

## Trends in Cesarean Rates for First Births and Repeat Cesarean Rates for Low-Risk Women: United States, 1990–2003

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### Abstract

**Objectives**—This report presents trends in cesarean rates for first births and repeat cesarean rates for low-risk women, in relation to the Healthy People 2010 (HP 2010) objectives. Data for the U.S. showing trends by maternal age and race and Hispanic origin are presented.

**Methods**—Cesarean rates were computed based on the information reported on birth certificates.

**Results**—With a decrease between 1990 and 1996 and an increase between 1996 and 2003, the trend in the cesarean rate for low-risk women having a first birth paralleled trends in the primary (regardless of parity) and total cesarean rates. During 1996–2003 the cesarean rate for low-risk women having a first birth has consistently been at least 13 percent lower than the rate for all women having a first birth. For 2003 the cesarean rate for all primiparous women was 27.1 percent; for low-risk women the rate was 23.6 percent.

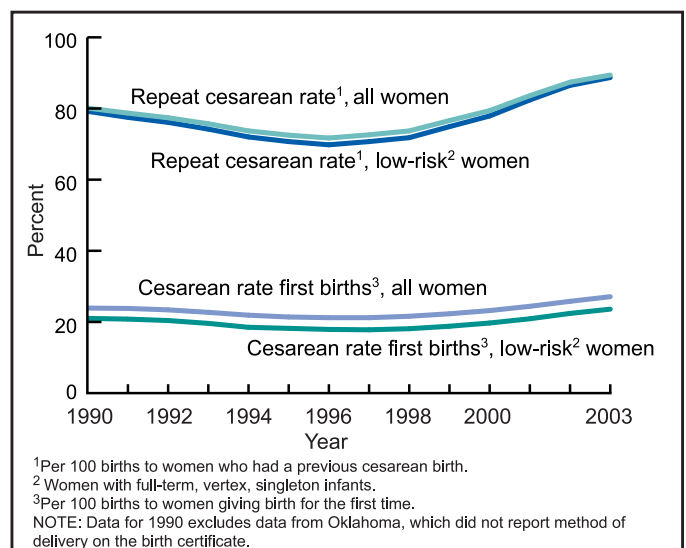
The trend in the repeat cesarean rate for low-risk women was similar to the trend in the repeat rate for all women, i.e., a decrease from 1990 to 1996 and an increase from 1996 to 2003. The repeat cesarean rate for low-risk women has consistently been slightly lower than the rate for all women. For 2003 the repeat rate for all women was 89.4; the rate for low-risk women was 88.7. These trends were found for low-risk women of all ages and racial or ethnic groups. Therefore, low-risk women giving birth for the first time who have a cesarean delivery are more likely to have a subsequent cesarean delivery.

**Keywords:** cesarean • low risk • repeat cesarean • VBAC • primary cesarean • birth certificate

### Introduction

Lowering the cesarean rate in the United States has been a goal for the past 25 years (1). In response to growing concerns in the 1980s about the rising cesarean rate, the U.S. Department of Health and Human Services established decreasing the cesarean rate as one of the Healthy People Year 2000 objectives (2). When objectives

were evaluated for HP 2010, lowering the cesarean rate was again included (3). However, for HP 2010, the focus of the objective was changed from *all* women giving birth to *low-risk* women. A low-risk woman is defined as one with a full-term (at least 37 completed weeks of gestation), singleton pregnancy (not a multiple pregnancy), with vertex fetal presentation (head facing in a downward position in the birth canal). Separate objectives were formulated for *low-risk women giving birth for the first time* (a subset of all women having a first birth) and for low-risk women who had a prior cesarean birth. The objectives set a target of 15 percent for cesarean delivery and 63 percent for repeat cesarean delivery (table A). This report presents detailed tabular data on trends for low-risk women, in relation to the HP 2010 objectives. Cesarean rates for low-risk women and for all women are shown in figure 1 and table B.



**Figure 1. Cesarean rates for first births and repeat cesarean rates, for all women and low-risk women: United States, 1990–2003**

**Table A. Healthy People Objectives regarding cesarean delivery**

Target and baseline

Objective	Reduce cesarean births among low-risk women <sup>1,2</sup>	Percent of live births		
		1998 Baseline	2003	2010 Target <sup>3</sup>
16-9a. . . . Women giving birth for the first time		18	23.6	15
16-9b. . . . Women who had a prior cesarean birth		72	88.7	63

<sup>1</sup>U.S. Department of Health and Human Services. Tracking Healthy People 2010. Washington, DC. U.S. Government Printing Office. November 2000.

<sup>2</sup>A low-risk woman is defined as one with a full-term (at least 37 completed weeks of gestation), singleton (not a multiple pregnancy), and vertex fetus (head facing in a downward position in the birth canal).

<sup>3</sup>[http://www.healthypeople.gov/Document/HTML/Volume216MICH.htm#\\_Toc494699664](http://www.healthypeople.gov/Document/HTML/Volume216MICH.htm#_Toc494699664).

The decrease from 1990 to 1996 in the rate for women with no previous cesarean regardless of parity (the primary cesarean rate) and the increase from 1996 to 2003 (the current rate is 19.1 percent) have been reported in detail elsewhere (4). More than 680,000 deliveries in 2003 were primary cesareans.

Although the total cesarean rate (the percent of all live births by cesarean delivery) is shown in this report to provide context, in keeping with the HP 2010 objectives, we concentrate on the cesarean rate for first births to low-risk women and the repeat cesarean rate, and focus on the trends since 1996. Data in this report are from birth certificates filed for all infants born in the United States during the years 1996–2003 (see “Technical Notes”). The annual number of births ranged from 3.9 million to 4.1 million.

## Results

### Cesarean rates increased 1996–2003 for all women and for low-risk women

For all women total and primary cesarean rates increased substantially from 1996 to 2003, as did the rates for all women giving birth for the first time. However, compared with cesarean rates for all women giving birth for the first time, rates for low-risk women having a first birth have been consistently lower. Nevertheless, for these women, the cesarean rate increased by one-third between 1996 and 2003 (to 23.6 percent) (tables B and 1 and figure 1). At the same time, the cesarean rate for women giving birth for the first time who were *not low-risk*, increased from 41.7 to 47.1 percent (tabular data not shown). In 2003 out of 363,924 cesarean deliveries to women having a first birth, 265,423 (73 percent) were to low-risk women. Out of the total number of cesarean deliveries (1,119,388), 24 percent were to low-risk women having a first birth. The trends for all women are generally replicated in the trends by age and race and Hispanic origin (see table 1 and figure 2).

### Repeat cesarean births increase 1996 to 2003

For women who have a first cesarean delivery, the next delivery will be either a repeat cesarean or a vaginal birth after cesarean (VBAC). The repeat rate increased by more than one-fourth from 1996 to 2003, from 69.8 to 88.7 per 100 births to low-risk women with a previous cesarean (figure 1, table B and table 2). In 2003 there were 434,699 repeat cesarean deliveries (4); 348,550 (80 percent)

were to low-risk women. Although following the trend for all women, repeat rates for low-risk women have consistently been slightly lower than rates for all women (by 1 percent since 2001). Of all cesarean deliveries, 31.1 percent were to low-risk women having a repeat cesarean.

This increase in the repeat rate indicates a corresponding decrease in the rate of VBAC deliveries. Accordingly, the VBAC rate declined by 63 percent between 1996 and 2003 (from 30.2 to 11.3 percent for low-risk women). To put this another way, only about 11 percent of *low-risk* women who had a previous cesarean delivery went on to have a subsequent vaginal delivery (table B). In 2003 of all VBAC deliveries (51,602) (4), 86 percent (44,380) were to low-risk women (tabular data not shown).

The trends in repeat cesarean delivery by age and race and Hispanic origin are similar to those for all women; variations are shown in table 2 and figure 3.

## Discussion and Conclusions

Since the late 1970s, the U.S. cesarean rate has received considerable attention (5–10). National efforts to decrease the cesarean rate now focus on low-risk women as defined in the HP 2010 objectives. Despite this focus, the trends in the rates for low-risk women continue to parallel the trends for all women. Primary and repeat cesarean rates for all women have now reached their highest levels and VBAC rates have dropped to their lowest levels since these data were first reported on the birth certificate in 1989 (4). The cesarean rate for low-risk women having a first birth has been consistently lower (by 13 to 16 percent since 1996) than the cesarean rate for all first-time mothers. However, the rate for low-risk primiparous women that had decreased by 15 percent between 1990 and 1996, then increased during the next 7 years, reaching 23.6 percent in 2003, the highest rate ever reported in the United States.

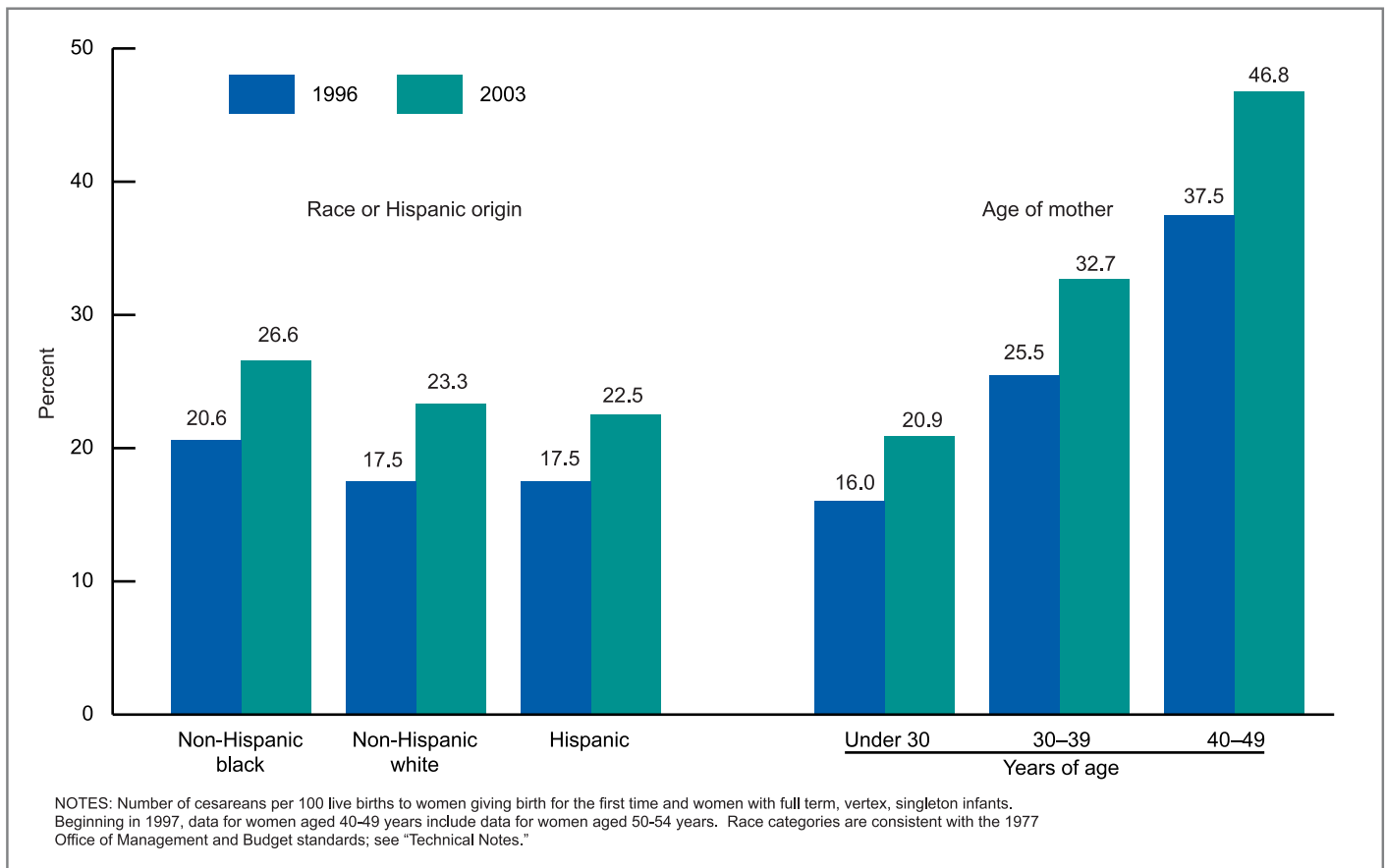
Table A shows the HP 2010 objectives for cesarean births, the 1998 baseline and the data for 2003. Both rates continue to move away from the stated objectives. For low-risk women giving birth for the first time, the objective is for a cesarean rate of no more than 15 per 100 births. Given the 2003 cesarean rate for births to these women (23.6 percent), a 36 percent drop in this rate will be necessary to achieve the objective. For low-risk women who have had a prior cesarean, the objective is for a cesarean rate of 63 per 100 births. Given the 2003 repeat rate for low-risk women of 88.7 percent, the repeat rate would have to decrease by 29 percent to reach the objective.

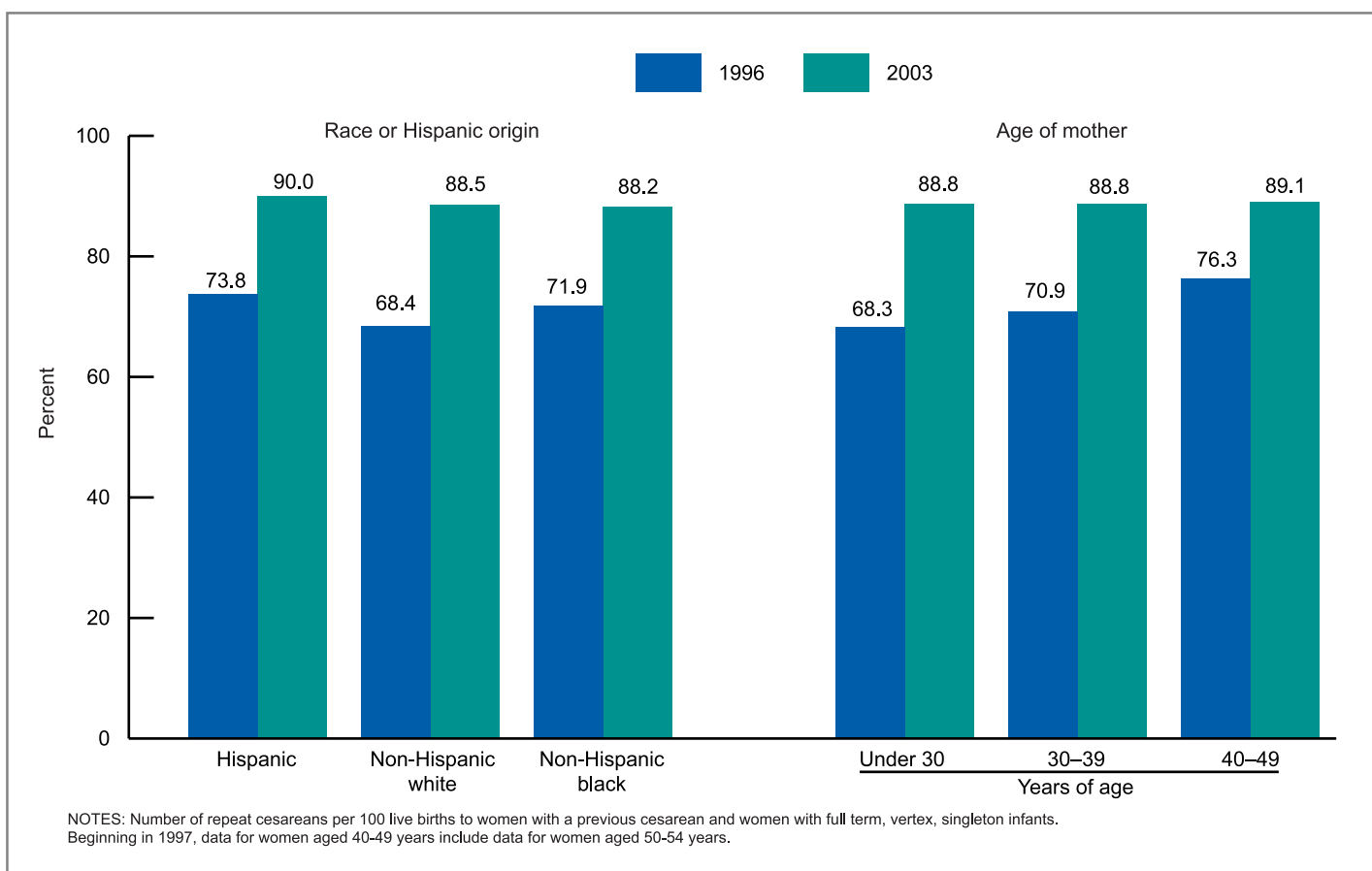
The classification of women by risk status is based on information generally well reported on birth certificates, namely birth order or parity, plurality, gestational age, and presentation (position) of the fetus in utero. However, a woman's risk is also influenced by the presence of medical risk factors and complications of labor and/or delivery, which are less well reported on birth certificates, or are not collected on birth certificates at all (11, 12). Nevertheless, an increase in the cesarean rate of 67 percent between 1991 and 2001 has been reported among even lower-risk mothers (i.e., women with singleton, full-term, vertex presentation births with no risk factors or complications of labor and/or delivery reported on the birth certificate) (13).

There is still considerable debate in the medical community as to the appropriate level for the cesarean rate; controversy continues regarding elective cesarean delivery, the woman's choice to undergo

**Table B. Total, cesarean rates for first births, repeat cesarean rates, and rates of vaginal birth after previous cesarean delivery (VBAC) for all women and for low-risk women: United States, 1990–2003**

Year	Total <sup>1</sup>		First births <sup>2</sup>		Repeat <sup>3</sup>		VBAC <sup>4</sup>	
	All	Low risk <sup>5</sup>	All first births	Low risk <sup>5</sup>	All	Low risk <sup>5</sup>	All	Low risk <sup>5</sup>
2003	27.5	23.5	27.1	23.6	89.4	88.7	10.6	11.3
2002	26.1	22.1	25.8	22.4	87.4	86.5	12.6	13.5
2001	24.4	20.6	24.4	20.9	83.6	82.4	16.4	17.6
2000	22.9	19.1	23.2	19.7	79.4	77.9	20.6	22.1
1999	22.0	18.2	22.3	18.8	76.6	74.9	23.4	25.1
1998	21.2	17.4	21.6	18.1	73.7	71.8	26.3	28.2
1997	20.8	17.1	21.2	17.8	72.6	70.7	27.4	29.3
1996	20.7	17.1	21.2	17.9	71.7	69.8	28.3	30.2
1995	20.8	17.4	21.4	18.2	72.5	70.7	27.5	29.3
1994	21.2	17.8	21.9	18.5	73.7	72.0	26.3	28.0
1993	21.8	18.5	22.7	19.6	75.7	74.2	24.3	25.8
1992	22.3	19.0	23.4	20.4	77.4	76.1	22.6	23.9
1991	22.6	19.4	23.8	20.8	78.7	77.5	21.3	22.5
1990 <sup>6</sup>	22.7	19.6	23.9	21.0	80.1	79.2	19.9	20.8

<sup>1</sup>Percentage of all live births by cesarean delivery.<sup>2</sup>Number of cesareans per 100 live births to women giving birth for the first time.<sup>3</sup>Number of repeat cesareans per 100 live births to women who had a previous cesarean.<sup>4</sup>Number of vaginal births after previous cesarean delivery per 100 live births to women with a previous cesarean delivery.<sup>5</sup>A low-risk woman is defined as one with a full-term (at least 37 completed weeks of gestation), singleton (not a multiple pregnancy), and vertex fetus (head facing in a downward position in the birth canal).<sup>6</sup>Excludes data for Oklahoma, which did not report method of delivery on the birth certificate.**Figure 2. Cesarean rates for first births for low-risk women, by age and race and Hispanic origin of mother: United States, 1996 and 2003**



**Figure 3. Repeat cesarean rates for low-risk women by age and race and Hispanic origin of mother: United States, 1996 and 2003**

an elective primary cesarean, the safety of VBAC deliveries, and the risks and benefits of vaginal delivery (9,14–17). The fact that the increase in cesarean rates has been widespread and increasing yearly for low-risk women of all ages and racial or ethnic groups supports the idea that the criteria or indications for cesarean delivery in the United States have changed.

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**Table 1. Cesarean rates for first births to low-risk women by age and race and Hispanic origin of mother: United States, 1990, 1996, and 2003 (numbers shown for 2003), and percentage changes 1990 and 1996 and 1996 and 2003**

Age and race	2003	1996	1990	Percent change 1990 and 1996	Percent change 1996 and 2003
All races <sup>1</sup> . . . . .	23.6 (265,423)	17.9	21.0	-15	32
Total					
Under age 20 years . . . . .	16.6 (42,044)	12.3	14.7	-16	35
20-24 years. . . . .	20.7 (70,735)	16.3	19.7	-17	27
25-29 years. . . . .	24.8 (67,609)	19.6	23.4	-16	27
30-34 years. . . . .	30.3 (55,810)	24.0	27.7	-13	26
35-39 years. . . . .	38.8 (23,918)	30.3	34.6	-12	28
40-49 years <sup>2</sup> . . . . .	46.9 (5,307)	37.5	41.6	-10	25
Non-Hispanic white <sup>3</sup>					
Total . . . . .	23.3 (152,991)	17.5	21.1	-17	33
Under age 20 years . . . . .	16.1 (17,826)	11.4	14.6	-22	41
20-24 years. . . . .	19.7 (37,078)	15.5	19.5	-21	27
25-29 years. . . . .	23.4 (41,576)	18.5	22.6	-18	26
30-34 years. . . . .	28.9 (36,866)	22.6	26.6	-15	28
35-39 years. . . . .	37.3 (16,076)	28.3	33.3	-15	32
40-49 years <sup>2</sup> . . . . .	44.7 (3,569)	34.7	40.6	-15	29
Non-Hispanic black <sup>3</sup>					
Total . . . . .	26.6 (37,070)	20.6	22.1	-7	29
Under age 20 years . . . . .	19.5 (10,792)	15.1	16.3	-7	29
20-24 years. . . . .	26.3 (12,545)	20.5	22.7	-10	28
25-29 years. . . . .	33.4 (6,524)	27.9	30.3	-8	20
30-34 years. . . . .	40.0 (4,504)	33.9	36.0	-6	18
35-39 years. . . . .	48.6 (2,168)	41.8	40.5	3	16
40-49 years <sup>2</sup> . . . . .	56.8 (537)	49.2	46.5	6	15
Hispanic <sup>3,4</sup>					
Total . . . . .	22.5 (54,480)	17.5	20.0	-13	29
Under age 20 years . . . . .	15.6 (12,231)	12.0	13.9	-14	30
20-24 years. . . . .	20.5 (17,900)	16.7	19.3	-13	23
25-29 years. . . . .	27.6 (12,779)	22.7	26.2	-13	22
30-34 years. . . . .	35.7 (7,913)	28.5	32.5	-12	25
35-39 years. . . . .	43.0 (3,019)	35.7	40.9	-13	20
40-49 years <sup>2</sup> . . . . .	53.0 (638)	43.9	45.3	-3	21

<sup>1</sup>Includes races other than white and black and origin not stated.

<sup>2</sup>Beginning in 1997, includes data for women aged 40-54 years.

<sup>3</sup>For 1990, excludes data for New Hampshire, which did not report Hispanic origin. See "Technical Notes."

<sup>4</sup>Includes all persons of Hispanic origin of any race.

NOTES: Number of cesareans per 100 births to women giving birth for the first time. A low-risk woman is defined as one with a full-term (at least 37 completed weeks of gestation), singleton (not a multiple pregnancy), vertex fetus (head facing in a downward position in the birth canal). Data for 1990 exclude Oklahoma, which did not report method of delivery on the birth certificate.

**Table 2. Rate of repeat cesarean births for low-risk women by age and race and Hispanic origin of mother: United States, 1990, 1996, and 2003 (numbers shown for 2003), and percentage changes 1990 and 1996 and 1996 and 2003**

Age and race	2003	1996	1990	Percent change 1990 and 1996	Percent change 1996 and 2003
<b>All races<sup>1</sup></b>					
Total . . . . .	88.7 (348,550)	69.8	79.2	-12	27
Under age 20 years . . . . .	89.7 (7,973)	65.8	74.5	-12	36
20-24 years . . . . .	89.2 (63,058)	67.7	78.0	-13	32
25-29 years . . . . .	88.2 (91,239)	68.9	79.1	-13	28
30-34 years . . . . .	88.6 (108,554)	70.0	79.4	-12	27
35-39 years . . . . .	88.8 (63,116)	72.7	81.7	-11	22
40-49 years <sup>2</sup> . . . . .	89.3 (14,610)	76.3	84.0	-9	17
<b>Non-Hispanic white<sup>3</sup></b>					
Total . . . . .	88.5 (194,623)	68.4	79.0	-13	29
Under age 20 years . . . . .	91.3 (2,722)	64.6	76.6	-16	41
20-24 years . . . . .	90.1 (29,418)	66.9	78.8	-15	35
25-29 years . . . . .	88.3 (47,767)	67.7	78.9	-14	30
30-34 years . . . . .	88.3 (66,373)	68.1	78.5	-13	30
35-39 years . . . . .	87.7 (39,304)	70.5	80.9	-13	24
40-49 years <sup>2</sup> . . . . .	87.8 (9,039)	74.3	83.0	-10	18
<b>Non-Hispanic black<sup>3</sup></b>					
Total . . . . .	88.2 (48,589)	71.9	79.4	-9	23
Under age 20 years . . . . .	87.8 (2,223)	67.0	72.8	-8	31
20-24 years . . . . .	88.8 (13,412)	68.7	77.1	-11	29
25-29 years . . . . .	87.2 (13,174)	71.1	80.0	-11	23
30-34 years . . . . .	87.7 (11,347)	74.4	83.2	-11	18
35-39 years . . . . .	89.7 (6,775)	77.7	84.2	-8	15
40-49 years <sup>2</sup> . . . . .	91.1 (1,658)	80.6	85.6	-6	13
<b>Hispanic<sup>3,4</sup></b>					
Total . . . . .	90.0 (85,240)	73.8	81.1	-9	22
Under age 20 years . . . . .	90.0 (2,833)	66.2	73.6	-10	36
20-24 years . . . . .	88.6 (18,227)	69.5	77.9	-11	27
25-29 years . . . . .	89.1 (25,943)	72.3	81.2	-11	23
30-34 years . . . . .	90.7 (23,323)	77.0	83.5	-8	18
35-39 years . . . . .	92.0 (12,240)	80.0	86.3	-7	15
40-49 years <sup>2</sup> . . . . .	92.5 (2,674)	82.2	86.8	-5	13

<sup>1</sup>Includes races other than white and black and origin not stated.<sup>2</sup>Beginning in 1997, includes data for women aged 40-54 years.<sup>3</sup>For 1990, excludes data for New Hampshire, which did not report Hispanic origin. See "Technical Notes."<sup>4</sup>Includes all persons of Hispanic origin of any race.

NOTES: Number of repeat cesarean births to low-risk women with a previous cesarean delivery per 100 live births to low-risk women with a previous cesarean delivery. A low-risk woman is defined as one with a full-term (at least 37 completed weeks of gestation), singleton (not a multiple pregnancy), vertex fetus (head facing in a downward position in the birth canal).

## Technical Notes

### Sources of data

The National Center for Health Statistics (NCHS) collects 100 percent of all birth certificates through the Vital Statistics Cooperative Program. Cesarean rates for low-risk women were computed for those birth records in which the "method of delivery" item was stated: more than 96 percent of all births for 1990–93 and more than 99 percent of all births since 1994.

### Age and race and Hispanic origin of mother

#### Age

Age of mother is computed in most cases from the mother's and infant's dates of birth as reported on the birth certificate. Missing data are not shown for the variable age of mother. Missing data are imputed in these cases. Age of mother was imputed for just 0.02 percent of births in 2003 (4).

#### Race and Hispanic origin

Data 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. However, the vast majority of births to Hispanic women are reported as white (4). Missing data are not shown for the variable race of mother. The race of the mother was imputed for just 0.4 percent of births in 2003 (4).

Race categories in this report are consistent with the 1977 Office of Management and Budget guidelines. Detailed information on the reporting of race and ethnicity information is available in earlier reports (4,18).

More information on the reporting of maternal age, race, and the reporting of other items analyzed in this report (e.g., breech/malpresentation, period of gestation, plurality, and total birth order), is presented in other reports (4,18).

### Computation of rates

Only records in which data on method of delivery, breech/malpresentation, period of gestation, plurality, and total birth order were completed, were used in the computation of cesarean and VBAC rates for low-risk women.

The **cesarean rate for low-risk women having a first birth** relates the number of cesarean births to low-risk women having a first birth to the total number of births to low-risk women having a first birth.

The formula for this rate is:

$$\frac{\text{Number of cesarean births to low-risk women having a first birth}}{\text{Number of cesarean births to low-risk women having a first birth} + \text{number of vaginal births (excluding VBACs) to low-risk women having a first birth}} \cdot 100$$

The **repeat cesarean rate for low-risk women** relates the number of cesarean births to low-risk women who had a previous cesarean to the total number of low-risk women with a previous cesarean.

The formula for the **repeat cesarean rate** for low-risk women is:

$$\frac{\text{Number of cesarean births to low-risk women with a previous cesarean}}{\text{Number of vaginal births after a previous cesarean to low-risk women} + \text{number of repeat cesarean births to low-risk women}} \cdot 100$$

The **VBAC rate** relates the number of vaginal births to low-risk women who had a previous cesarean to the total number of low-risk women with a previous cesarean.

The formula for the **VBAC rate** for low-risk women is:

$$\frac{\text{Number of vaginal births after a previous cesarean to low-risk women}}{\text{Number of vaginal births after a previous cesarean to low-risk women} + \text{number of repeat cesarean births to low-risk women}} \cdot 100$$

Note that the denominator is the same for the VBAC rate and the repeat cesarean rate, as only a woman who had a previous cesarean delivery could have either a VBAC or a repeat cesarean.

### 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. All cesarean and VBAC rates in this report were computed based on more than 100 births. A detailed description of the method for computing relative standard errors and for conducting significance tests is published elsewhere (19).



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