
Obstetrical/medical factors				
Parity				
2	218 (64.7)	969 (72.2)	115 (95.0)	1,302 (72.3)
3	72 (21.4)	201 (15.0)	3 (2.5)	276 (15.3)
≥4	47 (14.0)	172 (12.8)	3 (2.5)	222 (12.3)
Gestational age at delivery, wk				
37.0–40.0	281 (83.4)	1,114 (83.0)	95 (78.5)	1,490 (82.8)
40.1–41.0	51 (15.1)	172 (12.8)	16 (13.2)	239 (13.3)
>41.0	5 (1.5)	56 (4.2)	10 (8.3)	71 (3.9)
Infant birth weight, g				
Mean	3,421.4	3,345.0	3,497.5	3,369.5
Range	2,248–4,911	1,614–5,741	2,255–4,834	1,614–5,741
<3.499	197 (59.5)	838 (63.8)	64 (54.2)	1,099 (62.4)
3,500–4,000	101 (30.5)	354 (27.0)	35 (29.7)	490 (27.8)
>4,000	33 (10.0)	121 (9.2)	19 (16.1)	173 (9.8)
Gestational diabetes				
No	294 (87.2)	1,264 (94.2)	118 (97.5)	1,676 (93.1)
Yes	43 (12.8)	78 (5.8)	3 (2.5)	124 (6.9)
Pregestational diabetes				
No	331 (98.2)	1,305 (97.2)	121 (100.0)	1,757 (97.6)
Yes	6 (1.8)	37 (2.8)	0 (0.0)	43 (2.4)
Labor induction				
No	305 (90.5)	1,210 (90.2)	120 (99.2)	1,635 (90.8)
Yes	32 (9.5)	132 (9.8)	1 (0.8)	165 (9.2)
Labor augmentation				
No	281 (83.4)	1,155 (86.1)	107 (88.4)	1,543 (85.7)
Yes	56 (16.6)	187 (13.9)	14 (11.6)	257 (14.3)
Previous VBAC				
No	287 (85.2)	1,178 (87.8)	118 (97.5)	1,583 (87.9)
Yes	50 (14.8)	164 (12.2)	3 (2.5)	217 (12.1)

(*continued on next page*)

Table 1 (*continued*)

Characteristic	Distribution, *n* (%)			
	Hispanic ($n = 337$; 18.7%)	Non-Hispanic Black ($n = 1,342$; 74.6%)	Non-Hispanic White ($n = 121$; 6.7%)	Total ($N = 1,800$; 100.0%)
Health system factors				
Delivery day of the week				
Weekday	264 (78.3)	1,120 (83.5)	105 (86.8)	1,489 (82.7)
Weekend	73 (21.7)	222 (16.5)	16 (13.2)	311 (17.3)
Time of delivery				
Day shift (6 AM–5:59 PM)	206 (61.1)	876 (65.3)	84 (69.4)	1,166 (64.8)
Night shift (6 PM–5:59 AM)	131 (38.9)	466 (34.7)	37 (30.6)	634 (35.2)
Payer source				
Public	249 (73.9)	867 (64.7)	21 (17.4)	1,137 (63.2)
Private	88 (26.1)	474 (35.4)	100 (82.6)	662 (36.8)
Provider gender				
Female	241 (71.5)	898 (66.9)	86 (71.1)	1,225 (68.1)
Male	96 (28.5)	444 (33.1)	35 (28.9)	575 (31.9)

Abbreviations: BMI, body mass index; VBAC, vaginal birth after cesarean.

resulted in 2,787 births for inclusion. Delivery and prenatal electronic medical records for these births were then linked using an optimized deterministic linking algorithm with three criteria (medical record number, maternal date of birth, and delivery date) (Blanchette, Dekoven, De, & Roberts, 2013; Joffe et al., 2014; Zhu, Matsuyama, Ohashi, & Setoguchi, 2015).

Among the 2,787 linked birth records, those with missing information about previous cesarean history and ethnicity/race were individually reviewed to obtain this information. Additionally, delivery records with ethnicity/race reported as unknown, declined, do not use, other, two or more races, multiracial, or Asian were individually reviewed to confirm ethnicity/race. Information on previous delivery history was complete after individual review of records, but 64 women were excluded from final analysis owing to missing information on ethnicity/race. The study sample was further restricted to Hispanic women of all races and non-Hispanic Black and White women with one prior cesarean, resulting in a sample for analysis of 1,800 women. Data were de-identified for analysis.

The dependent variable was dichotomous, whether a woman had an RCD after a primary cesarean birth. The primary independent variable was ethnicity/race as reported in the medical record with mutually exclusive categories for Hispanic, non-Hispanic Black, and non-Hispanic White women. Covariates were categorized as demographic, anthropomorphic, obstetrical/medical, and health system factors and defined as categorical or dichotomous for analysis.

Some covariates require further clarification. For marital status, divorced or separated women were included in the single category, because they made up less than 1% of the sample. Elementary maternal education was defined as less than 8 years of education and secondary education as 9–12 years or high school diploma. Maternal languages other than English or Spanish included French and Amharic. Only births after 2010 were sampled to account for American College of Obstetricians and Gynecologists (2010) guidelines for VBAC.

Determination of gestational age was based on best obstetric estimate. The medical record did not distinguish between insulin and non–insulin-dependent diabetes; diabetes was coded as present or absent. Preeclampsia and hypertensive disorders were not included owing to questionable validity; only 0.8% ($n = 14$) and 1.3% ($n = 24$) of the sample had documented preeclampsia and hypertension, respectively. It also was not possible to obtain reliable data from the medical records on whether a trial of labor was attempted before an RCD, but prior delivery history was extracted to determine if a woman experienced a previous VBAC.

The year, time of day, and day of the week of the delivery were included in the analysis to adjust for possible temporal trends in delivery preferences. Insurance type was identified as public or private; self-pay/uninsured (8.8%) was included in the public category.

We first conducted a descriptive analysis of the overall sample characteristics, and then analyses for Hispanic, non-Hispanic Black, and non-Hispanic White women separately. A χ^2 test was used to compare RCD rates across ethnicity/race groups. Multivariable logistic regression models estimated odds ratios (ORs) with 95% confidence intervals (CIs) for the association of ethnicity/race with RCD. Variables were chosen for the multivariate model based on findings from other studies, results of the exploratory data analysis, and analyses of unadjusted odds for each variable. Covariates were included in models if they significantly changed the odds ratio for ethnicity/race by 10% or more or if they had an independent effect on the odds of RCD.

Missing values for the final sample ranged from 0.1% (insurance) to 9.9% (education) for eight variables: marital status, language, insurance, maternal height, prepregnancy weight, weight at admission, infant birth weight, and education. Multiple imputation by chained equations was conducted with a total of 35 imputations generated for the variables with missing data (Bodner, 2008); each variable was imputed separately. All multiple imputation procedures were conducted using STATA 14.2 (Stata/IC 14.2, 2017; UCLA: Statistical Consulting Group, n.d.). Variables included in the imputations model were determined after correlation analysis and independent means testing (Wilcoxon Mann-Whitney and *t* tests) resulted in no significant differences in ethnicity/race and mode of delivery between women with and without missing information.

Sensitivity analyses were performed for obstetrical and medical factors to assess their effect on the ethnicity/race estimates. Two separate analyses also were conducted to address the small cell size for the language covariate because this covariate was of interest to the primary independent variable of ethnicity/race. STATA 14.2 software (Stata/IC 14.2, 2017) was used for all analyses, with a *p* value of .05 to indicate statistical significance.

The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed and approved the study protocol and an Institutional Review Board Authorization Agreement was approved by the Medstar Research Institute.

Table 2
Repeat Cesarean Delivery Rates (January 1, 2010, through October 31, 2016)

Characteristic	RCD Rates, %
Demographic factors	
Race*	
Non-Hispanic White	70.3
Hispanic	63.5
Non-Hispanic Black	76.2
Maternal age, y	
18–24	73.1
25–29	71.9
30–34	72.9
35–50	75.9
Marital status	
Single	74.2
Married	71.2
Maternal education*	
Elementary	62.9
Secondary	72.2
College or above	78.5
Maternal language*	
English	75.9
Spanish	60.7
Other	68.0
Year of delivery	
2010	75.2
2011	73.2
2012	72.2
2013	74.8
2014	73.2
2015	71.4
2016	71.8
Anthropomorphic factors	
Height, cm	
<150.0	80.4
150.0–154.9	72.4
155.0–160.0	72.5
>160.0	74.1
Prepregnancy BMI,* kg/m^2	
<25.0	68.5
25.0–29.9	70.8
≥30.0	79.8
Obstetrical/medical factors	
Parity*	
2	81.0
3	60.9
≥4	44.1
Gestational age at delivery, wk*	
37.0–40.0	76.0
40.1–41.0	61.9
≥41.1	57.8
Infant birth weight, g†	
<3,499	72.3
3,500–4,000	73.1
>4,000	82.7
Gestational diabetes	
No	73.0
Yes	79.0
Induction or augmentation*	
No	81.9
Yes	43.0
History of a VBAC*	
No	79.0
Yes	32.7
Health system factors	
Day of the week of delivery*	
Weekday	76.8
Weekend	56.9
Time of delivery*	
Day shift (6 AM–5:59 PM)	80.2
Night shift (6 PM–5:59 AM)	60.9
Payer source*	
Public	69.2
Private	80.5
Provider gender*	
Female	69.4
Male	81.9

Abbreviations: BMI, body mass index; VBAC, vaginal birth after cesarean.
* $p < .001$.
† $p < .05$.

Results

Table 1 describes the characteristics of the final study sample of 1,800 women after exclusion criteria were applied. Most women in the sample were non-Hispanic Black women (74.6%) and Hispanic women (18.7%). Hispanic and non-Hispanic Black women had similar distributions of age, marital status, parity, and insurance. Hispanic women and non-Hispanic Black women were younger, more likely to be single, less educated, of higher parity, more likely to undergo induction of labor and be on public insurance than non-Hispanic White women. Hispanic women were generally shorter in stature than non-Hispanic White and Black women.

The DC VBAC rate for 2013, the most current year for which the data were reported, was 20.0% (Division of Vital Statistics, n.d.), comparable to the VBAC rate among women with a prior cesarean at the Hospital Center in 2013 of 25.2%. The unadjusted RCD rates differed significantly by ethnicity/race ($p < .001$) (Table 2); rates were lowest for Hispanic women. Educational attainment and maternal language were also significantly associated with RCD ($p < .001$). Women with more than 12 years of education had a higher RCD rate than those with secondary education (78.5% vs. 72.2%), and those who spoke English had a higher rate than those who spoke Spanish (75.9% vs. 60.7%). Only prepregnancy body mass index was significantly related to RCD ($p < .001$) among the anthropomorphic factors; women with a prepregnancy body mass index of 30.0 or above had higher rates of RCD.

Among the obstetrical/medical factors, parity, gestational age, and labor induction or augmentation were significantly associated with RCD ($p < .001$). Women whose current birth was their second had the highest RCD rate and women with parities of four or more the lowest RCD. Women who delivered at 41.1 weeks gestation or more had the lowest RCD rate. Infant birth weight was also significantly associated with RCD. Among women with birth weights greater than 4,000 grams, Hispanic women had higher rates of RCD (87.9%) than non-Hispanic White (57.9%) women; non-Hispanic Black women had similar rates to Hispanic women (85.1%). Women who underwent labor induction or augmentation or had a history of a previous VBAC had lower rates of RCD than those who did not. All health systems factors were statistically significant ($p < .001$). Women who had a birth during the weekend were significantly less likely to deliver by RCD. Publicly insured Hispanic women had the lowest RCD rates (58.6%) and privately insured non-Hispanic Black women the highest (82.9%).

Unadjusted odd ratios (ORs) and adjusted ORs (AORs) for RCD are reported in Table 3. Hispanic women had lower unadjusted odds of an RCD than non-Hispanic White women (unadjusted OR, 0.74; 95% confidence interval [CI], 0.47–1.15) whereas non-Hispanic Black women had higher unadjusted odds of RCD than non-Hispanic White women (unadjusted OR, 1.35; 95% CI, 0.90, 2.04). Neither difference was statistically significant in the

Table 3
Unadjusted and Adjusted Odds Ratios of Repeat Cesarean Delivery ($N = 1{,}800$) Using Multivariable Logistic Regression

Characteristic	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Demographic factors		
Race		
Non-Hispanic White	1.00	1.00
Hispanic	0.74 (0.47–1.15)	2.48 (1.03–6.01)*
Non-Hispanic Black	1.35 (0.90–2.04)	2.83 (1.67–4.81)‡
Maternal age, y		
18–24	1.00	1.00
25–29	0.94 (0.70–1.28)	1.47 (1.01–2.14)*
30–34	0.99 (0.73–1.34)	2.10 (1.40–2.15)‡
35–50	1.16 (0.84–1.60)	2.58 (1.63–4.11)‡
Marital status		
Single	1.00	1.00
Married	0.86 (0.68–1.08)	0.65 (0.47–0.90)†
Maternal education		
Elementary	1.00	1.00
Secondary	1.55 (1.10–2.18)*	0.93 (0.58–1.50)
College or above	2.14 (1.48–3.11)‡	0.89 (0.51–1.55)
Maternal language		
English	1.00	1.00
Spanish	0.48 (0.37–0.63)‡	0.44 (0.20–0.98)*
Other	0.68 (0.37–1.24)	0.59 (0.28–1.23)
Year of delivery		
2010	1.00	1.00
2011	0.90 (0.64–1.27)	0.91 (0.60–1.37)
2012	0.86 (0.60–1.23)	0.84 (0.55–1.31)
2013	0.98 (0.68–1.41)	0.86 (0.55–1.36)
2014	0.90 (0.61–1.33)	0.79 (0.49–1.27)
2015	0.82 (0.56–1.22)	0.72 (0.44–1.17)
2016	0.84 (0.57–1.25)	0.70 (0.43–1.12)
Anthropomorphic factors		
Height, cm		
<150.0	1.00	1.00
150.0–154.9	0.57 (0.33–0.98)*	0.61 (0.32–1.18)
155.0–160.0	0.65 (0.38–1.10)	0.57 (0.30–1.07)
>160.0	0.70 (0.42–1.17)	0.53 (0.28–0.98)*
Prepregnancy BMI, kg/m^2		
<25.0	1.00	1.00
25.0–29.9	1.09 (0.84–1.43)	1.13 (0.82–1.57)
≥30.0	1.81 (1.39–2.35)‡	1.63 (1.18–2.25)†
Obstetrical/medical factors		
Parity		
2	1.00	1.00
3	0.36 (0.28–0.48)‡	0.58 (0.39–0.86)†
≥4	0.19 (0.14–0.25)‡	0.29 (0.19–0.46)‡
Gestational age at delivery, wk		
37.0–40.0	1.00	1.00
40.1–41.0	0.51 (0.39–0.69)‡	0.70 (0.49–1.00)
≥41.1	0.43 (0.27–0.70)‡	0.70 (0.38–1.30)
Infant birth weight, g		
<3,499	1.00	1.00
3,500–4,000	1.03 (0.81–1.31)	1.14 (0.84–1.54)
>4,000	1.84 (1.21–2.78)†	2.00 (1.20–3.33)†
Gestational diabetes		
No	1.00	1.00
Yes	1.40 (0.89–2.18)	1.92 (1.08–3.40)*
Induction or augmentation		
No	1.00	1.00
Yes	0.17 (0.13–0.21)‡	0.20 (0.15–0.26)‡
History of a VBAC		
No	1.00	1.00
Yes	0.13 (0.10–0.18)‡	0.24 (0.15–0.37)
Health system factors		
Day of the week of delivery		
Weekday	1.00	1.00
Weekend	0.40 (0.31–0.51)‡	0.58 (0.42–0.78)‡
Time of delivery		
Day shift (6 AM–5:59 PM)	1.00	1.00
Night shift (6 PM–5:59 AM)	0.38 (0.31–0.48)‡	0.58 (0.45–0.75)‡
Payer source		
Public	1.00	1.00
Private	1.84 (1.46–2.31)‡	1.25 (0.91–1.71)
Provider gender		
Female	1.00	1.00
Male	2.00 (1.56–2.55)‡	1.83 (1.37–2.45)‡

Abbreviations: BMI, body mass index; VBAC, vaginal birth after cesarean.
* $p < .05$.
† $p < .01$.
‡ $p < .001$.

unadjusted model ($p > .15$). Hispanic women, however, had more than twice the odds of RCD than non-Hispanic White women (AOR, 2.48; 95% CI, 1.03–6.01; $p < .05$) after adjusting for all factors in the full regression model, as did non-Hispanic Black women (AOR, 2.83; 95% CI, 1.67–4.81; $p < .001$) in the full model. Women aged 25 and older, with prepregnancy body mass indexes of greater than 30.0, or with gestational diabetes had significantly increased odds of RCD. Birth weight of more than 4,000 grams and provider gender (male) also were associated with increased odds of RCD. Married women, Spanish-speaking women, women taller than 160.0 cm, and women with higher parities had decreased odds of RCD. Other factors significantly associated with lower odds of RCD were use of induction and augmentation methods, a history of a previous VBAC, and delivering on the weekend or during the night shift.

The logistic regression results revealed that the odds of RCD were significant for Hispanic and non-Hispanic Black women only when obstetrical/medical factors were added to the model. Analyses were conducted to examine the impact of individual obstetrical and medical factors on the adjusted odds for ethnicity/race (Table 4). Addition of gestational age, infant birth weight, and presence of gestational diabetes improved the fit of the model, but resulted in little change in the odds for Hispanic or non-Hispanic Black women; the change in odds was less than 5%. Adjustment for parity and induction or augmentation methods, in contrast, resulted in increased odds of RCD for both Hispanic and non-Hispanic Black women, regardless of adjustment for other variables. The effect estimate was similar even after adjustment for the presence of a previous VBAC. Adjustment for both induction or augmentation methods and history of a previous VBAC also resulted in significantly increased odds of RCD for both Hispanic (AOR, 2.49; 95% CI, 1.04–5.99; $p < .05$) and non-Hispanic Black women (AOR, 2.46; 95% CI, 1.47–4.11; $p < .001$).

Language also had a significant effect on the association between ethnicity/race and odds of RCD; sensitivity analysis was conducted to examine this effect (Table 5). The odds for Spanish-speaking Hispanic women did not differ significantly from those for English-speaking non-Hispanic White women when the sample was restricted to women who only spoke English or Spanish ($p = .771$). The odds of an RCD were significant only for English-speaking Hispanic women (AOR, 2.77; 95% CI, 1.12–6.85; $p < .05$) and non-Hispanic Black women (AOR, 2.79; 95% CI, 1.64–4.74; $p < .001$) when compared with non-Hispanic White women in the restricted sample.

Discussion

We examined the association between ethnicity/race and RCD and whether demographic, anthropomorphic, obstetrical/medical, and health system factors explained observed

Table 4
Sensitivity Analysis, Obstetrical/Medical Factors ($N = 1{,}800$) Using Multivariable Logistic Regression

Models	Hispanic	Non-Hispanic Black	Non-Hispanic White	Model Adjustment
Model 1	1.70 (0.76–3.81)	1.55 (0.96–2.50)	1.00	All covariates except OB/medical*
Model 2	2.48 (1.08–5.71)†	2.35 (1.43–3.87)‡	1.00	Model 1 with parity
Model 3	2.26 (0.97–5.26)	1.92 (1.16–3.16)†	1.00	Model 1 with induction or augmentation
Model 4	1.93 (0.83–4.51)	2.00 (1.22–3.27)†	1.00	Model 1 with VBAC

* Covariates included maternal age, marital status, maternal education, maternal language, year of delivery, maternal height, maternal prepregnancy body mass index, day of the week of the delivery, time of delivery, payer source, and delivering provider gender.
† $p < .05$.
‡ $p < .001$.

differences in mode of delivery among 1,800 Hispanic and non-Hispanic Black and White women who delivered at a large hospital in the District of Columbia with an RCD rate lower than the national average (73.4% vs. 89.5%, respectively) (Division of Vital Statistics, n.d.). Findings indicate that Hispanic and non-Hispanic Black women had higher odds of RCD than non-Hispanic White women after adjusting for demographic, anthropomorphic, obstetrical/medical, and health system factors. These findings are consistent with studies evaluating ethnic/racial differences in cesarean delivery using samples of women that included Hispanic women with prior cesareans (Bryant et al., 2009; Edmonds et al., 2016; Janevic et al., 2014; Zlot et al., 2005). AORs in these studies were lower and estimates more precise than for our study, likely owing to our smaller sample size and differences in exclusion criteria. Sensitivity analysis suggests that the variables of parity and induction or augmentation of labor were of significance in explaining the higher AOR for Hispanic and non-Hispanic Black women.

Hispanic and non-Hispanic Black women in our sample were more likely to have parities of greater than two, which was associated with lower odds of RCD. Having one prior cesarean and no vaginal births (parity of two) was an important covariate in our final model. This finding is likely related to limiting our sample to women with one previous cesarean birth but, nevertheless, provides some insight about the role of a primary cesarean birth and differences by ethnicity/race in RCD. Women with parities of greater than two had experienced a previous vaginal delivery or VBAC, both of which may result in a better chance of a successful trial of labor (ACOG Practice Bulletin No. 205, 2019; Landon et al., 2005). Owing to data limitations, we were unable to account for the occurrence of a trial of labor. The results of a previous study by Hollard et al. (2006), however, indicated no differences in trial of labor rates between Hispanic and non-Hispanic women, although Hispanic and non-Hispanic Black women had significantly greater odds of a failed trial of labor than non-Hispanic White women; the greater odds of RCD are consistent with our findings.

Table 5
Sensitivity Analysis, Language ($n = 1{,}733$), Using Multivariable Logistic Regression

Race/Ethnicity/Language	Unadjusted OR	AOR*
English-Speaking Hispanic	1.50 (0.71–3.18)	2.77 (1.12–6.85)†
Spanish-Speaking Hispanic	0.66 (0.42–1.05)	1.10 (0.58–2.06)
English-Speaking Non-Hispanic Black	1.39 (0.92–2.09)†	2.79 (1.64–4.74)‡
English-Speaking Non-Hispanic White	1.00	1.00

* Adjusted for all covariates.
† $p < .05$.
‡ $p < .001$.

In our study, Hispanic and non-Hispanic Black women were more likely to experience induction or augmentation of labor than non-Hispanic White women, a factor noted to be protective against RCD. A systematic review and meta-analysis of randomized controlled trials of induction of labor versus expectant management identified 157 eligible studies (Mishanina et al., 2014.). Results showed that the risk of cesarean after an induction of labor was significantly lower than the risk following expectant management. Studies from 1975 to 2010 were included in the review but study sites were not specified; variability in recommendations over time and practice settings are important in interpreting these results. However, the role of induction or augmentation in mediating the risk of cesareans remains unclear (Min, Ehrenthal, & Strobino, 2015).

Factors explored in this study did not explain why Hispanic and non-Hispanic Black women had increased odds of RCD after adjustment for covariates. In fact, adjusting for parity and the use of induction and augmentation methods actually revealed differences in the odds for these two groups of women relative to non-Hispanic White women. Provider bias has been proposed as a factor that may directly and indirectly influence medical decisions. There is evidence in the literature to suggest that increases in cesarean births are associated with more subjective indications for these births, such as labor arrest and nonreassuring fetal heart tracings (Barber et al., 2011; Hollard et al., 2006; Janevic et al., 2014). Variation in labor practices and management related to use of induction and augmentation methods may be associated with provider perceptions and a lower threshold for intervention. Consideration of provider bias in medical decision-making is a growing focus of research with unclear results (Dehon et al., 2017; Hall et al., 2015). We were unable to explore provider bias or cesarean indications in this study.

English-speaking Hispanic women had significantly higher odds of RCD than Spanish-speaking Hispanic women. Our finding supports the importance of considering within group differences when categorizing women by ethnicity/race (Edmonds et al., 2016; Janevic et al., 2014; Zlot et al., 2005). Reasons for this finding after adjustment for parity and induction or augmentation methods are not clear, but may be related to RCD indications, women's preferences, or patient–provider communication. Additional work is needed, particularly in the area of provider communication about mode of delivery after a previous cesarean with Hispanic women living in the United States.

Strengths and Limitations

Several strengths of the study addressed limitations of prior research. The single-site cohort study design is a strength. By

limiting our study to one urban hospital that offered a trial of labor for women with one prior cesarean birth, we controlled for hospital type, state/district liability differences, and institutional policies—all factors that have been identified in the literature as associated with delivery route. The inclusion and exclusion criteria were clearly defined for our study sample and only women with one prior cesarean were included. Electronic medical data captured maternal risks and pregnancy complications not otherwise available from other data sources, and prenatal records were used to address otherwise missing data. The thorough review of the data, with extensive comparisons between data in the electronic delivery and prenatal records for completeness and accuracy, resulted in very complete data. Also, the study site serves a diverse population of women, which contributed to the ability to obtain a sample for the three ethnic/racial groups. The large volume of deliveries at the Hospital Center also assisted in attaining a sufficiently large sample of women with one previous cesarean.

Our study also has several limitations. First, it was not possible to account for all confounders that may play a role in explaining the association between ethnicity/race and mode of delivery, particularly RCD indications. RCD indications were missing from a large percentage of records, which constrained our ability to determine if an RCD was elective or medically indicated. This distinction is important when exploring factors to explain the increased odds of RCD among Hispanic and non-Hispanic Black women, although it could not be included as risk factor; it is only relevant to RCD. Knowing the indication for the RCD is particularly important regarding our findings related to the use of induction or augmentation methods, which are unlikely to occur with elective procedures; that is, neither would be implemented if an RCD were scheduled.

The single-site study design also presented some limitations. Generalizability is limited because Hispanic women delivering at the Hospital Center may reflect populations primarily from Central America and, thus, results may not be applicable to Hispanic women from other countries. Additionally, comparisons across ethnic/racial groups may have been affected by inadequate cell sizes for specific factors, especially among non-Hispanic White women whose demographic characteristics were markedly different than those of Hispanic and non-Hispanic Black women; the small cell sizes may have led to wide CIs and imprecise estimates.

Implications for Practice and/or Policy

Our study was based on electronic medical records, which provided a rich source of data. Limitations found with this particular data source, however, could have important practice and policy implications. First, ethnicity was less accurately recorded on delivery records compared with self-reports on prenatal records and obtaining complete information about ethnicity required a thorough review of data through linkage of delivery records with prenatal records. Second, although we were unable to assess indications for RCD or induction or augmentation indications owing to missing data, these data may be important in any multifaceted approach to understanding the association between ethnicity/race, obstetrical/medical factors, and RCD.

The need for more precise and standardized documentation in delivery records presents an important policy implication. Studies using electronic medical records data at the local level in particular may have an impact on provider practices. In prior studies, obstetricians have remarked that local evidence is necessary to effectively change their practices because it validates "the transferability of the guidelines in their own practices" (Chaillet et al., 2007). Additionally, our findings suggest that hospital-level policies that create a favorable environment for VBAC may be insufficient to address increased risk for unnecessary RCD. Our study identified that Hispanic and non-Hispanic Black women experiencing birth at a site with favorable policies towards VBAC still experienced disparities in odds of RCD. The need to determine more granular reasons for these disparities provides direction for further research.

Conclusions

Our findings suggest that Hispanic and non-Hispanic Black women may face similar disparities in odds of RCD even in settings with policies favorable to VBAC. After adjusting for obstetrical/medical factors, Hispanic and non-Hispanic Black women had higher odds of RCD than non-Hispanic White women; adjustment for demographic and anthropomorphic factors did not appear to alter the association of ethnicity/race with RCD, whereas adjustment for parity and labor augmentation and induction revealed noticeable disparities. Further work is needed to fully understand the reasons for these differences, particularly the extent to which patient–provider interaction and provider bias play a role in explaining the differences. Our work is a necessary first step in recognizing the need to create effective public health policy and programs that target potentially preventable RCD to decrease the associated risk and health care costs for Hispanic and non-Hispanic women, particularly by highlighting the need to evaluate additional factors than those included in the literature thus far.

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References

ACOG Practice Bulletin No. 205. (2019). Vaginal Birth After Cesarean Delivery. *Obstetrics and Gynecology*, 133(2), e110–e127.

ACOG Practice Bulletin No. 115. (2010). Vaginal Birth After Previous Cesarean Delivery. *Obstetrics and Gynecology*, 116(2, Part 1), 450–463.

Barber, E. L., Lundsberg, L. S., Belanger, K., Pettker, C. M., Funai, E. F., & Illuzzi, J. L. (2011). Indications contributing to the increasing cesarean delivery rate. *Obstetrics and Gynecology*, 118(1), 29–38.

Blanchette, C. M., Dekoven, M., De, A. P., & Roberts, M. (2013). Probabilistic data linkage: A case study of comparative effectiveness in COPD. *Drugs in Context*, 2013, 212258.

Bodner, T. E. (2008). What improves with increased missing data imputations? *Structural Equation Modeling: A Multidisciplinary Journal*, 15(4), 651–675.

Braveman, P., Egerter, S., Edmonston, F., & Verdon, M. (1995). Racial/ethnic differences in the likelihood of cesarean delivery, California. *American Journal of Public Health*, 85(5), 625–630.

Bryant, A. S., Washington, S., Kuppermann, M., Cheng, Y. W., & Caughey, A. B. (2009). Quality and equality in obstetric care: Racial and ethnic differences in caesarean section delivery rates. *Paediatric and Perinatal Epidemiology*, 23(5), 454–462.

Chaillet, N., Dubé, E., Dugas, M., Francoeur, D., Dubé, J., Gagnon, S., … Dumont, A. (2007). Identifying barriers and facilitators towards implementing guidelines to reduce Caesarean section rates in Quebec. *Bulletin of the World Health Organization*, 85, 791–797.

Chung, J. H., Garite, T. J., Kirk, A. M., Hollard, A. L., Wing, D. A., & Lagrew, D. C. (2006). Intrinsic racial differences in the risk of cesarean delivery are not explained by differences in caregivers or hospital site of delivery. *American Journal of Obstetrics and Gynecology*, 194(5), 1323–1328.

Colomar, M., Cafferata, M. L., Aleman, A., Castellano, G., Elorrio, E. G., Althabe, F., & Engelbrecht, S. (2014). Mode of childbirth in low-risk pregnancies:

Nicaraguan physicians' viewpoints. *Maternal and Child Health Journal*, 18(10), 2382–2392.
Creanga, A. A., Berg, C. J., Ko, J. Y., Farr, S. L., Tong, V. T., Bruce, F. C., & Callaghan, W. M. (2014). Maternal mortality and morbidity in the United States: Where are we now? *Journal of Women's Health (2002)*, 23(1), 3–9.
Cunningham, F. G., Bangdiwala, S. I., Brown, S. S., Dean, T. M., Frederiksen, M., Rowland Hogue, C. J., … Zimmet, S. C. (2010). NIH consensus development conference draft statement on vaginal birth after cesarean: New insights. *NIH Consensus and State-of-the-Science Statements*, 27(3), 1–42.
Dehon, E., Weiss, N., Jones, J., Faulconer, W., Hinton, E., & Sterling, S. (2017). A systematic review of the impact of physician implicit racial bias on clinical decision making. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine*, 24(8), 895–904.
Division of Vital Statistics (DVS) U.S. Department of Health and Human Services (USDHHS) Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS). Natality public use natality file. 2015 update. Available: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/DVS/natality/UserGuide2015.pdf. Accessed: February 16, 2018.
Dweik, D., Girasek, E., Mészáros, G., Töreki, A., Keresztúri, A., & Pál, A. (2014). Non-medical determinants of cesarean section in a medically dominated maternity system. *Acta Obstetricia Et Gynecologica Scandinavica*, 93(10), 1025–1033.
Edmonds, J. K., Hawkins, S. S., & Cohen, B. B. (2016). Variation in vaginal birth after cesarean by maternal race and detailed ethnicity. *Maternal and Child Health Journal*, 20, 1114–1123.
Fawsitt, C. G., Bourke, J., Greene, R. A., Everard, C. M., Murphy, A., & Lutomski, J. E. (2013). At what price? A cost-effectiveness analysis comparing trial of labour after previous caesarean versus elective repeat caesarean delivery. *PloS One*, 8(3), e58577.
Gamble, J. A., & Creedy, D. K. (2001). Women's preference for a cesarean section: Incidence and associated factors. *Birth (Berkeley, Calif.)*, 28(2), 101–110.
Gilbert, S. A., Grobman, W. A., Landon, M. B., Varner, M. W., Wapner, R. J., Sorokin, Y., … Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. (2013). Lifetime cost-effectiveness of trial of labor after cesarean in the United States. *Value in Health: The Journal of the International Society for Pharmacoeconomics and Outcomes Research*, 16(6), 953–964.
Gonzalez-Mendez, E., Gonzales-Mendez, E., Gonzalez-Maddux, C., Hall, C., Maddux-Gonzalez, M., & Handley, M. A. (2012). An examination of cesarean and vaginal birth histories among Hispanic women entering prenatal care in two California counties with large immigrant populations. *Journal of Immigrant and Minority Health/Center for Minority Public Health*, 14(2), 209–214.
Grobman, W. A., Gilbert, S., Landon, M. B., Spong, C. Y., Leveno, K. J., Rouse, D. J., … Mercer, B. M. (2007). Outcomes of induction of labor after one prior cesarean. *Obstetrics and Gynecology*, 109(2 Pt 1), 262–269.
Guise, J.-M., Eden, K., Emeis, C., Denman, M. A., Marshall, N., Fu, R. R., … McDonagh, M. (2010). Vaginal birth after cesarean: New insights. *Evidence Report/Technology Assessment*, (191), 1–397.
Hall, W. J., Chapman, M. V., Lee, K. M., Merino, Y. M., Thomas, T. W., Payne, B. K., … Coyne-Beasley, T. (2015). Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: A systematic review. *American Journal of Public Health*, 105(12), e60–e76.
Hehir, M. P., Ananth, C. V., Siddiq, Z., Flood, K., Friedman, A. M., & D'Alton, M. E. (2018). Cesarean delivery in the United States 2005 through 2014: A population-based analysis using the Robson 10-Group Classification System. *American Journal of Obstetrics and Gynecology*, 219(1), 105.e1–105.e11.
Hildingsson, I. (2008). How much influence do women in Sweden have on caesarean section? A follow-up study of women's preferences in early pregnancy. *Midwifery*, 24(1), 46–54.
Hollard, A. L., Wing, D. A., Chung, J. H., Rumney, P. J., Saul, L., Nageotte, M. P., & Lagrew, D. (2006). Ethnic disparity in the success of vaginal birth after cesarean delivery. *Journal of Maternal-Fetal & Neonatal Medicine*, 19(8), 483–487.
Janevic, T., Loftfield, E., Savitz, D. A., Bradley, E., Illuzzi, J., & Lipkind, H. (2014). Disparities in cesarean delivery by ethnicity and nativity in New York city. *Maternal and Child Health Journal*, 18(1), 250–257.
Joffe, E., Byrne, M. J., Reeder, P., Herskovic, J. R., Johnson, C. W., McCoy, A. B., … Bernstam, E. V. (2014). A benchmark comparison of deterministic and probabilistic methods for defining manual review datasets in duplicate records reconciliation. *Journal of the American Medical Informatics Association: JAMIA*, 21(1), 97–104.
Johansson, M., Hildingsson, I., & Fenwick, J. (2014). "As long as they are safer– Birth mode does not matter" Swedish fathers' experiences of decision-making around caesarean section. *Women and Birth: Journal of the Australian College of Midwives*, 27(3), 208–213.
Kolip, P. (2008). Attitudes to cesarean delivery: The view of cesarean section mothers. *Gesundheitswesen*, 70(8–9), e22–e28.
Kudish, B., Mehta, S., Kruger, M., Russell, E., & Sokol, R. J. (2010). Delivery route preferences of urban women of low socioeconomic status. *International Journal of Gynaecology and Obstetrics*, 111(1), 28–31.
Landon, M. B., Leindecker, S., Spong, C. Y., Hauth, J. C., Bloom, S., Varner, M. W., … National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. (2005). The MFMU Cesarean Registry: Factors affecting the success of trial of labor after previous cesarean delivery. *American Journal of Obstetrics and Gynecology*, 193(3 Pt 2), 1016–1023.
Loke, A. Y., Davies, L., & Li, S. (2015). Factors influencing the decision that women make on their mode of delivery: The Health Belief Model. *BMC Health Services Research*, 15, 274.
Marshall, N. E., Fu, R., & Guise, J.-M. (2011). Impact of multiple cesarean deliveries on maternal morbidity: A systematic review. *American Journal of Obstetrics and Gynecology*, 205(3), 262.e1–262.e8.
Martin, J. A., Hamilton, B. E., Osterman, M. J. K., Driscoll, A. K., & Drake, P. (2018). Births: Final data for 2016. *National Vital Statistics Report*, 67(1), 1–54.
Mazzoni, A., Althabe, F., Gutierrez, L., Gibbons, L., Liu, N. H., Bonotti, A. M., … Belizán, J. M. (2016). Women's preferences and mode of delivery in public and private hospitals: A prospective cohort study. *BMC Pregnancy and Childbirth*, 16, 34.
Min, C. J., Ehrenthal, D. B., & Strobino, D. M. (2015). Investigating racial differences in risk factors for primary cesarean delivery. *American Journal of Obstetrics and Gynecology*, 212(6), 814.e1–814.e14.
Mishanina, E., Rogozinska, E., Thatthi, T., Uddin-Khan, R., Khan, K., & Meads, C. (2014). Use of labour induction and risk of cesarean delivery: A systematic review and meta-analysis. *Canadian Medical Association*, 186(9), 665–673.
National Center for Health Statistics (2015). User Guide to the 2013 Natality Public Use File. Available: ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/dvs/natality/userguide2013.pdf. Accessed: February 16, 2018.
Quinlan, J. D., & Murphy, N. J. (2015). Cesarean delivery: Counseling issues and complication management. *American Family Physician*, 91(3), 178–184.
Regan, M., McElroy, K. G., & Moore, K. (2013). Choice? Factors that influence women's decision making for childbirth. *Journal of Perinatal Education*, 22(3), 171–180.
StataCorp. (2015). *Stata Statistical Software: Release 14. College Station*. TX: StataCorp LP.
UCLA: Statistical Consulting Group. Multiple Imputation in STATA. Available: https://stats.idre.ucla.edu/stata/seminars/mi_in_stata_pt1_new/. Accessed: August 22, 2017.
Washington, S., Caughey, A. B., Cheng, Y. W., & Bryant, A. S. (2012). Racial and ethnic differences in indication for primary cesarean delivery at term: Experience at one U.S. Institution. *Birth (Berkeley, Calif.)*, 39(2), 128–134.
Wiklund, I., Andolf, E., Lilja, H., & Hildingsson, I. (2012). Indications for cesarean section on maternal requestâ" Guidelines for counseling and treatment. *Sexual & Reproductive Healthcare*, 3(3), 99–106.
Wu, E., Kaimal, A. J., Houston, K., Yee, L. M., Nakagawa, S., & Kuppermann, M. (2014). Strength of preference for vaginal birth as a predictor of delivery mode among women who attempt a vaginal delivery. *American Journal of Obstetrics and Gynecology*, 210(5), 440.e1–440.e6.
Zhu, Y., Matsuyama, Y., Ohashi, Y., & Setoguchi, S. (2015). When to conduct probabilistic linkage vs. deterministic linkage? A simulation study. *Journal of Biomedical Informatics*, 56, 80–86.
Zlot, A. I., Jackson, D. J., & Korenbrot, C. (2005). Association of acculturation with cesarean section among Latinas. *Maternal and Child Health Journal*, 9(1), 11–20.

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