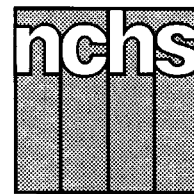


Monthly Vital Statistics Report



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Rates of Cesarean Birth and Vaginal Birth After Previous Cesarean, 1991–95

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Abstract

Objectives—This report presents trends in cesarean rates (total and primary) and vaginal birth after previous cesarean (VBAC) rates from birth certificate data for 1991–95. Trends in rates by age of mother for non-Hispanic white, non-Hispanic black, and Hispanic subgroups are presented. For each subgroup, cesarean and VBAC rates for 1995 are presented by selected demographic and lifestyle characteristics of the mother and by medical risk factors and complications of labor and/or delivery.

Methods—Cesarean and VBAC rates were computed based on the information from birth certificates in which the “method of delivery” item was completed. For 1991–95 all States and the District of Columbia reported information on method of delivery and the item was completed on more than 96 percent of birth certificates.

Results—The U.S. cesarean rate dropped 8 percent, from 22.6 in 1991 to 20.8 in 1995. Likewise, the primary cesarean rate dropped 8 percent during this period, to 14.7 per 100 births in 1995 for women with no previous cesarean. During this same period, the VBAC rate increased by 29 percent, from 21.3 in 1991 to 27.5 in 1995. Non-Hispanic white women experienced the greatest decline in the cesarean rate over the period. The cesarean rate for Hispanic women also declined between 1991 and 1995, while the rate for non-Hispanic black women remained relatively steady. Similarly, non-Hispanic white women had the largest increase in the VBAC rate followed by Hispanic women and then non-Hispanic black women. Cesarean rates increased with maternal age for all groups, while VBAC rates declined with increasing maternal age. There was considerable variation in cesarean and VBAC rates by demographic and lifestyle characteristics of the mother as well as by medical risk factors and complications of labor and/or delivery.

Keywords: cesarean rates • VBAC rates • birth certificate

Introduction

The U.S. cesarean rate has been the focus of considerable attention over the past two decades because of its dramatic increase during the 1970's and early 1980's (1) and its high level compared with many other industrialized nations (2). During the peak years, nearly one of four births in the United States were by cesarean (1). However, the increase in the cesarean rate apparently did not contribute to the decline in infant mortality during the last 20 years (3) and maternal morbidity and mortality are higher in cesarean deliveries than in routine vaginal deliveries (4). In response to growing concern, the Department of Health and Human Services established lowering the cesarean rate to no more than 15 per 100 births as one of the Healthy People Year 2000 Objectives (5). More specific components of this objective are to lower the primary cesarean rate (number of primary cesareans per 100 births to women with no previous cesarean) to 12 cesareans or fewer and to

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increase the rate of vaginal birth after previous cesarean (VBAC—number vaginal births per 100 births to women with a previous cesarean) to 35 births or more.

The National Center for Health Statistics (NCHS) has collected information on cesarean deliveries from the National Hospital Discharge Survey (NHDS) since 1965. NHDS is a nationally representative sample of patient discharge records from non-Federal, short-stay hospitals. In 1989 cesarean data also became available from certificates of live birth when the standard certificate of live birth was revised to include an item on “method of delivery.” By 1991 all States and the District of Columbia were reporting information on method of delivery. Thus, there are now two national sources of data on cesarean and VBAC deliveries. Data from the birth certificate provide considerably more detail on the demographic and lifestyle characteristics of the mother than NHDS data provide. However, NHDS provides cesarean data by hospital characteristics and source of payment for the delivery, which are currently not included on the birth certificate.

This report presents findings on cesarean deliveries from birth certificate data. Trends in the total and primary cesarean and VBAC rates by age, race, and Hispanic origin are presented for 1991–95. Differences in cesarean and VBAC rates by maternal demographic and lifestyle characteristics are presented for 1995. Finally, total cesarean rates for selected maternal medical risk factors of pregnancy and complications of labor and/or delivery are presented for 1995.

Methods

NCHS collects data from 100 percent of birth certificates registered in all States and the District of Columbia. More than 99 percent of births occurring in this country are registered (6). All States and the District of Columbia reported the method of delivery on their birth certificates during 1991–95. Cesarean and VBAC rates were computed for birth records in which the method of delivery item was reported. The percent of birth records in which method of delivery was not stated was about 3 percent in 1991 but dropped to less than 1 percent by 1995.

All tabulations are by race and Hispanic origin of mother as reported on the birth certificate. Race and ethnicity differentials in cesarean and VBAC rates may reflect differences in income, education, access to health care, and health care coverage. Additional information on the race, Hispanic origin items, and on the computation of the cesarean and VBAC rates are presented in the [Technical notes](#).

Results

Cesarean rates, 1991–95

The total and primary cesarean rates steadily declined during the 1991 to 1995 period ([table 1](#) and [figure 1](#)). The total rate of cesarean delivery (number of cesarean births per 100 births) in 1995 was 20.8, an 8-percent decline from the 1991 rate of 22.6. Likewise, the rate of primary cesarean delivery was about 8 percent lower in 1995 (14.7 primary cesareans per 100 births to women with no previous cesarean) than in 1991 (15.9). In total there were 806,722 births in 1995 that were by cesarean delivery and 510,104 of these were primary cesareans ([table A](#)).

For all years total cesarean rates were lowest for the youngest mothers and consistently increased with age ([table 1](#)). In 1995 the cesarean rate for women 40–49 years of age (31.6 percent) was more than twice that of women under 20

years of age (14.7 percent). The disparity in cesarean rates by age became more pronounced over the 1991 to 1995 period due to greater declines in cesarean rates for younger mothers than in rates for older mothers—cesarean rates for women under 25 years of age declined between 10 and 11 percent from 1991 to 1995, while the comparable decline rate for women 40–49 years was only about 2 percent.

Primary cesarean rates also consistently increase with age, but the disparity between the youngest and oldest mothers is not as noticeable as for total cesarean rates. Similar to the findings for the total cesarean rate, differences by age in primary cesarean rates increased over this period due to the greater declines for younger than for older women.

For non-Hispanic white women, the total and primary cesarean rates were 9 to 10 percent lower in 1995 than in 1991, while the declines for non-Hispanic black women were much smaller, less than 1 percent. As a result of these trends, the 1995 total cesarean rate was 4 percent higher for non-Hispanic black than for non-Hispanic white women, which reversed the pattern evident in 1991, when the rate for non-Hispanic white women was 6 percent higher. The decline in the total and primary cesarean rates for Hispanic women was intermediate between non-Hispanic white and non-Hispanic black women, between 6 and

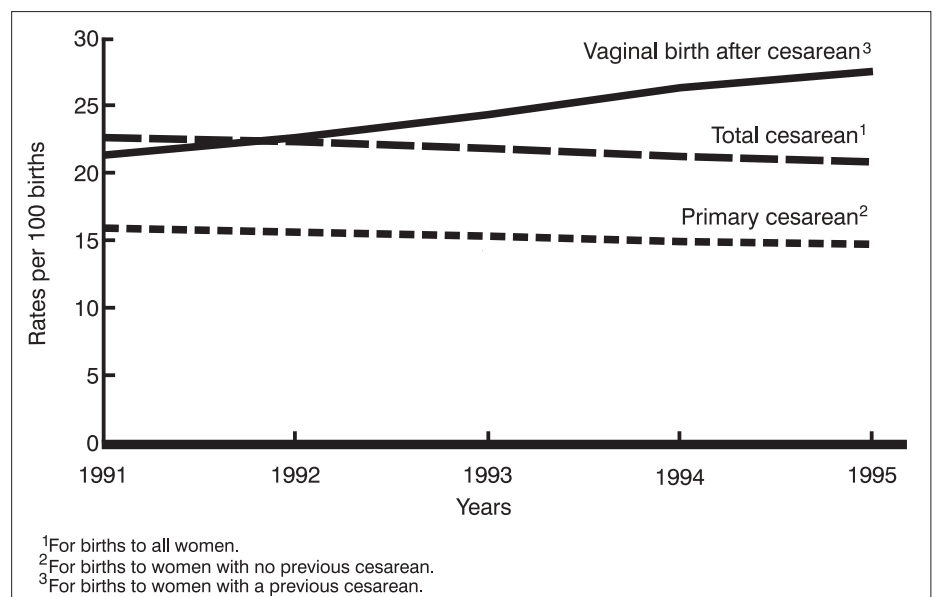


Figure 1. Total and primary cesarean rates and vaginal birth after cesarean rates: 1989–95

Table A. Number of births by cesarean and by vaginal birth after cesarean by age, race, and Hispanic origin of the mother, 1995

Age, race, and Hispanic origin	All races ¹	Non-Hispanic White	Non-Hispanic Black	Hispanic ²
Total cesarean				
Total	806,722	496,103	127,171	136,640
Under 20	74,534	33,533	21,560	17,014
20–24	170,818	94,573	34,043	35,423
25–29	220,911	140,495	30,292	37,721
30–34	214,078	144,501	25,675	29,340
35–39	104,502	69,011	12,958	14,001
40–49	21,879	13,990	2,643	3,141
Primary cesarean³				
Total	510,104	313,933	82,395	82,662
Under 20	66,340	30,540	18,736	14,866
20–24	119,217	67,820	22,425	23,954
25–29	137,441	89,827	17,870	20,900
30–34	118,541	80,688	14,601	14,323
35–39	55,683	36,794	7,137	6,895
40–49	12,882	8,264	1,626	1,724
Vaginal birth after previous cesarean⁴				
Total	112,439	72,124	15,721	17,396
Under 20	3,913	1,382	1,457	922
20–24	21,739	11,208	4,908	4,625
25–29	32,932	20,894	4,308	5,806
30–34	35,858	25,668	3,380	4,196
35–39	15,605	11,299	1,468	1,561
40–49	2,392	1,673	200	286

¹Includes all births regardless of race and Hispanic origin.

²Persons of Hispanic origin may be of any race.

³Number of first cesarean births to women with no previous cesarean delivery.

⁴Number of vaginal births after a previous cesarean delivery.

7 percent (table 1). Although the cesarean rates for Hispanic women declined less between 1991 and 1995 than the rate for non-Hispanic white women, the 1995 cesarean rates for Hispanic women (20.2 total and 13.7 primary) were the lowest of all groups.

For non-Hispanic white women, cesarean rates for all age groups were lower in 1995 than in 1991 with the youngest age groups experiencing the greatest declines. For non-Hispanic black women, cesarean rates declined between 1991 and 1995 for age groups under 30 years but fluctuated and increased for women 35 years of age and older. Cesarean rates for Hispanic women declined between 1991 and 1995 for all age groups under 35 years. As a result of these trends, in 1995 cesarean rates for all age groups were higher for non-Hispanic black than for non-Hispanic white women or Hispanic women (figure 2), partially reversing the 1991 pattern. Although the overall rate was lower for Hispanic women than for non-Hispanic white women, cesarean rates for Hispanic women 25 years of age and over were higher than for their non-Hispanic white counterparts.

Vaginal births after cesarean rates, 1991–95

The rate of vaginal birth after cesarean increased dramatically between 1991 and 1995, by 29 percent, from 21.3 to 27.5 vaginal births per 100 births to women with a previous cesarean (table 2). In total there were 112,439

VBAC births in 1995 (table A). VBAC rates generally decline with advancing age. In 1995 the rate was 32.3 for teenagers, declining to 21.0 for mothers in their forties. However, the disparity by age has narrowed slightly since 1991 as VBAC rates rose 33 percent for mothers 40–49 years of age, the most for any age group.

The rise in the VBAC rate during the 1991 to 1995 period was higher for non-Hispanic white than for non-Hispanic black or Hispanic women. The VBAC rate for non-Hispanic white women was 32 percent higher in 1995 (28.4) than in 1991 (21.5), reflecting increases in rates from 30 to 40 percent for all age groups. The VBAC rate for non-Hispanic black women was 23 percent higher in 1995 (26.0) than in 1991 (21.1) with increases between 23 and 35 percent for all age groups. For Hispanic women, the VBAC rate increased 28 percent between 1991 and 1995—from 19.0 to 24.4. Increases in VBAC rates by age for Hispanic women ranged between 20 and 49 percent. The 1995 VBAC rate for non-Hispanic white women was higher than for Hispanic women overall and for every age group. Compared with non-Hispanic black women, the 1995 VBAC rate for non-Hispanic white women was higher overall and for all age groups of 25 years or over, and lower for women under 25 years.

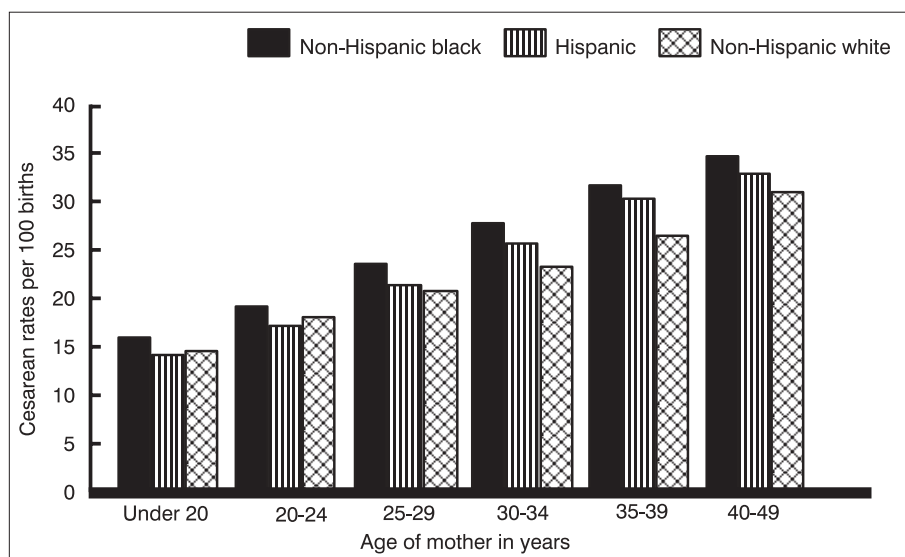


Figure 2. Cesarean rates by age, race, and Hispanic origin: 1995

Cesarean rates by maternal characteristics

Table 3 shows 1995 cesarean (total and primary) and VBAC rates for non-Hispanic white and black women and Hispanic women for selected maternal demographic and lifestyle characteristics. For all groups of women, total cesarean rates were highest in the South (between 22.7 and 22.9). For non-Hispanic white women, cesarean rates were lowest in the West (19.1), while rates were lowest in the Midwest for non-Hispanic black women (19.0) and Hispanic women (17.9). The pattern for primary cesarean rates by region was fairly similar to that for all cesareans—the highest rate for all groups was in the South, while the lowest rates were in the West and Midwest.

The total cesarean rate for married women was 14 percent higher than the rate for unmarried women, 21.7 compared with 19.0, and this pattern was generally true for all groups. However, the disparity in rates by marital status was much greater for non-Hispanic black women than for either non-Hispanic white or Hispanic women.

At time of delivery, unmarried women are generally younger than their married counterparts, a factor in their lower cesarean rates. When maternal age is taken into account, cesarean rates for unmarried women are similar to or slightly higher than those for married women. For example, for women 25–29 years of age, the cesarean rate for unmarried women was 21.9 compared with 20.7 for married women (tabular data not shown).

The primary cesarean rate for married women was only 2 percent higher than the rate for unmarried women, 14.8 compared with 14.5. There was very little difference in these rates for non-Hispanic white women and Hispanic women; however, the rate for married non-Hispanic black women was 20 percent higher than the rate for their unmarried counterparts.

The cesarean rate for women giving birth to their first child (22.2) was 9 percent higher than the rate for women giving birth to their second child (20.4) and 15 percent higher than the rate for women giving birth to a third- or higher-order child (19.3). This relationship held

for non-Hispanic white and black mothers. Cesarean rates for Hispanic mothers also declined with increasing birth order, but the difference was narrower than the difference for non-Hispanic black and white women. Primary cesarean rates for second- and third- or higher-order births (between 8.1 and 8.4) were about one-third the rate for first births (22.1), and this relationship was evident for all groups. Thus, if a mother had a vaginal delivery for her first child, it is far less likely that subsequent deliveries will be by cesarean.

Total cesarean rates were lowest for mothers who gained 16 to 35 pounds during pregnancy (between 19.1 and 19.4), intermediate for mothers who gained less than 16 pounds (21.8), and highest for mothers who gained 36 pounds or more (23.7). Mothers who gain at least 36 pounds are more likely to be older, which partly accounts for their higher cesarean rates. They are also more likely to have babies weighing more than 4,000 grams (8 pounds 14 ounces), which places them at an increased risk for cesarean delivery. Mothers who gained less than 16 pounds are more likely to have a preterm birth or a low-birthweight infant, which is associated with higher than average cesarean rates. For all groups primary cesarean rates were much higher for women who gained 36 pounds or more during pregnancy (between 18.1 and 19.3) than for women who gained less weight. Primary cesarean rates were generally lowest for women who gained between 16 and 25 pounds (11.9 to 13.8).

Non-Hispanic white women who gain less than 16 pounds have a higher cesarean rate, total and primary, than their non-Hispanic black and Hispanic counterparts. At higher weight gains, the cesarean rate was highest for non-Hispanic black women.

Cesarean rates generally increased with additional education, from 17.2 for mothers with a grade school education to 22.4 for mothers with some college and declined slightly to 22.1 for mothers with at least a college degree. This pattern was evident for all groups although the disparity in rates by education was much greater for non-Hispanic black women than for the other groups, with rates rising from 17.3 to 17.4 for mothers with

less than 12 years of schooling to 29.5 for mothers with a college degree. In general, women with more education are older, one factor that contributes to the higher cesarean rates for these women. When maternal age is considered, differences in cesarean rates by educational attainment diminish. However, for every age group, mothers with only a grade school education have a lower risk of cesarean delivery than mothers with more education. For example, for mothers in the modal age group of 25–29 years, cesarean rates ranged from 17.5 for mothers with a grade school education to 19.5 to 22.1 for mothers with more education (tabular data not shown).

Cesarean rates are highest for all groups of mothers who obtain adequate prenatal care and lowest for mothers who receive inadequate care (adequacy of care as measured by the Kessner index). The difference in cesarean rates by adequacy of care was greatest for non-Hispanic black mothers with rates ranging from 24.0 for mothers with adequate care to 15.7 for mothers with inadequate care.

As would be expected, the patterns in VBAC rates by maternal characteristics are generally opposite the pattern for the overall and primary cesarean rates—groups with higher cesarean rates tended to have lower VBAC rates. For example, VBAC rates are generally lowest in the South. One exception to this pattern are VBAC rates by educational attainment of the mother. For non-Hispanic white women, mothers who have at least a college education have slightly higher than average cesarean rates, but also have the highest VBAC rates of any education group (31.6).

Cesarean rates by medical risk factors and complications of labor and/or delivery

Table 4 presents cesarean rates by selected medical risk factors and complications of labor and/or delivery. Cesarean rates were higher than the national average for all of the medical risk factors. More than 30 percent of mothers with diabetes, genital herpes, hydramnios, chronic or pregnancy-associated hypertension, eclampsia, incompetent cervix,

or uterine bleeding had births by cesarean. Cesarean rates were generally similar among the racial and ethnic groups, especially for mothers with acute and chronic lung disease, genital herpes, chronic hypertension, eclampsia, and incompetent cervix. For the remaining medical risk factors, cesarean rates were generally highest for either non-Hispanic white or black mothers and lowest for Hispanic mothers.

There was wide variation in cesarean rates by complications of labor and/or delivery. For mothers with precipitous labor, cesarean rates for all groups were very low, ranging between 1.8 and 3.2 percent, while cesarean rates for mothers with cephalopelvic disproportion were 97 percent for all groups. For all groups more than one-half of mothers with breech/malpresentation, placenta previa, dysfunctional labor, cord prolapse, abruptio placenta, and fetal distress had births delivered by cesarean. Cesarean rates for most complications were highest for non-Hispanic black mothers.

Discussion

The cesarean rates presented in this report show that progress is being made toward lowering cesarean rates and increasing VBAC rates. However, the data show that most of the decline in cesarean rates since 1991 has been for non-Hispanic white mothers and to a lesser extent, Hispanic mothers. Rates for non-Hispanic black mothers declined only slightly from 1991 to 1995. While VBAC rates increased for all mothers, the increases were much greater for non-Hispanic white than for either non-Hispanic black or Hispanic mothers. As mentioned previously, the differences by race and ethnicity in trends in cesarean and VBAC rates may reflect, among other things, differences in access to health care and health care coverage.

The age of the mother has been shown to be a strong, independent predictor of cesarean delivery, which may stem from physiological changes associated with aging (7). Older mothers are prone to have more of the medical risk factors and complications of labor and/or delivery, which would necessitate a

cesarean delivery. The data in this report clearly show the direct relationship between age and cesarean rates in total and for all racial/ethnic groups. In addition, the findings show that not only do older mothers have higher cesarean rates than younger mothers, but the declines since 1991 have been less, and cesarean rates for older mothers for some groups have actually increased.

Maternal age is an important factor for explaining some of the variation in cesarean rates by other maternal characteristics such as marital status, education, and prenatal care. In addition to maternal age, another factor to consider is the link between cesarean rates and socioeconomic status. One study found that mothers in higher socioeconomic groups tend to have higher cesarean rates than mothers of lower socioeconomic status even after taking into account differences in maternal age, parity, birthweight, race, ethnicity, and complications of pregnancy and delivery (8). The researchers speculated that the difference in cesarean rates by socioeconomic status could be due to differences between poor and affluent women in the health care setting and in the clinical management of the delivery. The education of the mother is one indicator of her socioeconomic status, and the data from this study show that cesarean rates increased with additional education even after considering the mother's age. The mother's socioeconomic status may also play a part in the higher cesarean rates for mothers who received adequate prenatal care. These women are more likely to be of higher socioeconomic status than mothers who received intermediate or inadequate prenatal care.

Examining cesarean and VBAC rates by maternal medical risk factors and complications of labor and/or delivery can identify the mothers who are at the highest risk for cesarean delivery. Strategies to lower cesarean rates have focused on the risk factors and complications for which there is potential for substantial decline (9). As mentioned in the findings, all of the maternal medical risk factors presented in this report were associated with cesarean rates that were higher than the national average. However, cesarean rates for all of the risk factors have declined since 1991 (10). The largest

declines have been for mothers with genital herpes, hydramnios/oligohydramnios, Rh sensitization, and cardiac disease.

Although cesarean rates for many of the complications of labor and/or delivery were quite high, only mothers with cord prolapse had a higher cesarean rate in 1995 than in 1991 (10). Cesarean rates for the remaining complications either remained steady or declined. Mothers with anesthetic complications, febrile, premature rupture of membranes, and fetal distress had cesarean rates in 1995 that were at least 10 percent lower than the rates in 1991. In general, there was much similarity among racial and ethnic groups in the cesarean rates by medical risk factors and complications. Further research that accounts for the differences in the prevalence of these complications among racial and ethnic groups will be important in addressing questions of disparities in cesarean rates.

References

1. Centers for Disease Control and Prevention. Rates of cesarean delivery—United States, 1993. *MMWR* 44(15):303–7. 1995.
2. Notzon FC, Cnattingius S, Bergsjö P, et al. Cesarean section delivery in the 1980's: International comparison by indication. *Am J Obstet Gynecol* 170:495–504. 1994.
3. Shearer EL. Cesarean section: Medical benefits and costs. *Soc Sci Med* 37(10):1223–31. 1993.
4. Petitti DB. Maternal mortality and morbidity in cesarean section. *Clin Obstet Gynecol* 28:763. 1985.
5. U.S. Department of Health and Human Services. Healthy people 2000. National health promotion and disease prevention objectives. Washington: Public Health Service. 1990.
6. National Center for Health Statistics. Technical appendix. Vital statistics of the United States, 1992, vol I, natality. Washington: U.S. Department of Health and Human Services. 1996.
7. Peipert JF, Bracken MB. Maternal age: An independent risk factor for cesarean delivery. *Obstet Gynecol* 81(2):200–5. 1993.
8. Gould JB, Davey B, Stafford RS. Socioeconomic differences in rates of cesarean section. *NEJM* 321(4):233–9. 1989.

9. Paul RH, Miller DA. Cesarean birth: How to reduce the rate. *Am J Obstet Gynecol* 172(6):1903-11. 1995.

10. National Center for Health Statistics. Advance report of maternal and infant health data from birth certificate, 1991. *Monthly vital statistics report*; vol 42 no 11, supp. Hyattsville, Maryland: Public Health Service. 1994.

11. Deardorff KE, Montgomery P, Hollman FW. U.S. population estimates by age, sex, race, and Hispanic origin: 1990 to 1995. U.S. Bureau of the Census. PPL-41. Washington: U.S. Department of Commerce. 1996.

12. U.S. Bureau of the Census. Age, sex, race, and Hispanic origin information from the 1990 census: A comparison of the census results where age and race have been modified. Census file CPH-L-74. Washington: U.S. Department of Commerce. 1991.

List of detailed tables

1. Cesarean rates by age, race, and Hispanic origin of mother, United States, 1991-95. 7

2. Vaginal birth after cesarean rates by age, race, and Hispanic origin of mother, United States, 1991-95 . . . 8

3. Cesarean rates by selected maternal characteristics, 1995 9

4. Cesarean rates by selected medical risk factors and complications of labor and/or delivery according to race and Hispanic origin, 1995. . . . 10

Table 1. Cesarean rates by age, race, and Hispanic origin of mother, United States, 1991–95

Age and race	1991	1992	1993	1994	1995	Percent change between 1991 and 1995
Total cesarean		Percent of all live births by cesarean				
All races¹:						
Total	22.6	22.3	21.8	21.2	20.8	-8
Under 20	16.4	16.1	15.5	15.0	14.7	-10
20–24	19.9	19.5	18.9	18.3	17.8	-11
25–29	23.3	22.8	22.1	21.5	20.9	-10
30–34	25.7	25.3	24.8	24.2	23.8	-7
35–39	29.0	28.7	28.5	27.7	27.4	-6
40–49	32.1	31.7	32.2	31.5	31.6	-2
White, non-Hispanic²:						
Total	23.2	22.8	22.2	21.5	21.0	-9
Under 20	17.1	16.6	15.6	15.0	14.5	-15
20–24	20.7	20.2	19.4	18.6	18.0	-13
25–29	23.5	23.0	22.2	21.4	20.7	-12
30–34	25.4	25.0	24.3	23.6	23.2	-9
35–39	28.7	28.2	27.8	26.8	26.4	-8
40–49	31.8	31.0	31.4	30.8	30.9	-3
Black, non-Hispanic²:						
Total	21.9	22.2	22.0	21.9	21.8	-0
Under 20	16.4	16.6	16.2	16.1	15.9	-3
20–24	19.9	19.9	19.5	19.4	19.1	-4
25–29	24.1	24.3	23.8	23.7	23.5	-2
30–34	27.7	27.9	28.0	27.9	27.7	0
35–39	30.6	31.6	31.8	31.2	31.6	3
40–49	34.4	34.6	36.1	34.5	34.6	1
Hispanic^{2,3}:						
Total	21.6	21.2	20.9	20.5	20.2	-6
Under 20	15.7	15.1	14.9	14.2	14.1	-10
20–24	18.8	18.4	18.1	17.5	17.1	-9
25–29	23.1	22.5	22.0	21.8	21.3	-8
30–34	26.6	26.7	26.4	26.1	25.6	-4
35–39	29.8	30.0	30.0	29.6	30.0	1
40–49	32.0	33.5	33.8	33.3	32.8	2
Primary cesarean		Primary cesareans per 100 live births to women who have not had a previous cesarean				
All races¹:						
Total	15.9	15.6	15.3	14.9	14.7	-8
Under 20	14.6	14.3	13.9	13.6	13.4	-8
20–24	14.8	14.4	14.1	13.7	13.5	-9
25–29	16.1	15.7	15.3	14.8	14.6	-9
30–34	16.5	16.2	15.9	15.5	15.5	-6
35–39	18.9	18.7	18.5	17.9	17.6	-7
40–49	22.9	22.4	22.7	22.3	22.2	-3
White, non-Hispanic²:						
Total	16.4	16.0	15.6	15.1	14.9	-9
Under 20	15.5	15.0	14.3	13.9	13.5	-13
20–24	15.7	15.2	14.8	14.2	13.9	-11
25–29	16.4	16.0	15.6	15.1	14.8	-10
30–34	16.3	16.0	15.6	15.2	15.1	-7
35–39	18.6	18.2	17.9	17.2	16.9	-9
40–49	22.6	21.7	22.1	21.7	21.8	-4
Black, non-Hispanic²:						
Total	15.5	15.7	15.7	15.7	15.7	1
Under 20	14.0	14.2	14.1	14.3	14.2	1
20–24	13.8	13.9	13.7	13.9	13.9	1
25–29	16.1	16.3	16.1	16.0	15.9	-1
30–34	18.4	18.5	18.7	18.5	18.7	2
35–39	21.1	21.9	21.8	21.5	21.2	0
40–49	25.7	26.3	27.2	25.6	25.3	-2
Hispanic^{2,3}:						
Total	14.8	14.4	14.2	13.9	13.7	-7
Under 20	13.9	13.3	13.2	12.6	12.6	-9
20–24	13.7	13.4	13.1	12.7	12.5	-9
25–29	14.9	14.3	13.9	13.8	13.5	-9
30–34	16.1	16.0	15.8	15.3	15.0	-7
35–39	19.0	18.5	18.5	18.2	18.1	-5
40–49	22.5	23.1	23.1	22.9	21.9	-3

¹Includes all births regardless of race and Hispanic origin.

²All births to New Hampshire residents for 1991 and 1992 were assumed to be non-Hispanic. See [Technical notes](#).

³Persons of Hispanic origin may be of any race.

Table 2. Vaginal birth after previous cesarean rates by age, race, and Hispanic origin of mother, 1991–95

Age and race	1991	1992	1993	1994	1995	Percent change between 1991 and 1995
Vaginal births after previous cesarean delivery per 100 live births to women with a previous cesarean						
All races¹						
Total	21.3	22.6	24.3	26.3	27.5	29
Under 20	25.1	26.3	28.4	31.2	32.3	29
20–24	22.6	24.0	26.1	28.4	29.6	31
25–29	21.6	23.0	25.1	26.8	28.3	31
30–34	20.9	22.3	23.6	25.8	27.3	31
35–39	18.6	20.2	21.5	23.3	24.2	30
40–49	15.8	17.1	18.4	20.2	21.0	33
White, non-Hispanic²						
All ages	21.6	23.0	24.9	27.0	28.4	31
Under 20	22.5	24.3	27.3	31.0	31.6	40
20–24	22.0	23.3	25.8	28.1	29.5	34
25–29	21.9	23.3	25.6	27.6	29.2	33
30–34	21.9	23.3	24.9	27.1	28.7	31
35–39	19.8	21.6	23.0	24.9	26.0	31
40–49	17.4	18.3	20.0	21.7	22.6	30
Black, non-Hispanic²						
All ages	21.1	22.3	23.7	25.5	26.0	23
Under 20	27.5	27.8	29.5	31.3	34.0	24
20–24	23.6	24.8	26.8	28.8	29.7	26
25–29	20.9	22.4	24.1	25.5	25.8	23
30–34	17.7	19.4	20.2	23.1	23.4	32
35–39	14.9	16.1	17.9	19.1	20.1	35
40–49	13.2	15.1	15.7	17.4	16.4	24
Hispanic^{2,3}						
Total	19.0	20.1	21.4	23.2	24.4	28
Under 20	25.0	26.2	27.8	30.3	30.0	20
20–24	22.0	23.7	24.6	27.3	28.7	30
25–29	19.5	20.7	22.6	24.0	25.7	32
30–34	16.3	17.3	18.6	20.4	21.8	34
35–39	15.0	14.7	15.7	18.0	18.0	20
40–49	11.3	13.0	13.8	14.7	16.8	49

¹Includes all births regardless of race and Hispanic origin.

²All births to New Hampshire residents in 1991 and 1992 were assumed to be non-Hispanic. See [Technical notes](#).

³Persons of Hispanic origin may be of any race.

Table 3. Cesarean rates by selected maternal characteristics, 1995

Selected maternal characteristics	Total cesarean rate				Primary cesarean rate				Vaginal birth after previous cesarean			
	All races	Non-Hispanic White	Non-Hispanic Black	Hispanic ¹	All races	Non-Hispanic White	Non-Hispanic Black	Hispanic ¹	All races	Non-Hispanic White	Non-Hispanic Black	Hispanic ¹
	Percent of all births by cesarean				Primary cesareans per 100 live births to women who have not had a previous cesarean				Vaginal births after previous cesarean per 100 live births to women with a previous cesarean			
Region:												
Northeast	21.5	21.7	21.8	21.1	15.4	15.4	16.2	14.8	31.4	31.2	32.1	30.4
Midwest	19.3	19.6	19.0	17.9	13.5	13.6	13.4	12.2	30.3	30.5	28.4	30.7
South	22.8	22.9	22.7	22.8	16.2	16.4	16.6	15.3	23.9	24.6	24.1	19.8
West	19.1	19.1	22.4	18.8	13.3	13.6	15.2	12.6	27.0	29.0	20.3	24.5
Marital status:												
Unmarried	19.0	19.0	19.9	18.5	14.5	15.0	14.9	13.4	27.7	27.9	27.7	26.1
Married	21.7	21.5	26.2	21.4	14.8	14.9	17.9	13.9	27.4	28.4	23.5	23.6
Live-birth order:												
First child	22.2	22.4	23.2	20.8	22.1	22.4	23.2	20.7
Second child	20.4	20.4	21.9	20.0	8.4	8.2	10.5	7.9	27.1	27.8	24.7	24.6
Third child or higher	19.3	19.3	19.8	19.5	8.1	7.8	9.3	8.3	28.0	29.1	27.1	24.2
Weight gain²:												
Under 16 pounds	21.8	23.2	20.8	19.5	13.7	14.4	14.1	11.6	25.9	25.2	26.4	26.6
16–25 pounds	19.1	19.2	19.6	18.8	12.7	12.7	13.8	11.9	29.5	29.9	28.0	27.0
26–35 pounds	19.4	19.0	21.0	20.3	13.6	13.2	15.3	13.7	29.9	30.9	27.6	25.0
36 pounds and higher	23.7	23.3	25.1	24.5	18.3	18.1	19.3	18.5	26.5	27.4	23.5	23.6
Education:												
0–8 years	17.2	16.6	17.4	17.7	11.4	11.2	14.3	11.3	26.6	29.6	29.9	25.2
9–11 years	17.7	18.0	17.3	18.1	12.5	12.7	12.6	12.3	27.0	26.5	29.9	24.8
12 years	21.3	21.4	21.7	21.5	14.7	14.8	15.2	14.6	26.2	26.6	25.5	23.6
13–15 years	22.4	21.8	24.6	23.9	15.8	15.4	17.8	16.7	26.9	27.9	24.1	23.6
16 years or more	22.1	21.3	29.5	26.7	16.4	15.7	22.8	19.3	30.5	31.6	23.1	23.9
Prenatal care (Kessner index):												
Adequate	21.9	21.6	24.0	21.9	15.6	15.4	17.6	15.0	26.7	27.9	23.0	22.8
Intermediate	18.5	18.5	19.7	18.1	12.7	12.8	13.8	11.9	28.9	29.8	27.9	26.4
Inadequate	15.7	16.0	15.7	15.8	10.6	11.0	10.3	10.4	34.4	34.9	37.0	30.8

... Category not applicable.

¹Persons of Hispanic origin may be of any race.

²Cesarean rates by weight gain exclude data for California.

Table 4. Cesarean rate by selected medical risk factors and complications of labor and/or delivery according to race and Hispanic origin, 1995

[Per 100 births to women with a selected medical risk factor or complication]

Medical risk factor and complication	All races ¹	Non-Hispanic White	Non-Hispanic Black	Hispanic ²
Medical risk factors				
Anemia	22.6	23.5	23.5	20.9
Cardiac disease	24.0	23.7	25.7	22.7
Acute and chronic lung disease	24.8	25.1	24.9	23.6
Diabetes	35.4	35.3	40.0	34.5
Genital herpes ³	37.8	38.3	37.0	37.7
Hydramnios/Oligohydramnios	37.8	38.7	38.2	34.5
Hemoglobinopathy	25.6	28.2	25.2	23.2
Hypertension, chronic	39.6	39.1	41.3	39.8
Hypertension, pregnancy-related	36.8	36.0	39.3	38.1
Eclampsia	49.1	49.4	49.0	49.7
Incompetent cervix	30.1	30.1	29.6	31.6
Renal disease	24.8	23.0	21.1	20.4
Rh sensitization ⁴	21.3	25.6	25.6	20.6
Uterine bleeding ³	30.6	31.1	32.4	24.6
Complications of labor and/or delivery				
Febrile	30.9	30.1	33.5	30.3
Meconium, moderate/heavy	20.9	20.3	22.8	20.5
Premature rupture of membranes	25.6	25.5	26.1	26.6
Abruptio placenta	57.7	58.3	58.8	55.7
Placenta previa	81.8	80.9	81.9	82.9
Other excessive bleeding	32.6	31.8	39.3	32.1
Seizures during labor	45.4	47.9	58.2	49.0
Precipitous labor	2.0	1.8	2.0	3.2
Prolonged labor	35.9	34.9	40.9	40.9
Dysfunctional labor	63.4	60.9	71.3	69.4
Breech/Malpresentation	85.1	85.7	79.4	87.3
Cephalopelvic disproportion	96.9	97.0	97.1	97.0
Cord prolapse	63.1	63.9	67.1	56.0
Anesthetic complications ⁵	42.1	40.9	52.6	33.0
Fetal distress ⁵	54.9	52.9	59.7	56.6

¹Includes all births regardless of race and Hispanic origin.²Persons of Hispanic origin may be of any race.³Texas does not report this risk factor.⁴Kansas does not report this risk factor.⁵Texas does not report this complication.

Technical notes

Sources of data

Data shown in this report for 1991–95 are based on more than 96 percent of the birth certificates in all States and the District of Columbia. The National Center for Health Statistics (NCHS) collects 100 percent of all birth certificates through the Vital Statistics Cooperative Program. Cesarean rates were computed for those birth records in which the “method of delivery” item was stated, which comprised more than 96 percent of all births in 1991 and more than 99 percent by 1995.

Race and Hispanic origin

All of the data for 1991–95 are tabulated by race of mother. Hispanic origin is reported and tabulated independently of race. Thus, persons of Hispanic origin may be of any race. In 1995, 91 percent of women of Hispanic origin were white (11). In 1991 and 1992, all States and the District of Columbia reported Hispanic origin except New Hampshire. According to data from the 1990 census, less than 0.1 percent of the Hispanic population resided in New Hampshire, so the reporting area was essentially complete (12). All States and the District of

Columbia reported Hispanic origin during the 1993–95 period. For cesarean and VBAC rates for 1991 and 1992, all births to New Hampshire residents were assumed to be non-Hispanic. In 1990, 1.0 percent of the New Hampshire population was reported to be Hispanic (12). Thus, the effect on the rates is believed to be small.

Computation of rates

Only records in which the “method of delivery” item was stated were used in the computation of cesarean and VBAC rates. The formula for the total cesarean rate is:

$$\frac{\text{Total number of births by cesarean}}{\text{Total number of births}} \cdot 100$$

The primary cesarean rate relates the number of first cesarean births to the total number of births to women who have not had a previous cesarean. The formula for the primary cesarean rate is:

$$\frac{\text{Number of primary cesarean births}}{\text{Number of primary cesarean births} + \text{number of vaginal births (excluding VBAC's)}} \cdot 100$$

The VBAC rate relates the number of vaginal births to women who had a previous cesarean to the total number of women with a previous cesarean. The formula for the VBAC rate is:

$$\frac{\text{Number of vaginal births after a previous cesarean}}{\text{Number of vaginal births after a previous cesarean} + \text{number of repeat cesarean births}} \cdot 100$$

Random variation and relative standard error

Although the birth data in this report are not subject to sampling error, they may be affected by random variation in the number of births involved. When the number of events is small (perhaps less than 100) considerable caution must be observed in interpreting the data. Nearly all cesarean and VBAC rates in this report were computed based on substantially more than 100 births. The only exceptions are for some rare complications of labor and/or delivery. These events may be assumed to follow a Poisson probability distribution. A detailed description of the method for computing relative standard errors and for conducting significance tests is published elsewhere (6). Any differences noted in this report were significant.

Contents

Abstract 1
 Introduction 1
 Methods 2
 Results 2
 Cesarean rates, 1991–95.. 2
 Vaginal births after
 cesarean rates, 1991–95 .. 3
 Cesarean rates by maternal
 characteristics..... 4
 Cesarean rates by medical
 risk factors and
 complications 4
 Discussion 5
 References 5
 List of detailed tables 6
 Technical notes..... 11

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