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## Annual Summary of Vital Statistics: 2000

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*Note to the Reader: This annual article is a long-standing feature in Pediatrics. Last year, we used this column to mark the end of the 20th century with a summary of long-term trends in the health of Americans over the past 100 years.<sup>1</sup> This year, we return to the usual format and provide a summary of vital statistics data through 2000. The most current information (2000) is based on preliminary data while more detailed analyses are based on final data (1999 for birth and death; 1998 for linked birth and infant death). In addition, we include a special feature that focuses on the major methodologic changes underway since 1999 for national mortality data: the reporting of cause of death according to a new revision of the International Classification of Diseases, and the change in the standard population used to calculate age-adjusted death rates. We hope that these data will help readers to make informed inferences about current and past trends and variations in mortality patterns.*

**ABSTRACT.** The birth rate in 2000 (preliminary data) was 14.8 births per 1000 population, an increase of 2% from 1999 (14.5). The fertility rate, births per 1000 women aged 15 to 44 years, increased 3% to 67.6 in 2000, compared with 65.9 in 1999. The 2000 increases in births and the fertility rate were the third consecutive yearly increases, the largest in many years, halting the steady decline in the number of births and fertility rates in the 1990s.

Fertility rates for total white, non-Hispanic white, black, and Native American women each increased about 2% in 2000. The fertility rate for black women, which declined 19% from 1990 to 1996, has changed little since 1996. The rate for Hispanic women rose 4% in 2000 to

reach the highest level since 1993. Birth rates for women 30 years or older continued to increase. The proportion of births to unmarried women remained about the same at one third, but the number of births rose 3%.

The birth rate for teen mothers declined again for the ninth consecutive year. The use of timely prenatal care (83.2%) remained unchanged in 2000, and was essentially unchanged for non-Hispanic white (88.5%), black (74.2%), and Hispanic (74.4%) mothers.

The number and rate of multiple births continued their dramatic rise, but all of the increase was confined to twins; for the first time in more than a decade, the number of triplet and higher-order multiple births declined (4%) between 1998 and 1999 (multiple birth information is not available in preliminary 2000 data). The overall increases in multiple births account, in part, for the lack of improvement in the percentage of low birth weight (LBW) births. LBW remained at 7.6% in 2000.

The infant mortality rate (IMR) dropped to 6.9 per 1000 live births (preliminary data) in 2000 (the rate was 7.1 in 1999). The ratio of the IMR among black infants to that for white infants was 2.5 in 2000, the same as in 1999. Racial differences in infant mortality remain a major public health concern. The role of low birth weight in infant mortality remains a major issue. Among all of the states, Utah and Maine had the lowest IMRs. State-by-state differences in IMR reflect racial composition, the percentage LBW, and birth weight-specific neonatal mortality rates for each state. The United States continues to rank poorly in international comparisons of infant mortality.

Expectation of life at birth reached a record high of 76.9 years for all gender and race groups combined. Death rates in the United States continue to decline. The age-adjusted death rate for suicide declined 4% between 1999 and 2000; homicide declined 7%. Death rates for children 19 years of age or less declined for 3 of the 5 leading causes in 2000; cancer and suicide levels did not change for children as a group. A large proportion of childhood deaths, however, continue to occur as a result of preventable injuries. *Pediatrics* 2001;108:1241-1255; *birth, birth weight-specific mortality, death, infant mortality, low birth weight, mortality, multiple births, vital statistics, ICD-10, year 2000 population.*

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ABBREVIATIONS. IMR, infant mortality rate; LBW, low birth weight; NCHS, National Center for Health Statistics; ICD-10, *International Classification of Diseases, 10th Revision*; NMR, neonatal mortality rate; PNMR, postneonatal mortality rate; TFR, total fertility rate; VBAC, vaginal births after previous cesarean; VLBW, very low birth weight; SIDS, sudden infant syndrome; ICD, *International Classification of Diseases*; ICD-9, *International Classification of Diseases, Ninth Revision*.

In general, the vital statistics trends observed over the past several years continued in 1999 and 2000. The birth rate for teen mothers declined again for the ninth consecutive year (through 2000). Life expectancy at birth increased in 2000 to 76.9 years. Death rates in the United States continue to decline, including drops in mortality for 9 of the 15 leading causes of death. The infant mortality rate (IMR) also declined. The proportion of births to unmarried mothers remained about the same at one third. The number and rate of multiple births continued their dramatic rise, accounting, in part, for the lack of improvement in low birth weight (LBW) births, although in 1999 (the most recent year for which multiple birth data are available), there was, for the first time in more than a decade, a decline in higher-order multiple births.

## METHODS

The data presented in this report were obtained from vital statistics records—birth certificates, fetal death reports, and death certificates—for residents of the United States. Data for 1999 and earlier years are final and include all records. Data for 2000 are preliminary; the 2000 data are based on >96% of births and at least 85% of deaths reported to the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS). More complete descriptions of vital statistics data systems are available elsewhere.<sup>2-5</sup> The preliminary estimates for 2000 may differ from the final data for 2000 that will include all records, but most differences are usually small.

Current vital statistics patterns and recent trends through 2000 are presented in this report by state of residence, age, race and Hispanic origin, as well as other birth and death characteristics. More detailed data are available in the final birth and death files for 1999 than in the preliminary files for 2000, so some of the detailed analyses of birth and death patterns focus on the 1999 data. Data on infant deaths from the linked birth/infant death data set are for 1998.

Hispanic origin and race are collected as separate items in vital records. Persons of Hispanic origin may be of any race, although most births and infant deaths of Hispanic origin (97%) are to white women. Because there are often important differences in child-bearing patterns between non-Hispanic white and Hispanic women, all tables that present data by race include data separately for non-Hispanic white and Hispanic women. Data for black, Native American, and Asian or Pacific Islander women are not shown separately by Hispanic origin because the vast majority of these women are not Hispanic.

The mother's marital status for birth data, underlying cause of death for deaths, and birth weight for infant deaths have the following special considerations. Mother's marital status was reported directly on the birth certificates or through the electronic birth registration process in all but 2 states (Michigan and New York) in 1999 and 2000. Details about the reporting of marital status in those 2 states and methods of edits and imputations applied to other items on the birth certificate are presented in NCHS publications.<sup>2,4,6</sup>

Cause of death statistics in this report are based solely on the underlying cause of death. The underlying cause of death is defined as "a) the disease or injury which initiated the train of morbid events leading directly to death, or b) the circumstances of the accident or violence which produced the fatal injury." From 1999 to the present, cause of death data in the United States have

been classified according to the *International Classification of Diseases, 10th Revision (ICD-10)*.<sup>7</sup> The last section in this report discusses the cause of death classification in greater detail.

Infant mortality refers to the death of an infant under 1 year of age. Infant mortality statistics by birth weight in this report (Table 6) were obtained from the 1998 period linked birth-infant death data set.<sup>8</sup> In this data set, the death certificate is linked with the corresponding birth certificate for each infant who died in 1998 in the United States. The purpose of this linkage is to use additional variables available from the birth certificate, such as birth weight, to better interpret infant mortality patterns. Numbers of infant deaths were weighted to compensate for the 1.6% of infant deaths in 1998 for which the matching birth certificate could not be identified.<sup>8</sup> The weighting procedure results in the same overall IMR as that based on unlinked death or mortality data; however, small differences may exist because of geographic coverage differences, additional quality control, and weighting.<sup>8</sup> Neonatal mortality rates (NMRs) are shown for infants dying between 0 and 27 days of age and postneonatal mortality rates (PNMRs) are shown for infants dying between 28 days and 1 year of age. Infant mortality statistics in Tables 1, 5, 7, and 8 are based on the unlinked mortality data.

Two additional perinatal mortality measures are shown in the report. Perinatal mortality rates are shown for fetal deaths at 28+ weeks' gestation and infant deaths at <7 days of age. Fetal mortality rates are shown for fetal deaths at 20+ weeks' gestation.

Population denominators for the calculation of birth, death, and fertility rates are estimates of the US population as of July 1 of each year, produced by the US Bureau of the Census.<sup>9,10</sup> All population denominators for this article for years since 1990 are estimates projected from the 1990 census. NCHS will recalculate the population-based rates for the 1990s and 2000 when population estimates from the 2000 census and intercensal estimates become available. Because of differences in projections and counts, it is expected that rates based on the 2000 census will differ from those based on the 1990 census-based estimates. IMRs were computed by dividing the total number of infant deaths in each calendar year by the total number of live births in the same year.<sup>3,5,8</sup> Fetal and perinatal mortality rates were computed by dividing the number of fetal or perinatal deaths by the number of live births plus fetal deaths. IMR, NMR, PNMR, fetal, and perinatal mortality rates are all shown per 1000 births (births plus fetal deaths for fetal and perinatal mortality rates).

International data on births, birth rates, and IMRs were obtained from United Nations sources including the *1998 Demographic Yearbook*,<sup>11</sup> and the *Population and Vital Statistics Reports, Statistical Papers* with the most recent data available as of January 1, 2000<sup>12</sup> and January 1, 2001.<sup>13</sup> If there was a discrepancy between figures for the *1998 Demographic Yearbook* and the later reports, the later report was used. The data on IMRs were not available for 1998 for 5 countries, although for 3 of these countries, provisional data were available for 1999.

## NATURAL INCREASE

As a result of natural increase (the excess of births over deaths), 1 660 350 persons (preliminary data) were added to the population in 2000 (Table 1).<sup>4,5</sup> The rate of natural increase increased in 2000 to 6.1 persons per 1000 population, compared with 5.7 in 1999. The increase was attributable more to the increase in the birth rate than to the decline in the death rate.

## BIRTHS

The number of births in the United States increased in 2000 to 4 064 948 (preliminary data), up 3% compared with the final total for 1999 (Table 1). The birth rate in 2000 was 14.8 births per 1000 population, up 2% from the rate for 1999 (14.5). The fertility rate, defined as the number of births per 1000 women aged 15 to 44 years, increased 3% to 67.6 in 2000, compared with 65.9 in 1999. The upturn in 2000 was the third consecutive increase—and the larg-

**TABLE 1.** Vital Statistics of the United States, Final 1915–1999 (Selected Years) and Preliminary 2000

Item	Number			Rate*						
	2000	1999	1998	2000	1999	1998	1990	1980	1950	1915†
Live births	4 064 948	3 959 417	3 941 553	14.8	14.5	14.6	16.7	15.9	24.1	29.5
Fertility rate				67.6	65.9	65.6	70.9	68.4	106.2	125.0
Deaths	2 404 598	2 391 399	2 337 256	8.7	8.8	8.6	8.6	8.8	9.6	13.2
Age-adjusted rate				8.7	8.8	8.8	9.4	10.4	14.5	21.7
Natural increase	1 660 350	1 567 787	1 604 297	6.1	5.7	6.0	8.1	7.1	14.5	16.3
Infant mortality	27 987	27 937	28 371	6.9	7.1	7.2	9.2	12.6	29.2	99.9
Population base (in thousands)				275 265	272 691	270 299	248 710	226 542	150 697	100 546

\* Rates per 1000 population except for fertility, which is per 1000 women aged 15 to 44 years of age and infant mortality, which is per 1000 live births.

† Birth rate adjusted to include states not in registration area (10 states and the District of Columbia when started in 1915).<sup>7</sup> Death rate is for death registration area. Infant mortality rate is for birth registration area.<sup>7</sup>

Notes: Data for 2000 are preliminary. Data for 1999 and earlier years are final. Populations are as of July 1 for 1998, 1999 and 2000, and as of April 1 in 1950, 1980, and 1990. Population for 1915 is the midyear estimate based on the April 15, 1910 census.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, and the US Bureau of the Census.

est—following steady declines in these measures through 1997.<sup>2</sup>

### Racial and Ethnic Composition

Fertility rates vary among race and ethnicity groups, although the disparity has narrowed in recent years for most groups. The rate for Hispanic women (105.9 births per 1000 women aged 15–44 years in preliminary 2000 data) remains the highest.<sup>4</sup> Rates in 2000 were considerably lower for black (71.4), Native American (71.3), and Asian or Pacific Islander women (70.7), and substantially lower for non-Hispanic white women (58.7). Between 1999 and 2000, fertility rates for total white, non-Hispanic white, black, and Native American women each increased about 2%. Although the fertility rate for black women dropped 19% from 1990 to 1996, it varied little between 1996 and 1999. The rate for Hispanic women rose 4% in 2000 to reach the highest level since 1993.

Among populations of Hispanic origin for which fertility rates can be reliably computed, Mexican American women continue to have the highest fertility, with a rate of 111.6 per 1000 in 1999 (Table 2),

and the highest age-specific birth rates among women under age 30. In contrast, Asian or Pacific Islander women have the highest rates among women 30 years and older.<sup>2</sup>

### Trends in Age-Specific Birth Rates

#### Teen Childbearing

The birth rate for teenagers dropped 22% between 1991, when it reached a 20-year high (62.1 per 1000 aged 15–19), and 2000 (48.7), when it reached a record low for the nation (Tables 2 and 3). The 2000 rate (preliminary data) was 2% lower than in 1999.<sup>4,14</sup> The number of births to teenagers declined in 2000, entirely as a result of the declining birth rate; in fact, the number of female teenagers has increased steadily since 1993.<sup>9,10</sup>

Birth rates for teenagers in all age groups declined from 1999 to 2000, in some instances reaching or matching record lows (Table 3). The rate for the youngest group, aged 10 to 14 years, was 0.9 per 1000, matching the 30-year low reached in 1999; the number of births in this age group in 2000 (8561) was the fewest in more than 3 decades. The birth rate for teenagers 15 to 17 years reached a historic low in

**TABLE 2.** Live Births, Age-Specific Birth Rates\*, and TFR† by Race and Hispanic Origin of Mother: United States, Final, 1999

	Live Births	Age-Specific Birth Rate by Age of Mother*								TFR†
		15–44‡	15–17	18–19	20–24	25–29	30–34	35–39	40–44	
Total	3 959 417	65.9	28.7	80.3	111.0	117.8	89.6	38.3	7.4	2075.0
White	3 132 501	65.1	24.8	73.5	107.0	121.1	93.2	38.8	7.3	2065.0
Black	605 970	70.1	52.0	122.8	141.7	101.9	64.5	30.8	6.5	2146.5
Native American§	40 170	69.7	41.4	110.6	137.1	102.4	64.3	30.7	7.1	2056.5
Asian/Pacific Islander	180 776	65.6	12.3	38.0	70.0	116.4	109.3	54.6	11.6	1927.0
All Hispanic	764 339	102.0	61.3	139.4	178.7	163.1	102.2	46.3	10.7	2985.0
Mexican	540 674	111.6	65.4	156.8	194.2	169.8	107.9	49.1	10.8	3181.5
Puerto Rican	57 138	77.7	53.2	117.1	166.0	127.9	64.3	28.4	7.3	2378.0
Cuban	13 088	51.2	15.7	46.2	71.8	92.8	72.9	39.6	7.4	1563.0
Central and South American and Other	153 439	92.6	57.1	108.2	148.0	166.2	108.8	48.3	12.4	2836.5
Non-Hispanic White	2 346 450	57.8	17.1	58.9	89.9	111.0	90.3	37.3	6.8	1850.0

\* Rates per 1000 women in age-specific group.

† Sum of age-specific birth rates times 5 divided by 1000 (includes rates for ages 10–14 and 45–49 years, not shown separately).

‡ Relates the number of births to women of all ages to women aged 15 to 44 years.

§ Includes births to Aleuts and Eskimos.

Note: Births are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, natality.



**TABLE 3.** Birth Rates\* for Teens, by Age, Race, and Hispanic Origin: United States, Final, Selected Years, 1990–1999 and Preliminary 2000

Age and Race and Hispanic Origin of Mother	2000	1999	1998	1991	1990‡	Percent Change 1991–2000
15–19 y						
All races†	48.7	49.6	51.1	62.1	59.9	–21.6
White, total	43.9	44.6	45.4	52.8	50.8	–16.9
White, non-Hispanic	32.8	34.0	35.2	43.4	42.5	–24.4
Black, total	79.2	81.0	85.4	115.5	112.8	–31.4
Hispanic	94.4	93.4	93.6	106.7	100.3	–11.5
15–17 y						
All races†	27.5	28.7	30.4	38.7	37.5	–28.9
White, total	23.8	24.8	25.9	30.7	29.5	–22.5
White, non-Hispanic	15.9	17.1	18.4	23.6	23.2	–32.6
Black, total	50.2	52.0	56.8	84.1	82.3	–40.3
Hispanic	60.0	61.3	62.3	70.6	65.9	–15.0
18–19 y						
All races†	79.5	80.3	82.0	94.4	88.6	–15.8
White, total	73.0	73.5	74.6	83.5	78.0	–12.6
White, non-Hispanic	57.3	58.9	60.6	70.5	66.6	–18.7
Black, total	121.1	122.8	126.9	158.6	152.9	–23.6
Hispanic	143.5	139.4	140.1	158.5	147.7	–9.5

\* Rates per 1000 women in specified group.

† Includes races other than white and black.

‡ Excludes data for New Hampshire and Oklahoma, which did not report Hispanic origin.

Note: Births are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, natality.

2000 while the rate for older teenagers 18 to 19 in 2000 was the lowest since 1987.

Birth rates for teenagers differ considerably by race and Hispanic origin, but all rates declined in the 1990s (Fig 1 and Table 3).<sup>2,4,14</sup> The rate for Hispanic teens (94.4) has declined only since the mid 1990s. On the other hand, the rate for black teenagers in 2000 was lower than in any year since 1960 when data for black women first became available.<sup>15</sup> Even more striking have been the reductions in birth rates for teenagers 15 to 17 years, for whom the rate for blacks dropped 40% from 1991 to 2000.<sup>2,14</sup>

Not all pregnancies end in live births. Among

teenagers, an estimated 55% of pregnancies ended in live birth, 29% in induced abortion, and 15% in fetal loss in 1997, the most recent year for which abortion statistics are available.<sup>16</sup> During the 1990–1997 period, teenage birth rates decreased 13%, while abortion rates decreased much more, by nearly a third. Patterns by race and ethnicity are similar to those for live births: pregnancy rates declined much more for white and black teenagers than for Hispanics.

During the late 1990s, the declines in teenage birth rates were driven by reductions in first birth rates. First births account for nearly 4 in 5 teen births. Rates for repeat teen births have stabilized since 1996 after falling in the early 1990s.<sup>14</sup> Although repeat births account for only 22% of all teen births, they are of particular concern; a teenager with 2 or more children is at greater risk for a host of difficulties.<sup>17</sup>

#### Childbearing for Women 20 Years of Age and Older

Birth rates for women in their 20s, the principal childbearing ages, increased 1% and 3%, respectively, in 2000, to 112.5 per 1000 for ages 20 to 24 and 121.7 for ages 25 to 29 years (preliminary data). Rates for women in these age groups have been relatively stable over the last 2 decades.<sup>2</sup>

Birth rates for women in their 30s continued to increase in 2000, rising 5% to their highest levels in at least 30 years, to 94.2 per 1000 women aged 30 to 34 and 40.3 per 1000 women aged 35 to 39 years. Birth rates have also increased for women in their 40s. The rate for women aged 40 to 44 years in 2000, 7.9 per 1000, more than doubled from its low point in 1981 (3.8). The steady upward trend in the rates for women in their 30s and 40s reflects in large part the ongoing tendency for many women to make up for previously postponed childbearing.<sup>2,18</sup>

The total fertility rate (TFR) provides an estimate of the number of births that a hypothetical group of 1000 women would have if they experienced,

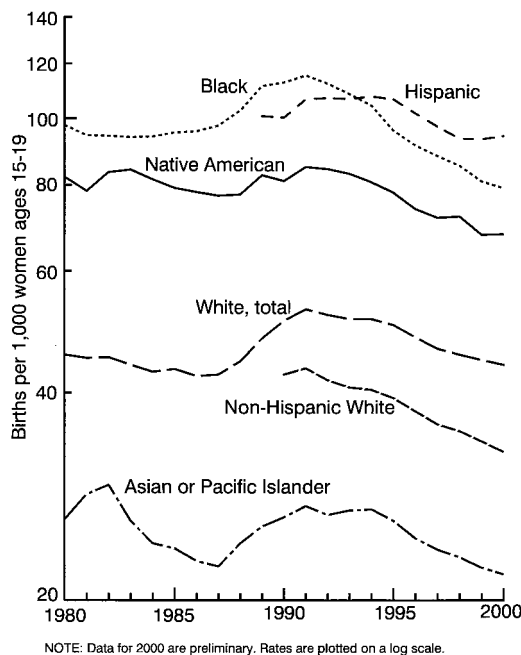


Fig 1. Birth rate for teens 15 to 19 by race and Hispanic origin: United States, 1980–2000

throughout their childbearing years, the age-specific birth rates observed in a given year. Because it is computed from age-specific birth rates, the TFR is age-adjusted; it is not affected by changes over time in age composition. The TFR varies significantly among racial and ethnic origin groups (Table 2). It increased 3% in 2000 to 2133.5, reflecting increases in birth rates for women aged 20 and older. TFRs rose for all racial and ethnic groups, by 2% for non-Hispanic white (1887.0), black (2183.5), and Native American (2098.5) women; by 4% for Hispanic women (3107.5), and by 8% for Asian or Pacific Islanders (2072.0).

#### Unmarried Mothers

All measures of childbearing by unmarried women increased in 2000 (Table 4).<sup>2,4</sup> The number of births to unmarried women increased 3% in 2000 to 1 345 917 (preliminary data), the highest number ever reported. The birth rate rose to 45.2 births per 1000 unmarried women aged 15 to 44 years, about 2% higher than in 1999 (44.4), but still about 4% lower than its peak level, 46.9, in 1994. In 2000, 33.1% of all births were to unmarried women, slightly higher than in 1999 (33.0). This proportion has changed little since 1994.<sup>19</sup> It was stable for non-Hispanic white women (22.1%), but increased for Hispanic women (42.5%) and declined slightly for black women (68.5%).

The proportion of teen births that were to unmar-

ried women was unchanged in 2000 compared with 1999, at 79.0%. Birth rates for unmarried teenagers, available through 1999, describe the risk that an unmarried teenager will give birth. This rate declined by 13% overall between 1994 and 1999.<sup>2</sup>

#### Smoking During Pregnancy

Smoking during pregnancy has declined steadily since 1989, the first year this information was reported on the birth certificate. In 1999 (latest year for which data are available), 12.6% of women reported smoking during pregnancy, a third lower than in 1989 (19.5%).<sup>2,20</sup> Tobacco use during pregnancy is a risk factor for a variety of adverse outcomes, including LBW, intrauterine growth retardation, and infant mortality, as well as negative consequences for child health.<sup>2,8,21-24</sup>

Smoking rates have fallen for pregnant women in most age groups, with the particular exception of teenagers. Teen smoking rates decreased earlier in the 1990s but the decline has stalled and even reversed since 1994. Pregnant teens now have higher smoking rates than any other age group (18%). Although still relatively rare, smoking during pregnancy by black teenagers rose from 5.0% to 7.2% since 1994.<sup>2,20</sup>

#### Prenatal Care

In 2000 as in 1999, 83.2% of all pregnant women (preliminary data) received prenatal care beginning

**TABLE 4.** Percent of Births With Selected Characteristics, by Race and Hispanic Origin of Mother: United States, Final 1990, 1999, Preliminary 2000

	All Races*			White, Total			Non-Hispanic White			Black, Total			Hispanic		
	2000	1999	1990	2000	1999	1990	2000	1999	1990†	2000	1999	1990	2000	1999	1990†
<b>Mother</b>															
<20 y	11.8	12.3	12.8	10.6	10.9	10.9	8.8	9.2	9.6	19.8	20.7	23.1	16.2	16.7	16.8
Unmarried	33.1	33.0	28.0	27.1	26.8	20.4	22.1	22.1	16.9	68.5	68.9	66.5	42.5	42.2	36.7
<12 completed years of school‡	—	16.1	17.6	—	16.3	17.1	—	8.2	15.2	—	16.9	19.6	—	44.3	53.9
16 or more completed years of school‡	—	27.4	20.1	—	28.9	21.7	—	34.6	22.5	—	14.3	9.4	—	8.8	5.1
Smoker§	—	12.6	18.4	—	13.6	19.4	—	15.9	20.9	—	9.3	15.9	—	3.7	6.7
Diabetes during pregnancy	—	2.7	2.1	—	2.6	2.2	—	2.6	2.3	—	2.6	1.8	—	2.8	2.4
Pregnancy-associated hypertension	—	3.8	2.7	—	3.9	2.8	—	4.2	3.1	—	4.1	2.7	—	2.8	2.3
<b>Health care utilization</b>															
First trimester prenatal care	83.2	83.2	75.8	85.0	85.1	79.2	88.5	88.4	83.3	74.2	74.1	60.6	74.4	74.4	60.2
Midwife-attended births	—	7.7	3.9	—	7.6	3.9	—	7.0	3.2	—	7.5	4.5	—	9.5	6.2
Cesarean delivery rate	22.9	22.0	22.7	22.8	21.9	23.0	23.0	22.1	23.4	24.3	23.2	22.1	22.1	21.2	21.2
<b>Infant</b>															
Birth weight															
VLBW	1.4	1.5	1.3	1.1	1.2	1.0	1.1	1.2	0.9	3.1	3.1	2.9	1.1	1.1	1.0
LBW	7.6	7.6	7.0	6.5	6.6	5.7	6.6	6.6	5.6	12.9	13.1	13.3	6.4	6.4	6.1
<b>Multiple births per 1000</b>															
Live births in twin deliveries (not percent)	—	28.9	22.6	—	28.8	22.1	—	31.5	22.9	—	32.0	26.5	—	20.1	18.0
Live births in higher-order multiple deliveries (not percent)	—	1.8	0.7	—	2.1	0.8	—	2.5	0.9	—	0.9	0.5	—	0.8	0.4

\* Includes races other than white and black.

† Excludes data for New Hampshire and Oklahoma, which did not report Hispanic origin.

‡ Includes mothers 20 years of age and older. For 1990, excludes data for New York (exclusive of New York City) and Washington, which did not report educational attainment of mother.

§ For 1999, excludes data for California and South Dakota, which did not report tobacco use during pregnancy. For 1998, excludes data for California, Indiana, New York State (but includes New York City), and South Dakota, which did not report tobacco use during pregnancy. For 1990, excludes data for California, Indiana, New York, Oklahoma, and South Dakota, which did not report tobacco use during pregnancy.

|| VLBW, birth weight of <1500 g (3 lb, 4 oz), and LBW, birth weight of <2500 g (5 lb, 8 oz.)

NOTE: Births are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, natality.

in the first trimester (Table 4). Although the proportion of women beginning care in the first trimester of pregnancy changed little during the 1980s, it has increased by 10% since 1989 (75.5%). The percent of women with first trimester care was essentially unchanged in 2000 for non-Hispanic white women (88.5%), black (74.2%), and Hispanic women (74.4%). Between 1990 and 1999, first trimester care rose 22 and 24%, respectively, among black and Hispanic women.

The benefits of prenatal care for pregnancy outcomes are difficult to measure, but timely and appropriate prenatal care may promote better birth outcomes by providing early risk assessment to manage preexisting medical conditions, and by offering health behavior advice such as smoking cessation and nutrition counseling.<sup>25–27</sup> The proportion of women beginning care late in pregnancy (during the third trimester), or with no care at all, has changed little in recent years; it was 3.9% (preliminary data) in 2000.

### Cesarean Delivery

The cesarean delivery rate rose in 2000 for the fourth consecutive year, to 22.9% of live births (preliminary data), the highest level since 1989 (Table 4).<sup>2,4,28</sup> The rise is attributable to both an increase in the primary cesarean rate (first cesareans per 100 live births to women who had no previous cesarean was 16.0% in 2000) and a decline in the rate of vaginal births after previous cesarean (VBAC) delivery (to 20.7 per 100 women with a previous cesarean delivery). The changes represent complete reversals of the trends earlier in the 1990s.

A recent study showed that cesarean rates rose for all racial, ethnic, and age groups between 1996 and 1999.<sup>28</sup> Overall cesarean rates increased 4% to 5% among non-Hispanic white, black, and Hispanic women in 2000. Cesarean rates vary substantially by maternal age; rates in 1999 for women aged 35 and older were about double the rates for teenagers. The recent decline in the VBAC rate may reflect renewed controversy over the safety of VBAC compared with elective repeat cesareans.<sup>29,30</sup>

### Multiple Births

The number and rate of multiple births continued to climb, but in 1999 (the most recent year for which this information is available), for the first time in over a decade, higher-order multiple births (ie, triplets, quadruplets, etc) declined. During 1990–1998, higher-order multiples rose about 13% per year. The number of triplet and other higher-order multiple births soared 470% from 1980 to 1998 (from 1337 to 7625 births) before declining 4% to 7321 in 1999.<sup>2,31</sup> The number of births in twin deliveries rose 3% between 1998 and 1999, and 67% since 1980 (from 68 339 to 114 307).<sup>2,31</sup> Twins, triplets, and other higher-order multiples accounted for 3.1% of all births in 1999.

The twin birth rate (the number of twin births per 1000 live births) was up 3% to 28.9 per 1000 for 1999 (Table 4). Before 1999, the higher-order multiple birth rate had more than doubled since 1991 (81.4 per

100 000 live births) and quadrupled since 1980 (37.0). The rate in 1999 was 184.9.

The increase in multiple births, especially higher-order multiples, has been associated with two related trends—older age at childbearing and increased use of ovulation-inducing drugs and assisted reproductive technologies, such as in vitro fertilization.<sup>2,31,32</sup> The rise in multiple births has been especially steep among births to women in the oldest childbearing ages; for example, nearly 1 in 5 births to women aged 45 to 54 years in 1999 was part of a multiple delivery compared with 1 in 50 in 1990 (tabular data not shown).<sup>2</sup>

Multiple births, regardless of how conceived, tend to be high-risk births. About half of all twins and the great majority of triplets are born preterm or LBW. This higher risk, coupled with the escalating multiple birth rate, has had a large influence on overall national and state measures of infant health.<sup>2,31</sup>

### Birth Weight

The rate of LBW (<2500 g) was unchanged for 1998–2000 at 7.6%, up from 7.5% in 1997.<sup>2,4</sup> During 1984–1998, the percent of LBW births increased fairly steadily from the low of 6.7% reported in 1984. The rate of very low birth weight ([VLBW]; infants weighing <1500 g) declined slightly to 1.42% for 2000, from 1.45% in 1999. VLBW had risen moderately during the 1980s and 1990s (from 1.15% in 1980).<sup>2</sup> When compared with heavier infants (2500 g or more), the risk of infant death in 1998 was 6 times higher for infants weighing 1500 to 2499 g, and 96 times higher for infants born weighing 1500 g or less.<sup>8</sup>

Between 1999 and 2000, the LBW rate declined slightly among black mothers (from 13.1% to 12.9%) and was unchanged for non-Hispanic white (6.6%) and Hispanic (6.4%) mothers. LBW among black mothers has declined from a high of 13.6% reported for 1991, but remains higher than levels reported during the early and mid 1980s (12.6% to 12.8%).

The rise in the multiple birth rate has markedly influenced overall rates of LBW. Multiple births also have an important impact on age-specific LBW rates, especially among older mothers who have disproportionately high rates of multiple births. For example, among all births to women 45 to 54 years of age, the LBW rate was 18.3%; when multiple births are excluded, however, the level drops by half to 9.1%.

LBW risk varies considerably among Hispanic and Asian and Pacific Islander subgroups. For 1999, the LBW rate among mothers of Puerto Rican origin (9.3%) was 58% higher than the rate of their Mexican counterparts (5.9%). Similarly, among Asian and Pacific Islanders, LBW risk ranged from 5.2% for Chinese mothers (the lowest level reported among any of the racial/ethnic groups) to 8.3% for Filipino mothers. These disparities have persisted for many years.

### INFANT MORTALITY

In 2000, 27 987 infant deaths (preliminary data) were reported in the United States (Table 1). The IMR of 6.9 per 1000 live births (preliminary data) (Table 5)

is 3% less than the 1999 rate of 7.1 and is a record low for the nation.<sup>3,5</sup> The NMR was 4.6 per 1000 live births in 2000, 2% less than the rate of 4.7 in 1999, while the PNMR was 2.3 per 1000 live births in both 1999 and 2000. Between 1999 and 2000, the NMR declined 3% for infants of white mothers; the IMR and NMR declined 4% and 5%, respectively, for infants of black mothers. There was no statistically significant change in IMR for infants of white mothers or in the PNMR for infants of all races, white, or black mothers.

Information from the linked birth/infant death data set (linked file) available for 1998 shows important differences in IMRs according to key maternal demographic and health characteristics. Rates were higher for infants whose mothers were teenagers or

40 years of age or older, did not complete high school, were unmarried, began prenatal care after the first trimester of pregnancy, or smoked during pregnancy. IMRs were also higher for male infants, multiple births, and infants born preterm or LBW.

Infant mortality in the United States has declined by >45% since 1980 (Table 5 and Fig 2). The NMR declined more rapidly during the 1980s, whereas the PNMR declined more rapidly during the 1990s. The decline in the perinatal mortality rate has closely paralleled the decline in the NMR, while the fetal mortality rate has declined more slowly.

Racial differences in the IMR remain a major national concern. The relative difference in rates between black and white newborns expressed as a ratio of black to white IMRs was 2.5 in 2000 (Table 5). Infant mortality has declined more for white newborns than black newborns since 1998. The Hispanic IMR was not statistically different from the non-Hispanic white IMR in 2000; this was also the case in 1998 and 1999. Racial disparities in IMR present continued challenges for researchers and health care providers alike.<sup>33-35</sup>

**TABLE 5.** IMR, NMR, PNMR, Perinatal Mortality Rate and Fetal Mortality Rate by Race of Mother: Final 1980, 1998, and 1999, and Preliminary 2000

	2000	1999	1998	1980	Percent Change, 1980-2000
IMR*†	6.9	7.1	7.2	12.6	-45.2
White, total	5.7	5.8	6.0	10.9	-47.7
White Non-Hispanic	5.7	5.8	6.0	—	—
Black, total	14.0	14.6	14.3	22.2	-36.9
Hispanic	5.6	5.8	5.9	—	—
Black:white ratio	2.5	2.5	2.4	2.0	—
NMR*†	4.6	4.7	4.8	8.5	-45.9
White, total	3.8	3.9	4.0	7.4	-48.6
White, Non-Hispanic	3.8	3.9	3.9	—	—
Black, total	9.3	9.8	9.5	14.6	-36.3
Hispanic	3.7	3.9	4.0	—	—
Black:white ratio	2.4	2.5	2.4	2.0	—
PNMR*†	2.3	2.3	2.4	4.1	-43.9
White, total	1.9	1.9	2.0	3.5	-45.7
White, Non-Hispanic	1.9	1.9	2.0	—	—
Black, total	4.7	4.8	4.8	7.6	-38.2
Hispanic	1.9	1.9	1.9	—	—
Black:white ratio	2.5	2.5	2.4	2.2	—
Perinatal mortality rate*¶	—	—	7.2	13.2	-45.5
White, total	—	—	6.2	11.8	-47.5
White, Non-Hispanic‡	—	—	5.8	—	—
Black, total	—	—	12.9	21.3	-39.4
Hispanic‡	—	—	6.2	—	—
Black:white ratio	—	—	2.1	1.8	—
Fetal mortality rate*§	—	—	6.7	9.1	-26.4
White, total	—	—	5.7	8.1	-29.6
White, Non-Hispanic‡	—	—	5.2	—	—
Black, total	—	—	12.3	14.7	-16.3
Hispanic‡	—	—	5.6	—	—
Black:white ratio	—	—	2.2	1.8	—

\* Includes races other than white and black.

† Rate per 1000 live births.

‡ States not reporting Hispanic origin for 1998 for fetal deaths are Maryland and Oklahoma.

§ Number of fetal deaths at ≥20 weeks' gestation per 1000 live births plus fetal deaths.

|| Percent change is from 1980-1998 because data for 1999 and 2000 are not available.

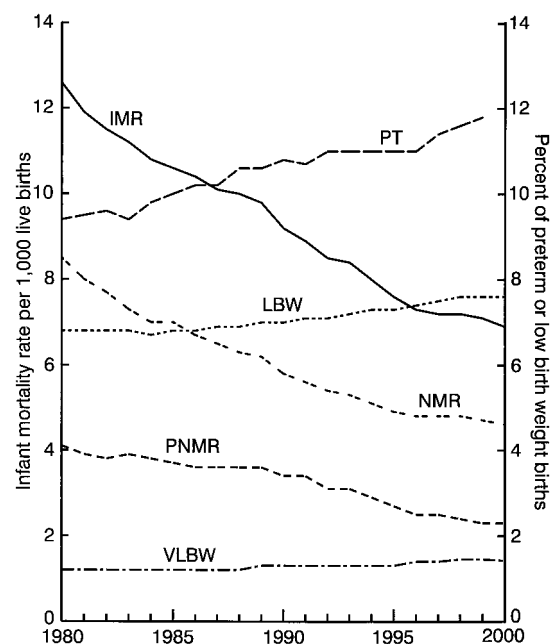
¶ Number of fetal deaths at ≥28 weeks' gestation plus number of infant deaths at <7 days of age per 1,000 live births plus fetal deaths.

—, Data not available.

Note: Infant, fetal, and perinatal deaths are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race. IMRs, NMRs, and PNMRs by race from unlinked data may differ slightly from those based on the linked file (Table 6). Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, natality, mortality (unlinked file), and fetal death files.

### Birth Weight-Specific Infant Mortality

Birth weight is one of the most important predictors of infant mortality. The IMR for a given population can be partitioned into 2 key components: the birth weight distribution and birth weight-specific mortality rates (the mortality rate for infants at a given weight). The IMR can decrease when either the percentage of LBW births decreases or birth weight-specific mortality rates decrease. The percentage of



**Fig 2.** Infant, neonatal, and postneonatal mortality, LBW and VLBW, and preterm delivery, United States, 1980-2000. IMR indicates infant deaths per 1000 live births; NMR indicates neonate deaths per 1000 live births; PNMR indicates postneonatal deaths per 1000 live births; LBW, percent low birth weight (<2500 g); VLBW, percent VLBW (<1500 g); PT, percent preterm (<37 weeks' gestation).



LBW births plateaued during the early 1980s, but generally increased since then until 1998, and has remained unchanged through 2000 (Fig 2). Thus, all of the decline in the IMR since 1980 has been attributable to declines in birth weight-specific IMRs, and not to a reduction of LBW. These declines have been attributed primarily to improvements in obstetric and neonatal care. The United States has been unsuccessful in reducing the number of preterm and LBW deliveries in recent years although prevention efforts have the potential to save many more infant lives and reduce subsequent morbidity than do additional improvements in neonatal care.

In 1998, 65% of all infant deaths occurred to the 7.6% of infants born LBW, and 51% of all infant deaths occurred to the 1.5% of infants born VLBW (most recent year for which linked file data are available).<sup>8</sup> Almost 9 out of 10 infants weighing <500 g at birth die within the first year of life—98% of the smallest infants dying within the first few days of life (Table 6). An infant's chances of survival increase rapidly thereafter with increasing birth weight. At birth weights of 1250 to 1499 g, about 95 out of 100 infants now survive the first year of life. IMRs are lowest for infants weighing 4000 to 4499 g, with small increases among the heaviest infants.

IMRs are higher for infants born to black mothers than for infants born to non-Hispanic white or Hispanic mothers and for infants born at VLBW (<1500 g), according to linked birth and infant death file data. However, within birth weight categories of <1250 g, IMRs are slightly lower for infants born to black mothers compared with infants born to non-Hispanic white mothers, although these differences are not statistically significant. Among infants born to black mothers, much higher proportions of the births are at extremely low birth weights, thus ac-

counting for much of the overall disparity. At birth weights of >2500 g, IMRs are consistently and significantly higher for infants born to black than for infants born to non-Hispanic white or Hispanic mothers. In fact, the largest relative difference in birth weight-specific IMRs among infants of Hispanic, non-Hispanic white, and black mothers is for infants weighing 2500+ g (2.2, 2.4, and 4.0, respectively). Thus, much of the excess mortality for black infants can be explained by two factors: 1) a birth weight distribution with a higher incidence of LBW, VLBW, and preterm births among infants of black mothers; and 2) higher IMRs for black infants weighing 2500+ g.

Birth weight-specific IMRs for infants of Hispanic and non-Hispanic white mothers are quite similar. Except for infants weighing 1250 to 1999 g, IMRs for infants born to Hispanic mothers are the same as or lower than IMRs for infants born to non-Hispanic white mothers.

From 1995 to 1998, IMRs declined more for infants weighing 1000 to 1249 g than any other birth weight group (by 16%). IMRs decreased 13% to 14% for infants weighing 750 to 999 g, 1500 to 1999 g, 3000 to 3499 g, and 4500 to 4999 g at birth.<sup>8</sup> In contrast, mortality rates for infants born at <500 g declined very little (4%) from 1995–1998, reflecting the limited success of intensive efforts made to save these very small infants. The few infants who do survive at these VLBWs are at great risk of suffering lifetime disabilities such as blindness, mental retardation, and neurologic disorders, necessitating increased levels of medical and parental care.<sup>36,37</sup>

#### Geographic Variation

Table 7 presents information on state variations in LBW and IMR for 1999 (latest year for which reliable

**TABLE 6.** IMR and NMR by Birth Weight and Race of Mother, United States, 1998 Linked File

Birth Weight (g)	IMR‡				NMR§			
	All Races*	Non-Hispanic White	Black	Hispanic	All Races*	Non-Hispanic White	Black	Hispanic
Total	7.2	6.0	13.8	5.8	4.8	3.9	9.4	3.9
<2500	61.5	55.3	77.4	56.8	50.5	45.9	62.2	47.0
<1500	250.0	236.1	270.9	241.4	221.5	212.2	235.7	212.6
<500	868.2	886.3	860.6	822.2	853.7	872.8	845.5	808.6
500–749	485.6	501.9	458.9	491.6	425.1	446.6	390.4	435.2
750–999	157.4	165.8	138.6	163.0	122.3	136.4	96.3	126.5
1000–1249	71.5	72.4	70.7	69.0	52.4	57.4	43.3	50.3
1250–1499	50.0	48.3	49.0	57.4	35.7	36.4	31.8	40.4
1500–1999	28.7	27.6	29.0	30.7	18.6	19.0	15.2	21.4
2000–2499	12.5	12.7	12.6	12.0	6.7	7.1	5.4	7.5
≥2500	2.6	2.4	4.0	2.2	0.9	0.9	1.2	0.8
2500–2999	4.8	4.8	5.8	4.0	1.8	1.9	1.8	1.6
3000–3499	2.5	2.5	3.6	2.1	0.9	0.9	1.0	0.8
3500–3999	1.8	1.7	3.0	1.5	0.6	0.6	0.8	0.5
4000–4499	1.6	1.5	3.0	1.4	0.7	0.6	0.9	0.5
≥4500	2.2	1.8	5.7	2.0	1.3	1.1	†	†

\* Includes races other than white and black.

† Figure does not meet standards of reliability or precision.

‡ IMRs are infant deaths during a year per 1000 live births in specified group.

§ NMRs are deaths of infants 0 to 27 days of age per 1000 live births in specified group.

Note: IMRs and NMRs by race from the linked file differ slightly from those based on unlinked data because the linked file uses the self-reported race of mother from the birth certificate, whereas the unlinked data uses the race of child as reported by the funeral director on the death certificate. Births are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race.

Source: National Center for Health Statistics 1998 Period Linked Birth/Infant Death Data Set.

**TABLE 7.** Percent LBW and IMR by Race of Mother, United States and Each State, 1999

State of Residence	Percent LBW*					IMR‡				
	All Races†	White, Total	Non-Hispanic, White	Black	Hispanic	All Races	White, Total	Non-Hispanic, White	Black	Hispanic
United States	7.6	6.6	6.6	13.1	6.4	7.1	5.8	5.8	14.6	5.8
Alabama	9.3	7.3	7.3	13.6	6.6	9.8	6.9	7.0	16.0	§
Alaska	5.8	5.3	5.2	10.5	6.6	5.7	4.7	4.8	§	§
Arizona	6.9	6.6	6.5	12.1	6.7	6.8	6.2	5.1	19.1	7.9
Arkansas	8.6	7.4	7.5	13.0	5.9	8.0	7.0	7.4	12.0	§
California	6.1	5.5	5.6	11.7	5.5	5.4	5.0	4.8	12.9	5.2
Colorado	8.3	8.0	8.0	13.8	8.2	6.7	6.3	6.3	16.2	6.3
Connecticut	7.6	6.8	6.3	13.1	9.1	6.1	5.7	5.3	10.6	8.4
Delaware	8.6	6.8	6.8	13.8	7.0	7.4	3.9	3.8	18.0	§
District of Columbia	13.1	6.4	6.7	16.1	6.1	15.0	§	§	19.0	§
Florida	8.2	6.9	7.1	12.2	6.4	7.4	5.6	5.8	13.6	5.0
Georgia	8.7	6.7	6.8	12.7	5.8	8.2	5.4	5.7	13.8	3.6
Hawaii	7.6	5.4	5.2	9.8	8.0	7.0	§	§	§	9.0
Idaho	6.2	6.1	6.1	§	6.0	6.7	6.6	6.7	§	§
Illinois	8.0	6.5	6.5	14.2	6.4	8.5	6.3	5.9	18.4	7.1
Indiana	7.9	7.2	7.3	12.9	6.5	8.0	7.0	6.9	17.0	7.8
Iowa	6.2	5.9	5.9	12.6	5.7	5.7	5.3	5.2	20.6	§
Kansas	7.1	6.7	6.7	12.2	6.2	7.3	6.8	7.0	14.4	§
Kentucky	8.2	7.6	7.7	14.0	6.3	7.6	7.1	7.1	12.7	§
Louisiana	10.0	6.9	7.0	14.5	6.2	9.2	5.9	6.0	14.2	§
Maine	6.0	6.0	6.1	§	§	4.8	4.7	4.8	§	§
Maryland	9.0	6.7	6.7	13.5	7.2	8.4	5.1	5.3	14.6	§
Massachusetts	7.1	6.6	6.4	10.9	8.2	5.2	4.8	4.5	9.8	5.5
Michigan	8.0	6.5	6.4	14.6	6.7	8.1	6.0	6.0	17.9	8.0
Minnesota	6.1	5.6	5.7	11.0	6.0	6.2	5.4	5.3	15.4	10.0
Mississippi	10.3	7.4	7.4	13.8	6.2	10.1	6.8	6.8	14.2	§
Missouri	7.7	6.7	6.7	13.7	5.8	7.8	5.8	5.7	18.9	9.3
Montana	6.8	6.8	6.9	§	§	6.7	5.9	5.9	§	§
Nebraska	6.7	6.4	6.4	12.9	6.6	6.8	5.9	5.7	18.9	9.6
Nevada	7.6	7.0	7.6	12.4	6.1	6.6	6.1	6.2	13.2	6.6
New Hampshire	6.2	6.2	5.9	§	7.3	5.8	5.7	5.6	§	§
New Jersey	8.2	6.9	6.7	13.4	7.2	6.7	5.2	4.9	14.1	5.7
New Mexico	7.7	7.6	7.7	12.3	7.6	6.9	6.5	5.7	§	7.4
New York	7.8	6.8	6.5	11.7	7.6	6.4	5.5	5.5	10.6	4.6
North Carolina	8.9	7.2	7.3	13.7	6.4	9.1	6.9	6.8	15.5	7.8
North Dakota	6.2	6.2	6.3	§	§	6.8	5.8	5.4	§	§
Ohio	7.9	6.9	6.9	13.7	7.5	8.2	6.6	6.6	17.6	8.5
Oklahoma	7.4	7.0	7.2	11.9	5.9	8.5	8.0	8.4	15.6	5.6
Oregon	5.4	5.3	5.3	10.7	5.2	5.8	5.7	5.6	§	6.7
Pennsylvania	7.9	6.8	6.7	14.3	9.1	7.3	5.8	5.6	16.8	8.5
Rhode Island	7.3	6.8	6.7	11.3	7.1	5.7	5.0	4.1	§	§
South Carolina	9.8	7.2	7.3	14.7	5.5	10.2	6.7	6.7	16.9	§
South Dakota	5.9	5.9	5.9	§	§	8.9	7.7	7.9	§	§
Tennessee	9.2	7.9	7.9	14.2	6.6	7.7	5.7	5.7	15.2	§
Texas	7.4	6.6	6.7	12.6	6.6	6.2	5.5	5.2	12.5	5.8
Utah	6.8	6.7	6.7	13.6	6.7	4.8	4.8	4.8	§	5.0
Vermont	5.7	5.7	5.6	§	§	5.8	5.9	5.9	§	§
Virginia	7.8	6.4	6.5	12.0	5.8	7.3	5.6	5.5	13.0	5.8
Washington	5.8	5.5	5.4	10.4	5.3	5.0	4.7	4.4	15.0	6.6
West Virginia	8.0	7.9	7.9	12.3	§	7.4	7.3	7.4	§	§
Wisconsin	6.7	5.9	5.9	13.4	6.1	6.7	5.8	5.7	16.0	7.9
Wyoming	8.4	8.1	8.4	§	5.7	6.9	6.8	6.7	§	§
Puerto Rico	11.4	11.4	—	11.4	—	10.6	11.3	—	§	—
Virgin Islands	10.1	§	—	10.3	§	§	§	§	§	§
Guam	7.8	1.0	—	§	§	8.7	§	§	§	§
American Samoa	3.6	§	—	§	—	11.5	§	—	§	—
Northern Marianas	8.2	§	—	§	—	§	§	—	§	—

\* Percent of births <2500 g (5 lb, 8 oz.).

† Includes races other than white and black.

‡ Infant deaths under 1 year of age per 1000 live births.

§ Figure does not meet standards of reliability or precision.

—, Data not available.

Note: Births and infant deaths are tabulated separately by race and Hispanic origin; persons of Hispanic origin may be of any race.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, 1999 National Vital Statistics System, mortality (unlinked file) and natality.

**TABLE 8.** Infant Deaths and Infant Mortality Rates for the 10 Leading Causes of Infant Death in 2000: United States, Final 1999 and Preliminary 2000

Cause of Death and ICD-10 Codes	Rank*	2000			1999			Percent Change 1999–2000
		Number	Percent	Rate†	Number	Percent	Rate†	
All causes	—	27 983‡	100.0	688.4	27 937	100.0	705.6	–2.4
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	1	5779	20.7	142.2	5473	19.6	138.2	2.9
Disorders relating to short gestation and low birth weight, not elsewhere classified (P07)	2	4299	15.4	105.8	4392	15.7	110.9	–4.6
Sudden infant death syndrome (R95)	3	2151	7.7	52.9	2648	9.5	66.9	–20.9
Newborn affected by maternal complications of pregnancy (P01)	4	1372	4.9	33.8	1399	5.0	35.3	–4.2
Newborn affected by complications of placenta, cord and membranes (P02)	5	1028	3.7	25.3	1025	3.7	25.9	–2.3
Respiratory distress syndrome (P22)	6	1018	3.6	25.0	1110	4.0	28.0	–10.7
Accidents (unintentional injuries) (V01-X59)	7	826	3.0	20.3	845	3.0	21.3	–4.7
Bacterial sepsis of newborn (P36)	8	723	2.6	17.8	691	2.5	17.5	1.7
Intrauterine hypoxia and birth asphyxia (P20-P21)	9	642	2.3	15.8	613	2.2	15.5	1.9
Diseases of the circulatory system (I00-I99)	10	632	2.3	15.5	667	2.4	16.8	–7.7

\* Rank based on 2000 data. Ranking is shown for ten leading causes of infant death. For an explanation of ranking procedures, see *Technical Appendix in Vital Statistics of the United States, Vol. II, Mortality Part A* (published annually).

† Rate per 100 000 live births.

‡ Two separate sets of weights were applied to mortality records—1 for demographic, and 1 for cause of death data, resulting in slight inconsistencies in the number of deaths between Tables 1 and 8.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, 1999–2000 National Vital Statistics System, mortality (unlinked file).

data are available for both LBW and IMR). Alaska, Oregon, Vermont, and Washington State had the lowest percent of LBW births (5.4%–5.8%), while Louisiana (10.0%), Mississippi (10.3%), and the District of Columbia (13.1%) had the highest. When examining IMRs by state, Maine and Utah had the lowest rates in 1999 (4.8 per 1000), and the District of Columbia, South Carolina, and Mississippi had the highest (10.1–15.0 per 1000). Although rates by area for both LBW and IMR were highest for the District of Columbia, it is more appropriate to compare these rates to those for other large US cities because of the high concentrations of high-risk women in these areas. Variations by state in LBW and IMR reflect compositional differences by race, ethnicity, and socioeconomic status in the population in addition to other factors (prenatal, quality of care, and postnatal influences on infants) that are associated with LBW or IMR.

### Leading Causes of Infant Death

The 10 leading causes of infant death for 2000 (preliminary data classified according to the ICD-10; see the section called “Impact of Age Adjustment and the ICD-10” for a discussion of the ICD-10) are shown in Table 8.<sup>5</sup> About half of all infant deaths were attributable to the 4 leading causes of infant death: congenital malformations, disorders relating to short gestation and unspecified LBW, sudden infant death syndrome (SIDS), and newborns affected by maternal complications of pregnancy. Disorders relating to short gestation and unspecified LBW decreased 5% between 1999 and 2000. The trend for this condition has been of long-term stability. SIDS rates declined slowly during the 1980s before the American Academy of Pediatrics issued a recommendation in 1992 to reduce the risk of SIDS by placing infants on their backs or sides to sleep.<sup>38–40</sup> Rates dropped by almost 35% between 1992 and 1996 and have

continued to do so. The 21% decline between 1999 and 2000 for SIDS is expected to be reduced when the final data become available because the results from ongoing investigations into SIDS cases will be incor-

**TABLE 9.** Number of Live Births and Birth Rates for 1998 and IMR for 1996, 1997, and 1998 for countries of >250,000 population and with IMR Equal to or Less than the United States Rate for 1996, 1997, or 1998

	Number of Births in 1998	Birth Rates in 1998	IMR		
			1998	1997	1996
Hong Kong	53 052*	7.9*	3.2*	3.9	4.1
Sweden	88 384*	10.0*	3.4*†	3.7	4.0
Switzerland	73 473‡	10.3‡	3.4‡	4.5	4.7
Japan	1 203 149*	9.5*	3.6	3.7	3.8
Norway	58 272*	13.1*	4.0	4.1	4.0
Singapore	43 838*	11.3*	4.2*	3.8	3.8
Finland	57 108	11.1	4.2	3.9	4.0
Germany	797 541*	9.7*	4.6*	4.9	5.0
Denmark	66 162*	12.5*	4.7*	5.3	5.6
France	740 300*	12.6*	4.8*	4.8	4.8
Austria	81 233*	10.1*	4.9*	4.7	5.1
Australia	249 283*	13.3*	5.0*	5.3	5.8
The Netherlands	199 408	12.7	5.2	5.2*	5.7
Czech Republic	90 535*	8.8*	5.2*	5.9	6.0
Canada	348 598‡	12.1‡	—	5.5	5.6
Italy	532 843	9.3	—	5.5	6.0
Belgium	115 864	11.3	5.5	6.1	5.7
New Zealand	57 818*	15.3*	5.5*	6.5	7.1
Israel	130 039*	21.2	5.7	6.0	6.3
United Kingdom	700 100*†	11.9*†	5.8*†	5.9	6.1
Greece	99 000*	9.4*	6.1*	6.4	7.2
Ireland	53 551*	14.5*	6.2*	6.2	5.6
United States	3 941 553	14.6	7.2	7.2	7.3
Portugal	113 510*	11.4*	8.4*	6.4	6.9

\* Provisional data.

† 1999 data, no 1998 data.

‡ 1997 data, no 1998 data.

Sources: United Nations 1998 *Demographic Yearbook, Population and Vital Statistics Report, Statistical Papers, Series A, Vol. L11, No. 1*, January 2000. *Population and Vital Statistics Report, Statistical Papers, Series A, Vol. L111, No. 1*, January 2001.

**TABLE 10.** Mortality From 15 Leading Causes of Death: United States, Final 1999 and Preliminary 2000

Causes of Death and ICD-10 Codes	Rank*	2000			1999			Percent Change in Age-Adjusted Rate, 1999–2000
		Number	Percent	Rate†	Number	Percent	Rate†	
All causes		2 404 624‡	100.0	872.4	2 391 399	100.0	881.9	–1.1
Diseases of heart (I00–I09, I11, I13, I20–I51)	1	709 894	29.5	257.5	725 192	30.3	267.8	–3.8
Malignant neoplasms (C00–C97)	2	551 833	22.9	200.5	549 838	23.0	202.7	–1.1
Cerebrovascular diseases (I60–I69)	3	166 028	6.9	60.2	167 366	7.0	61.8	–2.6
Chronic lower respiratory diseases (J40–J47)	4	123 550	5.1	44.9	124 181	5.2	45.8	–2.0
Accidents (unintentional injuries) (V01–X59, Y85–Y86)	5	93 592	3.9	33.9	97 860	4.1	35.9	–5.6
Diabetes mellitus (E10–E14)	6	68 662	2.9	24.9	68 399	2.9	25.2	–1.2
Influenza and pneumonia (J10–J18)	7	67 024	2.8	24.3	63 730	2.7	23.6	3.0
Alzheimer's disease (G30)	8	49 044	2.0	17.8	44 536	1.9	16.5	7.9
Nephritis, nephrotic syndrome, and nephrosis (N00–N07, N17–N19, N25–N27)	9	37 672	1.6	13.7	35 525	1.5	13.1	4.6
Septicemia (A40–A41)	10	31 613	1.3	11.5	30 680	1.3	11.3	1.8
Intentional self-harm (suicide) (X60–X84, Y87.0)	11	28 332	1.2	10.3	29 199	1.2	10.7	–3.7
Chronic liver disease and cirrhosis (K70, K73–K74)	12	26 219	1.1	9.5	26 259	1.1	9.7	–2.1
Essential (primary) hypertension and hypertensive renal disease (I10, I12)	13	17 964	0.7	6.5	16 968	0.7	6.3	3.2
Pneumonitis attributable to solids and liquids (J69)	14	16 659	0.7	6.1	15 268	0.6	5.6	8.9
Assault (homicide) (X85–Y09, Y87.1)	15	16 137	0.7	5.8	16 889	0.7	6.2	–6.5

\* Rank based on 2000 data. Ranking is shown for 15 leading causes. For an explanation of ranking procedures, see *Technical Appendix in Vital Statistics of the United States, Vol. II, Mortality Part A* (published annually).

† Age-adjusted death rate per 100 000 US standard population.

‡ Two separate sets of weights were applied to mortality records—1 for demographic, and 1 for cause of death data, resulting in slight inconsistencies in the number of deaths between Tables 1 and 10.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, mortality, 1999–2000.

porated into the final data. Medical reporting practices have also contributed to decreases in death rates for SIDS as physicians have begun to use other terms that result in classification of these deaths to a different ill-defined category as the cause of death. Respiratory distress syndrome declined substantially after new medical treatments became widely available in the late 1980s<sup>41–43</sup>; this cause of death decreased 11% between 1999 and 2000.

#### INTERNATIONAL COMPARISONS

Table 9 shows the number of live births and birth rates in 1998 and IMRs in 1996, 1997, and 1998 for countries with populations of at least 2.5 million and an IMR less than the US rate in at least 1 of the 3 years (Spain is not included in the table because 1996 was the only year for which IMR was available). In 1998, the United States, as in previous years, continued to have an IMR and birth rate higher than most other developed countries. Part of the reason for this unenviable position is the higher percentage of LBW infants born in the United States than in other developed countries. The percentage of these smallest and most vulnerable infants has increased in the United States in recent years, making it unlikely that the United States will gain much ground on other countries. One of the other reasons for differences is reporting variations, particularly differences among countries in reporting of LBW infants dying soon after birth, but the magnitude of their effect is unknown.<sup>44–46</sup> Variations by country also reflect compositional differences in the population by factors such as race, ethnicity, and socioeconomic status.

#### DEATHS

There were 2 404 598 deaths (preliminary data) in the United States in 2000 (Table 1), 13 199 more than the 2 391 399 deaths reported in 1999. The death rate for 2000 was 873.6 deaths per 100 000 population, a 0.4% decrease from final 1999 rate of 877.0. Age-adjusted death rates are better indicators of the risk of mortality over time than crude death rates because they control for variations in the age composition of the population. The age-adjusted death rate for 2000 was 872.4 deaths per 100 000 US standard population.<sup>5</sup> This rate was 1% lower than the final 1999 age-adjusted death rate of 881.9 and was a record low for the United States.<sup>3,5</sup>

#### Expectation of Life

The estimated expectation of life at birth for a given year represents the average number of years that a group of infants would be expected to live if, throughout their lifetime, they were to experience the age-specific death rates prevailing during the year of their birth. In 2000, the expectation of life at birth reached a new record high of 76.9 years (preliminary data), an increase of 0.2 years from the previous year.<sup>5</sup> Life expectancy increased from the previous year by 0.5 years for black males, 0.3 years for black females, 0.2 years for white males, and 0.1 years for white females, setting record highs for the 3 former groups, and matching the record high set in 1998 for white females. In 2000, life expectancy at birth was 80.0 years for white females, 75.0 years for black females, 74.8 years for white males, and 68.3 years for black males.



## Causes of Death

The 15 leading causes of death in 2000 (preliminary data classified according to the *ICD-10*, see the section called "Impact of Age Adjustment and the *ICD-10*" for a discussion of the *ICD-10*) accounted for >80% of all US deaths (Table 10). Between 1999 and 2000, age-adjusted death rates declined for a number of causes of death including: assault (homicide) by 7%, accidents (unintentional injuries) by 6%, diseases of the heart by 4%, intentional self-harm (suicide) by 4%, cerebrovascular diseases by 3%, chronic lower respiratory diseases by 2%, chronic liver disease and cirrhosis by 2%, malignant neoplasms (cancer) by 1%, and diabetes mellitus by 1%.<sup>5</sup> Among the 15 leading causes of death in 2000, age-adjusted death rates increased for pneumonitis attributable to aspiration of solids or liquids by 9%, Alzheimer's disease by 8%, nephritis, nephrotic syndrome and nephrosis (kidney disease) by 5%, influenza and pneumonia by 3%, hypertension by 3%, and septicemia by 2%. The

statistics for causes such as homicide and suicide differ between the preliminary and final data because of the additional time needed to complete investigations on these types of death.

## Deaths Among Children

An estimated 25 745 children and adolescents between the ages of 1 and 19 years (preliminary data) died in the United States in 2000 (Table 11).<sup>5</sup> The death rate for children 1 to 4 years old in 2000 was 32.6 per 100 000 population, 6% lower than the rate of 34.7 in 1999. From 1999 to 2000, the respective death rates for children and teens aged 5 to 9 and 15 to 19 declined by 5% and 3%.

For children 1 to 4 years of age, unintentional injury was the leading and congenital malformations the second leading cause of death. Unintentional injuries accounted for 36% of all deaths in this age group (35% of unintentional injury deaths were from the motor vehicle subcategory of unintentional inju-

**TABLE 11.** Deaths and Death Rates for the Five Leading Causes of Childhood Death in Specified Age Groups in 2000: United States, Final 1999 and Preliminary 2000

Age, Causes of Death, and <i>ICD-10</i> Codes	Rank*	2000			1999			Percent Change 1999–2000
		Number	Percent	Rate†	Number	Percent	Rate†	
<b>Total: 1–19 y</b>								
All causes	—	25 745	100.0	34.5	26 622	100.0	35.8	–3.6
Accidents (unintentional injuries) (V01-X59, Y85-Y86)	1	11 232	43.6	15.0	11 677	43.9	15.7	–4.5
Assault (homicide) (X85-Y09, Y87.1)	2	2544	9.9	3.4	2901	10.9	3.9	–12.8
Malignant neoplasms (C00-C97)	3	2135	8.3	2.9	2175	8.2	2.9	0.0
Intentional self-harm (suicide) (X60-X84, Y87.0)	4	1871	7.3	2.5	1859	7.0	2.5	0.0
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	5	1071	4.2	1.4	1199	4.5	1.6	–12.5
<b>1–4 y</b>								
All causes	—	4942	100.0	32.6	5249	100.0	34.7	–6.1
Accidents (unintentional injuries) (V01-X59, Y85-Y86)	1	1780	36.0	11.7	1898	36.2	12.6	–7.1
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	2	471	9.5	3.1	549	10.5	3.6	–13.9
Malignant neoplasms (C00-C97)	3	393	8.0	2.6	418	8.0	2.8	–7.1
Assault (homicide) (X85-Y09, Y87.1)	4	318	6.4	2.1	376	7.2	2.5	–16.0
Diseases of heart (I00-I09, I11, I13, I20-I51)	5	169	3.4	1.1	183	3.5	1.2	–8.3
<b>5–9 y</b>								
All causes	—	3262	100.0	16.5	3474	100.0	17.4	–5.2
Accidents (unintentional injuries) (V01-X59, Y85-Y86)	1	1341	41.1	6.8	1459	42.0	7.3	–6.8
Malignant neoplasms (C00-C97)	2	502	15.4	2.5	509	14.7	2.6	–3.8
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	3	200	6.1	1.0	207	6.0	1.0	0.0
Assault (homicide) (X85-Y09, Y87.1)	4	144	4.4	0.7	186	5.4	0.9	–22.2
Diseases of heart (I00-I09, I11, I13, I20-I51)	5	102	3.1	0.5	116	3.3	0.6	–16.7
<b>10–14 y</b>								
All causes	—	4078	100.0	20.5	4121	100.0	21.1	–2.8
Accidents (unintentional injuries) (V01-X59, Y85-Y86)	1	1538	37.7	7.7	1632	39.6	8.3	–7.2
Malignant neoplasms (C00-C97)	2	515	12.6	2.6	503	12.2	2.6	0.0
Intentional self-harm (suicide) (X60-X84, Y87.0)	3	292	7.2	1.5	242	5.9	1.2	25.0
Assault (homicide) (X85-Y09, Y87.1)	4	221	5.4	1.1	246	6.0	1.3	–15.4
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	5	187	4.6	0.9	221	5.4	1.1	–18.2
<b>15–19 y</b>								
All causes	—	13 463	100.0	67.7	13 778	100.0	69.8	–3.0
Accidents (unintentional injuries) (V01-X59, Y85-Y86)	1	6573	48.8	33.1	6688	48.5	33.9	–2.4
Assault (homicide) (X85-Y09, Y87.1)	2	1861	13.8	9.4	2093	15.2	10.6	–11.3
Intentional self-harm (suicide) (X60-X84, Y87.0)	3	1574	11.7	7.9	1615	11.7	8.2	–3.7
Malignant neoplasms (C00-C97)	4	725	5.4	3.6	745	5.4	3.8	–5.3
Diseases of heart (I00-I09, I11, I13, I20-I51)	5	372	2.8	1.9	463	3.4	2.3	–17.4

\* Rank based on 2000 data. Ranking is shown for 5 leading causes for specified age groups. For an explanation of ranking procedures, see *Technical Appendix in Vital Statistics of the United States, Vol. II, Mortality Part A* (published annually).

† Rate per 100 000 population in specified group.

Source: Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, mortality, 1999–2000.

ries). Death rates for unintentional injuries and congenital anomalies have decreased 7% and 14%, respectively, since 1999. An estimated 393 children 1 to 4 years old died from cancer, making cancer the third leading cause of death in this age group. Homicide and diseases of the heart are the fourth and fifth leading causes among this age group. Since 1999, homicide has decreased 16%.

For children 5 to 9 years old, unintentional injury, cancer, congenital malformations, homicide, and heart disease were the leading causes of death in descending order. Unintentional injury (56% of unintentional injury deaths were from the motor vehicle component of unintentional injuries) accounted for nearly 41% of all deaths in 2000 while cancer accounted for 15% of all deaths in this age group. Since 1999, homicide has decreased 22%.

For children 10 to 14 years of age, unintentional injury was the leading cause of death and accounted for 38% of all deaths in this age group, with 63% of unintentional injury deaths from the motor vehicle subcategory of unintentional injuries. The second leading cause was cancer, followed by suicide, homicide, and congenital malformations. Since 1999, unintentional injuries and congenital malformations have decreased 7% and 18%, respectively; while rates for suicide have increased a troubling 25%.

For teens aged 15 to 19 years, the leading cause of death, unintentional injuries, accounted for 49% of all deaths in 2000 (78% of unintentional injury deaths were from the motor vehicle component of unintentional injuries). An estimated 1861 teens were victims of homicide, the second leading cause, in 2000, accounting for 14% of all deaths. Suicide was the third leading cause of death for this age group, accounting for 12% of all deaths. Cancer and diseases of the heart were the fourth and fifth leading causes for this age group. The death rate for homicide and diseases of the heart has decreased by 11% and 17%, respectively, between 1999 and 2000.

In sum, death rates for children and teenagers dropped by 4% between 1999 and 2000. Despite declines, the leading cause of death in 2000 among children and teens continued to be unintentional injury. Among children 1 to 19 years of age, 67% of unintentional injury deaths involve motor vehicles; the proportion of unintentional injury deaths involving motor vehicles increases from 35% among 1- to 4-year-old to 78% among 15- to 19-year-old decedents. The declines in unintentional injuries have been attributed, in part, to injury prevention measures such as mandatory car seat requirements, smoke alarms, and sprinkler systems in homes and schools.<sup>47</sup> Congenital malformations was the second leading cause of death at ages 1 to 4 years but dropped in importance for successively older age groups as cancer, homicide, and suicide became more prominent. Cancer accounts for 5% to 15% of deaths for each of the age groups under 19 years of age. Decreases for homicide have continued for 7 consecutive years. Suicide rates had decreased for a number of years, but did not between 1999 and 2000 because of an increase among 10- to 14-year-old children. A large proportion of childhood deaths con-

tinue to occur as a result of preventable injuries.<sup>48</sup> American pediatricians must further strengthen their efforts to prevent many of these deaths.

#### IMPACT OF AGE ADJUSTMENT AND THE ICD-10

This report incorporates two methodologic changes for mortality statistics beginning with 1999 data: a new standard population used to calculate age-adjusted death rates and a new cause of death classification. The change with the standard population is a relatively straightforward mathematical one while the change in the classification is more complex.

Death rates are age-adjusted to remove the effect of differences in the age distributions of populations on the rates being compared. This is necessary because older populations have higher death rates merely because the risk of death increases with age. For example, despite major reductions in the risk of death at younger ages over the past 50 years, the crude death rate has declined only 8% since 1958 because of the aging of the population. In contrast, the age-adjusted death rate has declined by close to 40% (Fig 3). Age-adjusted death rates, however, should be used for comparative purposes only and should not be interpreted as the absolute risk of death.

Beginning with 1999 data, the "projected 2000 standard population" became the standard for producing age-adjusted death rates, replacing the "1940 standard million" population that had been in wide (although not exclusive) use since 1943.<sup>49-51</sup> The new standard is intended to promote uniformity and comparability of data among many organizations by choosing a single population standard that meets the needs of multiple users.

Comparing age-adjusted rates calculated by the 2000 standard to those calculated by the 1940 stan-

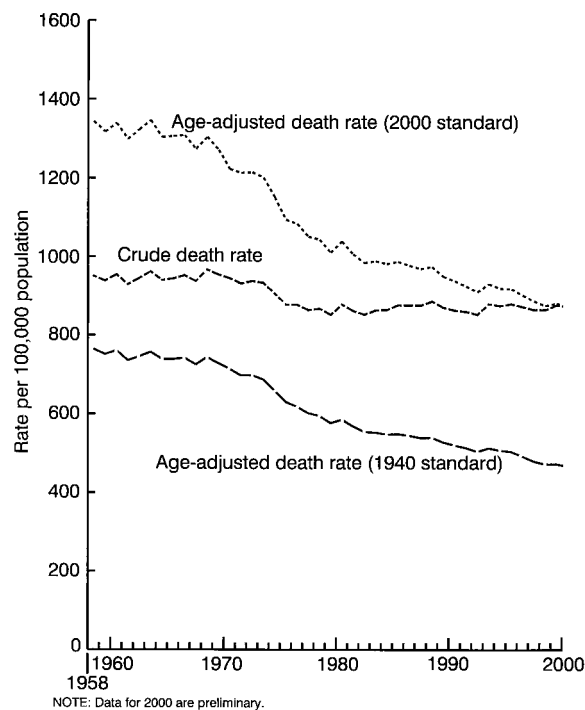
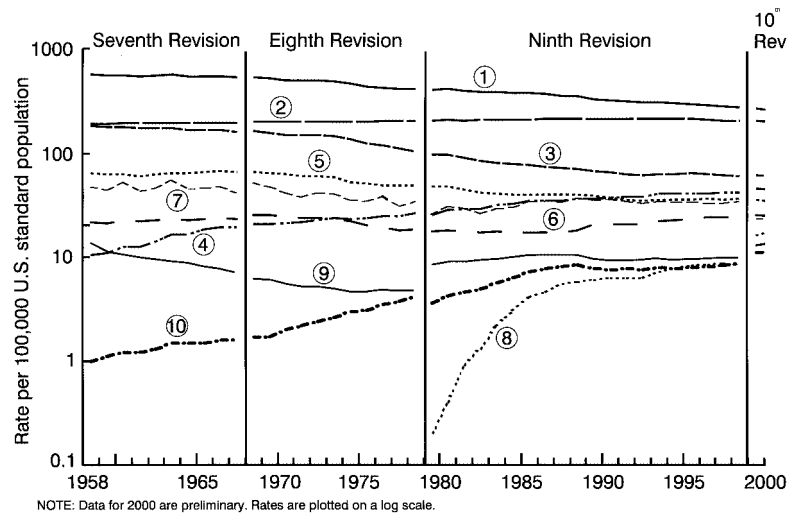


Fig 3. Crude and age-adjusted death rates based on the 1940 and 2000 standard populations: United States, 1958-2000.

**Fig 4.** Age-adjusted death rates for the 10 leading causes of death: United States, 1958–2000. The number 1 in the Figure indicates diseases of heart; 2, malignant neoplasms; 3, cerebrovascular diseases; 4, chronic lower respiratory diseases; 5, accidents (unintentional injuries); 6, diabetes mellitus; 7, influenza and pneumonia; 8, Alzheimer's disease; 9, nephritis, nephrotic syndrome, and nephrosis; and 10, septicemia.



standard has 4 important effects: 1) an increase in age-adjusted rates for all causes combined (Fig 3); 2) a relatively substantial increase in rates for causes such as major chronic diseases for which mortality risk increases with age; 3) a reduction in age-adjusted rates for some causes such as homicide for which mortality risk is concentrated among the younger population; and 4) a reduction in racial disparities typically seen in overall and cause-specific death rates because the differential by race contracts and then reverses with increasing age. These changes, however, represent only the effect of the new standard, not a real change in mortality risk.

Causes of death are classified, processed, and tabulated according to the *International Classification of Diseases (ICD)*. The ICD is a classification system developed and maintained collaboratively between the World Health Organization and 10 international centers so that the medical terms reported by physicians, medical examiners, and coroners on death certificates can be uniformly grouped for statistical purposes. The World Health Organization issues periodic revisions of the ICD to ensure that the classification reflects advances in medical science.

Beginning with 1999 data, the United States implemented the ICD-10 for classifying causes of death,<sup>52</sup> replacing the ninth revision, which was in use from 1979–1998.<sup>3</sup> There are several differences between the 9th and 10th revisions that affect the classification and presentation of cause-specific mortality data. The number of categories available for classification has doubled as a result of the addition or deletion of terms used to describe diseases or conditions, and the addition of separate categories identifies specific diseases or conditions that are of growing interest. In addition, some titles have changed; certain diseases were transferred from one section to another section of the classification; and coding rules for selecting an underlying cause of death were modified.

The comparability of trends across revisions is a major concern. Breaks in the comparability of some cause of death statistics result from changes in category titles, changes in the structure and content of the classification, and from changes in the coding

rules used to select the underlying cause of death from all conditions reported on the death certificate.<sup>53</sup> Adoption of successive ICD revisions has had little impact on the first 6 leading causes of death (Fig 4); however, causes ranked as the 7th through 10th leading cause all have breaks in comparability between revisions of the ICD.<sup>3,53</sup> NCHS publications present the results of a comparability study including measurement of the breaks in comparability between revisions and detailed explanations of the reasons for substantial discontinuity in specific cause of death trends.<sup>3,53</sup>

The shift from the *International Classification of Diseases, Ninth Revision (ICD-9)* to the ICD-10 causes changes in the order of leading causes of death for 2 reasons.<sup>3,53</sup> First, addition or deletion of specific causes from the list opens the way for the introduction or departure of conditions. Second, changes in the structure and content of the classification and in the coding rules used to select the underlying cause of death affect the number of records selected as resulting from any specific underlying cause of death.

In the case of both the new standard population (2000) and the ICD-10, readers need to take the change into account. Age-adjusted death rates cannot be compared unless the same standard population is used to calculate the rates. ICD revisions also cannot be compared across revisions without examining comparability issues. The impact of these methodologic changes is explained in detail in other publications.<sup>49–53</sup>

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