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Racial and ethnic differences in the likelihood of vaginal birth after cesarean delivery

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INTRODUCTION

Almost 1 in 3 babies in the US are born via cesarean delivery (1). The American College of Obstetricians and Gynecologists (ACOG) has called for a reduction in the occurrence of non-medically-indicated primary (2) and repeat (3) cesarean deliveries due to the associations between cesareans, higher healthcare costs, and increased maternal morbidity (4–8). These guidelines and other public health efforts(9) to reduce cesareans will require targeting mothers with no prior cesareans, as well as those at greater risk for repeat cesareans.

Vaginal births after cesarean (VBAC) are a safe and potentially optimal choice for many women (3, 10). But overall US rates of VBAC have declined since 1996(11, 12) contributing to an increase in cesarean deliveries (13). Identifying disparities in VBAC may have important implications for health services planning and targeted efforts to reduce overall rates of cesarean deliveries. Although racial/ethnic disparities in perinatal outcomes are widely recognized (14), we know of no population-based study directed towards racial/

ethnic differences in VBAC rates. We estimated the association between maternal race/ethnicity and VBAC using a population-based dataset.

METHODS

Data came from the Pregnancy to Early Life Longitudinal (PELL) Data System, a longitudinally-linked database containing birth certificates and hospital discharge data for all births to Massachusetts residents from 1998 to 2008 (N=852,825). We limited our analysis to the 72,415 mothers who delivered their first infant by cesarean and their second infant by any method in a Massachusetts hospital during the study period. These analyses received approval from the Institutional Review Boards of the Boston University Medical Center and the Massachusetts Department of Public Health.

Our dependent variable was method of delivery (VBAC versus repeat cesarean) for five groups: non-Hispanic white; non-Hispanic black; non-Hispanic Asian; non-Hispanic other race; and Hispanic. PELL includes a wide range of maternal demographic, birth, and medical risk variables from the birth certificate and hospital discharge data (7) (see Tables 1 and 2). Maternal demographic variables from the birth certificate included age, language preference, place of birth/nativity, marital status, payer source, and prenatal care utilization. Birth factors included plurality and gestational age at delivery. PELL also provided data on the following maternal health measures recorded on either the birth certificate *or* hospital discharge records: number of prenatal hospital contacts (hospitalizations, observational stays and emergency room visits); diabetes (gestational or chronic); hypertension (pregnancy induced or chronic); pregnancy risk factors (e.g., anemia, cardiac disease); and labor/delivery complications (e.g., abruptio placenta, placenta previa).

We used summary statistics to describe the sample characteristics and chi-square tests to determine significant differences in covariates by delivery status. We then used a series of General Estimating Equations (GEE) with a log link function and a Poisson distribution to assess the association between maternal race/ethnicity and VBAC. We used GEE, rather than logistic regression, because VBAC was a relatively common event in our sample and odds ratios would likely over-estimate risk. The first model estimated the risk of VBAC among the five racial/ethnic groups with non-Hispanic white as reference. The second model added demographic variables and the third model added maternal health measures.

RESULTS

The overall VBAC rate across the study period was 17.3%, with non-Hispanic Asian mothers experiencing the highest rate (21.1%) and non-Hispanic white mothers the lowest (16.8%) across the racial/ethnic groups of interest (Table 1). Younger maternal age and older gestational ages were associated with higher rates of VBAC.

In the unadjusted analysis (Table 2, Model 1), non-Hispanic Asian mothers were more likely to have VBAC than non-Hispanic white mothers (risk ratio [RR] 1.26; 95% confidence interval [CI]: 1.18–1.34). This association was unaffected by adjustment for demographic and birth factors (Model 2) and adding maternal health measures (Model 3) slightly increased the difference (adjusted risk ratio [ARR] 1.31; 95% CI: 1.23–1.39). No other

racial/ethnic group was significantly different from non-Hispanic whites in adjusted analyses. Stratification by maternal nativity (e.g., native versus foreign-born) had no appreciable effect on these differences (data not shown).

To better understand this relationship, we repeated the analyses using 21 unique ethnic categories reported on the birth certificate and found the greatest likelihood of VBAC among Cambodian mothers (overall VBAC rate 29.0%; ARR 1.38; 95% CI: 1.11–1.72; data not shown).

We also observed a significant and monotonic association by maternal age, such that the likelihood of VBAC decreased with increasing maternal age. In the fully-adjusted model, women aged 40 years or more were 53% less likely to have VBAC than women aged less than 20 years (ARR 0.47; 95% CI: 0.41–0.54).

DISCUSSION

In this population-based study, we found evidence of differences in VBAC rates by race/ethnicity after adjusting for multiple risk factors. Non-Hispanic Asian mothers were significantly more likely to experience VBAC than non-Hispanic white mothers, with the highest rate among Cambodian women. The overall VBAC rate of 17.3% is higher than previously published reports (15), but likely reflects the use of a more refined measure of delivery method that incorporated both vital statistics and hospital discharge data and resulted in higher VBAC rates than those reported from the birth certificate alone. Our data were also drawn from an earlier time period when VBAC rates were higher.

Previous studies investigating disparities in VBAC rates have had different and sometimes conflicting findings concerning racial/ethnic differences (15–22) with limited analyses reporting findings specifically for Asian mothers. Lower overall and primary cesarean rates have been found among East Asian women than non-Hispanic white women in New York City (23), but we know of no study reporting the overall higher VBAC rates among Asian mothers as noted here. Several possible mechanisms might underlie racial/ethnic differences in delivery method (e.g., culturally-rooted patient preferences and provider assumptions thereof, facility where the delivery occurred, placental factors) (16, 24, 25); further inquiry into these pathways among Asian mothers and within the Cambodian population is warranted.

We note several limitations. Experiences in Massachusetts may not be typical of the US as a whole. We could not account for all medical and institutional factors associated with VBAC (e.g. BMI, patient/provider preferences) (13, 26). However, we included two of key health conditions associated with obesity – diabetes and hypertension – in our analyses. Indeed a key strength of this analysis is our use of a combination of vital statistics (birth certificate) and administrative (hospital discharge) data, which should provide stronger validity over previous studies that were limited to using only one data source and fewer variables.

In summary, we provide population-based evidence of racial/ethnic disparities in VBAC. Future research should identify factors contributing to the racial/ethnic differences discovered here, which could inform public health efforts to reduce cesarean rates.

References

1. Hamilton, BE.; Martin, JA.; Osterman, MJ.; Curtin, SC. Births: Preliminary data for 2013. Hyattsville, MD: National Center for Health Statistics; 2014.
2. American College of Obstetricians and Gynecologists, Society for Maternal-Fetal Medicine. Safe Prevention of the Primary Cesarean Delivery. Obstetric Care Consensus. 2014; 1:1–19.
3. American College of Obstetricians and Gynecologists. ACOG Practice bulletin no. 115: Vaginal birth after previous cesarean delivery. Obstetrics and gynecology. 2010; 116(2 Pt 1):450. [PubMed: 20664418]
4. Boutsikou T, Malamitsi-Puchner A. Caesarean section: impact on mother and child. Acta paediatrica. 2011; 100(12):1518–22. [PubMed: 21950660]
5. Shearer EL. Cesarean section: medical benefits and costs. Social science & medicine. 1993; 37(10): 1223–31. [PubMed: 8272901]
6. Soet JE, Brack GA, DiIorio C. Prevalence and predictors of women's experience of psychological trauma during childbirth. Birth. 2003; 30(1):36–46. [PubMed: 12581038]
7. Declercq E, Barger M, Cabral HJ, Evans SR, Kotelchuck M, Simon C, et al. Maternal outcomes associated with planned primary cesarean births compared with planned vaginal births. Obstetrics and gynecology. 2007; 109(3):669–77. [PubMed: 17329519]
8. Liu TC, Chen CS, Lin HC. Does elective caesarean section increase utilization of postpartum maternal medical care? Medical care. 2008; 46(4):440–3. [PubMed: 18362825]
9. U.S. Department of Health and Human Services. With Understanding and Improving Health and Objectives for Improving Health. 2. Washington, DC: U.S. Government Printing Office; 2000. Healthy People 2010.
10. Cunningham FG, Bangdiwala S, Brown SS, Dean TM, Frederiksen M, Rowland Hogue CJ, et al. National Institutes of Health Consensus Development Conference Statement: Vaginal Birth After Cesarean: New Insights. March 8–10. Obstetrics and gynecology. 2010; 115(6):1279–95. [PubMed: 20502301]
11. Martin, JA.; Hamilton, BE.; Sutton, PD., et al. National vital statistics reports. Vol. 55. Hyattsville, MD: National Center for Health Statistics; 2006. Births: Final data for 2004.
12. Martin, JA.; Hamilton, BE.; Ventura, SJ., et al. National vital statistics reports. Vol. 62. Hyattsville, MD: National Center for Health Statistics; 2013. Births: Final data for 2011.
13. Obstetrics & Gynecology; National Institutes of Health Consensus Development Conference Statement: Vaginal Birth After Cesarean: New Insights; March 8–10, 2010; 2010. p. 1279-95.
14. Singh GK, Kogan MD. Persistent socioeconomic disparities ininfant, neonatal, and postneonatal moratlity rates in the United States, 1969–2001. Pediatrics. 2007; 119:e928–e39. [PubMed: 17403832]
15. MacDorman M, Declercq E, Menacker F. Recent trends and patterns in cesarean and vaginal birth after cesarean (VBAC) deliveries in the United States. Clinics in perinatology. 2011; 38(2):179–92. [PubMed: 21645788]
16. Hollard AL, Wing DA, Chung JH, Rumney PJ, Saul L, Nageotte MP, et al. Ethnic disparity in the success of vaginal birth after cesarean delivery. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2006; 19(8): 483–7.
17. Knight HE, Gurol-Urganci I, van der Meulen JH, Mahmood TA, Richmond DH, Dougall A, et al. Vaginal birth after caesarean section: a cohort study investigating factors associated with its uptake and success. BJOG : an international journal of obstetrics and gynaecology. 2014; 121(2): 183–92. [PubMed: 24251861]
18. Grobman WA, Lai Y, Landon MB, Spong CY, Leveno KJ, Rouse DJ, et al. Development of a nomogram for prediction of vaginal birth after cesarean delivery. Obstetrics and gynecology. 2007; 109(4):806–12. [PubMed: 17400840]
19. Landon MB, Leindecker S, Spong CY, Hauth JC, Bloom S, Varner MW, et al. The MFMU Cesarean Registry: factors affecting the success of trial of labor after previous cesarean delivery. American journal of obstetrics and gynecology. 2005; 193(3 Pt 2):1016–23. [PubMed: 16157104]

20. Kington R, Reuben D, Rogowski J, Lillard L. Sociodemographic and health factors in driving patterns after 50 years of age. American journal of public health. 1994; 84(8):1327–9. [PubMed: 8059898]

21. Durnwald C, Mercer B. Vaginal birth after Cesarean delivery: predicting success, risks of failure. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2004; 15(6):388–93.

22. Regan J, Keup C, Wolfe K, et al. Vaginal birth after cesarean success in high-risk women: a population-based study. J Perinatol. 2015 Apr; 35(4):252–7. [PubMed: 25341198]

23. Janevic T, Loftfield E, Savitz DA, Bradley E, Illuzzi J, Lipkind H. Disparities in cesarean delivery by ethnicity and nativity in New York city. Maternal and child health journal. 2014; 18(1):250–7. [PubMed: 23504133]

24. Fu JC, Xirasagar S, Liu J, Probst JC. Cesarean and VBAC rates among immigrant vs. native-born women: a retrospective observational study from Taiwan Cesarean delivery and VBAC among immigrant women in Taiwan. BMC public health. 2010; 10:548. [PubMed: 20831813]

25. Guise JM, Eden K, Emeis C, Denman MA, Marshall N, Fu RR, et al. Vaginal birth after cesarean: new insights. Evidence report/technology assessment. 2010; (191):1–397. [PubMed: 20629481]

26. Durnwald CP, Ehrenberg HM, Mercer BM. The impact of maternal obesity and weight gain on vaginal birth after cesarean section success. American journal of obstetrics and gynecology. 2004; 191(3):954–7. [PubMed: 15467571]

Table 1

Percent of vaginal births after cesarean (VBAC) among Massachusetts residents 1998–2008

	N (%)	% VBAC
Total	72,415 (100.0)	17.3
Maternal Factors		
Race/ethnicity		***
Non-Hispanic white	54,739 (75.6)	16.8
Non-Hispanic black	4,516 (6.2)	17.5
Non-Hispanic Asian	4,455 (6.2)	21.1
Non-Hispanic other race	1,340 (1.9)	18.4
Hispanic	7,365 (10.2)	18.4
Age, years		***
<20	871 (1.2)	26.2
20–24	6,793 (9.4)	21.7
25–29	14,015 (19.4)	18.9
30–34	27,858 (38.5)	17.3
35–39	18,594 (25.7)	15.2
≥40	4,284 (5.9)	12.3
Language preference		***
English	64,691 (89.3)	17.3
Spanish	3,374 (4.7)	19.2
Other	4,350 (6.0)	15.2
Place of birth		**
US	53,659 (74.1)	17.0
Foreign born	18,756 (25.9)	18.0
Marital status		*
Married	59,573 (82.3)	17.1
Not married	12,719 (17.6)	18.0
Previously married	123 (0.2)	17.1
Payer source		
Private insurance	52,548 (72.6)	17.3
Public insurance	18,531 (25.6)	17.2
Other	1,336 (1.8)	18.3
Prenatal care		***
Intermediate or less	9,347 (12.9)	19.4
Adequate	32,574 (45.0)	18.7
Adequate plus	30,494 (42.1)	15.1
Plurality		***
1	70,318 (97.1)	17.6
≥2	2,097 (2.9)	6.9
Gestational age at delivery, weeks		***
<37	6,635 (9.2)	15.5

	N (%)	% VBAC
37	6,325 (8.7)	14.6
38	17,220 (23.8)	12.3
39	24,398 (33.7)	13.9
40	10,938 (15.1)	28.1
≥41	6,899 (9.5)	28.4
Prenatal hospitalizations		
None	69,838 (96.4)	16.8
≥1	2,577 (3.6)	17.3
Chronic or gestational diabetes		***
Yes	4,296 (5.9)	10.4
No	68,119 (94.1)	17.7
Chronic or gestational hypertension		***
Yes	2,971 (4.1)	12.2
No	69,444 (95.9)	17.5
Any pregnancy risk factor[a]		***
Yes	19,050 (26.3)	15.6
No	53,365 (73.7)	22.1
Any labor/delivery complication[b]		***
Yes	38,703 (53.5)	19.9
No	33,712 (46.6)	14.2

* p<.05,

** p<.01,

*** p<.001

[a] Coded “yes” if any of these conditions were noted on either the birth certificate or hospital discharge record: anemia, cardiac disease, acute or chronic lung disease, hydramnios or oligohydramnios, hemoglobinopathy, eclampsia, incompetent cervix, previous infant more than 4,000 g, previous preterm or small for gestational age infant, renal disease, Rh sensitization, uterine bleeding.

[b] Coded “yes” if any of these conditions were noted on either the birth certificate or hospital discharge record: malpresentation, antepartum bleeding or placental abruption, macrosomia, unengaged fetal head, maternal soft tissue disorder, febrile, meconium moderate or heavy, premature rupture of membranes, seizures during labor, precipitous labor, prolonged labor, dysfunctional labor, cephalopelvic disproportion, cord prolapse, fetal distress obstructed labor, abnormality of forces of labor, long labor, umbilical cord complications.

Table 2

Multivariable models estimating the risk of vaginal birth after cesarean (VBAC) versus repeat cesarean delivery among Massachusetts mothers with prior cesareans (N=72,415)

	Model 1 URR (95% CI)	Model 2 ARR (95% CI)	Model 3 ARR (95% CI)
Maternal race/ethnicity			
Non-Hispanic white	1.00 (REF)	1.00 (REF)	1.00 (REF)
Non-Hispanic black	1.05 (0.97–1.11)	1.03 (0.96–1.10)	1.06 (0.99–1.14)
Non-Hispanic Asian	1.26 (1.18–1.34)	1.26 (1.17–1.35)	1.31 (1.23–1.39)
Non-Hispanic other race	1.09 (0.97–1.23)	1.08 (0.96–1.21)	1.07 (0.95–1.20)
Hispanic	1.10 (1.04–1.15)	1.01 (0.96–1.08)	1.04 (0.97–1.10)
Maternal age, years			
<20		1.00 (REF)	1.00 (REF)
20–24		0.80 (0.71–0.90)	0.80 (0.71–0.91)
25–29		0.66 (0.58–0.74)	0.67 (0.59–0.76)
30–34		0.59 (0.53–0.67)	0.61 (0.54–0.69)
35–39		0.54 (0.47–0.61)	0.55 (0.49–0.63)
≥40		0.45 (0.39–0.52)	0.47 (0.41–0.54)

URR – unadjusted risk ratio; RR – risk ratio; CI – confidence interval.

Model 2 adjusts for language preference, place of birth/nativity, marital status, payer source, plurality, and gestational age at delivery. Model 3 additionally adjusts for prenatal care utilization, number of prenatal hospital contacts, diabetes (gestational or chronic), hypertension (gestational or chronic), pregnancy risk factors, and labor and delivery complications.