

Births: Final Data for 2003

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Abstract

Objectives—This report presents 2003 data on U.S. births according to a wide variety of characteristics. Data are presented for maternal demographic characteristics including age, live-birth order, race, Hispanic origin, marital status, and educational attainment; maternal characteristics (medical risk factors, weight gain, and tobacco and alcohol use); medical care utilization by pregnant women (prenatal care, obstetric procedures, complications of labor and/or delivery, attendant at birth, and method of delivery); and infant characteristics (period of gestation, birthweight, Apgar score, abnormal conditions, congenital anomalies, and multiple births). Also presented are birth and fertility rates by age, live-birth order, race, Hispanic origin, and marital status. Selected data by mother's State of residence are shown, as well as data on month and day of birth, sex ratio, and age of father. Trends in fertility patterns and maternal and infant characteristics are described and interpreted.

Methods—Descriptive tabulations of data reported on the birth certificates of the 4.09 million births that occurred in 2003 are presented. Denominators for population-based rates are derived from the U.S. 2000 census.

Results—In 2003 there were 4,089,950 live births reported in the United States, 2 percent more than the number in 2002. The crude birth rate (CBR) and general fertility rate (GFR) rose slightly. Childbearing among teenagers declined for the 12th straight year to another historic low. Birth rates for women aged 20–24 years also declined, whereas rates for women aged 25–44 years increased 2–6 percent, reaching highs not reported since the mid- to late 1960s. All measures of unmarried childbearing increased considerably in 2003, but smoking during pregnancy continued to decline. Timely initiation of prenatal care improved slightly. The cesarean delivery rate jumped another 5 percent to another all-time high, and the rate of vaginal birth after previous cesarean dropped 16 percent, an all-time low. Key measures of birth outcome—the percentages of preterm and low birthweight (LBW) births—rose. The twinning rate increased, but the rate of triplet and higher order multiple births was essentially stable.

Keywords: births • birth certificate • maternal and infant health • birth rates • maternal characteristics

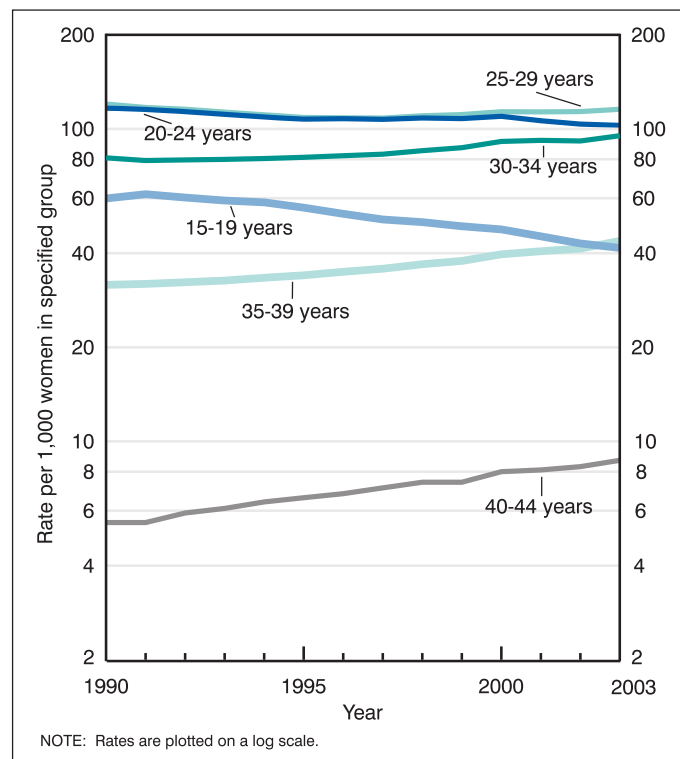


Figure 1. Birth rates by age of mother: United States, 1990–2003

Highlights

- In 2003, 4,089,950 births were registered in the United States, 2 percent more than in 2002. Births increased among non-Hispanic white, Hispanic, American Indian, and Asian or Pacific Islander (API) women but decreased among non-Hispanic black women.
- The 2003 **crude birth rate** for the United States increased 1 percent from 2002, to 14.1 live births per 1,000 total population. The **general fertility rate (GFR)** also increased, to 66.1 live births per

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1,000 women aged 15–44 years, 2 percent higher than the 2002 rate. Fertility rates increased for non-Hispanic white and Hispanic women by 2 and 3 percent, respectively, but decreased slightly for non-Hispanic black women. Fertility also increased for API women but was essentially unchanged for American Indian women.

- **The teenage birth rate** fell 3 percent in 2003 to 41.6 births per 1,000 women aged 15–19 years, another record low for the Nation. The rate has plummeted by one-third since the 1991 peak (61.8). The rate for females aged 10–14 years declined to 0.6 per 1,000, a one-third decline since 2000. Birth rates for teenagers 15–17 and 18–19 years each fell 3 percent. The rate for ages 15–17 years was 22.4 per 1,000, 42 percent lower than in 1991, and the rate for ages 18–19 years was 70.7 per 1,000, 25 percent lower than in 1991. Declines in rates have been especially striking for black teenagers: their overall rate dropped 45 percent since 1991, whereas the rate for young black females 15–17 years has plunged more than half. Rate declines for all teenagers were substantial enough to more than compensate for the increased number of female teenagers, so that the number of births to women under 20 years dropped to the fewest since 1946, the first year of the baby boom. **See figure 1.**
- The **birth rate for women aged 20–24 years** declined to 102.6 births per 1,000 women in 2003, the lowest rate on record. The birth rate for **women aged 25–29 years** rose 2 percent, to 115.6. The **birth rates for women aged 30–34 and 35–39 years** also rose, to 95.1 and 43.8, respectively, the highest rates reported since the mid-1960s. The **birth rate for women 40–44 years** increased 5 percent, to 8.7, the highest rate reported since 1969; the rate for this age group is up 58 percent since only 1990. The birth rate for women 45–49 years of age was unchanged.
- The **first birth rate** rose 3 percent between 2002 and 2003, to 26.5 births per 1,000 women aged 15–44 years. First birth rates for women under 20 years of age decreased, whereas first birth rates for women aged 25–44 years increased; rates for women 20–24 and 45–49 years of age were essentially unchanged.
- The mean or average age at first birth for the United States in 2003 was 25.2 years, slightly higher than in 2002.
- **Childbearing by unmarried women** rose steeply in 2003. The **birth rate** per 1,000 unmarried women aged 15–44 years jumped 3 percent to 44.9 births, breaking an 8-year period of little change.

The number of births to unmarried women climbed 4 percent to 1,415,995, the highest number recorded in the more than six decades for which national data are available. The proportion of all births to unmarried women increased to 34.6 percent; this measure has risen steadily since the late 1990s. Despite the overall increases, birth rates for unmarried teenagers continued to fall, with declines for younger teenagers outpacing those for older teenagers.

- **Cigarette smoking** during pregnancy fell to 10.7 percent of women giving birth in 2003. Among women who smoked, about one-quarter smoked half a pack of cigarettes or more per day. Smoking rates are especially high for women aged 18–24 years. Smoking during pregnancy is an important preventable risk factor for poor birth outcome. Compared with 7.7 percent of babies born to nonsmokers, in 2003, 12.4 percent of babies born to smokers were low birthweight (LBW), that is, they weighed less than 2,500 grams.
- **Timely initiation of prenatal care** improved again in 2003, rising to 84.1 percent of all mothers. The proportion of women beginning care in the first trimester of pregnancy has increased 11 percent since 1990. Late (care in the last trimester) or no prenatal care declined to 3.5 percent in 2003, down from 6.1 percent in 1990. Small gains in prenatal care timing were seen among each of the largest racial and ethnic groups between 2002 and 2003.
- The rate of **induction of labor** was unchanged for 2003 at 20.6 percent; this rate has more than doubled since 1990 (9.5 percent).
- For 2003 the **rate of cesarean delivery** increased 5 percent to 27.5 percent of all births, the highest rate ever reported in the United States. After falling between 1989 and 1996, the cesarean rate has risen by one-third. The **primary rate** increased 6 percent, and the rate of **vaginal birth after cesarean delivery (VBAC)** fell by 16 percent for 2002–03.
- The **preterm birth rate** (percentage of infants delivered at less than 37 completed weeks of gestation) increased 2 percent in 2003 to 12.3 percent of all births. The preterm delivery rate has risen 16 percent since 1990 and by more than 30 percent since 1981. Most of the current year increase was among infants born moderately preterm (32–36 weeks of gestation). Significant increases in moderately preterm births were also seen among singleton births only. Preterm rates increased among non-Hispanic white, non-Hispanic black, and Hispanic infants for the current year.
- The **low birthweight rate** (less than 2,500 grams) also increased in 2003, to 7.9 percent, the highest level reported since 1970. The percentage of infants born LBW has risen 18 percent since the 1984 low (6.7 percent). The rise for 2002–03 was among moderately LBW infants (1,500–2,499 grams); the very low birthweight (VLBW) level (less than 1,500 grams) was essentially unchanged. Levels increased for the three largest racial and ethnic groups and for singleton births only.
- The number of births in twin deliveries increased 3 percent for 2002–03, to 128,665 births; the twin birth rate rose 1 percent to 31.5 twins per 1,000 live births. Since 1980 the number of twins has climbed by three-fourths and the rate by two-thirds. The rate of **triplet and other higher order multiple births** (triplet+) was 187.4 per 100,000 in 2003, not significantly different from the 2002 level. The triplet/+ rate had surged from 37.0 to 193.5 between

1980 and 1998 but has been essentially stable since 1999. Multiple births continue to be at high risk of being delivered preterm or LBW.

Introduction

This report presents detailed data on numbers and characteristics of births in 2003, birth and fertility rates, maternal lifestyle and health characteristics, medical services utilization by pregnant women, and infant health characteristics. These data provide important information on fertility patterns among American women by such characteristics as age, live-birth order, race, Hispanic origin, marital status, and educational attainment. Up-to-date information on these fertility patterns is critical to understanding population growth and change in this country and in individual States. Data on maternal characteristics such as weight gain, tobacco and alcohol use, and medical risk factors are useful in accounting for differences in birth outcomes. Information on use of prenatal care, obstetric procedures, complications of labor and/or delivery, attendant at birth and place of delivery, and method of delivery by maternal demographic characteristics can also help explain differences in birth outcomes. It is very important that data on birth outcomes, especially levels of LBW and preterm birth, be monitored continuously because these variables are important predictors of infant mortality and morbidity.

A report of preliminary birth statistics for 2003 presented data on selected topics based on a substantial sample (98.5 percent) of the 2003 birth file (1). Findings for the selected measures (age, race, Hispanic origin, marital status of mother, live-birth order, prenatal care, maternal smoking, cesarean delivery, preterm births, and LBW) based on the preliminary data are very similar to those presented here based on final data. In addition to the tabulations included in this report, more detailed analysis is possible by using the Natality public-use file that is issued for each year. The data file is available on tape and in CD-ROM format since 1968, and selected detailed data tables are available on the National Center for Health Statistics (NCHS) Web site at <http://www.cdc.gov/nchs/datawh/statab/unpubd/natality/natab2000.htm> (2,3).

Methods

Data shown in this report are based on 100 percent of the birth certificates registered in all States and the District of Columbia. More than 99 percent of births occurring in this country are registered (4). Tables showing data by State also provide separate information for Puerto Rico, Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Marianas. However, these areas are not included in totals for the United States.

This report includes data for two States, Pennsylvania and Washington, that implemented the 2003 revision of the U.S. Standard Certificate of Live Birth in 2003 (revised), and also the remaining 48 States and the District of Columbia for which data are based on the 1989 revision of the U.S. Standard Certificate of Live Birth (unrevised). The 2003 revision is described in detail elsewhere (5–7); a forthcoming report will present information on new items for the revised States. Because few States provide data based on the revised certificate, in this report revised data are combined with unrevised data where comparable. Data for Pennsylvania and Washington are excluded from

the national figures for items where data are not comparable. The comparability of data items between the 1989 and the 2003 certificates is discussed in the “Technical Notes.”

Race and Hispanic origin are reported independently on the birth certificate. In tabulations of birth data by race and Hispanic origin, data for Hispanic persons are not further classified by race because the majority of women of Hispanic origin are reported as white. Most tables in this report show data for these categories: white total; non-Hispanic white; black total; non-Hispanic black; and Hispanic. Text discussions are for non-Hispanic white, non-Hispanic black, and Hispanic mothers wherever measures for these groups are available. Data for American Indian and Asian or Pacific Islander (API) births are not shown separately by Hispanic origin because the majority of these populations are non-Hispanic. Data are also presented for four specific Hispanic subgroups: Mexican, Puerto Rican, Cuban, and Central and South American, and for an additional subgroup referred to as “other and unknown Hispanic.” Text references to black births and black mothers or white births and white mothers are used interchangeably for ease in writing.

In 1997 the Office of Management and Budget (OMB) issued “Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity” (8–10). The 1997 revised standards incorporated two major changes designed to reflect the changing racial and ethnic profile of the United States. First, the revision increased from four to five the minimum set of categories to be used by Federal agencies for identification of race. The 1977 standards required Federal agencies to report race-specific tabulations using a minimum set of four single-race categories: American Indian or Alaska Native (AIAN), Asian or Pacific Islander (API), black, and white. The 1997 revised standards called for reporting Asians separately from Native Hawaiians or Other Pacific Islanders. The revised standards also require Federal data collection programs to allow respondents to select *one or more race categories*.

For the 2000 decennial census, the U.S. Census Bureau collected race and ethnicity data in accordance with the 1997 revised standards. However, the National Vital Statistics System, which is based on data collected by the States, will not be fully compliant with the new standards until all of the States revise their birth certificates to reflect the new standards. Thus, beginning with the 2000 data year, the numerators (births) for birth rates are incompatible with the denominators (populations) (see “Population denominators”). In order to compute rates, it is necessary to bridge population data for multiple-race persons to single-race categories. This has been done for birth rates by race presented in this report. Once all States revise their birth registration systems to comply with the 1997 OMB standards, the use of bridged populations can be discontinued.

Beginning with the 2003 data year, multiple-race was reported by California, Hawaii, Ohio (for births occurring in December only), Pennsylvania, Utah, and Washington. Data from the vital records of the remaining 44 States and the District of Columbia followed the 1977 OMB standards in which a single race is reported (8,9). In addition, these areas also report the minimum set of four races as stipulated in the 1977 standards, compared with the minimum of five races for the 1997 standards.

To provide uniformity and comparability of the data during the transition period before multiple-race data are available for all reporting areas, it is necessary to bridge the responses of those who reported more than one race to a single-race category. Multiple-race is imputed

to a single race (one of the following: AIAN, API, black, or white) according to the combination of races, Hispanic origin, sex, and age indicated on the birth certificate of the mother or father (10–13). See “Technical Notes.” The bridging procedure imputes multiple-race of mothers as reported on the birth certificate to one of the four minimum races stipulated in the 1977 OMB standards, that is, AIAN, API, black, or white. Mothers of a specified API subgroup (i.e., Chinese, Japanese, Hawaiian, or Filipino) in combination with another race (i.e., AIAN, black, or white) or another API subgroup cannot be imputed to a particular API subgroup. For this report, data are not shown for the specified API subgroups because of this change (14) (see “Technical Notes”). A report on births in 2003 to multiple-race women, which will include births to single- and multiple-race women of the API subgroups, is forthcoming.

Information on the measurement of marital status, gestational age, and birthweight; the computation of derived statistics and rates; population denominators; random variation and relative standard error; and the definitions of terms are presented in the “Technical Notes.”

Information on births by age, race, or marital status of mother is imputed if it is not reported on the birth certificate. These items were not reported for less than 1 percent of U.S. births in 2003. (See “Technical Notes” for additional information.) All other maternal and infant characteristics (except items on which length of gestation is calculated) are not imputed. Births for which a particular characteristic is unknown are subtracted from the figures for total births that are used as denominators before percentages, percent distributions, and medians are computed. Levels of non-reporting vary substantially by specific item and by State. Table I in the “Technical Notes” provides information on the percentage of records with missing information for each item by State for 2003. Readers should note that the levels of incomplete or inaccurate reporting for some of the items are quite high in some States. Data for 2003 for Alaska and Rhode Island are of particular concern.

Demographic Characteristics

Births and birth rates

Number of births

In 2003 a total of 4,089,950 **births** were registered in the United States, 68,224 more than in 2002 (an increase of 2 percent). The 2003 total is the highest number reported since 1963 (4,098,020). Except for a brief upward trend in the late 1990s, the number of births had generally declined since 1990, the most recent peak (4,158,212). (See tables 1–12 for national and State data by age, live-birth order, race, and Hispanic origin.)

The number of births for 2003 generally increased for all race and Hispanic origin groups (tables 1 and 6). Births rose 1 percent for non-Hispanic white women and 4 percent for Hispanic women. Births to American Indian and Asian or Pacific Islander (API) women increased 2 and 5 percent, respectively, whereas births to non-Hispanic black women (the only group to decline in 2003) fell slightly, by less than 1 percent. Among the specified Hispanic groups, increases in births ranged from 2 percent for Puerto Rican women to 8 percent for Central and South American women.

Crude birth rate

The **crude birth rate** (CBR) for 2003, 14.1 live births per 1,000 total population, was 1 percent higher than the rate for 2002 (13.9), the lowest birth rate on record for the United States (14). The 2003 rate is 16 percent lower than the most recent peak in 1990, 16.7. The CBR dropped steadily from 1990 to 1997 but has fluctuated since (table 1).

Fertility rate

In 2003 the **general fertility rate** (GFR) was 66.1 live births per 1,000 women of childbearing age (15–44 years), an increase of 2 percent from 2002 (64.8) and the highest rate since 1993 (67.0). Since 1990 the GFR has fluctuated but overall has declined 7 percent (from 70.9) (figure 2 and table 1).

The GFRs of non-Hispanic white (58.5 per 1,000 aged 15–44 years) and Hispanic (96.9) women rose 2 and 3 percent, respectively, between 2002 and 2003 (tables 1 and 6). Fertility also increased for API women (by 3 percent to 66.3). However, the rate for non-Hispanic black women declined slightly from 67.4 in 2002 to 67.1 in 2003; the rate for American Indian women was essentially unchanged. Among the specified Hispanic origin groups, the rates for Mexican, Cuban, and other Hispanic women increased 3, 5, and 6 percent, respectively, whereas the rate for Puerto Rican women was down 6 percent. Since 1990 fertility rates have decreased for all race and Hispanic origin groups except Cubans.

Age of mother

Teenagers—Birth rates for adolescents fell again in 2003, reaching historic lows for the Nation. Rates fell for all age groups, and, with only one or two exceptions, rates also declined within age groups for all race and ethnic population subgroups (tables A, 3, 4, 8, and 9). The **birth rate for the youngest teenagers** declined to 0.6 births per 1,000 females aged 10–14 years in 2003, compared with 0.7 in 2002; the 2003 rate was less than one-half the rate reported during 1989–94 (1.4 per 1,000) (15). The decline in the birth rate was substantial enough to more than compensate for the

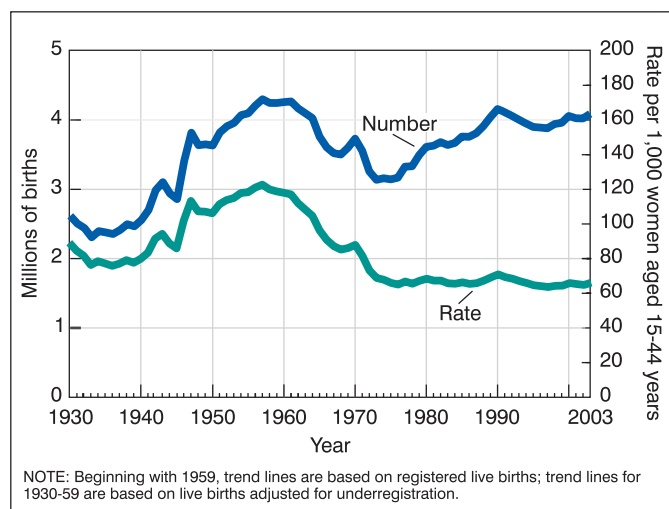


Figure 2. Live births and fertility rates: United States, 1930–2003

Table A. Birth rates for teenagers 15–19 years, by age, race, and Hispanic origin: United States, 1991, 2000, 2002, and 2003, and percentage change in rates, 1991–2003 and 2002–2003

[Rates per 1,000 women in specified group]

Age and race and Hispanic origin of mother	2003	2002	1991	Percent change, 2002–2003	Percent change, 1991–2003
10–14 years					
All races ¹	0.6	0.7	1.4	-14	-57
Non-Hispanic white	0.2	0.2	0.5	0	-60
Non-Hispanic black	1.6	1.9	4.9	-16	-67
American Indian total ²	1.0	0.9	1.6	11	-38
Asian or Pacific Islander total ²	0.2	0.3	0.8	-33	-75
Hispanic ³	1.3	1.4	2.4	-7	-46
15–19 years					
All races ¹	41.6	43.0	61.8	-3	-33
Non-Hispanic white	27.4	28.5	43.4	-4	-37
Non-Hispanic black	64.7	68.3	118.2	-5	-45
American Indian total ²	53.1	53.8	84.1	-1	-37
Asian or Pacific Islander total ²	17.4	18.3	27.3	-5	-36
Hispanic ³	82.3	83.4	104.6	-1	-21
15–17 years					
All races ¹	22.4	23.2	38.6	-3	-42
Non-Hispanic white	12.4	13.1	23.6	-5	-47
Non-Hispanic black	38.7	41.0	86.1	-6	-55
American Indian total ²	30.6	30.7	51.9	0	-41
Asian or Pacific Islander total ²	8.8	9.0	16.3	-2	-46
Hispanic ³	49.7	50.7	69.2	-2	-28
18–19 years					
All races ¹	70.7	72.8	94.0	-3	-25
Non-Hispanic white	50.0	51.9	70.6	-4	-29
Non-Hispanic black	105.3	110.3	162.2	-5	-35
American Indian total ²	87.3	89.2	134.2	-2	-35
Asian or Pacific Islander total ²	29.8	31.5	42.2	-5	-29
Hispanic ³	132.0	133.0	155.5	-1	-15

¹Includes races other than white and black.

²Race and Hispanic origin are reported separately on birth certificate. Race categories are consistent with the 1977 Office of Management and Budget standards. Data for persons of Hispanic origin are included in the data for each race group according to the mother's reported race; see "Technical Notes."

³Includes all persons of Hispanic origin of any race; see "Technical Notes."

increased number of female teenagers (table II) (16) so that the number of births in this age group also fell sharply, to 6,661, a 9-percent drop from 2002 (7,315).

The birth rate for teenagers 15–19 years declined 3 percent to 41.6 births per 1,000 females (tables A, 4, and 9). This rate has dropped 33 percent since the recent peak in 1991 (61.8). As was true for younger teenagers, the falling birth rate has resulted in fewer births to teenagers 15–19, even though the number of female teenagers increased modestly in 2003 (table II). In 2003 teenagers aged 15–19 years gave birth to 414,580 babies, more than 100,000 fewer than the recent peak in 1990 (521,826).

Birth rates for teenagers aged 15–17 and 18–19 years each dropped 3 percent in 2003, to 22.4 and 70.7, respectively. Overall since 1991 the rate for teenagers aged 15–17 years fell 42 percent, whereas the rate for older teenagers declined 25 percent. Births to 15–17-year-olds fell to 134,384, the fewest since 1952, whereas births to older teenagers declined to 280,196, the fewest since 1946 (235,282).

Birth rates for teenagers differ sharply among race and Hispanic ethnicity population subgroups. In 2003 the overall rate was highest for

Mexican teenagers, 93.2 per 1,000 aged 15–19 years, and lowest for API teenagers, 17.4. In-between rates were 64.7 for non-Hispanic black teenagers, 60.8 for Puerto Ricans, 53.1 for American Indians, and 27.4 for non-Hispanic white teenagers.

Whereas rates have fallen for adolescents in all groups over the 1991–2003 period, the most striking declines are for non-Hispanic black teenagers. Overall, their rate fell 45 percent during this period, but the rate for non-Hispanic black teenagers aged 15–17 years has fallen more than one-half, from 86.1 per 1,000 in 1991 to 38.7 in 2003 (figure 3, table A). State-specific teenage birth rates are discussed later in this report.

Teenage pregnancy rates have fallen substantially since 1990, generally mirroring the declines in the teenage birth rates. Pregnancy rates are computed from the sums of live births, induced abortions, and fetal losses. Currently, teenage pregnancy rates are available through 2000, the most recent year for which detailed national abortion estimates are available (17–20). The teenage pregnancy rate in 2000 was 84.5 per 1,000 females aged 15–19 years, the lowest rate reported since 1976, when the Centers for Disease Control and Prevention, NCHS series of national estimates first became available (19,20). The rate has dropped 27 percent since its 1990 peak (116.3). The decline in the pregnancy rate during 1990–2000 is reflected in declines in live births and induced abortions, with larger declines reported for abortions.

New information recently reported from the 2002 National Survey of Family Growth (NSFG) suggests a number of factors that likely account for the falling pregnancy rates (21). Compared with the 1995 NSFG and the 1995 National Survey of Adolescent Males, the 2002 NSFG found significant declines in the proportions of teenage males, both younger and older, and the proportion of young adolescent

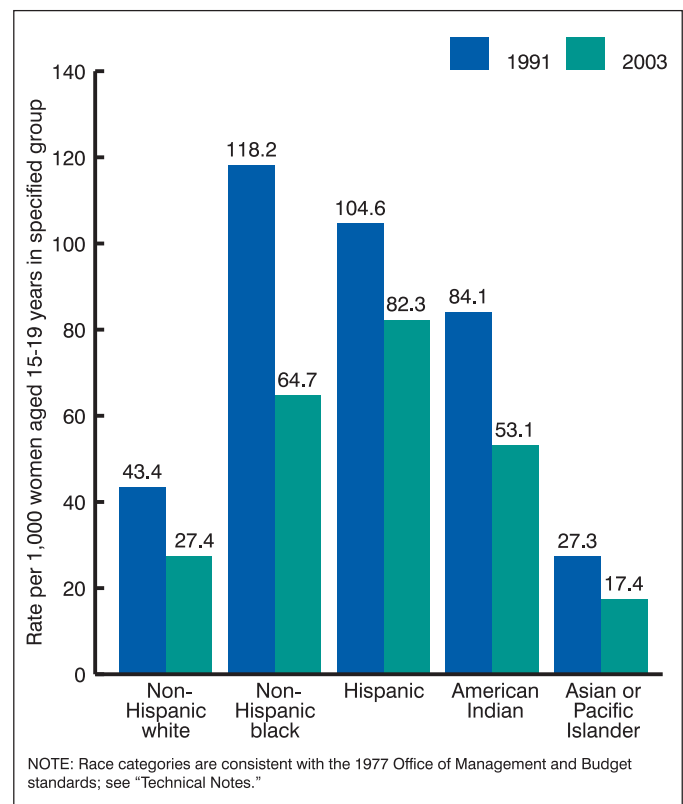


Figure 3. Birth rates for teenagers by race and Hispanic origin for 1991 and 2003

females who had ever had sexual intercourse. There were also important increases in the use of contraception, indicating more effective and consistent use. About three out of four teenagers used a method of contraception at first intercourse, and the overwhelming majority (83 percent of females and 91 percent of males) used a method at their most recent sex. The 2002 NSFG also documented increases in the use of highly effective hormonal methods such as Depo Provera™ and Lunelle™ and the use of dual methods, such as the condom with a hormonal method. Data from the CDC's Youth Risk Behavior Survey for school-age youth corroborate the findings reported by the NSFG (22). Over the past decade, many public and private efforts have focused teenagers' attention on the importance of pregnancy prevention through abstinence and responsible behavior (23,24).

Women aged 20 years and over: women in their twenties—The birth rate for women aged 20–24 years was 102.6 births per 1,000 women in 2003, down 1 percent from 2002 (103.6). This is the lowest birth rate for this age group on record for the United States (3). The rate has declined by 12 percent since 1990 (116.5) (figure 1, tables 3, 4, 8, and 9). The rate for women aged 25–29 years increased by 2 percent in 2003, rising to 115.6 from 113.6 births per 1,000 women in 2002. The rate has fluctuated but has declined by 4 percent overall since 1990. Women in their twenties, the principal childbearing ages, historically account for the largest share of all births. The proportion of births to these women has declined over the last three decades, falling from 65 percent in 1980 to 52 percent in 2003.

Women in their thirties—The birth rate for women aged 30–34 years rose 4 percent in 2003 to 95.1 births per 1,000 from 91.5 in 2002 and reached the highest rate since 1964 (3) (tables 4 and 9). This rate has generally been on the rise since the mid-1970s (52.3 in 1975). Between 1991 and 2003 the rate rose by 20 percent. Increases since 1991 were uninterrupted except for a slight decline in 2002. Between 1991 and 2003 the number of births to women aged 30–34 years increased by 10 percent, despite an 8 percent decrease in the population of women in this group. The birth rate for women aged 35–39 years also rose in 2003, to 43.8 births per 1,000 women from 41.4 in 2002, an increase of 6 percent and the highest rate for this age since 1965 (3). Between 1990 and 2003 the rate rose by 38 percent, with an average increase of 2.5 percent per year. The rate for this age group has increased each year since 1978. The number of births to women aged 35–39 years reached another record high in 2003 (467,642). Since 1990 the number of births to this age group has risen by 47 percent, compared with a 7 percent increase in the population of women 35–39 years of age (16,25).

Women in their forties—The birth rate for women aged 40–44 years rose by 5 percent in 2003 to 8.7 births per 1,000 women, the highest rate reported since 1969 (3). The rate for this age group has more than doubled since 1984 (3.9), the most recent low. Between 1990 and 2003 rates for this age group rose by 58 percent, from 5.5. The number of births to women aged 40–44 years has increased by over 100 percent, compared with a 30-percent increase in the population. The 2003 birth rate for women aged 45–49 years was 0.5, unchanged from 2002. The rate has been stable since 2000, but has increased from 0.2 since 1991. The number of births to women aged 45–49 years increased by 6 percent (from 5,224 to 5,522) between 2002 and 2003, nearly four times that for 1990 (1,638) and the highest reported since 1945 (5,554) (3).

Births to women aged 50 years and over—In 2003 there were 323 births to women aged 50–54 years, a 23-percent increase over the

263 births reported for 2002 (tables 2 and 7). Since 1997, when data for this age group became available again, the number of births for women aged 50–54 years has increased with an average annual gain of 14 percent. (From 1964 to 1996 age of mother was imputed if the reported age was under 10 years or 50 years or over; see “Technical Notes.”) Despite the increase, the number of births to women aged 50–54 years remains too small to compute age-specific birth rates. In computing birth rates by age of mother since 1997, births to women aged 50–54 years have been included with births to women 45–49 years; the denominator for the rate is women aged 45–49 years.

The increase in birth rates for women 35 years of age and over during the last 20 years has been linked, at least in part, to the use of fertility-enhancing therapies (26). The proportion of childless women aged 35–44 years reporting impaired fecundity who sought fertility treatment rose considerably from 1982 to 1995, although the proportion has leveled off from 1995 to 2002 (27,28). In 2003, 1 out of 18 births to women aged 35 years of age and over was a multiple delivery, an outcome associated with infertility treatment, compared with 1 out of 33 births to women under 35 years of age (see section on “Multiple births”).

Among all women in 2003 birth rates by age of mother peak at age 25–29 years (115.6 births per 1,000 women). However, as in previous years, age-specific childbearing patterns differ markedly by race and Hispanic origin. Birth rates reached an apex at ages 20–24 years for Hispanic (163.4), non-Hispanic black (128.1), and American Indian women (110.0), whereas rates peaked at ages 25–29 years for non-Hispanic white women (110.8) and at 30–34 years for API women (114.6) (figure 4 and tables 3, 4, 8, and 9).

Live-birth order

The first birth rate for women aged 15–44 years was 26.5 births per 1,000 women in 2003, a rise of nearly 3 percent from 2002 (25.8) (table 5). Between 1990 and 2002 the rate generally declined; the 2003 rate is 9 percent lower than that for 1990 (29.0).

First birth rates for women aged 10–14 and 15–19 years decreased by 14 and 2 percent, respectively, between 2002 and 2003; the first birth rates for women of all 5-year age groups 25–44 years increased, with the largest gains reported for women aged 35–39 years (11 percent) (table 3). The rates for women aged 20–24 and 45–49 years essentially were unchanged.

The rate of second- and third-order births for women aged 15–44 years rose by 1 and 2 percent, respectively, from 2002 to 2003, whereas the rates for fourth-, sixth-, seventh-, and eighth- and higher-order births were unchanged. The rate for fifth-order births increased from 1.5 to 1.6.

Another useful measure in interpreting childbearing patterns is the mean age at first birth. The mean is the arithmetic average of the age of mothers at the time of birth and is computed directly from the frequency of first births by age of mother. In 2003 the mean age of first-time mothers was 25.2 years, slightly higher than the previous record high set for the United States in 2002 (25.1 years) (table B). Mean age at first birth rose for nearly all race and Hispanic origin groups. However, considerable variation still exists. API women had the highest mean age at first birth in 2003, 28.3 years, whereas American Indian women had the lowest, 21.8 years. The average age of first-time mothers was 26.2 years for non-Hispanic white, 22.7 years for non-Hispanic black, and 23.1 years for Hispanic women. (Data not shown.)

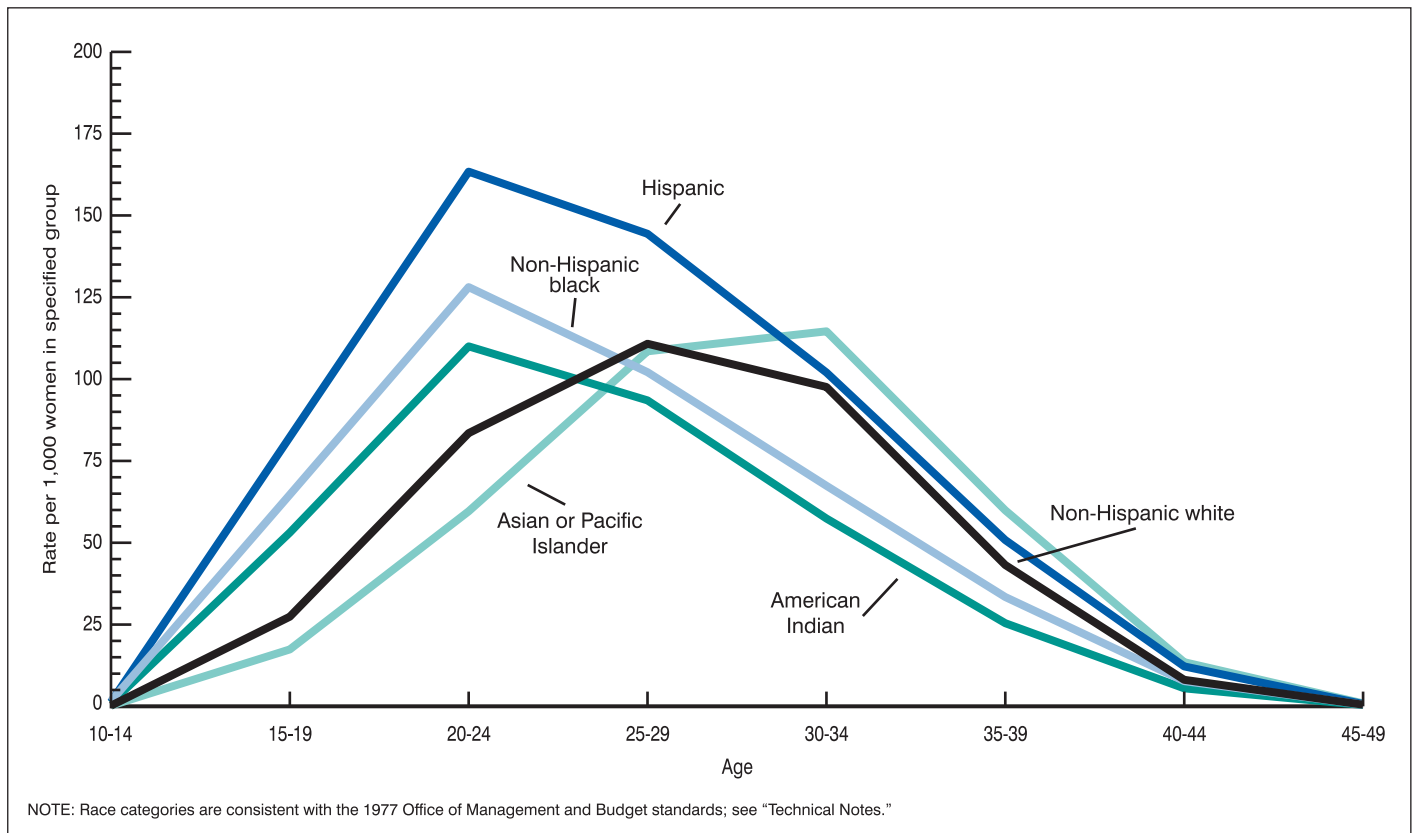


Figure 4. Birth rates by age, race, and Hispanic origin of mother: United States, 2003

Total fertility rate

The **total fertility rate** (TFR) summarizes the potential impact of current fertility patterns on completed family size. The TFR estimates the number of births that a hypothetical cohort of 1,000 women would have if they experienced throughout their childbearing years the same age-specific birth rates observed in a given year. The rate can be expressed as the average number of children that would be born per woman. Because it is computed from age-specific birth rates, the TFR is age adjusted and can be readily compared for populations across time or among geographic areas.

In 2003 the TFR was 2,042.5 (or 2.04 births per woman), 1 percent higher than the 2002 rate, 2,013.0 (tables 4 and 9). The TFR has

declined by 2 percent since 1990 when the rate was at its most recent high, 2,081.0. Between 1990 and 2003 the TFR has fluctuated, rising briefly from 1997 to 2000. The rise in the TFR between 2002 and 2003 is the result of increases in age-specific birth rates for women 25 and 44 years of age (see previous section on "Age of mother").

TFRs for most **race and Hispanic origin** groups also increased between 2002 and 2003, with rates rising 2 to 3 percent for non-Hispanic white, Hispanic, and API women. The rate for American Indians was essentially unchanged, whereas the rate for non-Hispanic black women declined 1 percent. Rates for Mexican, other Hispanic, and Cuban women increased 3, 5, and 6 percent, respectively, whereas the rate for Puerto Rican women was down 5 percent.

Differences among these groups are even more apparent when their rates are compared with the replacement rate. The replacement rate is the rate at which a given generation can exactly replace itself (2,100 births per 1,000 women). The U.S. TFR was below the replacement rate for the 32d consecutive year in 2003. Whereas the TFRs for most groups were below replacement in 2003, the rate was above replacement for Hispanics overall (2,785.5), and for Mexican (2,957.5) and other Hispanic women (2,733.0) (tables 4, 9, 13, and 14). State-specific TFRs for 2003 are discussed in the next section.

Births and birth rates by State

As noted previously, in 2003 the number of births in the United States increased by nearly 2 percent from the previous year. The increase in the national number of births was widespread across States; 24 States reported significant increases in their number of births. States with increased numbers of births were observed in nearly every region of the country. See table 10 for 2003 data.

Table B. Mean age of mother at first birth by race and Hispanic origin of mother: United States, 2003

Race and Hispanic origin of mother	Mean age
Total	25.2
Asian or Pacific Islander	28.3
Cuban	26.8
Non-Hispanic white	26.2
Central and South American	25.3
Puerto Rican	22.7
Non-Hispanic black	22.7
Mexican	22.5
American Indian	21.8

NOTES: Mean age at birth is the arithmetic average of the age of mothers at the time of the birth, computed directly from the frequency of births by age of mother and birth order (first). Race and Hispanic origin are reported separately on birth certificate. Race categories are consistent with the 1977 Office of Management and Budget standards; see "Technical Notes."

In 2003 CBRs by State ranged from 10.6 births per 1,000 total population (Maine and Vermont) to 21.2 (Utah). Between 2002 and 2003 rates increased significantly in seven States (California, Florida, Indiana, Maryland, Missouri, Pennsylvania, and Wisconsin) and were essentially unchanged in all other reporting areas. The rate declined significantly in Puerto Rico.

State-specific fertility rates, which provide a more refined picture of geographic variation in childbearing, ranged from a high of 92.2 births per 1,000 women aged 15–44 years in Utah to a low of 51.1 in Vermont. Fertility rates increased significantly for 31 States in 2003. Puerto Rico was the only reporting area for which the fertility rate fell significantly between 2002 and 2003.

State-specific TFRs for 2003, which provide a summary of lifetime fertility, are also shown in [table 10](#). Fertility tends to be higher for States in the western half of the country. In 2003, as in previous years, the majority of western States reported TFRs significantly above the national rate, whereas the majority of eastern States reported TFRs significantly below the national rate. In 2003 State-specific TFRs ranged from a high of 2,566.5 (2.6 births per woman) in Utah to a low of 1,683.0 (1.7 births per woman) in Vermont.

Birth rate for teenagers by State

In 2003 State-specific birth rates per 1,000 teenagers aged 15–19 years ranged from 18–19 in New Hampshire and Vermont to 62–63 in Mississippi, New Mexico, and Texas ([tables C and 10](#)). Between 2002 and 2003 teen birth rates declined significantly in 13 States (California, Colorado, Florida, Georgia, Illinois, Maryland, New Jersey, New York, North Carolina, Oregon, Rhode Island, Texas, and Vermont), the District of Columbia, and Puerto Rico. Birth rates were essentially unchanged for all other States and territories. Since 1991 teen birth rates have declined significantly for all reporting areas. More detailed analysis of trends and variations in teenage birthrates by age, race, and Hispanic origin are available elsewhere (29,30).

Sex ratio

There were 2,093,535 male live births in 2003 compared with 1,996,415 female live births. These numbers yield a sex ratio of 1,049 male per 1,000 female live births ([tables 13 and 14](#)). The sex ratio has fluctuated narrowly over the past 60 years, ranging from 1,046 to 1,059. A recent report, however, has shown a decline in the ratio after 1971 (31). Similar to previous years, the sex ratio was the highest for births to API mothers (1,067), followed by births to non-Hispanic white (1,053), American Indian (1,047), Hispanic (1,041), and non-Hispanic black (1,036) mothers.

Month of birth

In 2003 the average number of births per month was 340,829. The actual number of births per month ranged from 307,248 in February to 364,226 in July ([table 15](#)). Observed monthly birth and fertility rates, which take into account the different number of days in the month, increased significantly for most months between 2002 and 2003. Observed birth rates were lower, however, for January, August, and November, and unchanged in February. Observed fertility rates increased in 2003 for all months except January, August, and November, which were essentially unchanged. Observed fertility rates were at their highest in September (70.3) and lowest in November

and January (62.5), consistent with the well-established pattern of birth rates peaking in the late summer before falling in the late fall and winter.

Day of the week of birth

On average 11,205 infants were born per day in 2003. However, the average number of births varied appreciably by day of the week. In 2003, as in previous years, the average number of births was the highest on Tuesday (13,001) and lowest on Sunday (7,563) ([table 16](#)).

An index of occurrence can be used to measure the variation in the daily pattern of births. The index is defined as the ratio of the average number of births per day of the week to the average number of births per day of the year with the base set at 100. In 2003 Tuesday had the highest index at 116.0, indicating that there were 16.0 percent more births on Tuesday than on the average day. As in previous years, infants in 2003 were much less likely to be born on weekends—Sunday (67.5) followed by Saturday (76.8).

This weekend deficit is evident for both vaginal and cesarean deliveries but is notably larger for cesarean births that had a Tuesday index of 123.4 and a Sunday index of 49.0. In 2003 the index of occurrence for vaginal births on Sunday was 74.7, compared with 59.5 for primary cesareans and 32.5 for repeat cesareans. Since 1989, when these data first became available, the weekend birth deficit for cesarean births has grown. Between 1989 and 2003 the Sunday index for all cesarean deliveries fell 19 percent, from 60.7 to 49.0.

Births to unmarried women

The **birth rate for unmarried women** jumped 3 percent in 2003, to 44.9 births per 1,000 unmarried women aged 15–44 years. The 2003 rate was the highest since 1994 (46.2). The rate indicates the risk that an unmarried woman will give birth. This rate had changed relatively little during the period 1995–2002 ([tables D, 17, and 18; figure 5](#)). Largely as a result of the rising birth rate, the **number of births to unmarried women** rose 4 percent in 2003, to 1,415,995, the highest number ever in the more than six decades for which national statistics are available (32). The number rose steadily through the mid- to late 1990s, principally as a result of increases in the number of unmarried women in the reproductive ages (33–35). The rise in 2003 reflects, in small part, the population growth, but mostly it reflects the increase in the birth rate. In 2003, **34.6 percent of all births were to unmarried women**. This percentage has risen steadily since the late 1990s, following several years of essentially no change ([table D](#)). About 42 percent of first births in 2003 were to unmarried women (tabular data not shown).

Since 1998 all States except Michigan and New York report mother's marital status on the birth certificate through a direct question in the birth registration process. Michigan and New York infer the mother's marital status on the basis of other information on the birth certificate; see "Technical Notes" for detailed information.

Birth rates for unmarried women by age continue to be highest for women in their twenties ([tables 17 and 18](#)). In 2003 the rates were 71.2 per 1,000 for women aged 20–24 years and 65.7 for women aged 25–29 years. The next highest rate was 57.6, for older unmarried teenagers aged 18–19 years. Rates for other age groups are considerably lower.

Table C. Birth rates for teenagers 15–19 years by State, 1991 and 2003, and percentage change 1991–2003: United States and each State and territory

[Birth rates per 1,000 estimated female population aged 15–19 years in each area]

State	1991	2003	Percent change, 1991–2003	State	1991	2003	Percent change, 1991–2003
United States ¹	61.8	41.6	–33	Nebraska	42.4	36.0	–15
Alabama	73.6	52.4	–29	Nevada	74.5	53.0	–29
Alaska	66.0	38.6	–42	New Hampshire	33.1	18.2	–45
Arizona	79.7	61.1	–23	New Jersey	41.3	25.5	–38
Arkansas	79.5	59.0	–26	New Mexico	79.5	62.7	–21
California	73.8	40.1	–46	New York	45.5	28.2	–38
Colorado	58.3	43.9	–25	North Carolina	70.0	49.0	–30
Connecticut	40.1	24.8	–38	North Dakota	35.5	26.8	–25
Delaware	60.4	44.9	–26	Ohio	60.5	39.4	–35
District of Columbia	109.6	60.3	–45	Oklahoma	72.1	55.9	–23
Florida	67.9	42.5	–37	Oregon	54.8	34.4	–37
Georgia	76.0	53.5	–30	Pennsylvania	46.7	31.2	–33
Hawaii	59.2	37.3	–37	Rhode Island	44.7	31.3	–30
Idaho	53.9	39.3	–27	South Carolina	72.5	51.5	–29
Illinois	64.5	40.4	–37	South Dakota	47.6	34.7	–27
Indiana	60.4	43.5	–28	Tennessee	74.8	53.5	–29
Iowa	42.5	31.9	–25	Texas	78.4	62.9	–20
Kansas	55.4	41.2	–26	Utah	48.0	34.6	–28
Kentucky	68.8	49.6	–28	Vermont	39.2	18.9	–52
Louisiana	76.0	56.0	–26	Virginia	53.4	36.1	–32
Maine	43.5	24.9	–43	Washington	53.7	31.5	–41
Maryland	54.1	33.3	–38	West Virginia	58.0	44.8	–23
Massachusetts	37.5	23.0	–39	Wisconsin	43.7	31.3	–28
Michigan	58.9	34.4	–42	Wyoming	54.3	40.8	–25
Minnesota	37.3	26.6	–29	Puerto Rico	72.4	59.5	–18
Mississippi	85.3	62.5	–27	Virgin Islands	77.9	50.9	–35
Missouri	64.4	43.2	–33	Guam	95.7	64.3	–33
Montana	46.8	35.0	–25	American Samoa	---	40.4	---
				Northern Marianas	---	42.3	---

--- Data not available.

¹Excludes data for the territories.

Largely reflecting fertility differentials for all women, **rates for unmarried women likewise vary considerably by race and ethnicity**. In 2003 the rate for Hispanic women was highest, at 92.2 per 1,000, followed by black women at 66.3, non-Hispanic white women at 28.6, and API women at 22.2. These differences have changed little in recent years. Birth rates by race and Hispanic origin increased slightly or were generally stable in 2003 ([table 18](#)). The largest 1-year increase was the rate for Hispanic women, up 5 percent, close to the level last reported in 1992 (92.8). The rate for unmarried black women was essentially unchanged; this rate had fallen 27 percent during 1989–2002. Rates for non-Hispanic white and API women changed little in recent years.

Birth rates for unmarried black and Hispanic teenagers are relatively similar, but at ages 20 years and over the rates increasingly diverge. In age groups 30–34 years and over, the rates for unmarried Hispanic women are about double the rates for unmarried black women. Among age groups under 20 years, API women have the lowest rates, whereas at ages 20 and over, rates are lowest for non-Hispanic white women.

The overall increase in the nonmarital birth rate from 2002 to 2003 entirely reflects increases in rates for women aged 20 and over, especially the 7- to 8-percent increases for women 25 and over. Rates for unmarried teenagers continued to fall. Overall, the birth rate for unmarried teenagers has dropped 24 percent since the 1994 peak, but the rate of decline for younger teenagers has considerably outpaced that for older teenagers, 36 percent compared with 17 percent.

Among teenage population subgroups, nonmarital birth rates have generally fallen since 1994, although rates for black teenagers have been declining since 1991. The largest declines have been reported for younger teenagers, 15–17 years. The rate for young black teenagers has plummeted more than one-half since 1991, whereas the rates for young Hispanic and non-Hispanic white teenagers fell 23 and 39 percent, respectively.

The **proportions of all births that are to unmarried women** increased in 2003 in the largest race or Hispanic origin groups. They were 15.0 percent for API women, 23.6 percent for non-Hispanic white women, 45.0 percent for Hispanic women, 61.3 percent for American Indian women, and 68.5 percent for non-Hispanic black women.

Numbers and proportions of births to unmarried women by race and Hispanic origin and by State are shown in [table 19](#). Numbers increased in the majority of areas; increases amounted to 5 percent or more in 12 States and American Samoa, and they declined in the District of Columbia, Vermont, Puerto Rico, and the Virgin Islands. Proportions rose in the majority of States with increases amounting to 3 percent or more in 13 States and American Samoa. There were declines in the District of Columbia, Montana, North Dakota, South Dakota, Vermont, and the Northern Marianas.

Age of father

The **birth rate per 1,000 men aged 15–54 years** was 48.9 in 2003, a slight increase from the all-time low of 48.4 reported in 2002

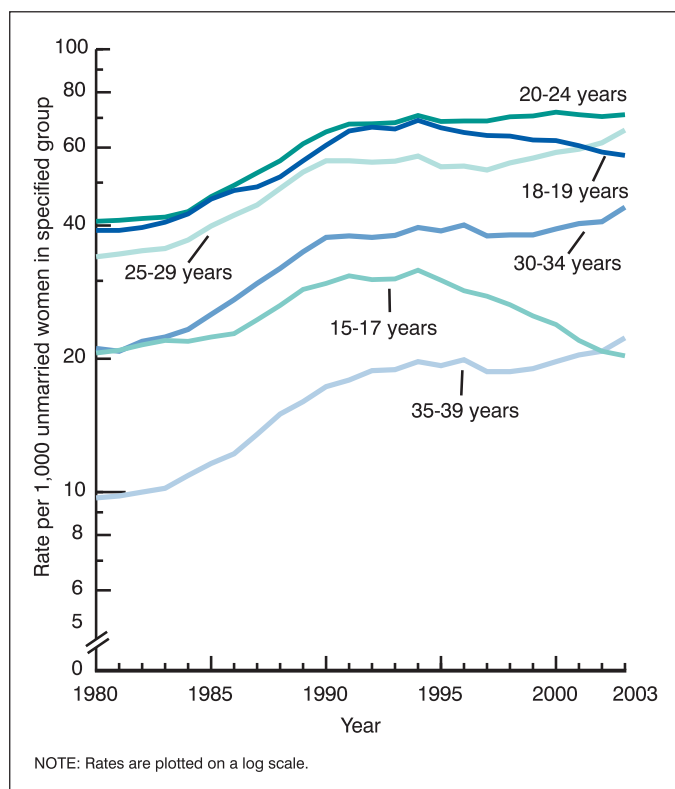


Figure 5. Birth rates for unmarried women, by age of mother: United States, 1980–2003

Table D. Number, rate, and percentage of births to unmarried women and birth rate for married women: United States, 1980 and 1985–2003

Year	Births to unmarried women			Birth rate for married women ³
	Number	Rate ¹	Percent ²	
2003	1,415,995	44.9	34.6	88.1
2002	1,365,966	43.7	34.0	86.3
2001	1,349,249	43.8	33.5	86.7
2000	1,347,043	44.0	33.2	87.4
1999	1,308,560	43.3	33.0	84.8
1998	1,293,567	43.3	32.8	84.2
1997	1,257,444	42.9	32.4	82.7
1996	1,260,306	43.8	32.4	82.3
1995	1,253,976	44.3	32.2	82.6
1994	1,289,592	46.2	32.6	82.9
1993	1,240,172	44.8	31.0	86.1
1992	1,224,876	44.9	30.1	88.5
1991	1,213,769	45.0	29.5	89.6
1990	1,165,384	43.8	28.0	93.2
1989	1,094,169	41.6	27.1	91.9
1988	1,005,299	38.5	25.7	90.8
1987	933,013	36.0	24.5	90.0
1986	878,477	34.2	23.4	90.7
1985	828,174	32.8	22.0	93.3
1980	665,747	29.4	18.4	97.0

¹Births to unmarried women per 1,000 unmarried women aged 15–44 years.

²Percent of all births to unmarried women.

³Births to married women per 1,000 married women aged 15–44 years.

(table 20). Birth rates for males aged less than 25 years continued to decline; birth rates for fathers aged 15–19 and 20–24 years posted all-time lows of 16.9 and 73.5 per 1,000, respectively. Birth rates increased for men in the 25–54-year age groups and were unchanged for men aged 55 and over.

Information on age of father is often missing on birth certificates of children born to women less than 25 years of age and to unmarried women. In 2003 age of father was not reported for 13 percent of all births, 24 percent of births to all women less than 25 years of age, and 37 percent of all nonmarital births. In computing birth rates by age of father, births where age of father is not stated were distributed in the same proportion as births where age of father is stated within each 5-year age interval of mother. This procedure avoids the distortion in rates that would result if the relationship between age of mother and age of father were disregarded. The procedures for computing birth rates by age of father are described in more detail in the “Technical Notes.”

Educational attainment

Information on educational attainment was reported on the birth certificates of all States and the District of Columbia in 2003. However, the education item on the 2003 Standard Certificate of Live Birth, implemented by Pennsylvania and Washington in 2003, has a different format than that of the 1989 standard certificate (see “Technical Notes”). As a result, education data for the States with the revised certificates are not comparable with the data for the States with the unrevised certificates. For this report, in order to compare the change over time, information on educational attainment for all years excludes data for Pennsylvania and Washington.

In 2003, 78.4 percent of women who gave birth had at least 12 or more years of schooling (a high school education), and 26.6 percent had 16 or more years of schooling (4 years of college), increases of less than 1 and 2 percent, respectively, from 2002 (table 21). The educational attainment of women giving birth (based on completed years of education at the time of birth) has increased substantially over the last few decades. Since 1990 the proportion of mothers with 16 or more years of schooling has increased by 52 percent. This trend, in part, reflects increases in educational attainment of all women during this time (36).

Although the overall trend in educational attainment has been on the increase, variations by race and ethnicity are still seen. In 2003, 88.5 percent of non-Hispanic white, 76.2 percent of non-Hispanic black, and 52.5 percent of Hispanic mothers had at least 12 years of schooling. Although the overall proportion of Hispanic mothers who have completed high school was comparatively low, variation among the specified Hispanic groups was wide, ranging from 46.4 percent of Mexican mothers to 88.5 percent of Cuban mothers. The percentage of American Indian and API mothers with at least 12 years of schooling was 69.5 and 90.1, respectively, in 2003 (tables 13, 14, and 21).

Maternal education has long been considered an important factor in fertility and maternal and infant health. The educational attainment of women has been shown to have a profound effect on the number of births and the risk of adverse birth outcome. Women with higher educational attainment are more likely to desire and give birth to fewer children, and they are less likely to engage in behaviors detrimental to health and pregnancy (27,29,37).

Maternal Lifestyle and Health Characteristics

Weight gain

Excessive and insufficient maternal weight gain during pregnancy can negatively influence pregnancy outcome. Inadequate weight gain has been associated with an increased risk of intrauterine growth retardation, shortened period of gestation, low birthweight (LBW), and perinatal mortality (38,39). High weight gain during pregnancy has been linked with an elevated risk of a large-for-gestational-age (LGA) infant, cesarean delivery, and long-term maternal weight retention (40). Based on the mother's body mass index (BMI), the Institute of Medicine (IOM) recommend that women who are underweight gain 28–40 pounds and those who are of normal weight gain 15–25 pounds. For extremely obese women, the IOM recommends a minimum weight gain of 15 pounds. However, the IOM recommends that weight gain goals be tailored to individual needs (41).

Median weight gain for 2003 was stable at 30.5 pounds, unchanged for 6 years. This measure has varied by only one-tenth of a pound since 1990. Among women with at least full-term births (40 weeks of gestation or more), 10.8 percent gained less than 16 pounds, considered inadequate for most women (41); 21.7 percent had weight gains of more than 40 pounds, considered excessive in most cases (table 22). Between 1989 (when data became available) and 2003, the percentage of all mothers who gained less than 16 pounds increased 31 percent (from 9.4 to 12.3), and the percentage who gained over 40 pounds rose by a similar amount (from 15.1 to 19.7). In short, in 2003 nearly one-third of mothers had weight gains outside of the guidelines recommended by the IOM (41).

BMI is calculated from a woman's prepregnancy weight and height, neither of which is available from the 1989 revision of the U.S. birth certificate, which only captures information on total weight gained during pregnancy. Therefore, it is not possible from these data to determine whether the weight gain was within the recommendations for the mother's BMI. The 2003 revision of the birth certificate does capture the mother's BMI directly (5). These data will be available later this year for the two States that implemented the 2003 revision of the Certificate of Live Birth.

Weight gained during pregnancy continues to differ widely by racial and ethnic group. Non-Hispanic white women and Asian and Pacific Islander women have relatively low proportions of women with weight gains of less than 16 pounds (10.2 and 9.6 percent, respectively), whereas non-Hispanic black women and American Indian women have higher proportions of women with inadequate weight gains (17.7 and 17.3 percent, respectively) (tables 24 and 25). Among the Hispanic subgroups, Mexican mothers were more than twice as likely to gain less than 16 pounds than Cuban mothers (16.9 compared with 7.8 percent) (table 25).

Moderate maternal weight gain and healthy birthweight are positively correlated, as demonstrated by a general decline in the percentage of LBW infants as maternal weight gain increases (from 13.9 percent for weight gains of less than 16 pounds to 5.6 percent for gains of 36–39 pounds) (table 23). The declining trend reverses slightly for weight gains of 40 or more pounds, but it still does not approach the level of risk for inadequate gain.

Medical risk factors

In 2003 the most frequently reported medical risk factors were **pregnancy-associated hypertension** (37.4 per 1,000 live births), **diabetes** (32.8), and **anemia** (23.8) (table 26). These have been the most frequently reported risk factors, with minor variation in order, since 1989 when these data became available from the birth certificates. After steadily rising during the 1990s (from 26.9), the rate of pregnancy-associated hypertension has been essentially unchanged since 2000. Rates for diabetes and anemia have risen nearly 40 percent for 1990–2003. For comparability, 1990 rates for certain medical risk factors exclude data for Pennsylvania and Washington, which implemented the 2003 Standard Certificate of Live Birth; see table 26 and "Technical Notes."

Pregnancy-associated hypertension, chronic hypertension, and eclampsia are all closely related hypertensive disorders, but the latter two are rarer conditions. The rate for **chronic hypertension** has increased since 1990 (6.5 in 1990; 8.8 in 2003), whereas the **eclampsia rate** has declined (4.0 in 1990; 3.0 in 2003).

During pregnancy, medical risk factors can contribute to serious complications and maternal and infant morbidity and mortality, particularly if not treated properly (42–44). Sixteen medical risk factors that can affect pregnancy outcome are separately identified on the 1989 revision of the Certificate of Live Birth used by 48 States and the District of Columbia for 2003 (table 26). Birth certificate data may underreport or incorrectly report medical risk factor prevalence because of a lack of adherence to uniform definitions and difficulty in interpreting data from medical records (45). Rates for rarely occurring medical risk factors and for smaller population groups can vary from year to year and should be used with caution.

The reported rate of **hydramnios/oligohydramnios** (the excess or shortage of amniotic fluid) has increased consistently during the 1990s, more than doubling between 1990 and 2003, from 5.9 to 13.8. This condition has been associated with maternal diabetes. **Acute or chronic lung disease** (e.g., asthma, tuberculosis) also has risen dramatically. The rate of lung disease more than quadrupled between 1990 and 2003 (from 3.0 to 12.1 per 1,000) and has increased for all age groups, most notably for younger women. In the early 1990s this condition was slightly more prevalent in older women.

The risk of having a medical condition during pregnancy often differs by maternal age (table 26). For example, teenage mothers are more than one-and-a-half times as likely to have anemia during pregnancy compared with women aged 40 years and over (3.3 compared with 2.0 percent). Older mothers, however, are much more prone to chronic conditions such as diabetes (7.6 for mothers aged 40 years and over compared with 1.0 for mothers under 20 years), chronic hypertension (2.6 compared with 0.3), and cardiac disease (0.9 compared with 0.3). Other risk factors, however, such as lung disease and pregnancy-associated hypertension, have higher rates at both the oldest and youngest ages.

The levels of medical risk factors during pregnancy can also vary greatly by maternal race and ethnicity (tables 27 and 28). In 2003 American Indian women had higher rates of anemia than other groups (52.4 per 1,000 compared with 19.9 percent for non-Hispanic white women). Rates for diabetes ranged from a low of 30.5 per 1,000 for non-Hispanic black women to a high of 55.1 for API women. Among Hispanic women, levels of diabetes were highest for Puerto Rican

mothers and those of other or unknown Hispanic origin; rates of pregnancy-associated hypertension were highest for Cuban, Puerto Rican, and other or unknown Hispanic origin mothers ([table 28](#)).

Tobacco use during pregnancy

Smoking during pregnancy was reported by 10.7 percent of women giving birth in 2003. This represents a decline from the 11.2 percent measured for the same group of reporting areas in 2002 (47 States and the District of Columbia). Among women who smoked during pregnancy in 2003, 26 percent smoked half a pack or more of cigarettes, unchanged from 2002 for the same reporting area.

Pennsylvania and Washington implemented the 2003 revision of the U. S. Standard Certificate of Live Birth in 2003. The tobacco use question on the 2003 revision differs from the question on the 1989 revision that is in use in the other States (see "Technical Notes"). Therefore data for Pennsylvania and Washington are not included in the tabulations in this report. In addition, California did not report smoking on the birth certificate in 2003. The reporting area accounted for 81 percent of U.S. births in 2003 (see [tables 29–32 for 2003 data](#)).

Findings from other studies suggest that smoking is somewhat underreported on the birth certificate. Nonetheless, the trends and variations in maternal smoking based on birth certificate data are corroborated by data from surveillance data and nationally representative surveys (22,27,46). The question on smoking on the 1989 revision of the birth certificate lacks a specific time reference and the source of information varies, thus affecting consistency and reliability of reporting. It is believed that the new question on prenatal smoking will provide much higher quality information because it has components for each trimester of pregnancy, thus affording women an opportunity to report changes in their smoking behavior (47–49).

Smoking during pregnancy has long been linked to adverse pregnancy outcomes, including LBW, intrauterine growth retardation, miscarriage, and infant mortality, as well as negative consequences for child health and development (50). These adverse outcomes in turn are associated with substantial economic and social costs (51).

Women in age groups 18–24 years have the highest smoking rates, a pattern that has been reported for many years. In 2003, 17.1 percent of teenagers 18–19 years and 16.1 percent of women in their early twenties reported smoking. Even among younger teenagers 15–17 years, one in eight were smokers. Rates are sharply lower for women in age groups 25–29 years and over.

Smoking rates differ sharply among racial and Hispanic origin populations ([tables 24 and 25](#)). The highest rates reported were for American Indian and non-Hispanic white women, 18.1 and 14.3 percent, respectively. Rates for other groups were 8.3 percent for non-Hispanic black; 7.9 percent for Puerto Rican; and 2 percent or less for Cuban, Mexican, and Central and South American women.

Women who have attended but not completed high school have the highest smoking rates among education subgroups: 22.8 percent reported smoking in 2003. More than 4 in 10 non-Hispanic white women in this category were smokers ([table 31](#)). Among non-Hispanic white women 20 years of age and over in the same educational group, nearly half were smokers (46.9 percent; tabular data not shown).

As noted, smoking during pregnancy has been repeatedly linked to elevated risk of low infant birthweight and a number of other adverse pregnancy outcomes (52,53). In 2003, 12.4 percent of babies born to smokers compared with 7.7 percent of babies born to nonsmokers were

LBW (less than 2,500 grams; 5 lb 8 oz) ([table 32](#)). The gap is almost twofold for maternal age groups 20–24 years and over, with a slightly smaller differential for teenage mothers, whose risk for LBW is already higher (see [table 45](#)). Further, there is no safe level of smoking. Even among births to women who smoked fewer than 6 cigarettes daily, LBW was 53 percent higher than among births to women who did not smoke (11.8 percent compared with 7.7 percent). About one-third of all smokers in 2003 smoked fewer than 6 cigarettes daily ([table 29](#)).

Alcohol use during pregnancy

Alcohol use during pregnancy is a major risk factor for poor birth outcome, independent of other maternal health risk and behavior factors (54,55). Questions on alcohol use are included on the birth certificates of the District of Columbia and all States except California, Pennsylvania, and Washington. This reporting area accounted for 81 percent of U.S. births in 2003.

Unfortunately, alcohol use is substantially underreported on the birth certificate, compared with data collected in nationally representative surveys of pregnant women. Only 0.7 percent of women giving birth in 2003 reported alcohol use during pregnancy, down from 0.8 percent in 2002 for the same reporting area ([data for 2003 shown in \[tables 24 and 25\]\(#\)](#)).

According to the most recently conducted Behavioral Risk Factor Surveillance System (BRFSS) survey, 12.8 percent of women reported alcohol use during pregnancy in 1999 compared with 1.0 percent based on 1999 birth certificate data (56,57). The BRFSS data indicate that alcohol use declined during the late 1990s; however, no decline in binge drinking was found (57).

The birth certificate question on alcohol use from the 1989 revision is evidently not sensitive enough to measure this behavior accurately. This is unfortunate because alcohol use is clearly a critical risk factor for poor birth outcome, and it is implicated as well in delayed infant and child development (54,55). The question wording as well as the lack of specific time reference for the birth certificate questions are probably factors contributing to the underreporting. In addition, the stigma of maternal alcohol use likely contributes to the underreporting (58,59).

Medical Services Utilization

Prenatal care

National measures for prenatal care in this report exclude data for Pennsylvania and Washington, which implemented the 2003 revision to the U.S. Standard Certificate of Live Birth (revised States). Data for all other reporting areas are based on the 1989 revision to the U.S. Standard Certificate of Live Birth (unrevised States). It was necessary to exclude data for these two revised States from the U.S. totals because the question on the timing of prenatal care was changed between the 1989 and 2003 revisions and because of likely changes in the sources of these data. As a result, 2003 prenatal care data for the revised States are not comparable with data for the unrevised States. Therefore, unless otherwise noted, data presented in this section are based on the 48 unrevised States. See "Technical Notes."

The proportion of women beginning prenatal care within their first trimester of pregnancy improved slightly from 83.7 percent for 2002 to 84.1 percent in 2003. (See [tables 24, 25, and 33–35](#).) Timely initiation

of prenatal care has been on a modest upswing in recent years, rising 11 percent since 1990 (see table E). The percentage of women beginning care in the last trimester of pregnancy, or with no prenatal care at all, declined slightly from 3.6 to 3.5 percent between 2002 and 2003; this measure has dropped from 6.1 percent since 1990. Appropriate prenatal care can enhance pregnancy outcome by providing health care advice and managing chronic and pregnancy-related health conditions (60–62).

Timely prenatal care initiation improved slightly among each of the largest racial and ethnic groups for 2002–03; non-Hispanic white (89.0 percent for 2003), non-Hispanic black (75.9 percent), and Hispanic (77.5 percent). Since 1990 substantial gains of at least 20 percent are seen in first trimester care receipt among non-Hispanic black, Hispanic, and American Indian women (see tables E, 24, and 25 for 2003 data). Concurrent declines over this time period in the percentage of women with late or no care have also been observed among these groups. These gains may be linked in part to the expansion of Medicaid for pregnant women in the late 1980s (63,64). Although differences by race and ethnicity in prenatal care receipt appear to be narrowing (64), large disparities persist. In 2003 more than 5–8 percent of Hispanic, non-Hispanic black, and American Indian mothers received late or no prenatal care compared with 2 percent of non-Hispanic white mothers.

Increases in prenatal care utilization between 1990 and 2003 are evident for the vast majority of States (data not shown). For 2003 three States—New Hampshire, Rhode Island, and Vermont—reported levels of first trimester care above 90 percent and levels of late or no care of less than 2 percent (table 34). Prenatal care utilization levels by

State were the least favorable in New Mexico, where only 68.9 percent of women received timely care and 8.1 percent began care late or had no care at all.

The “month that prenatal care began” item can be a useful measure of prenatal care timing, but it does not take into account the number of prenatal care visits or gestational age at delivery, important factors in determining the appropriateness of care. The Adequacy of Prenatal Care Index (APNCU) is an alternative measure based on recommendations from the American College of Obstetricians and Gynecologists that incorporates the month that care began, the number of prenatal visits, and adjusts for gestational age. It categorizes prenatal care utilization as follows: intensive, adequate, intermediate, and inadequate (65,66). According to the APNCU, one-third (32.5 percent) of all women had intensive utilization of prenatal care in 2003, that is, more than the recommended amount of care, and 11 percent of mothers received inadequate care (table F). This compares with levels of 25 and 18 percent, respectively, in 1990 (data not shown). Wide differences in utilization by race and Hispanic origin are also observed when prenatal care is measured using the APNCU. In 2003, 7 percent of non-Hispanic white mothers received inadequate care compared with 16–17 percent of Hispanic and non-Hispanic black women.

Obstetric procedures

In 2003, as in past years, of the six specific obstetric procedures reported on the 1989 revision of the birth certificate, electronic fetal monitoring (EFM) was reported most frequently (85.4 percent, or more than 3.2 million live births) (table 36). This rate has climbed steadily since 1989 (68.1 percent). The benefits and risks of routine use of EFM remain controversial (67). The use of EFM and other obstetric procedures may be underreported on the birth certificate (68). For comparability, 2003 and 1989 rates for a number of the obstetric procedures discussed exclude data for Pennsylvania and Washington, which implemented the 2003 Standard Certificate of Live Birth. For reporting areas for the specific procedures, see table 36 and “Technical Notes.”

In 2003, 67 percent of women who had live births received ultrasound, unchanged from 2002. The use of this procedure has also increased steadily since 1989, from 47.6 percent. Advances in this technology allow early screening for fetal anomalies (69).

The rate of induction of labor was unchanged between 2002 and 2003 (20.6 percent); this rate has more than doubled from the 1990 level of 9.5 percent. Between 1990 and 2000 the rate of induction rose steadily every year for all gestational ages, including preterm deliveries (less than 37 completed weeks of gestation). However, since 2000 the

Table E. First trimester prenatal care by race and Hispanic origin of mother: Total of 48 States and the District of Columbia, 1990, 1995, 2000–2003

Year	All races ¹	Non-Hispanic ¹		
		White	Black	Hispanic ²
2003	84.1	89.0	75.9	77.5
2002	83.7	88.7	75.3	76.8
2001	83.3	88.6	74.5	75.8
2000	83.1	88.6	74.3	74.5
1995	81.2	87.1	70.6	70.8
1990	75.6	83.3	61.0	60.2

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

²Includes all persons of Hispanic origin of any race.

NOTES: Race categories are consistent with the 1977 Office of Management and Budget standards; see “Technical Notes.” Excludes data for Pennsylvania and Washington, which implemented the 2003 Revision to the U.S. Standard Certificate of Live Birth; see “Technical Notes.”

Table F. Adequacy of Prenatal Care Utilization Index by race and Hispanic origin of mother: 48 States and the District of Columbia, 2003

All races and Hispanic origins	Intensive use	Adequate	Intermediate	Inadequate
Total	32.5	42.9	13.6	11.0
Non-Hispanic white	34.0	46.0	12.7	7.2
Non-Hispanic black	33.3	35.7	13.6	17.4
Hispanic	29.3	39.2	15.5	16.0

NOTES: Excludes data for Pennsylvania and Washington, which implemented the 2003 Revision to the U.S. Standard Certificate of Live Birth; see “Technical Notes.” See reference 61 for calculation of this measure. Race categories are consistent with the 1977 Office of Management and Budget standards; see “Technical Notes.”

preterm induction rate has fluctuated but has generally trended downward (13.4 for 2003). In contrast, for infants born at 37–41 weeks of gestation, the induction rate increased each year, to 21.6 percent for 2003. For gestational ages greater than 41 weeks, the rate increased each year during 1990–2001 but has been the same for 2002 and 2003 (24.2 percent).

For 2002–03 rates of induction were stable or increased only slightly for most racial and ethnic groups (tables 27 and 28). However, induction levels more than doubled for each of the largest racial and ethnic groups between 1990 and 2003, and rates among groups continue to vary widely. For example, the rate for non-Hispanic white women (24.7 percent) was notably higher than that for non-Hispanic black women (17.5) (figure 6). The 2003 rates among the Hispanic subgroups ranged from 13.0 percent for Mexican to 19.3 percent for Cuban mothers. The total rate for API mothers has been stable since 2001 at about 14 percent. The rate for American Indian mothers, which had been over 20 percent since 2000, was down slightly in 2003 (19.9).

It has been suggested that increasing induction rates may be related, in part, to an increase in elective inductions (inductions with no medical or obstetric indication). In a study of variation in induction rates among hospitals and clinicians, 25 percent of inductions had no apparent medical indication (70). Induction (including elective induction) may increase the risk of cesarean delivery in nulliparous women (71).

The rate of stimulation of labor was 16.7 percent for 2003, a slight decrease from the 2002 rate (17.0). This rate increased 59 percent between 1989 and 1997 but has fluctuated only slightly since. The overall rate for tocolysis, the use of agents that inhibit or delay uterine activity for the management of preterm labor, has remained at

2.1 percent since 2001. The rate of tocolysis has been fairly stable since 1996. There is continuing discussion regarding the safety, efficacy, and appropriate use of these agents (72).

The overall rate for amniocentesis continued to decrease. The amniocentesis rate was 1.7 percent of all live births in 2003, down from 1.9 percent in 2002 and 3.2 percent in 1989. This continuing downturn may reflect increased use of noninvasive screening tests in place of amniocentesis (e.g., ultrasound and measurement of serum markers) (73).

Complications of labor and/or delivery

The presence of moderate or heavy meconium staining was the complication most frequently reported on the birth certificate for 2003, as for previous years. This complication occurred at a rate of 48.6 per 1,000 births, or in about 5 percent of all deliveries. The presence of meconium during labor and delivery can directly alter the amniotic fluid, reduce antibacterial activity (and subsequently increase the risk of perinatal bacterial infection), and damage the infant's lungs if inhaled (43). Depending on the severity of the condition, other complications of labor and delivery reported on the birth certificate may require medical interventions and can also affect the health of the infant. Of the 15 complications of labor and/or delivery reported on the 1989 revision of the birth certificate, the other four most frequently reported complications for 2003 were as follows: breech/malpresentation (3.9 percent), fetal distress (3.8 percent), dysfunctional labor (2.9 percent), and premature rupture of membrane (PROM) (2.2 percent) (table 37). PROM rates have declined overall and among the largest race groups over the last 14 years. The rates

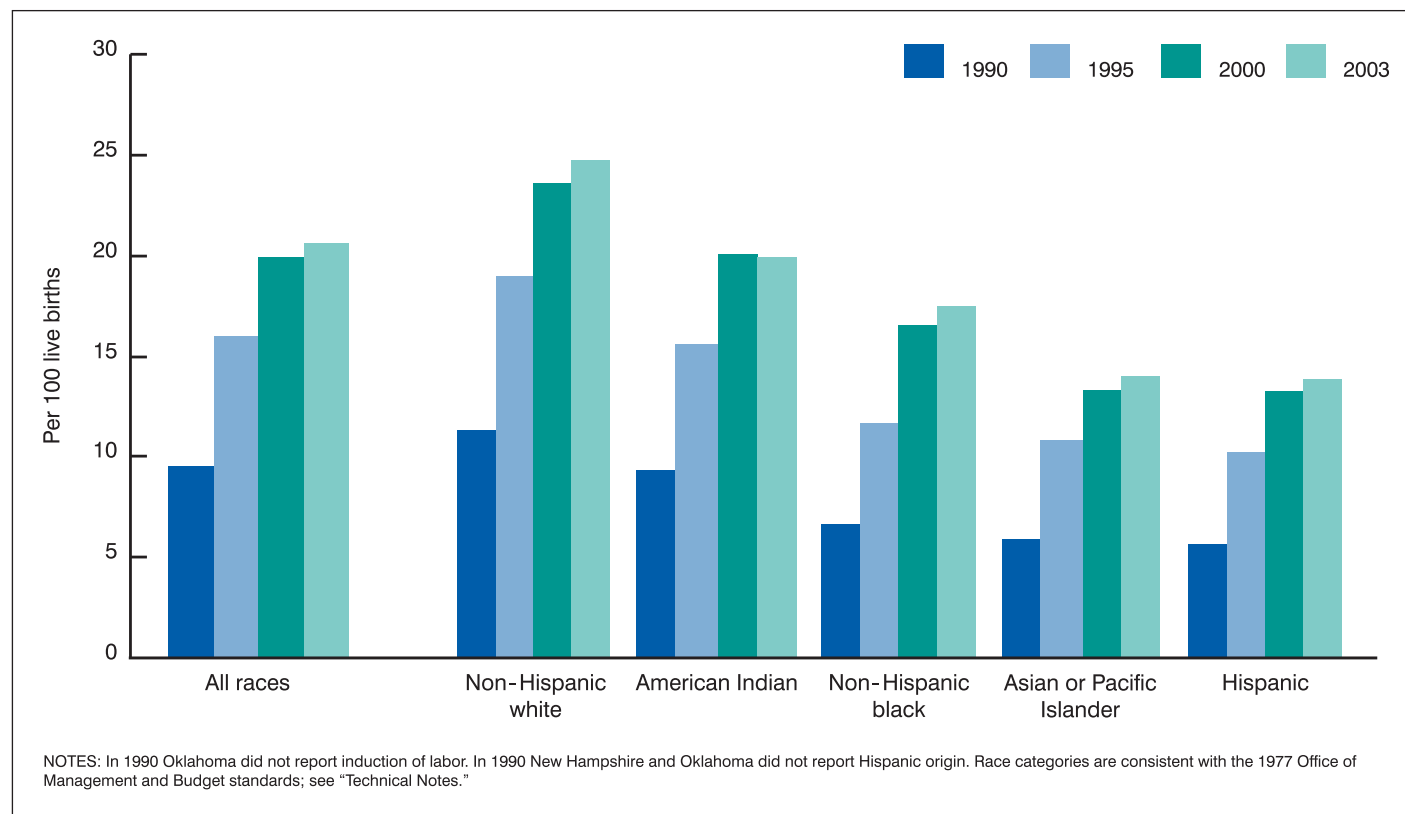


Figure 6. Rates of induction of labor by race and Hispanic origin of mother: United States, 1990, 1995, 2000, and 2003

of breech/malpresentation, on the other hand, have remained at the same level or increased slightly during this 14-year period.

Labor and delivery complication rates vary by race and Hispanic origin (tables 27 and 28). For example, non-Hispanic black women had higher meconium rates than non-Hispanic white women (63.9 in contrast to 42.8 per 1,000 live births). Non-Hispanic black women had substantially lower rates of cephalopelvic disproportion (10.7) and breech/malpresentation (31.6) (leading risk factors for cesarean delivery) compared with non-Hispanic white women (16.8 and 43.8, respectively). Differences in meconium rates also were evident among Hispanic subgroups. In 2003 rates for moderate/heavy meconium ranged from a low of 30.5 per 1,000 for Cuban mothers to a high of 58.8 for Central and South American mothers.

Attendant at birth and place of delivery

In 2003 the percentage of all births delivered by physicians in hospitals (91.4 percent) was essentially the same as in 2002 (91.3) (table 38). As in previous years, in 2003 almost all doctor-attended births were attended by doctors of medicine (M.D.s). The percentage of physician-attended births attended by doctors of osteopathy (D.O.s) was 4.8 percent in 2003, unchanged from 2002. This level has grown steadily from 3.0 percent reported in 1989 (the first year data on D.O.s were available from the birth certificate).

The percentage of all births attended by midwives, which had increased steadily between 1975 and 2002 (from less than 1.0 percent to 8.1 percent), was about the same in 2003 (8.0 percent). The vast majority of all midwife-attended births in 2003 were by certified nurse midwives (CNMs) (94.6 percent). This rate was stable at 95.0 percent for 1996–2000 but has declined slightly since. Hospitals are the primary site for midwife-attended births (74). Because of underreporting of midwife-attended deliveries, these data should be considered lower estimates of the actual number of midwife-attended births (4,75).

Ninety-nine percent of all births in 2003 were delivered in hospitals, a rate that has been stable over the past several decades. Out-of-hospital births occurred predominantly in a residence (65 percent); 27 percent were in a freestanding birthing center in 2003. These levels have fluctuated only moderately since 1989. A national study of the safety of vaginal birth after cesarean (VBAC) in birthing centers suggests that birthing centers should refer women who desire a VBAC to a hospital for delivery and that hospitals should provide the option of a midwife-obstetrician team for such women (76).

About 92 percent of births to non-Hispanic white and black women were attended by a physician in a hospital, compared with 90 percent of births to Hispanic women. As in previous years, in 2003 Hispanic women were more likely to have a midwife-attended hospital birth (9.1 percent) than non-Hispanic white and black women (6.8 and 7.0 percent, respectively).

Among the Hispanic subgroups, Cuban women had the highest rate of physician-attended hospital births (93.3 percent); the rates for Mexican, Puerto Rican, and Central or South American women ranged from 85 to 87 percent. Mexican, Puerto Rican, and Central or South American women also had the highest rates of midwife-attended hospital births (9–10 percent); Cuban women had the lowest rate (4 percent) (data not shown).

Method of delivery

For 2003 the rate of cesarean delivery increased to 27.5 percent of all births, the highest rate ever reported in the United States. This rate is a 5 percent rise from 2002 (26.1 percent). After falling between 1989 and 1996, the cesarean rate had risen by one-third from the 1996 low of 20.7 (tables 39 and 40 and figure 7). Data from the National Hospital Discharge Survey show similar trends in cesarean delivery for 1990–2002 (77).

The escalation in the total cesarean rate is being driven by both the rise in the primary cesarean rate and the steep decline in the VBAC rate. Controversy continues on the risks, benefits, and long-term consequences of cesarean delivery, especially with regard to medically indicated or elective cesarean delivery and VBAC delivery (78–80).

The primary cesarean rate for 2003 (19.1 per 100 live births to women who had no previous cesarean) was 6 percent higher than in 2002 (18.0). This rate has increased by an average of 5 percent each year during 1998–2003 and was 31 percent higher than the low reported for 1996–97 (14.6). The rates for low-risk women (i.e., primiparous women with full-term, singleton deliveries, with vertex presentations) have also increased (81) by an average of 5 percent per year since 1998 (data not shown). Rates for women at even lower risk (i.e., those with singleton, full-term, vertex presentation births with no risk factors or complications of labor or delivery reported on the birth certificate) increased 67 percent for 1991–2001 (82). The increase in primary cesarean deliveries may be associated with nonclinical factors such as demographics, physician practice patterns, and maternal choice (79,83).

Among women with a first (primary) cesarean delivery, subsequent deliveries will be either a repeat cesarean or a VBAC. Between 2002 and 2003 the rate of VBAC fell 16 percent—from 12.6 to 10.6 per 100 women with a previous cesarean and the lowest level reported from birth certificate data. The VBAC rate has plummeted by 63 percent since 1996, after increasing by 50 percent between 1989 and 1996 (from 18.9 to 28.3 percent) (figure 8). This rate has declined by a similar magnitude among low-risk women (full-term, singleton deliveries with vertex presentations) (data not shown).

This steep decline in the rate of VBAC implies a corresponding rise in the rate of repeat cesarean deliveries (the rate of cesarean delivery per 100 women with a previous cesarean) (figure 8). The

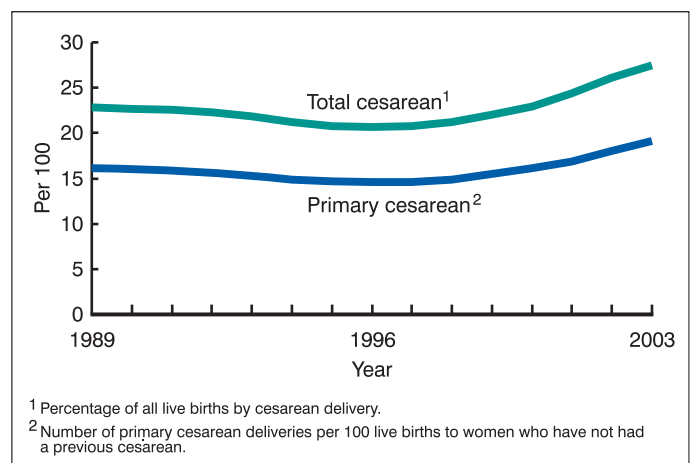


Figure 7. Total and primary cesarean rate: United States, 1989–2003

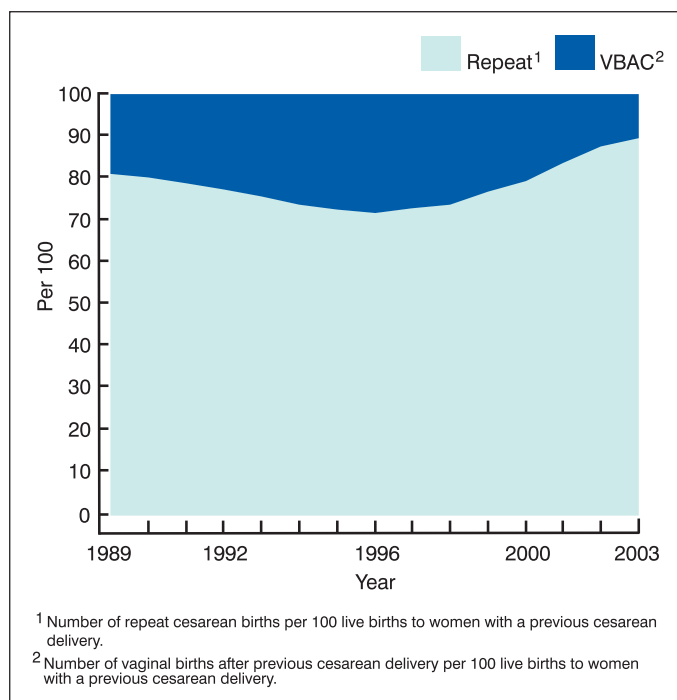


Figure 8. Rates of repeat cesarean delivery and vaginal birth after cesarean delivery (VBAC): United States, 1989–2003

repeat rate increased from 71.7 to 89.4 percent between 1996 and 2003; therefore, once a woman has a cesarean delivery, it is highly likely (there is an almost 90 percent chance) that subsequent deliveries will be by cesarean. The steep decline in the VBAC rate and, accordingly, the increase in the repeat cesarean rate may be related to reports of risks associated with VBAC, more conservative practice guidelines, legal pressures, as well as the continuing debate regarding the harms and benefits of vaginal birth compared with cesarean section (80, 83–86).

For 2002–03 the primary cesarean rate increased and the VBAC rate decreased for all age, racial, and ethnic groups (including subgroups). Between 2002 and 2003 the primary cesarean rate rose 7 percent for non-Hispanic white and non-Hispanic black women and 6 percent for Hispanic women. The primary rates for non-Hispanic black women (20.7) remained slightly higher than the rate for non-Hispanic white and Hispanic women (19.5 and 17.0, respectively). The VBAC rate declined by at least 14 percent for each group for 2003.

Until 2002 VBAC rates decreased and rates of repeat cesarean delivery increased with advancing maternal age. However, repeat cesarean rates and, therefore, VBAC rates have been essentially the same for all age groups since 2002. In 2003 at least 89 percent of women in all age groups who had a previous cesarean had a repeat cesarean delivery (data not shown).

As in past years, primary cesarean rates rose as maternal age increased. For example, the 2003 rate for mothers aged 40–54 years (42.5) was more than twice that of mothers under 20 years (17.2) (table 40). The increased likelihood of cesarean delivery in older women may be related to biologic factors, patient-practitioner concerns (87), and the increased rate of multiple births.

For American Indian women the overall cesarean rate in 2003 was 24.1 percent; the rate for API mothers was 26.6 percent. Among the Hispanic subgroups, the rate of cesarean delivery ranged between 25.8 for Mexican to 39.8 for Cuban mothers (tables 24 and 25).

Between 1996 and 2003 total cesarean rates increased for all gestational ages, with the greatest increase (about 33 percent) for moderately preterm (32–36 weeks) and term (37–41 weeks) infants. Rates for very preterm infants (less than 32 weeks) and postterm infants (greater than 41 weeks) increased by 25 and 23 percent, respectively. In 2003 one-half of all very preterm (49.5 percent) and over one-third (37.3 percent) of moderately preterm infants were cesarean deliveries (figure 9). See also the section on “Period of gestation.”

Cesarean rates increased for all 50 States and the District of Columbia for 2002–03. As in previous years, there was considerable variation in cesarean rates by State, from under 22 percent in Alaska, Idaho, New Mexico, Utah, and Wisconsin to over 30 percent for Florida, Kentucky, Louisiana, Mississippi, New Jersey, Texas, and West Virginia (table 41). Almost one-half (46.1 percent) of births in Puerto Rico were cesarean deliveries.

Between 2002 and 2003 VBAC rates decreased in 47 States and the District of Columbia and were unchanged in Hawaii. VBAC rates rose for Pennsylvania and Washington. This unexplained increase may be due to wording and formatting changes to the method of delivery item on the 2003 revision of the U.S. Standard Certificate of Live Birth; see “Technical Notes.” For 2003 VBAC rates ranged from 5.1 in Louisiana to 24.0 per 100 in Vermont; in other words, repeat cesarean rates ranged from 94.9 in Louisiana to 76.0 in Vermont.

Mothers reported to have medical risk factors and complications of labor and/or delivery during pregnancy frequently have higher rates of cesarean delivery (table 42). For example, more than 55 percent of mothers with eclampsia and almost all mothers with cephalopelvic disproportion (96.0 percent) and breech/malpresentation (87.0 percent) had a cesarean delivery.

Since 1996, as the cesarean rate has increased, the percentage of births delivered by either forceps or vacuum extraction has decreased (data not shown). The combined rate of forceps and vacuum

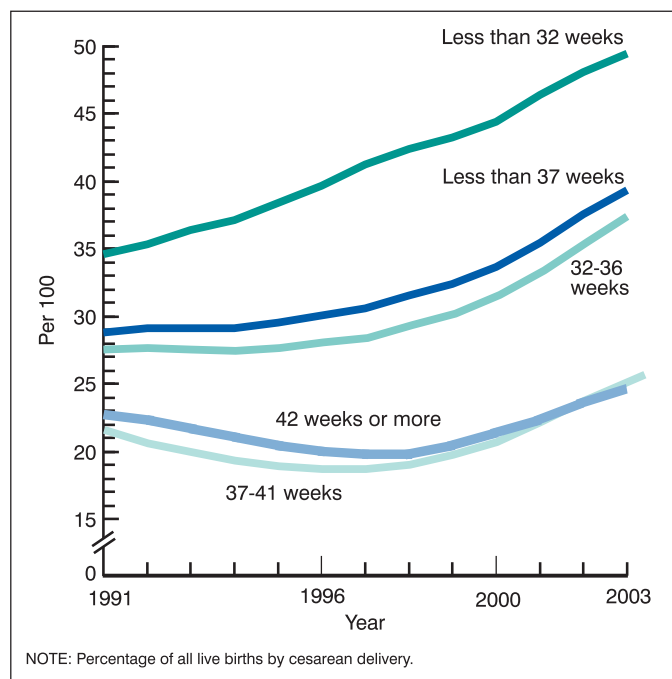


Figure 9. Total cesarean rate by gestational age at delivery: United States, 1991–2003

extraction for 2003 (5.6 percent) is 41 percent lower than the 1994 high of 9.5 percent (88).

Infant Health Characteristics

Period of gestation

The preterm birth rate rose 2 percent from 12.1 percent of all births in 2002 to 12.3 percent in 2003. The proportion of infants born preterm (less than 37 completed weeks of gestation) has risen 16 percent since 1990 (from 10.6 percent) and more than 30 percent since 1981 (9.4 percent). Most of the current year increase was among infants born at 32–36 weeks of gestation (from 10.12 to 10.37 percent) or those considered moderately preterm; the percentage of infants born at less than 32 weeks of gestation, or very preterm, was essentially unchanged at 1.97 percent (1.96 percent in 2002). The rate of very preterm births has risen moderately in recent years, however, from 1.81 percent since 1981. See tables 24, 25, 43, and 44. Preterm birth is a leading cause of infant death and is associated with nearly one-half of all congenital neurological defects (e.g., cerebral palsy) (89,90). Unfortunately, uncertainty continues on the causes and best management of preterm labor (90–92).

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. The LMP-based gestational age is subject to error for several reasons, including imperfect maternal recall or misidentification of the LMP because of postconception bleeding, delayed ovulation, or intervening early miscarriage. Although these data are edited for gestational ages that are clearly inconsistent with the infant's plurality and birthweight (see "Technical Notes"), these edits are conservative, and substantial incongruities in these data persist. Additionally, changes in reporting of this measure over time may affect trends in preterm birth rates, particularly by race. (93–95).

Preterm rates were up between 2002 and 2003 for the three largest race and ethnic groups: non-Hispanic white (11.0 to 11.3 percent), non-Hispanic black (17.7 to 17.8 percent), and Hispanic (11.6 to 11.9 percent) (table 44). Among births to non-Hispanic white mothers, rates increased for both very preterm and moderately preterm births. However, increases for non-Hispanic blacks and Hispanics were predominately among moderately preterm births. Since 1990 preterm birth rates have risen by one-third for non-Hispanic white births (from 8.5 percent) and a more modest 8 percent for Hispanic births (11.0 percent). In contrast, preterm rates among non-Hispanic black infants over this period have declined slightly (from 18.9 percent). Notwithstanding the more positive preterm trends for non-Hispanic blacks, their preterm risk continues to be substantially higher than those of other groups. The very preterm rate, about twice as high among non-Hispanic black compared with non-Hispanic white and Hispanic births (3.99 compared with 1.60 and 1.73 percent, respectively), is of particular concern. For preterm birth rates for American Indians, Asian and Pacific Islanders, and the Hispanic subgroups, see tables 24 and 25.

The rise in the incidence of plural births, which are much more likely than singletons to be born preterm, had an important influence on the overall preterm birth rate over the past two decades. The preterm rate for singletons rose from 10.4 to 10.6 between 2002 and 2003 and has risen 9 percent since 1990 (from 9.7). Fortunately, the increase in singleton preterm births is limited to those born moderately preterm;

the singleton very preterm birth rate declined slightly over this period (from 1.69 to 1.58) (14) (data for 2003 not shown).

A marked change in the proportion of births born at and postterm has also been observed in recent years. Births are increasingly more likely to be delivered earlier in term, or at 37–39 weeks of gestation, and less likely to be delivered at 40 weeks and later. The percentage of births delivered at 40 plus weeks declined from 48 to 36 percent between 1990 and 2003, whereas the proportion delivered at 37–39 weeks increased from 41 to 52 percent. See figure 10. The shift toward earlier delivery at all gestational ages suggests changes in the use of delivery management techniques such as induction of labor and cesarean delivery (96–98). (See section on "Method of delivery" and figure 9.)

The wide variation in preterm birth rates by State can be at least partly linked to differences in State demographics (e.g., maternal age distributions and multiple birth rates). For 2003 preterm birth rates below 10 percent were reported for Connecticut, New Hampshire, and Vermont, compared with levels of over 15 percent for Alabama, Louisiana, and Mississippi. Preterm rates increased for the vast majority of States between 1990 and 2003. See table G.

Birthweight

The low birthweight rate (LBW) rose to 7.9 percent for 2003, from 7.8 percent in 2002, the highest level reported since 1970. Following declines during the 1970s through the early 1980s, the percentage of newborns delivered LBW (birthweight of less than 2,500 grams or less than 5 lb 8 oz) has generally risen; the 2003 rate is 18 percent higher than the 1984 low (6.7 percent). The percentage of infants born very low birthweight (VLBW) (less than 1,500 grams or less than 3 lb 4 oz) was 1.45 percent for 2003, not significantly different from the previous year (1.46 percent). Thus, all of the increase in LBW for the current year was among moderately low birthweight (MLBW) infants, that is, infants born at between 1,500 and 2,499 grams. The percentage MLBW increased from 6.36 to 6.48 between 2002 and 2003 and has risen from 5.69 since 1990. Although essentially unchanged for the current year, the VLBW level has also climbed significantly in recent years. (See tables 43–47 and figure 11.)

Although the link may not be directly causal (99), weight at birth can be an important predictor of infant mortality. For VLBW infants, the risk of dying in the first year of life is nearly 100 times that of infants

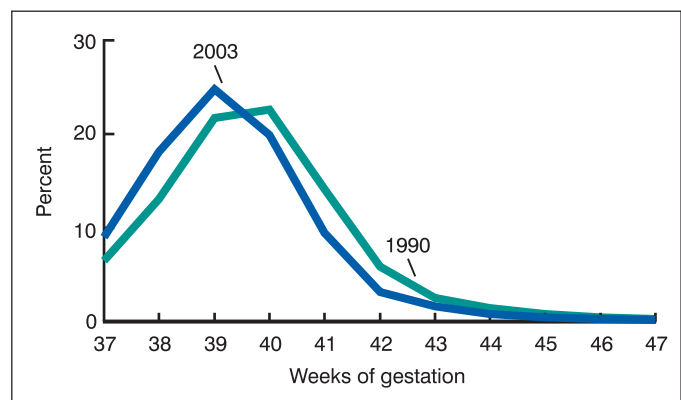


Figure 10. Percent distribution of births 37–47 weeks of gestation: United States, 1990 and 2003

Table G. Preterm birth rates by State: United States and each State, 1990 and 2002

State	2003	1990	Percent change, 1990–2003	State	2003	1990	Percent change, 1990–2003
United States	12.3	10.6	16	Nebraska.	12.4	8.5	45
Alabama	15.7	13.1	20	Nevada.	13.6	11.1	22
Alaska	11.1	9.0	23	New Hampshire.	9.2	6.8	36
Arizona	13.1	10.2	28	New Jersey	12.1	10.7	13
Arkansas.	13.0	12.5	4	New Mexico	12.7	11.0	15
California.	10.5	9.8	7	New York	11.4	10.7	7
Colorado	12.1	9.6	26	North Carolina.	13.6	12.5	9
Connecticut	9.7	8.9	9	North Dakota	12.0	8.3	45
Delaware.	13.7	11.1	24	Ohio	12.5	10.6	18
District of Columbia	14.8	20.7	–28	Oklahoma	12.7	10.1	26
Florida	13.0	11.6	13	Oregon.	10.1	8.0	25
Georgia	13.1	12.8	2	Pennsylvania	11.6	10.3	12
Hawaii	12.6	10.0	26	Rhode Island	11.6	9.6	21
Idaho	10.7	8.7	24	South Carolina	14.5	12.3	18
Illinois	12.8	11.4	13	South Dakota	11.2	8.9	25
Indiana	12.9	9.9	30	Tennessee	14.1	12.6	12
Iowa	11.4	8.7	31	Texas.	13.9	11.2	23
Kansas	11.6	9.5	22	Utah	10.4	8.7	20
Kentucky	14.0	10.5	34	Vermont	9.5	7.1	34
Louisiana.	15.6	13.9	12	Virginia.	12.1	11.0	9
Maine.	10.1	7.6	32	Washington	10.3	8.4	22
Maryland	13.1	11.2	16	West Virginia	13.3	9.9	34
Massachusetts	10.7	7.7	39	Wisconsin	11.3	9.2	23
Michigan	11.9	10.7	11	Wyoming.	11.8	10.3	15
Minnesota	10.2	8.2	25				
Mississippi	17.9	15.1	19				
Missouri	13.1	10.7	22				
Montana	11.1	8.5	31				

NOTE: Preterm is defined as less than 37 completed weeks of gestation.

who weigh at least 2,500 grams at birth; the risk for MLBW infants (1,500–2,499 grams) is more than five times higher than that of heavier newborns (89). Smaller infants who do survive, especially those born

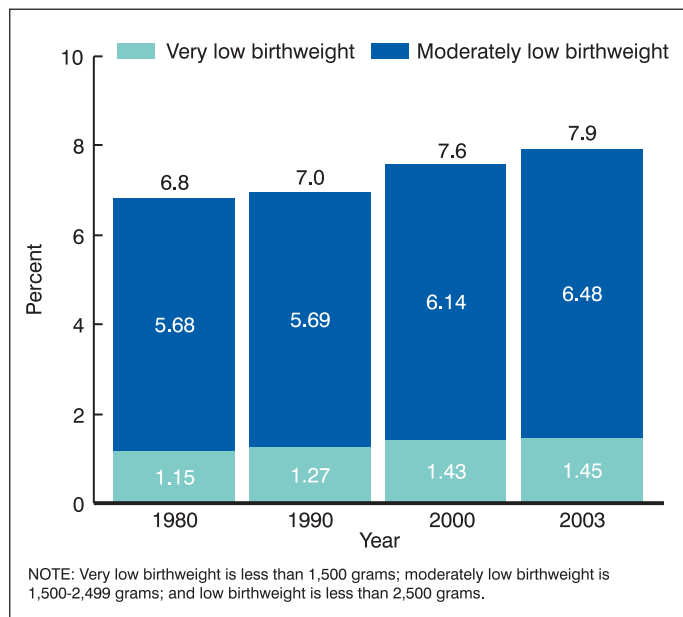


Figure 11. Percentage of births very low, moderately low, and low birthweight: United States, 1980, 1990, and 2000 and 2003

at less than 1,500 grams, are more likely to suffer long-term disabilities (100).

Recent trends in LBW are influenced by the strong growth in the multiple birth rate (101) (see section on “Multiple births”); twins and higher order multiples are much more likely to be born LBW than singletons; 58.2 percent of all plural births were born LBW in 2003. However, even when multiples are excluded, LBW rates are on the rise. For 2003 the **singleton LBW rate** was 6.2 percent, a small increase over 2002 (6.1 percent), and 5 percent higher than the 1990 level (5.9 percent). Studies suggest that singletons conceived with assisted reproductive technology (ART), which account for an increasing number of births (102,103), are at greater risk of LBW than those conceived spontaneously (104,105).

LBW levels increased for 2002–03 for the largest racial and ethnic groups: non-Hispanic white (from 6.9 to 7.0 percent), non-Hispanic black (from 13.4 to 13.6 percent), and Hispanic (from 6.5 to 6.7 percent). Fortunately, however, VLBW rates were essentially unchanged. **See tables 24 and 25** for VLBW and LBW levels for American Indian, Asian and Pacific Islander, Mexican, Puerto Rican, Cuban, and Central and South American infants.

Singleton LBW also rose between 2002 and 2003 among each of the largest racial groups. **See table H.** Since 1990 LBW rates for singletons have risen 6 and 12 percent for Hispanic and non-Hispanic white infants, respectively, but have declined 3 percent among non-Hispanic black newborns.

The percentage of infants born at 4,000 grams or more (at least 8 lb 14 oz) or macrosomic births, declined from 9.2 to 8.9 percent between 2002 and 2003. The proportion of higher birthweight infants

Table H. Rate of very low birthweight and low birthweight, and mean birthweight among singletons by race and Hispanic origin of mother, United States: 1990, 1995, 2000, and 2003

	2003	2002	2000	1995	1990 ¹
Total, all races, origins ²					
Percent very low birthweight	1.11	1.11	1.11	1.08	1.05
Percent low birthweight	6.20	6.12	6.00	6.05	5.90
Mean birthweight in grams (standard deviation) ³ . . .	3,325 (571)	3,332 (573)	3,348 (577)	3,353 (581)	3,365 (583)
Non-Hispanic white					
Percent very low birthweight	0.82	0.81	0.80	0.78	0.73
Percent low birthweight	5.11	5.02	4.88	4.87	4.56
Mean birthweight in grams (standard deviation) ³ . . .	3,384 (555)	3,392 (556)	3,410 (560)	3,416 (563)	3,433 (562)
Non-Hispanic black					
Percent very low birthweight	2.61	2.63	2.62	2.55	2.54
Percent low birthweight	11.58	11.44	11.28	11.66	11.92
Mean birthweight in grams (standard deviation) ³ . . .	3,122 (631)	3,128 (632)	3,141 (637)	3,132 (635)	3,128 (635)
Hispanic ⁴					
Percent very low birthweight	0.94	0.96	0.94	0.93	0.87
Percent low birthweight	5.55	5.44	5.36	5.36	5.23
Mean birthweight in grams (standard deviation) ³ . . .	3,324 (548)	3,332 (550)	3,344 (552)	3,343 (553)	3,351 (552)

¹Data for 1990 by race and Hispanic origin exclude data for New Hampshire and Oklahoma, which did not require reporting of Hispanic origin of mother.

²Includes births to races not shown separately.

³Computed in grams.

⁴Includes persons of Hispanic origin of any race.

NOTES: Very low birthweight is less than 1,500 grams. Low birthweight is less than 2,500 grams. Race categories are consistent with the 1977 Office of Management and Budget guidelines; see "Technical Notes."

has dropped from over 11 percent since the 1980s. (See tables 24, 25, and 45 for 2003 data.)

In 2003 the mean or average birthweight for infants delivered in single deliveries was 3,325 grams (7 lb 5 oz). Since 1990 the average birthweight has declined slightly, by about 1 percent, for U.S. births overall and for non-Hispanic white and Hispanic births. The mean birthweight for non-Hispanic black infants has been essentially stable over this period (table H).

LBW risk historically has differed markedly by maternal age, with the youngest and oldest mothers the most likely to deliver at-risk infants. In 2003 mothers under 15 years and mothers over 45 years of age were two to three times as likely to bear a VLBW infant compared with their 25–34-year-old counterparts. Any analysis of LBW or VLBW risk by maternal age, however, should take into account the disproportionate impact of multiple births on levels for older women. Plural births are much more likely to be LBW and VLBW and also occur much more frequently among older women. (See section on "Multiple births".) In illustration, among all infants born to women 45 years and over in 2003, the VLBW rate was 4.0 percent, twice the VLBW level for singletons born to this age group (2.0 percent). (Data not shown.)

LBW levels also vary widely by State. For 2003 the lowest LBW rates were reported for Alaska and Washington (6.0 percent); the highest rate was observed in Mississippi (11.4 percent). Maternal demographic factors such as age and race or ethnicity account for some of these differences by State. Rates for non-Hispanic white births ranged from a low of 5.2 percent (Alaska) to a high of 8.9 percent (Wyoming) (tables 46 and 47). For States reporting 1,000 or more births to non-Hispanic black women, the percentage of births born LBW ranged from 10.3 to 15.7 percent in Minnesota and Colorado, respectively. Ranges by State for Hispanic births are very similar to those for non-Hispanic white births. Rates for States with at least 1,000 births

to Hispanic mothers ranged from 5.1 and 5.3 percent for Minnesota and Oregon, respectively, to 8.7 and 8.9 percent for New Mexico and Rhode Island, respectively.

Apgar score

The Apgar score has been in use for over 50 years. In 1953 Virginia Apgar, M.D., proposed a new method of evaluating the general physical condition of the newborn at 1 minute, 5 minutes, and if desired, at additional 5-minute intervals after delivery (106). The Apgar score measures five easily identifiable infant characteristics—heart rate, respiratory effort, muscle tone, reflex irritability, and color. Each characteristic is assessed and assigned a value of 0 to 2, with 2 being optimum. The total score is the sum of the scores of the five components. A score of 0 to 3 indicates an infant in need of resuscitation; a score of 4 to 6 is considered intermediate; a score of 7 or greater indicates that the neonate is in good to excellent physical condition.

The 1-minute Apgar, no longer available from national vital statistics data, signals the need for immediate resuscitation. The 5-minute Apgar score can be a useful clinical indicator of the effectiveness of resuscitation efforts but has limited use in determining the severity of the problem and correlates poorly with future neurologic outcome. The 2003 revision of the Certificate of Live Birth includes items for both the 5- and 10-minute Apgar scores; for further information see the Revision Web site (5). All States except California and Texas reported information on the 5-minute Apgar score in 2003.

The proportion of newborns with 5-minute Apgar scores of 9 or 10, indicating excellent infant health status, has increased very slowly from 88.6 percent to 91.1 percent between 1978 and 2003. The proportion of births with low Apgar scores (below 7) declined over

30 percent from 1978 to 1993 (2.1 percent to 1.4) but has been unchanged since (tables 24 and 25). This is in contrast to trends in other indicators of infant health such as LBW and preterm births, which have generally risen in recent years (see the sections on gestational age and birthweight).

For non-Hispanic black infants, the percentage of unfavorable Apgar scores has declined and excellent Apgar scores have increased in the past decade, whereas low and high Apgar ratings have remained steady for non-Hispanic white infants. Despite the improvement in scores for non-Hispanic black infants, disparities persist between the two groups. In 2003, 2.3 percent of non-Hispanic black infants had Apgar scores under 7 compared with 1.3 percent of non-Hispanic white infants.

Of all LBW infants, 9 percent had low Apgar scores for 2003, compared with 1 percent of normal weight (2,500–3,999 grams) infants; among VLBW infants, 32 percent had low Apgar scores in 2003 (data not shown).

Abnormal conditions of the newborn

The most frequently reported of the eight abnormal conditions on the 1989 revision of the birth certificate are as follows: assisted ventilation less than 30 minutes, assisted ventilation of 30 minutes or longer, and hyaline membrane disease/respiratory distress syndrome (RDS) (table 48). There may be underreporting of abnormal conditions on the birth certificate (107), especially those difficult to identify at birth: for example, fetal alcohol syndrome (FAS) (108).

In 2003 the rate for assisted ventilation less than 30 minutes was 21.4 per 1,000, a rate almost double the 1990 rate of 12.9. For assisted ventilation of 30 minutes or longer the rate was 9.3 per 1,000. This rate has gradually increased since 1990 (7.2). Assisted ventilation is central to the therapy for respiratory disease such as RDS (109).

For comparability, rates and trend analysis for the abnormal conditions discussed exclude data for Pennsylvania and Washington, which implemented the 2003 Standard Certificate of Live Birth. See “Technical Notes.”

The overall rate of hyaline membrane disease/RDS in 2003 was 6.0 per 1,000. This rate has decreased since 1994, when the highest level (6.8) was reported. A frequent cause of disease in preterm infants, risk factors for hyaline membrane disease/RDS include early gestational age, inadequately controlled maternal diabetes, multiple births, and fetal asphyxia (109,110). It has been suggested that medically induced delivery before labor for early-term infants (gestational ages 37 and 38 weeks) may be a risk factor for RDS, possibly because of lung immaturity (111).

The rate for meconium aspiration syndrome (1.2 in 2003) has slowly decreased from the 1990 rate (3.1); the rate for anemia for 2003 (0.9) was one-half the 1990 rate (1.8).

Congenital anomalies

The leading cause of infant death in the United States, congenital anomalies (89) also cause metabolic disorders and disability (112) (table 49). Since 1992 there has been a national effort to prevent neural tube defects (NTDs), such as spina bifida and anencephalus, by encouraging increased intake of folic acid among women of childbearing age (113). Since 1998 fortification of all cereal and grain products with folic acid has been mandatory (113);

increased folate use among women of childbearing age has been reported (114). It has been suggested that greater maternal weight may be a risk factor for NTDs (115) and that multivitamin supplementation may also protect against defects other than NTDs (116).

The rate for the NTD anencephalus increased to 11.4 per 100,000 births in 2003, from 9.9 for 2002. The spina bifida/meningocele rate was 18.7 in 2003 compared with 20.0 for 2002. The rate for anencephalus declined for 1997–2002 (113); the rate for spina bifida declined between 1997 and 2003.

Among the most commonly reported specific anomalies, cleft lip/palate was reported at a rate of 75.9 per 100,000 births. The rate of clubfoot was 57.6 per 100,000; the rate of Down’s syndrome was 46.5. Rates for several of the congenital anomalies discussed exclude data for Pennsylvania and Washington, which implemented the 2003 Standard Certificate of Live Birth; see “Technical Notes.”

Although congenital anomalies are underreported on the birth certificate, birth certificate data may be a valuable resource for investigative or confirmatory studies (117). Birth certificate data have been used to support an association between maternal smoking and birth defects such as cleft lip/palate and clubfoot (117,118). Early ascertainment and reporting of congenital anomalies are limited because many anomalies are not recognizable at birth; the most serious or apparent anomalies are more likely to be observed and documented prior to birth registration (119). The congenital anomalies reported on birth certificates are rare events. Because a small change in the number of anomalies reported can result in a relatively large change in rates, caution should also be used in comparing yearly rates for a specific anomaly.

Rates for certain types of anomalies differ widely with maternal age (table 49). For example, in 2003 as in past years, rates for omphalocele/gastroschisis are highest for infants of the youngest mothers, whereas rates for Down’s syndrome and heart malformations are highest for infants of mothers aged 35 years and over.

Multiple births

The twin birth rate rose to 31.5 twin births per 1,000 total live births in 2003, another record high, and a 1 percent increase over the 2002 level (31.1). The twinning rate has climbed by two-thirds (from 18.9 per 1,000) and the number of births in twin deliveries by more than three-fourths since 1980, from 68,339 to 128,665 (120). (See tables 50 and J.)

The triplet/+ birth rate held steady for 2003 at 187.4, not significantly changed from the previous year (184.0). Between 1980 and 1998 the triplet/+ birth rate (the number of triplets, quadruplets, and quintuplets and other higher order multiples per 100,000 live births) had surged by more than 500 percent, rising from 37.0 to 193.5 (120). Since 1999, however, the triplet/+ rate has remained stable and significantly lower than the 1998 peak. Despite the stability in the rate, the number of triplet/+ born in 2003 was the highest ever reported, 7,663.

The rising incidence of multiple births over the last two decades has been associated with two related trends: the older age at childbearing (older mothers are more likely than younger mothers to conceive multiples spontaneously) and increasing use of fertility therapies (i.e., ART such as *in vitro* fertilization (IVF) and non-ART procedures such as intrauterine insemination and ovulation-inducing drugs) (26,102,121). A study of multiples born in the year 2000 estimated that natural conception accounted for 67 percent of the twins and only 18 percent of the triplet/+ born that year (122).

Table J. Numbers of twin, triplet, quadruplet, and quintuplet and other higher order multiple births: United States, selected years 1980–2003

Year	Twins	Triplets ¹	Quadruplets ¹	Quintuplets and higher order multiples ²	Triplet/+	Twin birth rate ³	Triplet/+ birth rate ⁴
2003	128,665	7,110	468	85	7,663	31.5	187.4
2002	125,134	6,898	434	69	7,401	31.1	184.0
2001	121,246	6,885	501	85	7,471	30.1	185.6
2000	118,916	6,742	506	77	7,325	29.3	180.5
1995	96,736	4,551	365	57	4,973	24.8	127.5
1990	93,865	2,830	185	13	3,028	22.6	72.8
1985	77,102	⁽⁵⁾ 1,925	---	---	1,925	20.5	51.2
1980	68,339	⁽⁵⁾ 1,337	---	---	1,337	18.9	37.0

--- Data not available.

¹Triplets, quadruplets, and quintuplets and other higher order multiple births were not differentiated in the national data set until 1989.

²Quintuplets, sextuplets, and higher order multiple births are not differentiated in the national data set.

³Births in twin deliveries per 1,000 live births.

⁴Births in triplet and higher order multiple deliveries per 100,000 live births.

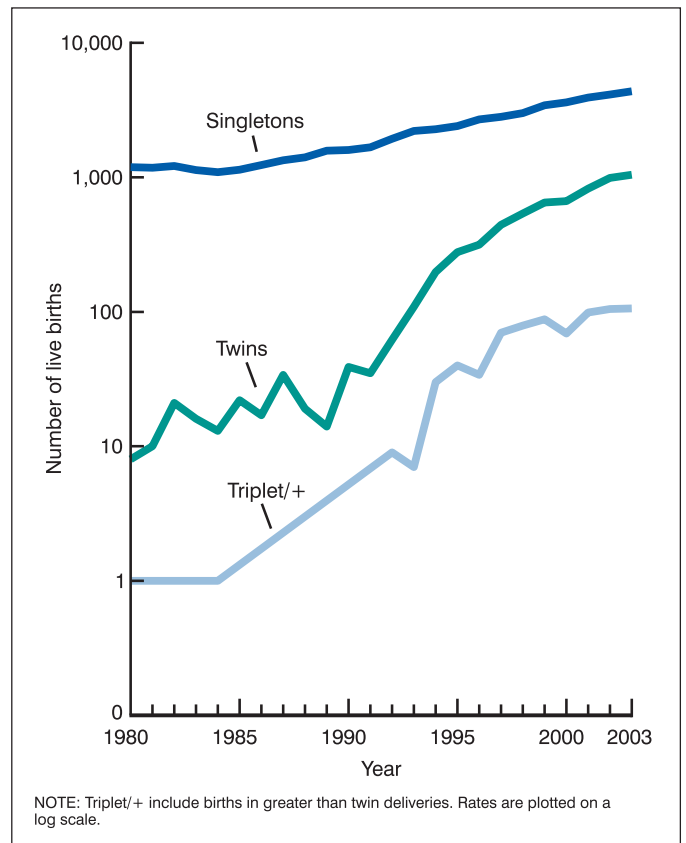
⁵Includes quadruplets and higher order multiple births.

The recent stabilization of the triplet/+ birth rate may be linked to recommendations in the late 1990s from The American College of Obstetricians and Gynecologists and The American Society of Reproductive Medicine intended to prevent higher order multiple pregnancies by limiting the number of embryos transferred (123,124). The proportion of ART procedures involving the transfer of three or more embryos, a predictor of triplet/+ birth outcome, appears to have declined between 1997 and 2001 (125). Refinements of ART therapies plus other factors also may have played a role (126,127).

Twinning rates increased for the current year among non-Hispanic white (35.2) and Hispanic (21.3) women but were unchanged for non-Hispanic black mothers (34.7). Triplet/+ birth rates were essentially stable for each group. The highest rates and the fastest growth in multiples are reported for non-Hispanic white mothers; women in this group are also more likely to receive infertility services (27). Between 1990 and 2003 the twin birth rate rose by more than 50 percent among non-Hispanic white women, and the triplet/+ rate rose by 184 percent. In comparison, twinning rates rose 30 percent among non-Hispanic black mothers and 18 percent among Hispanic mothers; triplet/+ birth rates by 137 and 117 percent, respectively.

By maternal age, the rise in twin and triplet/+ birth rates has been most pronounced among older mothers, and especially those aged 40 years and over. The number of singletons born to women aged 45–49 years has risen nearly threefold between 1990 and 2003 (from 1,599 to 4,371 births), but the number of multiples has climbed even more dramatically. Between 1990 and 2003 the number of twins born to women in this age group surged from only 39 to 1,045 and the number of triplet/+ births from 0 to 106 (120). See figure 12.

The greatly increased risk of adverse outcome associated with multiple gestation pregnancies compared with singleton gestation pregnancies is well documented, as is the way increasing rates of these high-risk pregnancies are affecting national measures of public health (128–130). In 2003 multiples accounted for 3 percent of all live births but more than one of every four VLBW infants (data not shown). In 2002, the latest year for which data are available, nearly one of every five neonatal deaths (death within the first month of birth) were born in a multiple delivery (130,131).

**Figure 12. Numbers of twin, triplet, and singleton births to women 45–49 years of age: United States, 1990–2003**

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List of Detailed Tables

1. Live births, birth rates, and fertility rates, by race: United States, specified years 1940–55 and each year, 1960–2003	29
2. Live births by age of mother, live-birth order, and race of mother: United States, 2003	30
3. Fertility rates and birth rates, by age of mother, live-birth order, and race of mother: United States, 2003	31
4. Total fertility rates and birth rates, by age of mother: United States, 1970–2003, and by age and race of mother: United States, 1980–2003	32
5. Fertility rates and birth rates, by live-birth order and race of mother: United States, 1980–2003.	35
6. Live births, birth rates, and fertility rates, by Hispanic origin of mother and by race for mothers of non-Hispanic origin: United States, 1989–2003	37
7. Live births by age of mother, live-birth order, Hispanic origin of mother, and by race for mothers of non-Hispanic origin: United States, 2003	38
8. Fertility rates and birth rates, by age of mother, live-birth order, Hispanic origin of mother, and by race for mothers of non-Hispanic origin: United States, 2003	40
9. Total fertility rates, fertility rates, and birth rates, by age and Hispanic origin of mother and by race for mothers of non-Hispanic origin: United States, 1989–2003	42
10. Number of births, birth rates, fertility rates, total fertility rates, and birth rates for teenagers 15–19 years, by age of mother: United States, each State and territory, 2003	45
11. Live births by race of mother: United States, each State and territory, 2003.	46
12. Live births by Hispanic origin of mother and by race for mothers of non-Hispanic origin: United States, each State and territory, 2003	47
13. Total number of births, rates (birth, fertility, and total fertility), and percentage of births with selected demographic characteristics, by race of mother and place of birth of mother: United States, 2003	48

14. Total number of births, rates (birth, fertility, and total fertility), and percentage of births with selected demographic characteristics, by Hispanic origin of mother and by race for mothers of non-Hispanic origin and by place of birth of mother: United States, 2003	49	attainment and race and Hispanic origin of mother: Total of 47 reporting States and the District of Columbia, 2003	71
15. Live births by race of mother and observed and seasonally adjusted birth and fertility rates, by month: United States, 2003	50	32. Percentage low birthweight by smoking status, age, and race and Hispanic origin of mother: Total of 47 reporting States and the District of Columbia, 2003	72
16. Live births by day of week and index of occurrence by method of delivery, day of week, and race of mother: United States, 2003	51	33. Live births by month of pregnancy prenatal care began and percentage of mothers beginning care in the first trimester and percentage with late or no care, by age and race and Hispanic origin of mother: Total of 48 States and the District of Columbia, 2003	73
17. Number, birth rate, and percentage of births to unmarried women, by age, race, and Hispanic origin of mother: United States, 2003	52	34. Percentage of mothers beginning prenatal care in the first trimester and percentage of mothers with late or no prenatal care, by race and Hispanic origin of mother: United States, each State and territory, 2003	75
18. Birth rates for unmarried women by age of mother: United States, 1970, 1975, and 1980–2003, and by age, race, and Hispanic origin of mother: United States, 1980–2003	53	35. Live births by month of pregnancy prenatal care began, number of prenatal visits, and median number of visits, by race and Hispanic origin of mother: Total of 48 States and the District of Columbia, 2003	77
19. Number and percentage of births to unmarried women, by race and Hispanic origin of mother: United States, each State and territory, 2003	56	36. Live births to mothers with selected obstetric procedures and rates by age of mother, by race of mother: United States, 2003	79
20. Birth rates by age and race of father: United States, 1980–2003	57	37. Live births to mothers with selected complications of labor or delivery and rates by age of mother, by race of mother: United States, 2003	80
21. Live births by educational attainment, and percentage of mothers completing 12 years or more and 16 years or more of school, by age and race and Hispanic origin of mother: Total of 48 States and the District of Columbia, 2003	59	38. Live births by attendant, place of delivery, and race and Hispanic origin of mother: United States, 2003	81
22. Number of live births and percent distribution, by weight gain during pregnancy and median weight gain, according to period of gestation and race and Hispanic origin of mother: Total of 49 reporting States and the District of Columbia, 2003	61	39. Live births by method of delivery and rates of cesarean delivery and vaginal birth after previous cesarean delivery, by race and Hispanic origin of mother: United States, 1989–2003	82
23. Percentage low birthweight by weight gain of mother during pregnancy, period of gestation, and race and Hispanic origin of mother: Total of 49 reporting States and the District of Columbia, 2003	63	40. Live births by method of delivery and rates of cesarean delivery and vaginal birth after previous cesarean delivery, by age and race and Hispanic origin of mother: United States, 2003	84
24. Percentage of births with selected medical or health characteristics, by race of mother, by place of birth of mother: United States, 2003	64	41. Rates of cesarean delivery and vaginal birth after previous cesarean delivery, by race and Hispanic origin of mother: United States, each State and territory, 2003	85
25. Percentage of births with selected medical or health characteristics, by Hispanic origin of mother and by race for mothers of non-Hispanic origin and by place of birth of mother: United States, 2003	65	42. Rates of cesarean delivery and vaginal birth after previous cesarean delivery, by selected maternal medical risk factors and complications of labor and/or delivery: United States, 2003	86
26. Live births to mothers with selected medical risk factors and rates by age of mother, by race of mother: United States, 2003	66	43. Live births by birthweight and percentage very low and low birthweight, by period of gestation and race and Hispanic origin of mother: United States, 2003	87
27. Number and rate of live births to mothers with selected medical risk factors, complications of labor, and obstetric procedures, by race of mother: United States, 2003	67	44. Percentage of live births very preterm and preterm and percentage of live births of very low birthweight and low birthweight, by race and Hispanic origin of mother: United States, 1981–2003	89
28. Number and rate of live births to mothers with selected medical risk factors, complications of labor, and obstetric procedures, by Hispanic origin of mother and by race for mothers of non-Hispanic origin: United States, 2003	68	45. Number and percentage low birthweight and number of live births by birthweight, by age and race and Hispanic origin of mother: United States, 2003	90
29. Number of live births by smoking status of mother, percentage smokers, and percent distribution by average number of cigarettes smoked by mothers per day, according to age and race of mother: Total of 47 reporting States and the District of Columbia, 2003	69	46. Number and percentage of births of low birthweight, by race and Hispanic origin of mother: United States, each State and territory, 2003	93
30. Number of live births by smoking status of mother and percentage of mothers who smoked cigarettes during pregnancy, by age and Hispanic origin of mother and by race for mothers of non-Hispanic origin: Total of 47 reporting States and the District of Columbia, 2003	70	47. Number and percentage of births of very low birthweight, by race and Hispanic origin of mother: United States, each State and territory, 2003	94
31. Number of live births, percentage of mothers who smoked cigarettes during pregnancy, and percent distribution by average number of cigarettes smoked by mothers per day, according to educational		48. Live births with selected abnormal conditions of the newborn and rates by age of mother, by race of mother: Total of 48 States and the District of Columbia, 2003	95
		49. Live births with selected congenital anomalies and rates by age of mother, by race of mother: Total of 49 reporting States and the District of Columbia, 2003	96
		50. Live births by plurality of birth and ratios, by age and race and Hispanic origin of mother: United States, 2003	98