

OBSTETRIC COMPLICATIONS DURING LABOR AND DELIVERY: ASSESSING ETHNIC DIFFERENCES IN CALIFORNIA

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Received 5 July 2005; revised 15 March 2006; accepted 24 March 2006

Purpose. We sought to compare obstetric complications during labor and delivery among white non-Latina (white), black, Asian, and Latina women who delivered in California hospitals. Many intrapartum complications are preventable.

Methods. We used linked 1996–1998 state hospital discharge and birth certificate data to examine obstetric complications *International Classification of Diseases, 9th Revision, Clinical Modification* codes considered relevant for population surveillance. We compared the observed and adjusted odds of experiencing a complication among women of color, using white women as the reference group.

Findings. One out of 5 deliveries had ≥ 1 complication. White (21.3%) and Asian women (21.1%) had similar prevalence rates, whereas black women (24.2%) had higher and Latina women (19.6%) had lower rates. After adjusting for covariates, the odds of experiencing ≥ 1 complication was lower for Asians (odds ratio [OR] = 0.95; 95% confidence interval [CI] = 0.93, 0.96) and Latinas (OR = 0.97; 95% CI = 0.96, 0.98) than whites; the odds for black women remained elevated (OR = 1.25; 95% CI = 1.23, 1.27). Asian women stood a higher risk of deliveries with major lacerations, postpartum hemorrhage, and major puerperal infections. Rates for the latter complication were higher among all women of color.

Conclusions. The burden of morbidity is high for all women, regardless of ethnicity. Yet, compared to white women, blacks suffer more aggregate morbidities, and Asians stand a high risk of all 3 intrapartum care-sensitive conditions. Furthermore, all women of color experience disproportionate rates of puerperal infections. Collective action is needed to reduce these disparities and improve maternal health.

Introduction

In the United States, between 7 and 8 women per 100,000 live births die in the delivery process, an indication that childbirth is safe (Chang et al., 2003).

Supported by the Maternal and Child Health Bureau and the Center for Health Research at the University of California, Berkeley

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Unfortunately, the record regarding maternal morbidity has been far less successful. According to a recent national study, ≥ 1 out of 4 women experience an obstetric complication during labor and delivery such as preeclampsia, eclampsia, hemorrhage, infection, or a major anal (sphincter/mucosal) laceration, suggesting that the burden of maternal ill health is both high and costly (Danel, Berg, Johnson, & Atrash, 2003).

Black women tend to have a high prevalence of maternal morbidity during pregnancy partly owing to their lower socioeconomic status (SES), accumulated

coded as Latinas regardless of race. Otherwise, a woman was coded as white, black, or Asian if she was reported as such on her baby's birth certificate. The *Asian* designation excludes Indian and Filipino women.

We postulated that maternal morbidities during labor and delivery for women of a specific ethnic group are influenced by a woman's sociodemographic profile, the timing of prenatal care (PNC) initiation and the quality of health care received. Sociodemographic characteristics included mother's age at delivery, parity, and 2 measures of SES: PNC payment source and maternal education (ranging from 0–17 years). If a woman paid out of pocket, or from public funds (Medicare, Medi-Cal, including the California Comprehensive Perinatal Services Program, Title V Maternal and Child Health funds, other government programs, and other nongovernmental programs), her SES was classified as low. If she paid with private insurance (prepaid HMO plans, Blue Cross, Blue Shield) her SES was classified as moderate to high. We measured the timing of initiation of PNC (whether in months 1–2, 3–4, 5–6, or 7–9 including no care) and the quality of obstetric care received during pregnancy.

Quality of obstetric care

Scant tools for measuring population-based quality of obstetric care are available (Bennett & Adams, 2002). Case mix adjusted neonatal mortality depends in part on the quality of both obstetric care and neonatal care and was used as a proxy for quality of obstetric care (Horbar & Gould, 2001; Phibbs, Bronstein, Phibbs, 1996; Rowley, Iyasu, Mac Dorman, & Atrash, 1995). The latter allows for screening, diagnosis, and treatment of maternal and fetal complications. Neonatal mortality data were obtained from California's Perinatal Quality Improvement Project for 1994–1997 and 1999 (Gould, Marks, & Chavez, 2002). To estimate quality of care, each hospital's expected neonatal death rate was compared to its observed neonatal death rate. A hospital's expected death rate was calculated based on its case mix on major risk factors, (birthweight, gender, race/ethnicity, and plurality) using the mortality experience of all births in California with the same characteristics during this time period (Gould, 1999). If the observed neonatal deaths were lower than the expected given the hospital's case mix, this was coded as "significantly better quality of care" at $p < .05$, and as "marginally better quality" for $p < .1$. Higher than expected levels of neonatal mortality were coded similarly and indicated worse quality of care (Gould, 1999).

Data analysis

We used SAS version 8.2 to compare sociodemographic and health care access characteristics for

white, black, Asian, and Latina women. We calculated the frequency of each morbidity per 1,000 deliveries. We compared all ethnicities to white women and calculated the odds ratios (ORs) and 95% confidence intervals (CIs), and excess morbidities for women who had had one or more morbidities during labor and delivery. To control for the sociodemographic profile (maternal age, parity, education, and funding source for PNC), month of initiation of PNC, and quality of obstetric care, we performed a logistic regression for ≥ 1 maternal morbidities. These models did not control for all relevant factors, only those for which data were available.

In addition, we performed the same analyses on the 3 conditions that evidence suggests are good indicators of quality of intrapartum care, namely, postpartum hemorrhage, major puerperal infections, and major lacerations. For the major lacerations, the model included birthweight in addition to the other covariates and we ran it for all deliveries and those excluding cesarean sections.

Results

Sociodemographic characteristics

Of the 1,426,854 deliveries in California between 1996 and 1998, 51% were to Latinas, 35% to whites, 7% to blacks, and 6.9% to Asians. The social risk profiles of women giving birth varied markedly by ethnicity.

Blacks and Latinas were younger on average at delivery, had a higher proportion of adolescent births, and higher parities than Asian and white women (Table 1). Latinas, on average, had 3.7 years less education than whites (mean = 13.1) and blacks had 1.2 years less than whites. Yet, although 0.5% of black women had no more than a completed elementary education, 20% of Latina women had this educational level. Similarly, 4.7% of blacks had at least some graduate school, compared to 2.1% of Latinas. Asian women had a bimodal distribution; 8.1% had no more than an elementary education and 15.4% had at least some graduate education. This proportion of women with graduate education exceeded that of white women at 14.9%. Income differentials based on payment source for delivery as a proxy measure for income reflected similar patterns by ethnicity to those observed with education.

Twice as many Latinas (4.7%) and blacks (4.4%) postponed PNC until the third trimester or went without care compared to white (2.3%) and Asian women (2.2%). White and Asian women were more likely to start PNC in the first 2 months of pregnancy. Despite having delayed access to PNC, a larger proportion of black women (17%) than white women (13.6%) delivered in hospitals that had a higher than

Table 3. One or More Maternal Morbidity During Labor and Delivery

	White	Asian	Latina	Black
Population	503,418	98,219	723,821	101,396
No. of cases	107,126	20,963	141,656	24,289
Cases per 1,000 deliveries	213	211	196	242
Observed OR (95% CI)	Ref	1.00 (0.99–1.02)	0.92 (0.91–0.93)	1.18 (1.16–1.20)
Adjusted OR* (95% CI)	Ref	0.95 (0.93–0.96)	0.97 (0.96–0.98)	1.25 (1.23–1.27)

Abbreviations: 95% CI, 95% confidence interval; OR, odds ratio.

*Log odds obstcmplany = const+black+asian+Latina+age+par1+seslow+education+kotelpnc+lowqual+hiqual

After adjusting for the social characteristics (age, parity, income, education), month of PNC initiation, and hospital quality of care at delivery, the odds of experiencing ≥ 1 obstetric complication was lower for Asian (OR = 0.95; 95% CI = 0.93–0.96) and Latina women (OR = 0.97; 95% CI = 0.96–0.98) compared to white women, whereas the odds for black women remained elevated (OR = 1.25; 95% CI = 1.23–1.27) (Table 3).

Intrapartum care-sensitive conditions

The aggregated results presented obscure vulnerabilities in specific morbidities. In particular, we focus on those conditions that evidence supports are sensitive to the quality of intrapartum obstetric care, namely, postpartum hemorrhage, third- and fourth-degree anal lacerations, and major puerperal infections (Agency for Healthcare Research and Quality, 2003; Casey & Cox, 1997; Combs et al., 1991; Lu et al., 2005).

For Asian women, vulnerabilities in comparison to white women were shown in all 3 conditions (Table 4). Asian women were more likely to develop postpartum hemorrhage (OR = 1.12; 95% CI = 1.08–1.17), a

major puerperal infection (OR = 1.37; 95% CI = 1.27–1.47), and a major laceration (OR = 1.32; 95% CI = 1.28–1.35). These vulnerabilities remained even after adjusting for covariates although the magnitude of the disparities declined for postpartum hemorrhage and puerperal infections.

Latina women were at greater odds of major puerperal infections (OR = 1.43; 95% CI = 1.38–1.49), at lower odds of major lacerations (OR = 0.70; 95% CI = 0.69–0.71), and were not significantly different from white women in terms of their odds of experiencing a postpartum hemorrhage (1.00; 95% CI = 0.97–1.02). These differences remained even after adjusting for covariates; however, the size of the disparities decreased considerably.

Results for black women followed the same pattern as those for Latina women. Black women were at greater odds of major puerperal infections (OR = 2.70; 95% CI = 2.55–2.85), at lower odds of major lacerations (OR = 0.48; 95% CI = 0.46–0.50), and were not significantly different from white women in terms their odds of experiencing a postpartum hemorrhage (1.03; 95% CI = 0.98–1.07). These differences remained

Table 4. Intrapartum Care-Sensitive Conditions

	White	Asian	Latina	Black
Postpartum hemorrhage				
No. of cases	12,136	2,652	17,400	2,505
Cases per 1,000 deliveries	24	27	24	25
Observed OR (95% CI)	Ref	1.12 (1.08–1.17)	1.00 (0.97–1.02)	1.03 (0.98–1.07)
Adjusted OR* (95% CI)	Ref	1.06 (1.02–1.11)	1.01 (0.98–1.04)	1.04 (0.99–1.08)
Major puerperal infections				
No. of cases	3,500	931	7191	1,878
Cases per 1,000 deliveries	7	9	10	19
Observed OR (95% CI)	Ref	1.37 (1.27–1.47)	1.43 (1.38–1.49)	2.70 (2.55–2.85)
Adjusted OR* (95% CI)	Ref	1.16 (1.08–1.25)	1.19 (1.13–1.24)	2.35 (2.21–2.49)
Major lacerations (3rd- and 4th-degree)				
No. of cases	24,534	6,206	25,121	2,438
Cases per 1,000 deliveries	49	63	35	24
Observed OR (95% CI)	Ref	1.32 (1.28–1.35)	0.70 (0.69–0.71)	0.48 (0.46–0.50)
Adjusted OR* (95% CI)	Ref	1.36 (1.32–1.40)	0.92 (0.91–0.95)	0.70 (0.67–0.73)
Adjusted OR vag deliv [‡] (95% CI)	Ref	1.22 (1.19–1.26)	0.91 (0.89–0.93)	0.63 (0.60–0.66)

Abbreviations: CI, confidence interval; OR, odds ratio; Ref, reference group; vag deliv, vaginal delivery.

*Log odds obstcmplany = const+black+asian+latina+age+par1+seslow+education+kotelpnc+lowqual+hiqual

†Log odds obstcmplany = const+black+asian+latina+age+par1+seslow+education+kotelpnc+lowqual+hiqual+gestational age

‡Log odds obstcmplany = const+black+asian+latina+age+par1+seslow+education+kotelpnc+lowqual+hiqual+birthweight

§Log odds obstcmplany = const+black+asian+latina+age+par1+seslow+education+kotelpnc+lowqual+hiqual+birthweight (vaginal deliveries only)

aggregate morbidities, particularly infections and pre-eclampsia/eclampsia, Asian women stand a high risk of poor outcomes with respect to intrapartum care-sensitive conditions. In addition, all women of color stand an elevated risk of exposure to puerperal infections compared to white women. Health disparities can mean decreased quality of life, loss of economic opportunities, and increased feelings of discrimination. We need to take collective action to reduce these disparities and improve maternal health.

Recommendations

Specific recommendations for research, advocacy, and practice that stem from this study that we wish to highlight are as follows:

1. That action be taken to raise awareness among providers, policymakers, and women themselves about the level of aggregate morbidity prevailing during labor and delivery, despite vast technical improvements in obstetric care.
2. That further research be undertaken to inquire about women's perceptions of these morbidities and the impact of these morbidities on the quality of women's lives and their satisfaction with the obstetric care received. Future PRAMS surveys could include questions that address these substantive issues.
3. That immediate attention be given to intrapartum care-sensitive conditions to assess ways of improving obstetric care during labor and delivery, particularly for minority women; that hospitals review cases of intrapartum complications with the goal of identifying care practices that might serve as starting points for continuous quality improvement; and that these conditions be included as quality markers for the Joint Commission on Accreditation of Healthcare Organizations.
4. That, through further clinical, laboratory, and epidemiologic research, providers assess and identify care practices that could be made available to women to reduce infections; in particular, reviews of studies done to confirm the efficacy of establishing group B streptococcal (GBS) carrier status before labor and prophylactic antibiotic treatment when positive should be conducted and disseminated so that best practices can be established and protocols adopted at all hospitals. For non-GBS carriers, a recommendation from the American College of Obstetricians and Gynecologists regarding the appropriate timing for antibiotic prophylaxis after rupture of membranes might provide clearer guidance and minimize risk. The efficacy of these measures for different minority groups should also be assessed.
5. That, with respect to prevention of major lacerations, researchers, physicians, and other providers should consider risk factors in the perineum that make tearing more likely.
6. That we continue to strengthen surveillance of maternal health to monitor changes across populations and care practices nationally, across states, and in diverse localities.

Acknowledgments

This paper was presented at Expecting Something Better: A Conference to Optimize Maternal Health Care sponsored by the Jacobs Institute for Women's Health, May 18–19, 2005. We thank Kate Cosby for her clerical assistance.

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Appendix. Continued

Maternal Morbidity	ICD-9 Codes
One or more maternal morbidities	Any of the obstetric complications listed above (excluding gestational diabetes and transient hypertension of pregnancy) that occurred during delivery

Abbreviations: CVA, cerebrovascular accident; GU, genitourinary; ICD, International Classification of Diseases; UTI, urinary tract infection.

Author Descriptions

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