

Epidural and Spinal Anesthesia Use During Labor: 27-state Reporting Area, 2008

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Abstract

Objectives—This report presents 2008 data on receipt of epidural and spinal anesthesia as collected on the 2003 U.S. Standard Certificate of Live Birth. The purpose of this report is to describe the characteristics of women giving birth and the circumstances of births in which epidural or spinal anesthesia is used to relieve the pain of labor for vaginal deliveries.

Methods—Descriptive statistics are presented on births occurring in 2008 to residents of 27 states that had implemented the 2003 U.S. Standard Certificate of Live Birth as of January 1, 2008. Analyses are

limited to singleton births in vaginal deliveries that occurred in the 27-state reporting area only and are not generalizable to the United States as a whole.

Results—Overall, 61 percent of women who had a singleton birth in a vaginal delivery in the 27 states in 2008 received epidural or spinal anesthesia; non-Hispanic white women received epidural or spinal anesthesia more often (69 percent) than other racial groups. Among Hispanic origin groups, Puerto Rican women were most likely to receive epidural or spinal anesthesia (68 percent). Levels of treatment with epidural or spinal anesthesia decreased by advancing age of mother. Levels increased with increasing maternal educational attainment. Early initiation of prenatal care increased the likelihood of epidural or

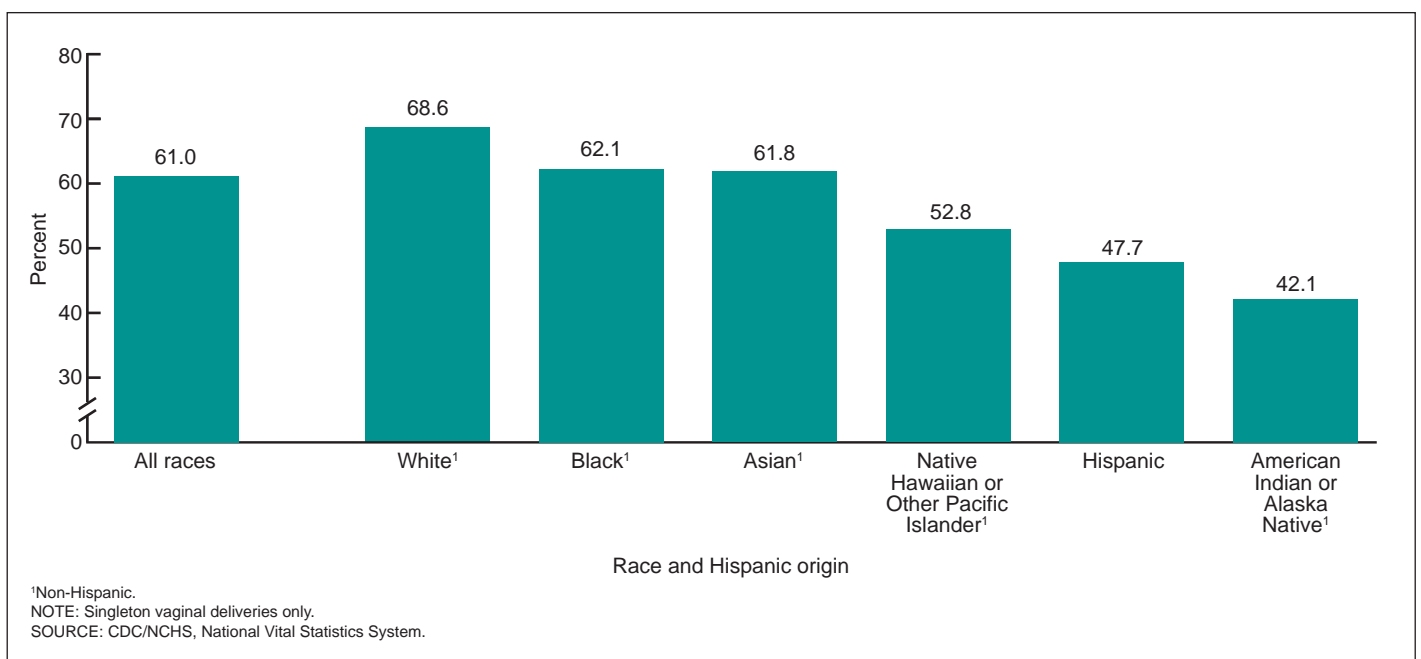


Figure 1. Epidural/spinal anesthesia receipt, by race and Hispanic origin of mother: 27-state reporting area, 2008

spinal anesthesia receipt, as did attendance at birth by a physician. Use of epidural or spinal anesthesia was more common in vaginal deliveries assisted by forceps (84 percent) or vacuum extraction (77 percent) than in spontaneous vaginal deliveries (60 percent). Use of epidural or spinal anesthesia was less likely when infants were born prior to 34 weeks of gestation or weighed less than 1,500 grams. Women with chronic and gestational diabetes were more likely to receive an epidural or spinal anesthesia than women with no pregnancy risk factors. Precipitous labor (less than 3 hours) was associated with decreased epidural or spinal anesthesia receipt.

Keywords: birth certificate • pain relief

Introduction

Labor and delivery is a very painful experience for many women (1). The American College of Obstetricians and Gynecologists (ACOG) states that “there are no other circumstances in which it is considered acceptable for an individual to experience untreated severe pain, amenable to safe intervention, while under a physician’s care” (1). Thus, ACOG recommends that pain relief be administered to a laboring woman upon request (1). There are many methods of pain relief available to women who want or need such assistance. Pharmaceutical methods involve medication, including epidurals, spinal blocks, combined spinal-epidurals, and systemic and local analgesia. Examples of nonpharmaceutical (“natural”) methods include Lamaze, acupuncture, and massage.

The 2003 U.S. Standard Certificate of Live Birth captures information on the pain relief methods “epidural or spinal anesthesia during labor” as a checkbox within the “characteristics of labor and delivery” category (2). This item captures receipt of epidurals, spinal blocks, and combined spinal-epidurals. These methods are flexible and potent, but allow a laboring woman to maintain appropriate motor function (3). For all of these methods, pain medication is injected into the lower region of the spine in order to provide regional pain relief (for more detail, see the “[Technical Notes](#)” section). Epidurals, spinal blocks, and combined spinal-epidurals are not distinguished from one another in these data; for ease of writing, all methods are referred to as “epidural/spinal anesthesia” in this report.

The birth certificate captures information only on epidural/spinal anesthesia and not on other types of pain relief. In this report, the group of women who do not receive epidural/spinal anesthesia is a heterogeneous group—including those who receive pain medication in locations other than the spine, nonpharmaceutical methods such as those noted above (e.g., Lamaze), and women who use no pain relief methods at all. Over the last several decades, the percentage of women who use nonpharmaceutical methods has steadily declined and epidural/spinal anesthesia has become the most common pain relief method (4).

The major benefits of epidural/spinal anesthesia are effective and fast relief for the mother and less need for additional forms of pain relief (5). This can lead to a more comfortable labor and delivery experience when compared with other forms of pain relief (e.g., systemic or local analgesia, Lamaze) (5). However, there are specific side effects of epidural/spinal anesthesia use that can influence the course of labor and delivery. Conditions of labor and delivery that are shown to be associated with the use of epidural/spinal anesthesia include increased risk of instrumental delivery (forceps or vacuum), fetal malposition, a

longer second stage of labor, and fetal distress (compared with women who receive opiates intravenously or by injection) (1,5,6). Severe headache, maternal hypotension, maternal fever, and urinary retention have also been associated with epidural/spinal anesthesia receipt (5).

This report examines the relationship between epidural/spinal anesthesia receipt and selected characteristics of the mother and of labor among vaginal deliveries in the 27-state reporting area as reported on the 2003 U.S. Standard Certificate of Live Birth.

Methods

Data are based on 100 percent of births registered in 27 states that had implemented the 2003 revision of the birth certificate as of January 1, 2008: California, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Washington, and Wyoming.

This report focuses on singleton births in vaginal deliveries (98.9 percent of all vaginal deliveries). Cesarean deliveries were excluded because all such deliveries require pain medication. Multiple births are at higher risk of preterm birth and low birthweight (7), which may influence the receipt of epidural/spinal anesthesia. There were 1,829,302 singleton vaginal births to residents of the 27 states, representing 65 percent of all 2008 U.S. singleton vaginal births. These data are not based on a random sample of births and are not generalizable to the country as a whole. Of note, the race and Hispanic origin distributions of births for the 27-state area are substantively different from those for the entire United States. Hispanic groups, especially births to Mexican women, are overrepresented in these data while births to non-Hispanic white and black women are underrepresented. Further, the Hispanic population composition in the reporting area differs from that of the United States with relatively more births to Mexican women and fewer births to Puerto Rican and Central and South American women (see [Table](#) in “[Technical Notes](#)”). These differences are likely due to the large Hispanic populations in Texas and California, which account for more than one-third of all births in the revised reporting area. Differences between the 27-state reporting area and the United States in the distributions of births by maternal age, marital status, and infant characteristics are smaller, but are also statistically significant (see [Table](#) in “[Technical Notes](#)”). (Presentation of data by race is discussed in more detail in the “[Technical Notes](#).”)

Race and Hispanic origin are reported independently on the birth certificate. This report includes data for “single-race, non-Hispanic white,” “single-race, non-Hispanic black,” “single-race, non-Hispanic Asian,” and Hispanic births. Detailed information on Native Hawaiian or Other Pacific Islander (NHOPI), American Indian or Alaska Native (AIAN), and multiple-race births is not shown because of the small numbers of births for these groups in this reporting area; summary data are shown for these groups. Detailed results for Hispanic subgroups are also not shown. For ease of writing, all references to racial groups (white, black, and Asian) are single race and non-Hispanic.

Births for which a particular characteristic is unknown are subtracted from the figures for total births that are used as denominators before percentages and percent distributions are computed.

Results

Maternal characteristics

Race and Hispanic origin—Overall, 61.0 percent of women with singleton vaginal deliveries in the 27 states in 2008 received epidural/spinal anesthesia during labor. Receipt of epidural/spinal anesthesia varied by race and Hispanic origin (Table A, Figure 1). White women received epidural/spinal anesthesia in 68.6 percent of singleton vaginal deliveries, compared with 62.1 percent of black women and 61.8 percent of Asian women. More than one-half of NHOPHI women (52.8 percent) received epidural/spinal anesthesia for pain relief whereas less than one-half of AIAN (42.1) and Hispanic (47.7) women received epidural/spinal anesthesia. The percentage receiving epidural/spinal anesthesia varied greatly by Hispanic subgroup, ranging from 43.8 percent of Mexican women to 68.1 percent of Puerto Rican women (Figure 2, Table A).

Age of mother—Use of epidural/spinal anesthesia decreased slightly with increasing maternal age. Nearly 64 percent of women under age 20 received epidural/spinal anesthesia compared with approximately 59 percent of women aged 35–39 (Table 1, Figure 3). Women aged 40 and over were the least likely to receive epidural/spinal anesthesia (55.3 percent).

Whereas women under age 20 in most racial and ethnic groups were most likely to receive epidural/spinal anesthesia, Asian women were most likely to receive epidural/spinal anesthesia for ages 25–29 (Table 1). White women of all age groups were more likely to receive epidural/spinal anesthesia than women in other racial and ethnic groups, whereas Hispanic women were the least likely for all but the youngest age group.

Parity—The distribution of epidural/spinal anesthesia use by age of mother was influenced by parity (the number of children to which a mother has given birth); that is, use of epidural/spinal anesthesia tended to decrease with increasing parity (Table 1). Among first births, 68.1 percent of all women received epidural/spinal anesthesia

compared with 57.3 percent of women delivering their second or higher child. This pattern was generally similar for each racial and ethnic group (Table 1).

Marital status—Overall, married women (62.5 percent) were somewhat more likely to receive epidural/spinal anesthesia during labor compared with unmarried women (59.1 percent) (Table 2). This pattern varied by race and Hispanic origin; Asian women had the largest difference in epidural/spinal anesthesia use for married (62.7 percent) compared with unmarried (56.2 percent) women.

Education—Women with higher educational attainment were more likely to receive epidural/spinal anesthesia. Women with at least a master's or doctoral degree (70.1 percent) were twice as likely to receive epidural/spinal anesthesia as women with an 8th grade education (33.8 percent) (data not shown). Differences were smaller between women with at least a master's degree and women with at least some college education or a bachelor's degree (Figure 4).

Racial and ethnic differences in the percentage of women receiving epidural/spinal anesthesia during labor decreased with increasing levels of educational attainment. At all educational levels beyond 8th grade, Asian and Hispanic women were less likely to receive epidural/spinal anesthesia than their white or black counterparts (Figure 4).

State of residence of mother—The percentage of women receiving epidural/spinal anesthesia varied by state of residence. Rates ranged from 21.9 percent in New Mexico and 42.5 in California to 78.2 percent in Kentucky. In 20 of the 27 states in the reporting area, 60 percent or more women received epidural/spinal anesthesia, whereas in four states (California, New Hampshire, New Mexico, and Vermont), less than one-half of all women received epidural/spinal anesthesia (Table B). Epidural/spinal anesthesia receipt by race and ethnicity also varied by state (data not shown).

Pregnancy-related characteristics

Prenatal care—Women who initiated prenatal care earlier in pregnancy were more likely to receive epidural/spinal anesthesia

Table A. Epidural/spinal anesthesia receipt for singleton vaginal deliveries, by race and Hispanic origin: 27-state reporting area, 2008

Race and Hispanic origin	All singleton vaginal deliveries	Percent receiving epidural/spinal anesthesia	Not stated (N)
All races	1,829,302	61.0	21,492
One race, non-Hispanic			
White	910,522	68.6	4,149
Black	223,432	62.1	4,584
American Indian or Alaska Native	11,830	42.1	45
Asian	97,568	61.8	311
Native Hawaiian or Other Pacific Islander	3,496	52.8	22
More than one race, non-Hispanic	24,170	64.6	122
Hispanic	532,219	47.7	2,855
Mexican	364,367	43.8	1,681
Puerto Rican	28,309	68.1	185
Cuban	7,165	66.6	20
Central or South American	65,172	48.2	565
Other or unknown	67,206	57.6	404

NOTES: The 27-state reporting area represents 65 percent of U.S. singleton vaginal births. Race and Hispanic origin are reported separately on the birth certificates. Race categories are consistent with the 1997 Office of Management and Budget standards; see reference 14.

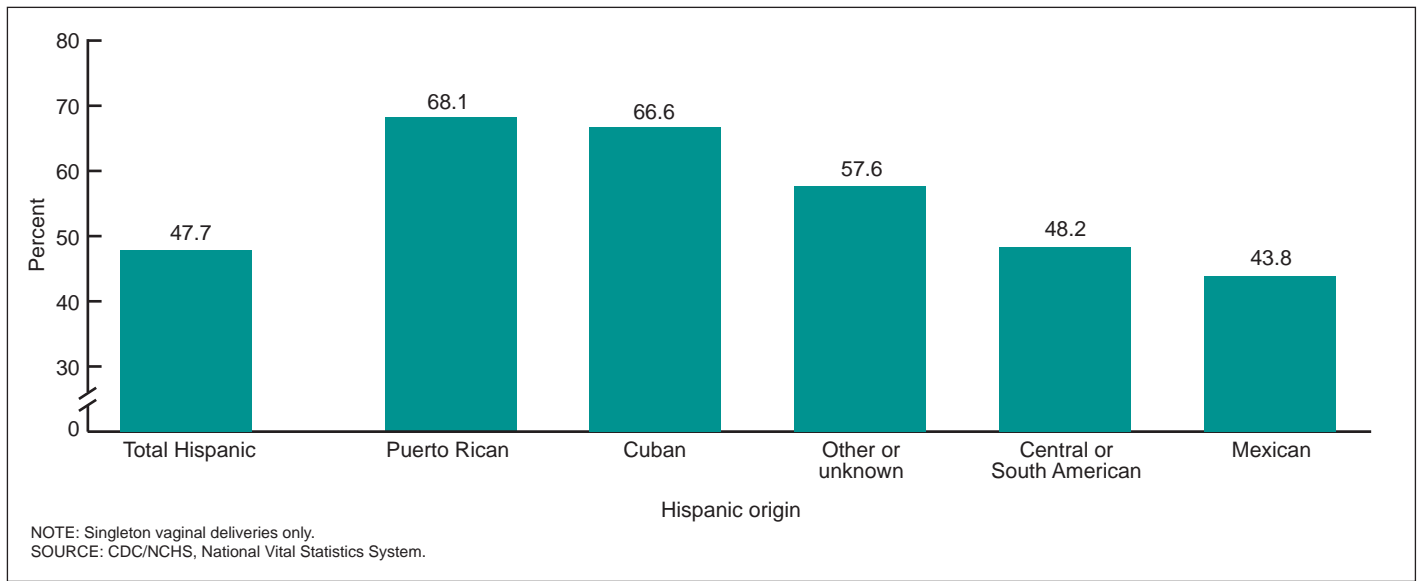


Figure 2. Epidural/spinal anesthesia receipt, by specified Hispanic origin: 27-state reporting area, 2008

(Table 2, Figure 5). Generally, the percentage of women receiving epidural/spinal anesthesia was highest among women who initiated prenatal care during the first 3 months of pregnancy (63.8 percent) and decreased steadily with increasingly late prenatal care initiation (Figure 5). Women who had no prenatal care were least likely to receive epidural/spinal anesthesia (44.4 percent).

Attendant at birth—More than three out of five women whose infants were delivered by a medical doctor (63.4 percent) or a doctor of osteopathic medicine (62.5 percent) received epidural/spinal anesthesia compared with less than one in two women attended by a certified nurse midwife (CNM) (49.8 percent) (Table 2). Women attended by CNMs were much less likely to receive epidural/spinal anesthesia in all racial and Hispanic origin groups (Table 2).

Method of delivery—The receipt of epidural/spinal anesthesia varied greatly by method of vaginal delivery (Table 2, Figure 6). Among the three different types of vaginal delivery (spontaneous, forceps, and vacuum), more than one-half of women (60.0 percent) who had spontaneous vaginal deliveries received epidural/spinal anesthesia during labor, compared with 83.8 percent of women who had a forceps delivery and 77.3 percent with a vacuum extraction. Patterns by method and route of delivery were similar for each racial and ethnic group (Figure 6).

Fetal presentation—Women delivering an infant in the cephalic (head first) presentation were more likely to receive epidural/spinal anesthesia for vaginal delivery (62.3 percent) than women delivering in the breech presentation (44.9 percent) and “other” presentations

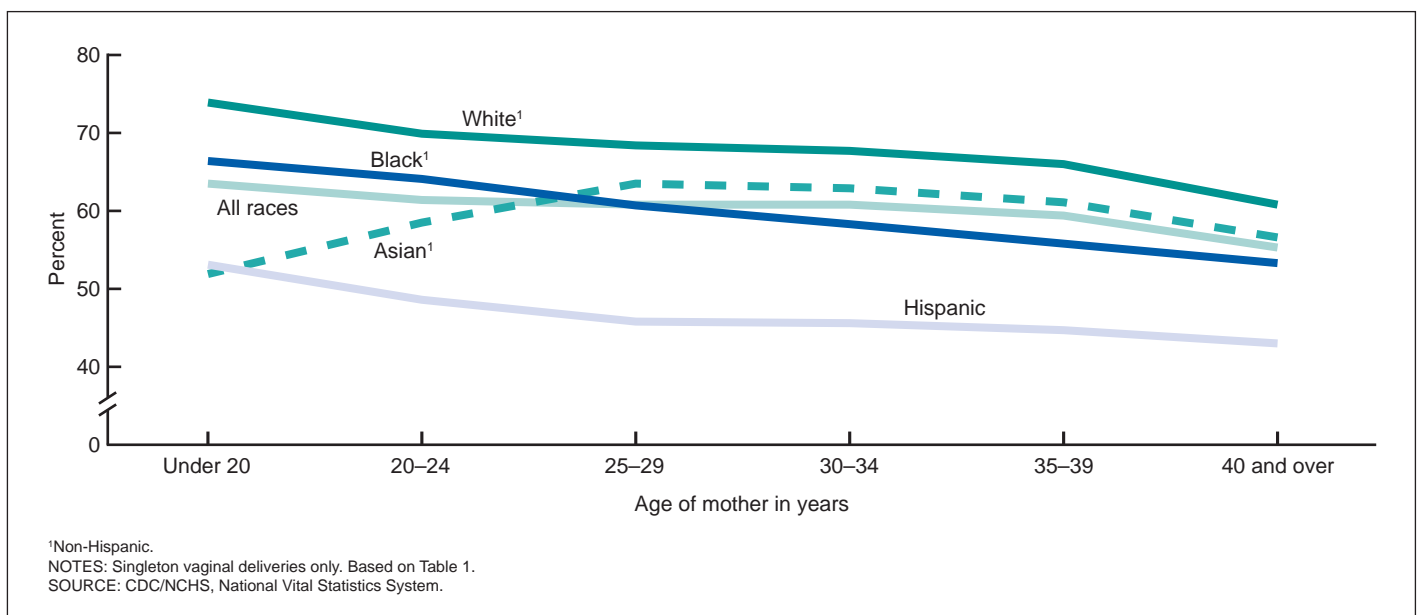


Figure 3. Epidural/spinal anesthesia receipt, by age of mother and by race and Hispanic origin: 27-state reporting area, 2008

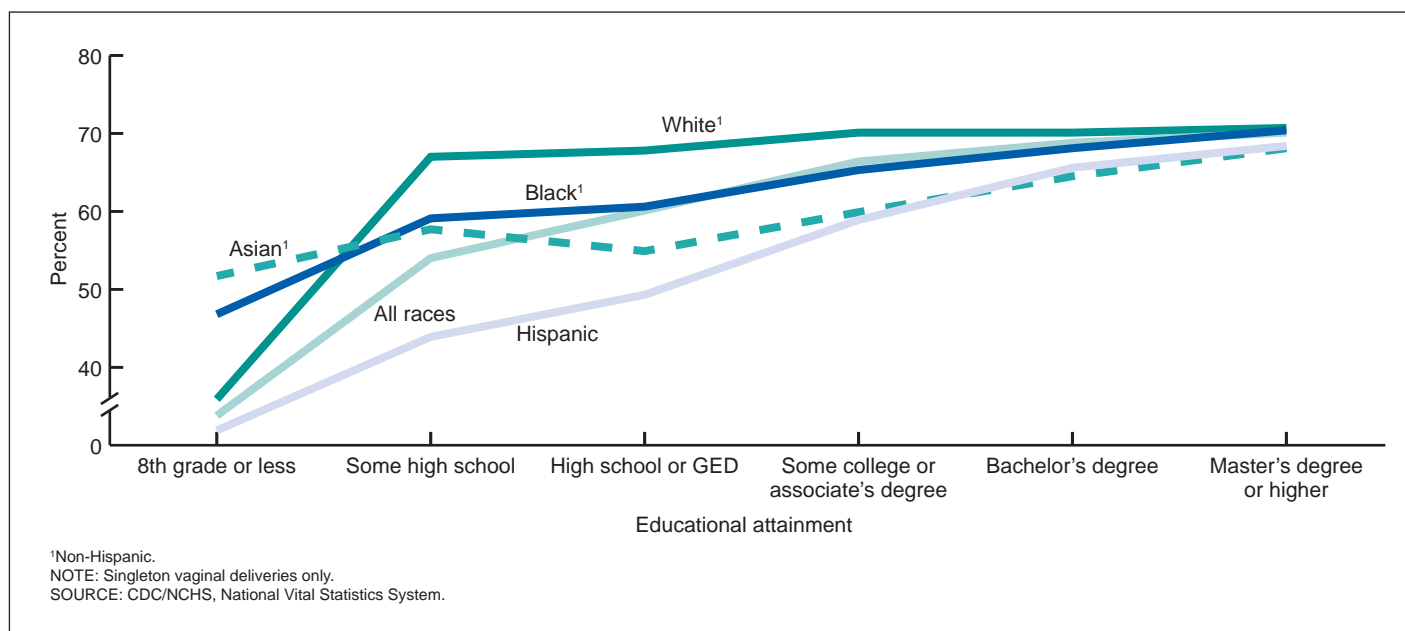


Figure 4. Epidural/spinal anesthesia receipt, by educational attainment and Hispanic origin of mother: 27-state reporting area, 2008

Table B. Percentage of women receiving epidural/spinal anesthesia for singleton vaginal deliveries by state: 27 reporting states, 2005–2008

State	2005	2006	2007	2008
California	---	34.6	40.4	42.5
Colorado	---	---	53.4	60.0
Delaware	---	58.6	65.3	69.9
Florida	57.2	59.6	62.1	65.0
Georgia	---	---	---	59.9
Idaho	68.9	[†] 68.2	69.9	68.4
Indiana	---	---	62.5	66.1
Iowa	---	---	58.8	63.3
Kansas	64.8	68.9	71.3	[†] 71.9
Kentucky	76.6	75.5	76.3	78.2
Michigan	---	---	---	50.0
Montana	---	---	---	55.6
Nebraska	66.7	70.1	71.8	[†] 72.6
New Hampshire	39.9	42.7	[†] 44.1	46.6
New Mexico	---	---	---	21.9
New York ¹	74.1	73.2	[†] 72.9	[†] 72.9
New York City	---	---	---	74.1
North Dakota	---	54.6	60.8	63.5
Ohio	---	---	64.8	71.0
Oregon	---	---	---	56.9
Pennsylvania	59.2	61.0	62.0	64.2
South Carolina	74.2	74.9	75.9	[†] 75.9
South Dakota	---	53.6	61.7	[†] 62.7
Tennessee	71.8	73.8	74.6	75.7
Texas	58.9	65.7	67.4	69.2
Vermont	---	44.0	48.1	[†] 47.3
Washington	55.3	57.6	58.9	59.5
Wyoming	---	60.7	[†] 62.5	66.3

[†] Not significantly different from previous year.

--- Data not available. State used 1989 U.S. Standard Certificate of Live Birth in specified year.

¹Excludes New York City.

NOTE: The 27-state 2008 reporting area represents 65 percent of U.S. singleton vaginal births.

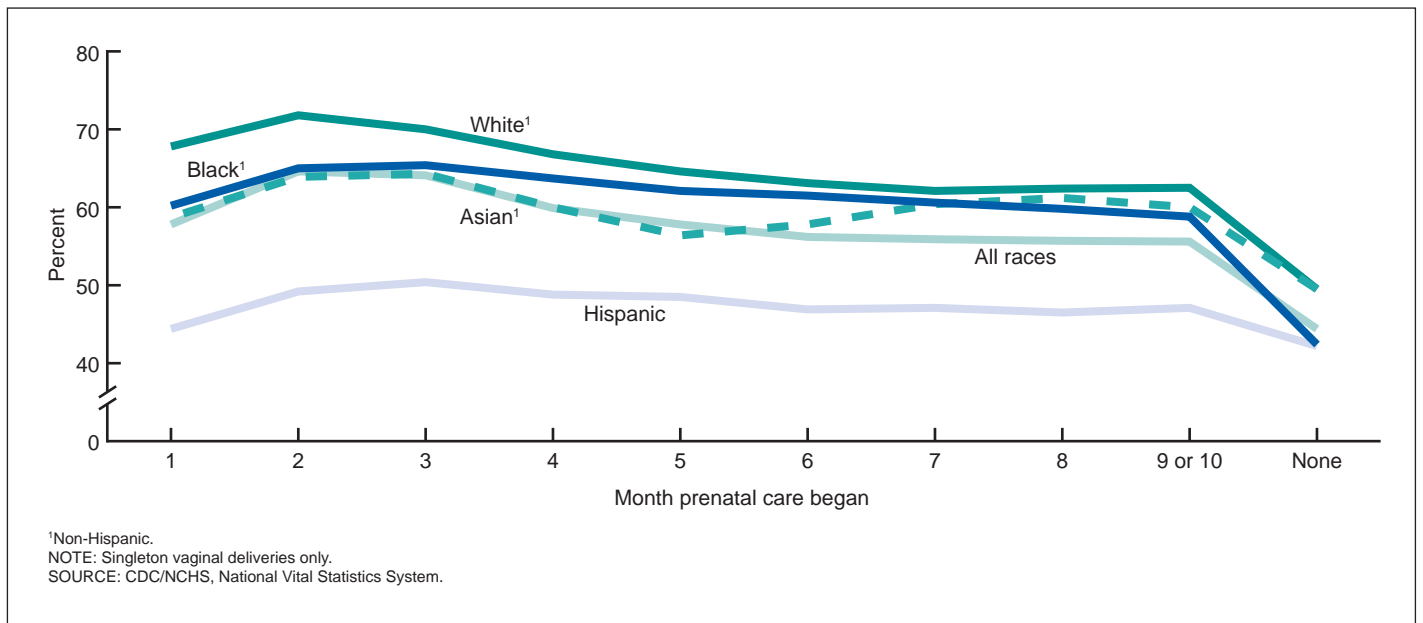


Figure 5. Percentage of women receiving epidural/spinal anesthesia, by month prenatal care began and by race and Hispanic origin of mother: 27-state reporting area, 2008

(56.0) (Table 2). (Breech presentation accounts for only 0.3 percent of all vaginal births; data not shown.) “Other” presentations are those in which the infant did not present head first and was not breech. Patterns varied by race and Hispanic origin (Table 2).

Gestational age—Receipt of epidural/spinal anesthesia increased from 32.3 percent of births prior to 28 weeks of gestation to 61.7 percent for term births (37–41 completed weeks). Rates decreased to 58.9 percent among births at 42 or more weeks (Table 2). Patterns were generally similar by race and ethnicity.

Birthweight—Receipt of epidural/spinal anesthesia also generally increased with birthweight. Among women with very low birthweight

infants (less than 1,500 grams), 35.6 percent received epidural/spinal anesthesia, compared with 57.6 percent of women with moderately low birthweight infants (1,500–2,499 grams) and 61.5 percent of women with infants weighing 2,500–3,999 grams (Table 2).

Selected health items

Table 3 shows levels of epidural/spinal anesthesia receipt for women with selected health and medical conditions compared with women with none of the selected conditions within the same category (risk factors, characteristics of labor and delivery, obstetric

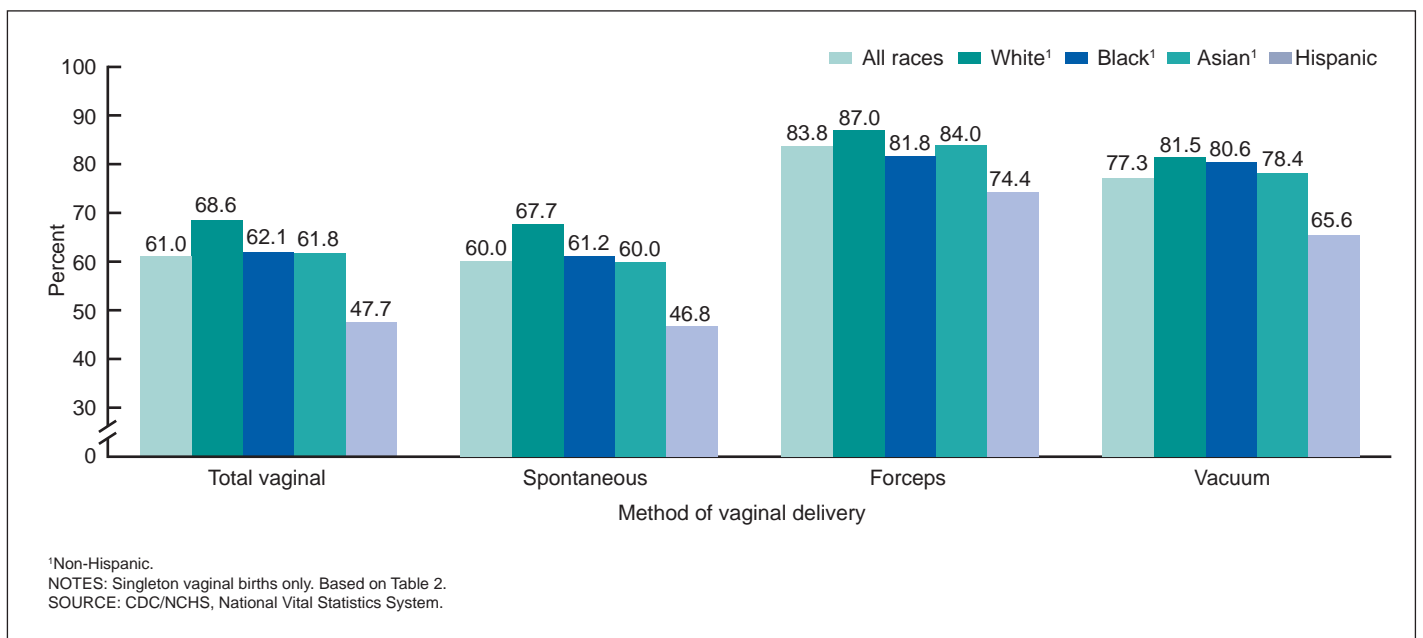


Figure 6. Epidural/spinal anesthesia, by method of delivery and race and Hispanic origin of mother: 27-state reporting area, 2008

procedures, and onset of labor). With only one exception (precipitous labor), the presence of any of the conditions or characteristics included in [Table 3](#) increased the likelihood of receiving epidural/spinal anesthesia.

Risk factors in this pregnancy—More than 7 out of 10 (74.2 percent) women who had chronic hypertension received epidural/spinal anesthesia compared with 60.3 percent of women with no reported risk factors during pregnancy. Women with pregnancy-induced hypertension were also more likely to receive epidural/spinal anesthesia than women with no risk factors (70.7 percent compared with 60.3 percent) ([Table 3](#)).

Characteristics of labor and delivery—Maternal fever during labor is a known side effect of epidural/spinal anesthesia receipt (3). Among women with chorioamnionitis (clinical chorioamnionitis diagnosed during labor or maternal temperature greater than or equal to 38° C/100.4° F), 87.2 percent had received epidural/spinal anesthesia compared with 45.3 percent of women with none of the characteristics of labor and delivery reported on the 2003 birth certificate ([Table 3](#)). It is not possible to distinguish between chorioamnionitis and maternal fever greater than or equal to 38° C in these data; maternal fever greater than or equal to 38° C may be more closely associated with epidural/spinal anesthesia.

Fetal intolerance of labor (requiring resuscitative measures, further fetal assessment, or operative delivery) was also associated with receipt of epidural/spinal anesthesia. Nearly 78 percent of women who experienced fetal intolerance of labor received epidural/spinal anesthesia compared with 45.3 percent without any other characteristics of labor and delivery ([Table 3](#)).

Only precipitous labor, that is, labor of less than 3 hours, was associated with decreased receipt of epidural/spinal anesthesia. Among women with precipitous labor, less than one out of three received epidural/spinal anesthesia (29.3 percent) compared with three out of five women who did not have any of the conditions of labor onset reported on the birth certificate ([Table 3](#)). This may be due to “precipitous” labor progressing too rapidly to allow for the administration of epidural/spinal anesthesia.

Discussion

This report shows that use of epidural/spinal anesthesia for pain relief during labor is very common in this 27-state reporting area. More than three out of five women received this treatment. White, Cuban, and Puerto Rican women received epidural/spinal anesthesia more often than women of other racial and ethnic groups as did women with more education and women having their first child. Not unexpectedly, use of epidural/spinal anesthesia was also associated with larger infants and more difficult pregnancies/deliveries (e.g., diabetes, hypertension, longer labors, instrumental assistance, etc.). However, even in the absence of most of the risk factors, conditions, and characteristics reported on the birth certificate, more than one-half of all women received epidural/spinal anesthesia.

Levels of epidural/spinal anesthesia receipt during labor shown here are comparable to estimates from other sources. The level of epidural/spinal anesthesia use reported in the 27-state reporting area is 61 percent (ranging by state from 22 to 78 percent), which is consistent with levels based on other sources for which rates ranged

from 38 to 77 percent (5,8–10). Further, receipt of epidural/spinal anesthesia for each racial and Hispanic origin group were also comparable to other sources (8,9,11).

This report shows large state differences in the percentage of mothers who receive epidural/spinal anesthesia. A state’s demographics may influence these differences as well as state, local, and physician practices, and hospital policies on epidural/spinal anesthesia administration. There may also be state differences in the completeness of data collection (12).

These data have several limitations. Although epidural/spinal anesthesia is recommended to be administered by an anesthesiologist only in controlled hospital settings, nonhospital births are included in these analyses (3); the number of nonhospital births is comparably small (approximately 1 percent of all singleton vaginal deliveries) and these events had essentially no effect on study results.

These data are also limited by the fact that the birth certificate does not provide information on the chronology of events that take place during labor and delivery. That is, for example, the onset of fever may precede the use of epidural/spinal anesthesia and, accordingly, may not be a consequence of the epidural/spinal anesthesia. Similarly, fetal intolerance of labor may precede the epidural/spinal anesthesia. All of the pregnancy risk factors included in this report (e.g., diabetes and hypertension) are conditions that exist prior to labor and delivery and may influence the need for epidural/spinal anesthesia.

These data are limited by a lack of information on other forms of pain relief. The group of women who did not receive epidural/spinal anesthesia is a heterogeneous group who may have received other forms of pharmaceutical pain relief, used nonpharmaceutical methods, or did not use formal pain relief.

Women who received epidural/spinal anesthesia during labor but ultimately had a cesarean delivery were excluded from the analysis. Thus, this analysis likely underestimates the proportion of all labors that involve epidural/spinal anesthesia.

These data are only representative of the 27 states included in this reporting area and are not generalizable to the United States as a whole. These 27 states differ significantly in their racial and Hispanic ethnicity composition as compared with all U.S. births as noted in the “Methods” section (see [Table](#) in “[Technical Notes](#)”). As more states adopt the 2003 birth certificate, these data will become more representative and will provide a more complete picture of the characteristics of women who receive epidural/spinal anesthesia during labor and delivery.

It is not possible to determine an overall trend for epidural/spinal anesthesia use due to the changing reporting area over the study period ([Table B](#)). However, there is some evidence that receipt of epidural/spinal anesthesia is increasing from year to year at the state level; levels increased in most states for which more than 1 year of data was available.

This report provides information on the characteristics of women who received epidural/spinal anesthesia during labor and delivery. It also provides an examination of certain circumstances of pregnancy, labor, and delivery also associated with receipt of epidural/spinal anesthesia. The differences in epidural/spinal anesthesia receipt by race and Hispanic origin demonstrated in this report have been documented in other studies (8,9,11). Studies show that differences in epidural/spinal anesthesia receipt persist when examined by rural or urban residence, access to anesthesiologists, and insurance status (8,9,11) and may be influenced by attitudes toward pain management

in labor and differences in the decision-making process (13). Efforts that take into account cultural difference in attitudes toward pain relief during labor and delivery are needed to better understand and address differences in epidural/spinal anesthesia receipt.

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List of Detailed Tables

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Table 1. Epidural/spinal anesthesia receipt for singleton vaginal deliveries, by age and birth order, and race and Hispanic origin of mother: 27-state reporting area, 2008

Race and Hispanic origin	All ages	Under 20 years	20–24 years	25–29 years	30–34 years	35–39 years	40 years and over
All births							
All races ¹	61.0	63.5	61.4	60.8	60.8	59.4	55.3
White	68.6	73.9	69.9	68.4	67.7	66.0	60.8
Black	62.1	66.4	64.1	60.7	58.3	55.8	53.3
Asian	61.8	51.9	58.5	63.5	62.9	61.1	56.6
Hispanic ²	47.7	53.1	48.6	45.8	45.6	44.7	43.0
First births							
All races ¹	68.1	65.3	67.5	70.5	70.8	69.3	65.2
White	74.2	75.2	74.0	74.6	73.9	72.1	68.6
Black	69.3	68.4	70.7	69.6	68.6	65.3	58.4
Asian	67.9	53.7	65.6	69.7	69.2	68.2	63.8
Hispanic ²	56.7	55.2	55.8	58.7	61.6	61.5	57.4
Second or higher births							
All races ¹	57.3	58.0	57.1	56.8	58.1	57.7	54.0
White	65.6	69.4	66.5	65.3	65.7	64.8	59.6
Black	58.6	61.3	60.5	58.7	56.7	54.7	52.8
Asian	57.6	45.5	48.9	57.3	59.4	59.0	55.3
Hispanic ²	43.4	47.3	44.2	42.4	43.1	42.8	41.8

¹Includes races other than white and black and origin not stated.

²Includes all persons of Hispanic origin of any race.

NOTES: The 27-state reporting area represents 65 percent of U.S. singleton vaginal births. Race and Hispanic origin are reported separately on the birth certificates. Race categories are consistent with the 1997 Office of Management and Budget standards; see reference 14. Data by race are non-Hispanic and exclude mothers reporting multiple races.

Table 2. Epidural/spinal anesthesia receipt for singleton vaginal deliveries, by selected characteristics and race and Hispanic origin of mother: 27-state reporting area, 2008

Selected characteristic	All races ¹	White	Black	Asian	Hispanic ²
Maternal					
Marital status					
Married	62.5	68.0	61.4	62.7	48.5
Not married.	59.1	70.0	62.4	56.2	46.9
Education					
Less than high school education	48.5	62.5	58.1	55.7	39.4
Bachelor's degree or higher	69.2	70.3	68.7	66.0	66.3
Medical services					
Prenatal care					
1st trimester care	63.8	70.7	64.7	63.6	49.2
3rd trimester care	55.7	62.3	60.0	60.6	46.9
No prenatal care.	44.4	49.5	42.4	49.5	42.2
Attendant at birth					
Medical doctor	63.4	72.3	63.7	63.0	48.9
Osteopath	62.5	67.6	62.9	61.3	48.5
Certified nurse midwife	49.8	54.4	53.1	53.2	40.8
Method of delivery					
Spontaneous vaginal	60.0	67.7	61.2	60.0	46.8
Forceps	83.8	87.0	81.8	84.0	74.4
Vacuum extraction.	77.3	81.5	80.6	78.4	65.6
Infant					
Presentation					
Cephalic	62.3	69.3	63.1	62.9	49.4
Breech	44.9	50.2	39.1	51.2	40.4
Other	56.0	68.7	64.5	57.1	40.1
Gestational age					
Less than 28 weeks	32.3	35.8	32.5	35.2	28.0
28 to 33 weeks	52.0	60.0	52.1	53.4	42.3
34 to 36 weeks	59.5	68.4	60.2	58.3	47.0
37 to 41 weeks	61.7	69.1	63.3	62.3	48.1
42 or more weeks.	58.9	65.8	61.5	61.1	46.2
Birthweight					
Less than 1,500 grams	35.6	39.7	35.6	39.7	30.4
1,500–2,499 grams	57.6	64.4	58.1	59.0	46.6
2,500–3,999 grams	61.5	69.2	63.0	62.0	47.9
4,000 or more grams	60.4	66.0	62.7	62.4	46.9

¹Includes races other than white and black and origin not stated.²Includes all persons of Hispanic origin of any race.

NOTES: The 27-state reporting area represents 65 percent of U.S. singleton vaginal births. Race and Hispanic origin are reported separately on the birth certificates. Race categories are consistent with the 1997 Office of Management and Budget standards; see reference 14. Data by race are non-Hispanic and exclude mothers reporting multiple races.

Table 3. Epidural/spinal anesthesia receipt for singleton vaginal deliveries, by selected pregnancy risk factors, characteristics of labor and delivery, obstetric procedures, onset of labor conditions, and race and Hispanic origin of mother: 27-state reporting area, 2008

Condition	All races ¹	White	Black	Asian	Hispanic ²
Risk factors in this pregnancy					
Prepregnancy diabetes	65.6	72.4	65.9	73.6	56.7
Gestational diabetes	66.4	73.1	68.5	71.0	53.7
Pregnancy-induced hypertension	70.7	75.1	67.4	72.0	62.2
Chronic hypertension	74.2	78.5	74.4	72.3	64.1
Eclampsia	67.6	74.5	63.6	60.0	59.5
None of the above risk factors	60.3	68.2	61.3	60.8	46.8
Characteristics of labor and delivery					
Induced labor	76.6	80.4	74.6	79.6	66.4
Augmented labor	75.0	80.4	74.2	79.4	63.8
Steroids	61.5	65.7	58.1	63.8	52.1
Antibiotics	71.6	75.7	70.0	73.3	62.4
Chorioamnionitis	87.2	89.8	82.6	91.1	84.7
Meconium staining	65.5	73.6	64.8	72.6	53.5
Fetal intolerance of labor	77.5	82.5	79.2	78.4	65.3
None of the above characteristics of labor and delivery	45.3	52.8	49.1	47.6	34.5
Onset of labor					
Precipitous labor	29.3	34.1	25.4	34.6	20.3
Prolonged labor	75.6	77.1	76.2	82.2	71.2
Premature rupture of membranes	69.5	73.9	65.3	76.5	60.5
None of the above onset of labor conditions	61.7	69.7	63.2	62.0	48.0

¹Includes races other than white and black and origin not stated.

²Includes all persons of Hispanic origin of any race.

NOTES: The 27-state reporting area represents 65 percent of U.S. singleton vaginal births. Race and Hispanic origin are reported separately on the birth certificates. Race categories are consistent with the 1997 Office of Management and Budget standards; see reference 14. Data by race are non-Hispanic and exclude mothers reporting multiple races.

Technical Notes

Sources of data

Data in this report are based on 100 percent of births registered in 27 states that implemented the 2003 U.S. Certificate of Live Birth as of January 1, 2008 (2): California, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Washington, and Wyoming. The 1,829,302 singleton vaginal deliveries to residents of the 27 states comprise 65 percent of all U.S. 2008 singleton vaginal deliveries.

Because these births are not a random sample of all births, the findings are not generalizable to the entire United States. Of note, the racial and Hispanic origin distributions of births for the 27-state area are substantively different from those for the entire United States (see Table). The 2003 revision of the U.S. Standard Certificate of Live Birth allows the reporting of more than one race (multiple races) for each parent (2). Accordingly, multiple-race data were reported by each of the states included in this report. However, it is not possible to compare the revised reporting area and entire United States without using bridged-race categories because many states that have not yet revised do not collect multiple-race information. Information on the processing and tabulation of data by race is presented in a recent report (7,14,15).

The 2003 Revision of the U.S. Standard Certificate of Live Birth

The 2003 revision of the birth certificate is seen as an important opportunity to improve data quality, primarily through the development of detailed, standardized data collection techniques. For more information on the revision and other new data, see "Expanded Health Data From the New Birth Certificate, 2006" (12).

Race of mother

Race of mother presented in this report is based on the minimum five categories stipulated in the Office of Management and Budget (OMB) standard (14)—American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, and white. OMB standards also allow reporting of one or more race categories (14). Single-race groups with more than 100,000 births were included in the detailed results (white, black, Asian). For more information on single- or multiple-race reporting, see "Characteristics of Births to Single- and Multiple-race Women: California, Hawaii, Pennsylvania, Utah, and Washington, 2003" (15).

Hispanic origin

Race and Hispanic origin are reported separately on the birth certificate. Data shown by race include persons of Hispanic or non-Hispanic origin. Data shown for Hispanic persons include all persons of Hispanic origin of any race.

Epidural or spinal anesthesia

A spinal block involves injecting pain medication into the spinal fluid via the lower back, providing immediate pain relief that lasts for

Table. Percentage of live births, by selected demographic and health characteristics: United States and total of 27 revised states, 2008

Characteristic of mother	27 states ¹	United States
Race or Hispanic origin of mother		
Non-Hispanic white ²	**51.3	53.81
Non-Hispanic black ²	**13.26	14.78
Hispanic ³	**28.93	24.70
Mexican	**19.46	16.25
Puerto Rican	**1.60	1.64
Cuban	**0.54	0.40
Central or South American	**3.61	3.69
Other and unknown Hispanic	**3.73	2.73
American Indian or Alaska Native ⁴	**0.88	1.17
Asian or Pacific Islander	**6.09	5.96
Unmarried women	**41.07	40.65
Age of mother		
Under 20 years	**10.52	10.37
20–24 years	**24.92	24.77
25–29 years	**28.01	28.15
30–34 years	**22.31	22.52
35–39 years	11.52	11.51
40–54 years	**2.71	2.67
Characteristic of infant or delivery		
Very preterm ⁵	**1.94	1.99
Preterm ⁶	**12.16	12.33
Very low birthweight ⁷	**1.42	1.46
Low birthweight ⁸	**8.05	8.19
4,000 grams or more ⁹	7.61	7.63
Singleton births	**96.68	96.59

** Difference significant at $p = 0.05$.

¹California, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Montana, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Washington, and Wyoming.

²Race and Hispanic origin are reported separately on birth certificates. Race categories for this table are consistent with the 1977 Office of Management and Budget (OMB) standards. All states in the 27-state reporting area reported multiple-race data for 2007. The multiple-race data for these were bridged to the single-race categories of the 1977 OMB standards for comparability with other states; see "Technical Notes."

³Includes persons of Hispanic origin of any race.

⁴Includes births to Aleut and Eskimo persons.

⁵Born prior to 32 completed weeks of gestation.

⁶Born prior to 37 completed weeks of gestation.

⁷Birthweight of less than 1,500 grams (3 pounds, 4 ounces).

⁸Birthweight of less than 2,500 grams (5 pounds, 8 ounces).

⁹Equivalent to 8 pounds, 14 ounces.

NOTES: It was necessary to use bridged-race categories to compare the 27-state reporting area with the entire United States for which single-race data are not available. This table includes all births. The distributions are similar for singletons only.

about 2 hours (3). For epidural analgesia, the injection is made close to the nerves that transmit stimuli from the uterus and birth canal; however, relief is slower than for a spinal block, taking effect in 10–20 minutes. A catheter left in place after the initial injection allows for easy repeated doses throughout labor (3,5). For cesarean births and those involving forceps or vacuum extraction, anesthesia may be used instead of analgesia for more complete pain relief (3). The combined spinal-epidural is a combination of these two methods, providing immediate pain relief that can last throughout labor with repeat doses (3).

Age of mother

Age of mother is computed in most cases from the mother's and infant's dates of birth as reported on the birth certificate. Beginning in

2003 for births occurring in states using the 2003 revision of the birth certificate (revised), age of mother is imputed for ages 8 and under and 65 and over (mother's age of 9 years is recoded as 10 years). A review and verification of unedited data for several years including 2007 showed that the vast majority of births reported as occurring to women aged 50 and over were to women aged 50–54. In this report, tables labeled 45–49 years, 45–54 years, and 50–54 years include births to mothers up to age 64.

In 2008, age of mother was not reported on 0.01 percent of the records; for these records age of mother was imputed according to the last record with the same race and total birth order.

Marital status

National estimates of births to unmarried women are based on two methods of determining marital status. Birth certificates in 48 states and the District of Columbia included a direct question about mother's marital status; in two of these states, California and Nevada, a direct question is part of the electronic birth registration process (transmitted to the National Center for Health Statistics) but does not appear on certified or paper copies of the birth certificate. The question in most states is: "Mother married? (At birth, conception, or any time between) (Yes or no)." Marital status is inferred in Michigan and New York. A birth is inferred as nonmarital if a paternity acknowledgment was filed or if the father's name is missing from the birth certificate (listed in respective priority-of-use order).

Gestational age

The primary measure used to determine the gestational age of the newborn is the interval between the first day of the mother's last normal menstrual period (LMP) and the date of birth. It is subject to error for several reasons, including imperfect maternal recall or misidentification of LMP because of postconception bleeding, delayed ovulation, or intervening early miscarriage. These data are edited for LMP-based gestational ages that are clearly inconsistent with the infant's plurality and birthweight, but reporting problems for this item persist and may occur more frequently among some subpopulations and among births with shorter gestations (16,17).

Computations of percentages and percent distributions

Births for which a particular characteristic is unknown were subtracted from the figures for total births that were used as denominators before percentages and percent distributions were computed. The percentage of records with missing information for each item is shown by state in Table B in "User Guide to the 2008 Natality Public Use File" (16) and includes all births to residents in the reporting area that occurred outside of the reporting area (i.e., in a jurisdiction that has not adopted the 2003 U.S. Standard Certificate of Live Birth). This percentage was 0.6 percent for the 27-state reporting area for 2008 with levels ranging from 0.5 percent (Nebraska and Washington) to 8.7 percent (New Hampshire).

The comparatively high level of unknown data for New Hampshire reflects the fact that 9.5 percent of births to New Hampshire residents occurred not in New Hampshire, but in states (mostly in Massachusetts) that have not yet implemented the 2003 Revision of the U.S. Standard

Certificate of Live Birth. For example, by residence, the percentage unknown for New Hampshire for obstetric procedures was 9.4 percent; see Table B in "User Guide to the 2008 Natality Public Use File" (16). However, when the unknown rate was examined by occurrence (i.e., only for births that occurred in the state), the unknown rate decreased to 0.8 percent (data not shown).

Random variation and significance testing for natality data

For information and discussion on random variation and significance testing for natality data, see "User Guide to the 2008 Natality Public Use File" (16).

Definitions of medical terms

Detailed definitions, recommended sources, and keywords for the medical and health data items are available in the "Guide to Completing the Facility Worksheets for the Certificate of Live Birth and Report of Fetal Death" (18).

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