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# Infant Mortality Statistics From the 2013 Period Linked Birth/Infant Death Data Set

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## Abstract

*Objectives*—This report presents 2013 period infant mortality statistics from the linked birth/infant death data set (linked file) by maternal and infant characteristics. The linked file differs from the mortality file, which is based entirely on death certificate data.

*Methods*—Descriptive tabulations of data are presented and interpreted.

*Results*—The U.S. infant mortality rate was 5.96 infant deaths per 1,000 live births in 2013, similar to the rate of 5.98 in 2012. The number of infant deaths was 23,446 in 2013, a decline of 208 infant deaths from 2012. From 2012 to 2013, infant mortality rates were stable for most race and Hispanic origin groups; declines were reported for two Hispanic subgroups: Cuban and Puerto Rican. Since 2005, the most recent high, the U.S. infant mortality rate

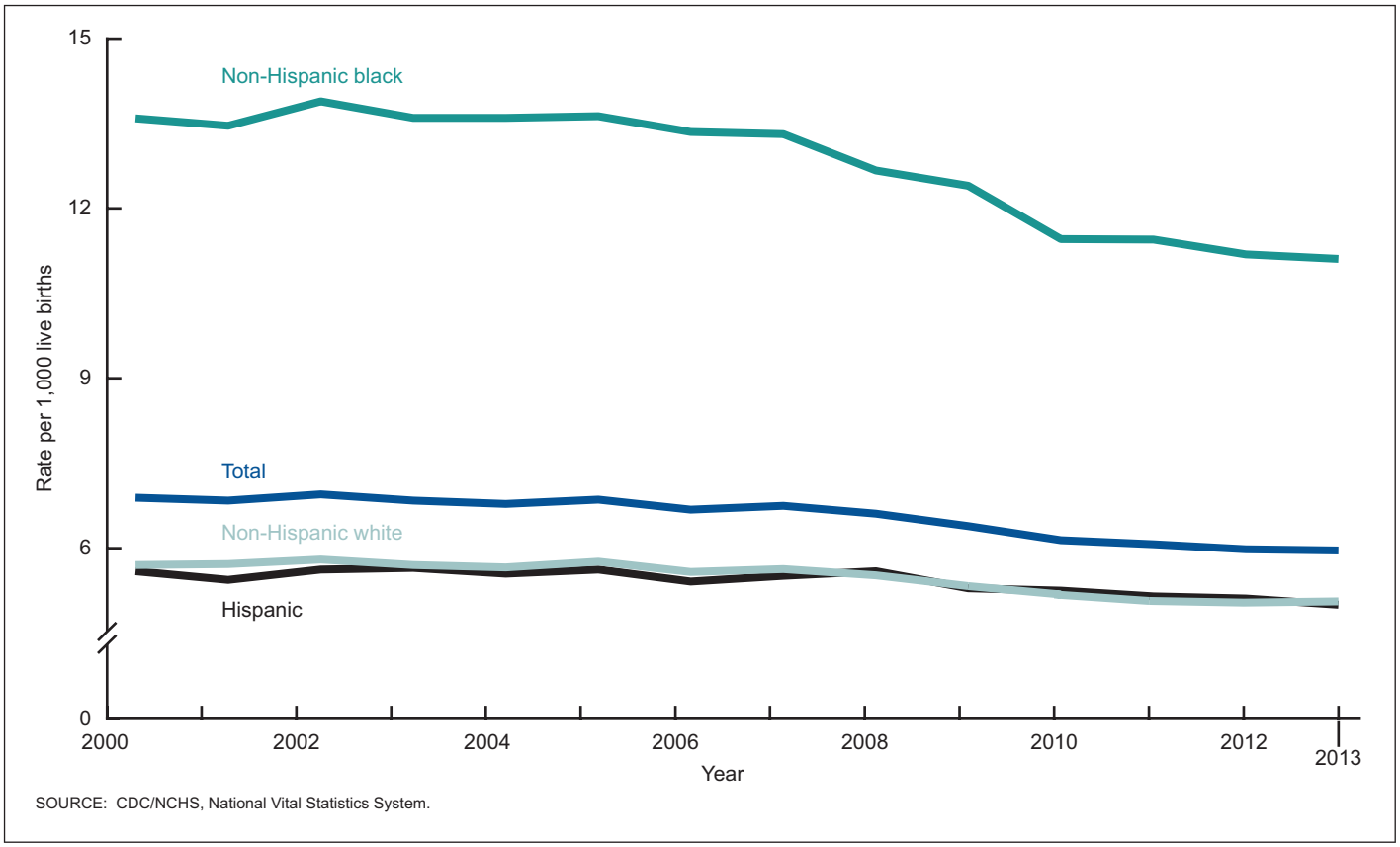


**Figure 1. Infant mortality rates, by race and Hispanic origin of mother: United States, 2000–2013**

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has declined 13% (from 6.86), with declines in both neonatal and postneonatal mortality overall and for most groups. In 2013, infants born at 37–38 weeks of gestation (early term) had mortality rates that were 63% higher than for full-term (39–40 week) infants. For multiple births, the infant mortality rate was 25.84, 5 times the rate of 5.25 for singleton births. In 2013, 36% of infant deaths were due to preterm-related causes of death, and an additional 15% were due to causes grouped into the sudden unexpected infant death category.

**Keywords:** infant health, birthweight, gestational age, maternal characteristics

## Introduction

This report presents infant mortality data from the 2013 period linked file. In the linked file, information from the death certificate is linked to information from the birth certificate for each infant under age 1 year who died in the 50 states, the District of Columbia (D.C.), Puerto Rico, or Guam during 2013 (1). For 2013, linked birth-infant death data are not available for American Samoa, the Commonwealth of the Northern Marianas, and the Virgin Islands. The purpose of the linkage is to use the many additional variables available from the birth certificate to conduct more detailed analyses of infant mortality patterns (2,3). This report presents infant mortality data by race and Hispanic origin of the mother, birthweight, period of gestation, sex of infant, plurality, maternal age, live-birth order, mother's marital status, mother's place of birth, age at death, and underlying cause of death (Tables 1–7, A–D, and Figures 1–5).

Data based exclusively on the vital statistics mortality file provide further information on trends in infant mortality and on causes of infant death (4). The linked file is used to analyze and calculate infant mortality rates by race and ethnicity that are more accurately measured from the birth certificate. Some rates calculated from the mortality file differ from those published using the linked file. A more detailed discussion of these differences is presented in the Technical Notes.

## Methods

Data shown in this report are based on birth and infant death certificates registered in all states, D.C., Puerto Rico, and Guam. As part of the Vital Statistics Cooperative Program (VSCP), each state provides matching birth and death certificate numbers for each infant under age 1 year who died in the state during 2013 to the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). When the birth and death occurred in different states, the state of death was responsible for contacting the state of birth identified on the death certificate to obtain the original birth certificate number. NCHS used the matching birth and death certificate numbers provided by the states to extract final edited data from the NCHS natality and mortality statistical files. These data were linked to form a single statistical record, thereby establishing a national linked record file.

After the initial linkage, NCHS returned lists of unlinked infant death records and records with inconsistent data between the birth and death certificates to each state. State additions and corrections were incorporated, and a final national linked file was produced. In 2013, 99.0% of all infant death records were successfully linked to their corresponding birth records. These records were weighted to adjust for the 1.0% of infant death records that were not linked to their corresponding birth certificates (see 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 2% of U.S. births in 2013 (2,3).

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, as the majority of women of Hispanic origin are reported as white. Data for American Indian or Alaska Native (AIAN) and Asian or Pacific Islander (API) births are not shown separately by Hispanic origin because the vast majority of these populations are non-Hispanic.

Cause-of-death statistics in this publication are classified in accordance with the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD–10) (5) (see Technical Notes).

### Data by maternal and infant characteristics

This report presents descriptive tabulations of infant mortality data by a variety of maternal and infant characteristics. These tabulations are useful for understanding the basic relationships between risk factors and infant mortality, *unadjusted for the possible effects of other variables*. In reality, women with one risk factor often have other risk factors as well. For example, teenage mothers are more likely to be unmarried and of a low-income status; mothers who do not receive prenatal care are more likely to be of a low-income status and uninsured. The preferred method for disentangling the multiple interrelationships among risk factors is multivariate analysis; however, an understanding of the basic relationships between risk factors and infant mortality is a necessary precursor to more sophisticated types of analyses, and is the aim of this publication.

*Race and Hispanic origin data*—Infant mortality rates are presented here by race and detailed Hispanic origin of mother. The linked file is particularly useful for computing accurate infant mortality rates for this purpose because the race and Hispanic origin of the mother from the birth certificate are used in both the numerator and denominator of the infant mortality rate. In contrast, for the vital statistics mortality file, race information for the denominator is the race of the mother as reported on the birth certificate, whereas the race information for the numerator is the race of the decedent as reported on the death certificate (2–4). Race information from the birth certificate reported by the mother is considered to be more reliable than that from the death certificate where the race and ethnicity of the deceased infant are reported by the funeral director based on information provided by an informant or by observation. These different reporting methods can lead to differences in race- and ethnicity-specific infant mortality rates between the two data files (4,6).

The 2003 revision of the U.S. Standard Certificate of Live Birth allows the reporting of more than one race (multiple races) for each parent (2,3,7,8). Forty-four states and D.C. reported multiple race data on their birth certificates for either part or all of 2013, and 33 states reported in 2012. To provide uniformity and comparability of the data, multiple race is imputed to a single race (see Technical Notes).

*Statistical significance*—Text statements have been tested for statistical significance, and a statement that a given infant mortality rate is higher or lower than another rate indicates that the rates are significantly different. Information on the methods used to test for statistical significance, as well as information on differences between period and cohort data, the weighting of the linked file, and a comparison of infant mortality data between the linked file and the vital statistics mortality file are presented in the Technical Notes. Additional information on maternal age, marital status, period of gestation, birthweight, and cause-of-death classification is also presented in the Technical Notes.

# Results and Discussion

## Trends in infant mortality

The overall 2013 infant mortality rate from the linked file was 5.96 infant deaths per 1,000 live births, nearly the same as the rate of 5.98 in 2012 (Tables A and B). The infant mortality rate plateaued from 2000 to 2005, fluctuated for 2 years, and then declined from 2007 to 2012 (Table B and Figure 1); the 2013 infant mortality rate is 13% lower than the 2005 high (6.86).

From 2012 to 2013, the infant mortality rates were stable for most groups but declined significantly for two Hispanic subgroups: 14% for Puerto Rican women (6.86 to 5.93) and 40% for Cuban women (5.00 to 3.02) (in 2013 there were 57 infant deaths to Cuban women) (Table B). Several groups had significant declines from 2005 (the most recent U.S. high) to 2013: Puerto Rican (29%), non-Hispanic black (18%), API (17%), non-Hispanic white (12%), and Mexican women (11%) (Table B and Figure 2).

## Infant mortality by race and Hispanic origin of mother

Infant mortality rates vary considerably by race and Hispanic origin of mother. In 2013, the highest rate, 11.11 per 1,000 live births, was for infants of non-Hispanic black mothers. Infants of Cuban mothers had the lowest rate at 3.02. Rates were higher for infants of non-Hispanic black, AIAN (7.61), and Puerto Rican (5.93) mothers compared with non-Hispanic white mothers (5.06). Rates were below the non-Hispanic white rate for infants of API (4.07), Central and South American (4.30), and Cuban (3.02) mothers (Tables A and B). These differences are explained in part by the differences in cause-specific infant mortality rates among race and Hispanic origin groups (9,10).

The disparity in the infant mortality rate between non-Hispanic black and non-Hispanic white women has more than doubled over the past decade. From 2005 (the most recent U.S. high) to 2013, the infant mortality rate declined for both groups. The ratio in the infant mortality rate was 2.4 from 2000 to 2007, 2.3 in 2008 and 2009, and has fluctuated between 2.2 and 2.3 from 2010 to 2013 (Table B).

## Age at death

Neither neonatal (under 28 days) nor postneonatal (28 days to under age 1 year) mortality rates changed significantly for the United States from 2012 to 2013 (Table B). The neonatal mortality rate was 4.04 in 2013 and 4.02 in 2012 for deaths under 28 days of age per 1,000 births. The postneonatal mortality rate was 1.92 in 2013 and 1.96 in 2012 for deaths from 28 days to under age 1 year per 1,000 live births.

The only decline in neonatal mortality from 2012 to 2013 was for births to Cuban women, down 43%, from 3.97 to 2.28 per 1,000. While all groups had lower postneonatal mortality rates from 2012 to 2013, none of the declines were significant (Table B).

Non-Hispanic black women had the highest neonatal mortality rate in 2013 at 7.46, 2.2 times that for non-Hispanic white women (3.34). Neonatal mortality rates were also higher for Puerto Rican (4.23) and AIAN (4.11) women than for non-Hispanic white women. Neonatal mortality rates were lower for API (2.99) and Cuban (2.28) women compared with non-Hispanic white women (Tables A and B).

Infants of non-Hispanic black (3.65) and AIAN (3.50) women had the highest postneonatal mortality rates of any group—more than twice the rate for non-Hispanic white women (1.71) (Tables A and B). In contrast, postneonatal mortality rates for Mexican (1.40), Central and South American (1.18), and API (1.08) women were lower than for non-Hispanic white women (Table A).

**Table A. Infant, neonatal, and postneonatal deaths and mortality rates, by race and Hispanic origin of mother: United States, 2013 linked file**

| Hispanic origin and race of mother | Live births | Number of deaths | | | Mortality rate per 1,000 live births | | |
|---|---|---|---|---|---|---|---|
| | | Infant | Neonatal | Postneonatal | Infant | Neonatal | Postneonatal |
| Total[1] | 3,932,181 | 23,446 | 15,893 | 7,553 | 5.96 | 4.04 | 1.92 |
| Non-Hispanic white | 2,129,196 | 10,766 | 7,119 | 3,647 | 5.06 | 3.34 | 1.71 |
| Non-Hispanic black | 583,834 | 6,488 | 4,355 | 2,133 | 11.11 | 7.46 | 3.65 |
| American Indian or Alaska Native | 45,991 | 350 | 189 | 161 | 7.61 | 4.11 | 3.50 |
| Asian or Pacific Islander | 265,673 | 1,082 | 794 | 288 | 4.07 | 2.99 | 1.08 |
| Hispanic | 901,033 | 4,507 | 3,200 | 1,308 | 5.00 | 3.55 | 1.45 |
| Mexican | 545,202 | 2,672 | 1,911 | 761 | 4.90 | 3.51 | 1.40 |
| Puerto Rican | 68,302 | 405 | 289 | 115 | 5.93 | 4.23 | 1.68 |
| Cuban | 18,854 | 57 | 43 | 14 | 3.02 | 2.28 | * |
| Central and South American | 131,305 | 565 | 410 | 155 | 4.30 | 3.12 | 1.18 |

* Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.
[1]Includes other and unknown Hispanic origin and Hispanic origin not stated, not shown separately.
NOTES: Infant deaths are weighted so numbers may not exactly add to totals due to rounding. Neonatal is under 28 days and postneonatal is 28 days to under age 1 year. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

## Infant mortality by state and race and ethnicity

Total infant mortality rates by state for 2005 (the most recent U.S. high) and 2013 and the number of infant deaths for 2013 are presented in Table C. Between 2005 and 2013, rates declined in 24 states, D.C., and Puerto Rico (Figure 3). These declines ranged from 51% for D.C. (13.67 to 6.68) to 9% for Pennsylvania (7.29 to 6.65). Six states and D.C. had declines greater than 20%. Rates for other states did not change significantly over this time period.

To examine variations across states in more detail and obtain statistically reliable state-specific rates by race and Hispanic origin, 3 years of data were combined (Table 2). Across the United States, infant mortality rates are generally higher in the South and Midwest and lower elsewhere. For 2011–2013, infant mortality rates ranged from a high of 9.25 for Mississippi to a low of 4.21 for Massachusetts.

Infant mortality rates differ by state among race and Hispanic origin groups. In 2011–2013, rates for infants of non-Hispanic black mothers could be reliably computed (20 or more infant deaths) in 39 states and D.C.; among these states, mortality rates ranged from a high of 14.18 in Kansas to a low of 6.90 in Massachusetts. For infants of non-Hispanic white mothers, West Virginia had the highest infant mortality rate (6.99) and New Jersey had the lowest rate (3.20). Among the 41 states and D.C. where infant mortality rates could be reliably computed for Hispanic mothers, Rhode Island had the highest rate (7.22) and Iowa had the lowest (2.65).

For infants of AIAN mothers, mortality rates for 2011–2013 could be reliably computed for only 15 states, and for infants of API mothers, rates could only be computed for 28 states. For infants of AIAN mothers, mortality rates ranged from 13.23 in North Dakota to 5.87 in New Mexico. Infant mortality rates for infants of API mothers ranged from 7.59 in Oklahoma to 3.32 in Massachusetts.

The data shown in Table 2 and described above show the wide disparities that exist in infant mortality rates across states. The U.S. infant mortality rate ratio for non-Hispanic black relative to non-Hispanic white populations for the 3 years 2011–2013 was 2.2.

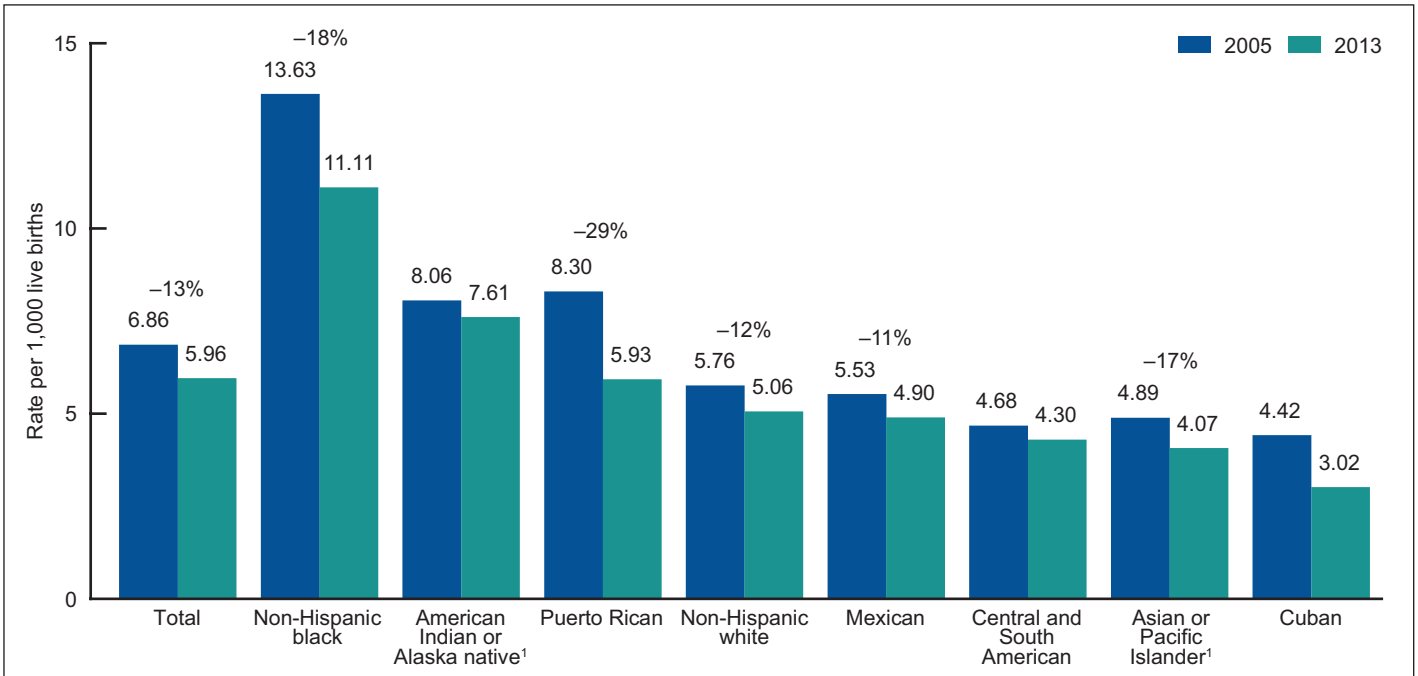
**Table B. Infant, neonatal, and postneonatal mortality rates, by race and Hispanic origin of mother: United States, 2000, 2005–2013 linked files**

| Race and Hispanic origin of mother | 2000 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | Percent change 2005 to 2013 | Percent change 2012 to 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Infant mortality rate | | | | | | |
| All races | 6.89 | 6.86 | 6.68 | 6.75 | 6.61 | 6.39 | 6.14 | 6.07 | 5.98 | 5.96 | †–13.1 | –0.3 |
| Non-Hispanic white | 5.70 | 5.76 | 5.58 | 5.63 | 5.52 | 5.33 | 5.18 | 5.07 | 5.04 | 5.06 | † –12.2 | 0.4 |
| Non-Hispanic black | 13.59 | 13.63 | 13.35 | 13.31 | 12.67 | 12.40 | 11.46 | 11.45 | 11.19 | 11.11 | † –18.5 | –0.7 |
| American Indian or Alaska Native | 8.30 | 8.06 | 8.28 | 9.22 | 8.42 | 8.47 | 8.28 | 8.21 | 8.40 | 7.61 | –5.6 | –9.4 |
| Asian or Pacific Islander | 4.87 | 4.89 | 4.55 | 4.78 | 4.51 | 4.40 | 4.27 | 4.36 | 4.06 | 4.07 | † –16.8 | 0.2 |
| Hispanic | 5.59 | 5.62 | 5.41 | 5.51 | 5.59 | 5.29 | 5.25 | 5.15 | 5.11 | 5.00 | †–11.0 | –2.2 |
| Mexican | 5.43 | 5.53 | 5.34 | 5.42 | 5.58 | 5.12 | 5.12 | 4.99 | 5.02 | 4.90 | †–11.4 | –2.4 |
| Puerto Rican | 8.21 | 8.30 | 8.01 | 7.71 | 7.29 | 7.18 | 7.10 | 7.85 | 6.86 | 5.93 | †–28.6 | †–13.6 |
| Cuban | 4.54 | 4.42 | 5.08 | 5.18 | 4.90 | 5.77 | 3.79 | 4.32 | 5.00 | 3.02 | –31.7 | †–39.6 |
| Central and South American | 4.64 | 4.68 | 4.52 | 4.57 | 4.76 | 4.47 | 4.43 | 4.35 | 4.14 | 4.30 | –8.1 | 3.9 |
| | | | | | | Neonatal mortality rate | | | | | | |
| All races | 4.62 | 4.54 | 4.46 | 4.42 | 4.29 | 4.18 | 4.05 | 4.06 | 4.02 | 4.04 | †–11.0 | 0.5 |
| Non-Hispanic white | 3.78 | 3.71 | 3.64 | 3.61 | 3.50 | 3.40 | 3.35 | 3.31 | 3.31 | 3.34 | †–10.0 | 0.9 |
| Non-Hispanic black | 9.19 | 9.13 | 8.95 | 8.74 | 8.28 | 8.13 | 7.45 | 7.62 | 7.46 | 7.46 | †–18.3 | 0.0 |
| American Indian or Alaska Native | 4.39 | 4.04 | 4.30 | 4.55 | 4.18 | 4.38 | 4.28 | 4.70 | 4.86 | 4.11 | 1.7 | –15.4 |
| Asian or Pacific Islander | 3.43 | 3.37 | 3.18 | 3.38 | 3.08 | 3.11 | 3.01 | 3.10 | 2.88 | 2.99 | †–11.3 | 3.8 |
| Hispanic | 3.77 | 3.86 | 3.74 | 3.72 | 3.76 | 3.56 | 3.59 | 3.63 | 3.58 | 3.55 | †–8.0 | –0.8 |
| Mexican | 3.61 | 3.78 | 3.73 | 3.68 | 3.78 | 3.44 | 3.53 | 3.51 | 3.56 | 3.51 | †–7.1 | –1.4 |
| Puerto Rican | 5.80 | 5.95 | 5.44 | 5.14 | 4.98 | 4.76 | 4.82 | 5.28 | 4.85 | 4.23 | †–28.9 | –12.8 |
| Cuban | 3.20 | 3.05 | 3.60 | 3.65 | 3.23 | 3.61 | 2.84 | 3.44 | 3.97 | 2.28 | –25.2 | †–42.6 |
| Central and South American | 3.26 | 3.23 | 3.12 | 3.14 | 3.19 | 3.17 | 3.00 | 3.23 | 2.85 | 3.12 | –3.4 | 9.5 |
| | | | | | | Postneonatal mortality rate | | | | | | |
| All races | 2.27 | 2.32 | 2.22 | 2.33 | 2.32 | 2.21 | 2.10 | 2.01 | 1.96 | 1.92 | †–17.2 | –2.0 |
| Non-Hispanic white | 1.92 | 2.05 | 1.94 | 2.02 | 2.02 | 1.93 | 1.82 | 1.76 | 1.73 | 1.71 | †–16.6 | –1.2 |
| Non-Hispanic black | 4.40 | 4.50 | 4.40 | 4.57 | 4.39 | 4.27 | 4.01 | 3.83 | 3.73 | 3.65 | †–18.9 | –2.1 |
| American Indian or Alaska Native | 3.94 | 4.02 | 3.98 | 4.67 | 4.24 | 4.09 | 4.00 | 3.51 | 3.51 | 3.50 | –12.9 | –0.3 |
| Asian or Pacific Islander | 1.44 | 1.51 | 1.37 | 1.40 | 1.43 | 1.29 | 1.25 | 1.26 | 1.17 | 1.08 | †–28.5 | –7.7 |
| Hispanic | 1.82 | 1.76 | 1.67 | 1.79 | 1.83 | 1.73 | 1.66 | 1.52 | 1.53 | 1.45 | †–17.6 | –5.2 |
| Mexican | 1.82 | 1.75 | 1.61 | 1.75 | 1.80 | 1.67 | 1.58 | 1.48 | 1.46 | 1.40 | †–20.0 | –4.1 |
| Puerto Rican | 2.41 | 2.37 | 2.57 | 2.57 | 2.30 | 2.42 | 2.28 | 2.55 | 1.99 | 1.68 | †–29.1 | –15.6 |
| Cuban | * | 1.37 | 1.42 | 1.53 | 1.62 | 2.10 | * | * | * | * | * | * |
| Central and South American | 1.38 | 1.46 | 1.41 | 1.43 | 1.57 | 1.30 | 1.42 | 1.12 | 1.29 | 1.18 | †–19.2 | –8.5 |

† Significant at $p < 0.05$.

* Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.

NOTES: Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3. Neonatal is under 28 days and postneonatal is 28 days to under age 1 year.




[1]Includes persons of Hispanic and non-Hispanic origin.
NOTE: Percent change indicates significant change between 2005 and 2013.
SOURCE: CDC/NCHS, National Vital Statistics System.

**Figure 2. Infant mortality rates, by race and Hispanic origin of mother: United States, 2005 and 2013**

Large ratios can occur for two reasons: the infant mortality rate for non-Hispanic black women can be comparatively high, or the rate for non-Hispanic white women can be relatively low. The reverse can be true when the rate ratio is low. State variation is a function of state variation in risk factors and variation in risk factor-specific rates. Several states that lack a calculable infant mortality rate for infants born to non-Hispanic black women due to fewer than 20 infant deaths do not have a rate ratio shown here (11 states and D.C.).

Areas with the highest rate ratios of 2.7 or greater for 2011–2013 were New Jersey (3.2), Connecticut (2.8), Wisconsin (2.8), Illinois (2.7), Maryland (2.7), and Utah (2.7). Ten areas had ratios less than 2.0 and greater than 1.0, and none had a ratio less than 1.0. Kentucky (1.5) had the lowest rate ratio (Table 2).

## Sex of infant

In the United States in 2013, the overall infant mortality rate for male infants was 6.51 per 1,000 births, 21% higher than the rate for female infants (5.39). In most countries, infant mortality rates are higher for male infants (11). Infant mortality rates were higher for male infants in each race and Hispanic origin group, although the difference was not significant for infants of AIAN, Cuban, and Puerto Rican mothers (Table 1).

## Multiple births

For multiple births, the infant mortality rate in 2013 was 25.84 per 1,000 live births, almost 5 times the rate of 5.25 for singleton births (Table 1). These rates were not significantly different from those in 2012 (25.24 and 5.30, respectively). Infant mortality rates for multiple births were higher than the rates for single births for all race and Hispanic origin groups for which rates could be reliably computed.

The risk of infant death increases with the increasing number of infants in the pregnancy. In 2013, the infant mortality rate for twins (24.37) was more than 4 times the rate for single births (5.25). The infant mortality rate for triplets (61.08) was nearly 12 times, and the rate for quadruplets (137.04) was 26 times the rate for single births. An infant mortality rate could not be computed for quintuplet and higher-order births due to the small number of events in that category (data not shown).

Multiple pregnancy can lead to an increase in maternal risks and complications associated with pregnancy (2,12–14). For example, multiple births are much more likely to be born preterm and low birthweight than singleton births (2,12–14). The higher risk profile of multiple births has a substantial impact on overall infant mortality (13). For example, in 2013, multiple births accounted for 3% of all live births, but 15% of all infant deaths in the United States (Table 1).

## Period of gestation

The gestational age of an infant is perhaps the most important predictor of his or her survival and subsequent health. Infants born too small or too soon have a much greater risk of death and both short-term and long-term disability compared with those born at full term (39–40 weeks of gestation) (15–21), and the percentage of preterm births has been linked to variations in infant mortality rates among countries (22). Because of their much greater risk of death, preterm infants have a large impact on the U.S. infant mortality rate. In 2013, two-thirds (67.0%) of all infant deaths occurred to the 11.4%

**Table C. Infant mortality rates, number of infant deaths, and percent change, by state: 2005 and 2013 linked files**

[By place of residence]

| State | Infant mortality rate per 1,000 live births | | Percent change 2005 to 2013 | Number of infant deaths in 2013 |
|---|---|---|---|---|
| | 2005 | 2013 | | |
| Total[1] | 6.86 | 5.96 | †–13.1 | 23,446 |
| Alabama | 9.53 | 8.60 | –9.7 | 500 |
| Alaska | 5.93 | 5.77 | –2.7 | 66 |
| Arizona | 6.85 | 5.25 | †–23.4 | 449 |
| Arkansas | 7.83 | 7.85 | 0.3 | 297 |
| California | 5.32 | 4.76 | †–10.5 | 2,354 |
| Colorado | 6.44 | 5.12 | †–20.5 | 333 |
| Connecticut | 5.85 | 4.79 | †–18.1 | 173 |
| Delaware | 9.02 | 6.37 | –29.4 | 69 |
| District of Columbia | 13.67 | 6.68 | †–51.2 | 62 |
| Florida | 7.24 | 6.14 | †–15.2 | 1,322 |
| Georgia | 8.07 | 6.98 | †–13.5 | 899 |
| Hawaii | 6.58 | 6.37 | –3.2 | 121 |
| Idaho | 5.98 | 5.63 | –5.9 | 126 |
| Illinois | 7.38 | 5.97 | †–19.2 | 937 |
| Indiana | 8.04 | 7.24 | –9.9 | 602 |
| Iowa | 5.44 | 4.25 | †–21.9 | 166 |
| Kansas | 7.37 | 6.49 | –11.9 | 252 |
| Kentucky | 6.73 | 6.39 | –5.1 | 356 |
| Louisiana | 9.85 | 8.69 | †–11.7 | 549 |
| Maine | 6.87 | 7.12 | 3.6 | 91 |
| Maryland | 7.30 | 6.63 | –9.1 | 477 |
| Massachusetts | 5.13 | 4.18 | †–18.5 | 300 |
| Michigan | 7.89 | 7.05 | †–10.6 | 800 |
| Minnesota | 5.09 | 5.09 | 0.0 | 352 |
| Mississippi | 11.46 | 9.60 | †–16.3 | 371 |
| Missouri | 7.52 | 6.52 | †–13.3 | 491 |
| Montana | 7.25 | 5.57 | –23.2 | 69 |
| Nebraska | 5.66 | 5.21 | –8.0 | 136 |
| Nevada | 5.66 | 5.31 | –6.2 | 186 |
| New Hampshire | 5.27 | 5.57 | 5.7 | 69 |
| New Jersey | 5.17 | 4.50 | †–12.9 | 462 |
| New Mexico | 6.17 | 5.27 | –14.6 | 139 |
| New York | 5.82 | 4.93 | †–15.2 | 1,169 |
| North Carolina | 8.81 | 6.99 | †–20.7 | 832 |
| North Dakota | 5.96 | 6.04 | 1.4 | 64 |
| Ohio | 8.17 | 7.33 | †–10.3 | 1,019 |
| Oklahoma | 7.95 | 6.73 | †–15.4 | 359 |
| Oregon | 5.99 | 4.94 | †–17.5 | 223 |
| Pennsylvania | 7.29 | 6.65 | †–8.8 | 937 |
| Rhode Island | 6.46 | 6.48 | 0.3 | 70 |
| South Carolina | 9.46 | 6.87 | †–27.4 | 390 |
| South Dakota | 6.98 | 6.45 | –7.6 | 79 |
| Tennessee | 8.77 | 6.80 | †–22.5 | 544 |
| Texas | 6.55 | 5.82 | †–11.1 | 2,255 |
| Utah | 4.52 | 5.18 | 14.6 | 264 |
| Vermont | 6.49 | 4.35 | –33.0 | 26 |
| Virginia | 7.47 | 6.18 | †–17.3 | 631 |
| Washington | 5.07 | 4.53 | –10.6 | 392 |
| West Virginia | 8.16 | 7.64 | –6.4 | 159 |
| Wisconsin | 6.54 | 6.26 | –4.2 | 417 |
| Wyoming | 6.63 | 4.84 | –27.0 | 37 |
| Puerto Rico | 9.22 | 7.10 | †–23.0 | 259 |
| Guam | 10.59 | 9.07 | –14.4 | 30 |

† Significant at $p < 0.05$.

[1]Excludes data for Puerto Rico and Guam.

of infants who were born preterm (Table D). Infant mortality rates are highest for very preterm (under 32 weeks) infants, and the risk decreases sharply with increasing gestational age (Table 1) (16,20). In 2013, the infant mortality rate for very preterm infants (163.71) was 88 times the rate for full-term infants (1.85). The infant mortality rate for infants born at 32–33 weeks of gestation was 16.02, nearly 9 times the rate for full-term infants.

Although mortality falls with increasing gestational age, even infants born only a few weeks early have a substantially increased risk of death and disability when compared with full-term infants (23–26). In 2013, the infant mortality rate for late preterm infants (34–36 weeks) was 7.23, 4 times the rate for full-term infants. The infant mortality rate for early term (37–38 weeks) infants was 3.01, 63% higher than for full-term infants. There were no significant changes in gestational age-specific infant mortality rates during 2012–2013.

There were large differences in the percentage of preterm births by race and ethnicity, and these differences have an impact on infant mortality rates (9,27). In 2013, the percentage of preterm births ranged from 10.2% of births for non-Hispanic white and API women to 16.3% of births for non-Hispanic black women (Table 3).

Gestational age-specific infant mortality rates also varied by race and ethnicity (Table 1). Compared with non-Hispanic white women, infant mortality rates were significantly higher for non-Hispanic black women for all gestational age categories except for 32–33 weeks of gestation. For AIAN women, infant mortality rates were higher at 39–40 and 37–41 weeks of gestation.

The percentage of preterm births increased by 36%, from 9.4% in 1984 to a high of 12.8% in 2006 (2). However, since 2006, the trend has reversed, and the percentage of preterm births declined to 11.4% in 2013, a decline of 11% (Table D). Declines were most rapid for late preterm (–13%) and early term (–14%) births, followed by early preterm (–7%) births (2). The percentage of births born at full term (39–40 weeks) increased by 13% during this period (Figure 4). Similar to the changes for births, the percentage of infant deaths that were preterm declined from 68.6% in 2005 to 67.0% in 2013, while the percentage of full-term infant deaths increased from 13.3% in 2005 to 15.6% in 2013.

## Birthweight

Birthweight is another important predictor of infant health. It is closely associated, but does not exactly correspond with, the period of gestation. Infant mortality rates are highest for the smallest infants and decrease as birthweight increases. In 2013, infant mortality rates were 25 times higher for low birthweight (less than 2,500 grams) infants (50.26 per 1,000) than for infants with birthweights of 2,500 grams or more (2.05) (Table 1). The infant mortality rate for very low birthweight (less than 1,500 grams) infants was 219.56, more than 100 times the rate for infants with birthweights of 2,500 grams or more. Among the smallest infants [less than 500 grams (1 lb. 1 oz. or less) (Table 4), 85% were reported to have died within the first year of life. Reporting of deaths among these very small infants may be incomplete (28). Infant mortality rates were lowest at birthweights of 3,500–4,499 grams.

**Table D. Infant mortality rates, and percent distribution of live births and infant deaths, by period of gestation: United States, 2000 and 2005–2013 linked files**

| Period of gestation (weeks) | 2000 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Infant mortality rates by gestational age[1] | | | | | |
| All gestational ages | 6.89 | 6.86 | 6.68 | 6.75 | 6.61 | 6.39 | 6.14 | 6.07 | 5.98 | 5.96 |
| Preterm (under 37) | 37.88 | 36.55 | 35.15 | 36.05 | 35.76 | 34.94 | 34.22 | 34.47 | 34.30 | 34.76 |
| Early preterm (under 34) | 109.75 | 109.77 | 105.31 | 107.13 | 105.71 | 103.48 | 99.97 | 100.35 | 99.15 | 99.50 |
| Under 32 | 180.95 | 183.24 | 175.94 | 178.36 | 175.45 | 172.15 | 165.57 | 166.66 | 163.14 | 163.71 |
| 32–33 | 17.37 | 16.69 | 16.19 | 16.12 | 17.58 | 16.07 | 15.83 | 15.91 | 16.23 | 16.02 |
| Late preterm (34–36) | 7.96 | 7.30 | 7.08 | 7.42 | 7.40 | 7.13 | 7.15 | 7.07 | 7.10 | 7.23 |
| Term (37–41) | 2.59 | 2.43 | 2.39 | 2.43 | 2.44 | 2.36 | 2.25 | 2.22 | 2.21 | 2.19 |
| Early term (37–38) | 3.38 | 3.08 | 3.02 | 3.09 | 3.13 | 3.09 | 3.03 | 2.92 | 3.05 | 3.01 |
| Full term (39–40) | 2.23 | 2.06 | 2.00 | 2.07 | 2.08 | 1.99 | 1.86 | 1.88 | 1.84 | 1.85 |
| Late term (41) | 2.28 | 2.13 | 2.31 | 2.08 | 2.10 | 1.93 | 1.92 | 2.07 | 1.87 | 1.80 |
| Postterm (42 or over) | 2.91 | 2.66 | 2.80 | 2.62 | 2.69 | 2.86 | 2.70 | 2.50 | 2.63 | 2.39 |
| | | | | | Percent distribution of infant deaths[2] | | | | | |
| All gestational ages | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Preterm (under 37) | 65.6 | 68.6 | 68.1 | 68.2 | 67.2 | 67.0 | 66.7 | 66.5 | 66.1 | 66.3 |
| Early preterm (under 34) | 55.8 | 58.8 | 58.3 | 58.2 | 57.3 | 57.3 | 56.8 | 56.9 | 56.5 | 56.7 |
| Under 32 | 52.0 | 54.9 | 54.3 | 54.4 | 53.1 | 53.3 | 52.9 | 52.9 | 52.4 | 52.7 |
| 32–33 | 3.7 | 3.9 | 4.0 | 3.8 | 4.2 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 |
| Late preterm (34–36) | 9.4 | 9.8 | 9.8 | 10.0 | 9.9 | 9.7 | 9.9 | 9.6 | 9.6 | 9.7 |
| Term (37–41) | 31.2 | 29.1 | 29.5 | 29.6 | 30.4 | 30.5 | 30.2 | 30.3 | 30.5 | 30.5 |
| Early term (37–38) | 12.3 | 12.9 | 13.2 | 13.2 | 13.3 | 13.4 | 13.2 | 12.4 | 12.7 | 12.5 |
| Full term (39–40) | 14.6 | 13.3 | 13.2 | 13.7 | 14.3 | 14.5 | 14.4 | 15.0 | 15.1 | 15.4 |
| Late term (41) | 3.6 | 2.7 | 2.9 | 2.6 | 2.7 | 2.5 | 2.6 | 2.8 | 2.7 | 2.6 |
| Postterm (42 or over) | 3.2 | 2.3 | 2.4 | 2.2 | 2.3 | 2.5 | 2.4 | 2.3 | 2.5 | 2.2 |
| | | | | | Percent distribution of live births[2] | | | | | |
| All gestational ages | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Preterm (under 37) | 11.6 | 12.7 | 12.8 | 12.7 | 12.3 | 12.2 | 12.0 | 11.7 | 11.5 | 11.4 |
| Early preterm (under 34) | 3.4 | 3.6 | 3.6 | 3.6 | 3.6 | 3.5 | 3.5 | 3.4 | 3.4 | 3.4 |
| Under 32 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.9 | 1.9 | 1.9 |
| 32–33 | 1.5 | 1.6 | 1.6 | 1.6 | 1.6 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Late preterm (34–36) | 8.1 | 9.1 | 9.1 | 9.0 | 8.8 | 8.7 | 8.5 | 8.3 | 8.1 | 8.0 |
| Term (37–41) | 81.1 | 81.4 | 81.5 | 81.7 | 82.0 | 82.3 | 82.4 | 82.6 | 82.8 | 83.0 |
| Early term (37–38) | 24.5 | 28.3 | 28.9 | 28.6 | 27.8 | 27.6 | 26.8 | 25.8 | 24.9 | 24.8 |
| Full term (39–40) | 45.1 | 44.2 | 44.0 | 44.7 | 45.6 | 46.5 | 47.4 | 48.4 | 49.3 | 49.8 |
| Late term (41) | 10.8 | 8.6 | 8.3 | 8.3 | 8.4 | 8.2 | 8.2 | 8.3 | 8.5 | 8.5 |
| Postterm (42 or over) | 7.3 | 5.8 | 5.7 | 5.6 | 5.7 | 5.5 | 5.5 | 5.6 | 5.6 | 5.5 |

[1]Rates are deaths under age 1 year per 1,000 live births in specified group.
[2]Infant deaths and live births with unknown gestational age are subtracted from the total number of events used as denominators for percentage computations.

Because of their much higher mortality rates, infants born at the lowest birthweights have a substantial impact on overall infant mortality rates. For example, infants born weighing less than 1,000 grams accounted for only 0.7% of births, but nearly one-half (47.2 %) of all infant deaths in the United States in 2013 (Table 4). Conversely, 91.9% of infants born in the United States in 2013 weighed 2,500 grams or more, but these infants accounted for less than one-third (31.7%) of infant deaths. The large variations by race and Hispanic origin in the percentage of births at low birthweight (from 6.6% for Mexican women to 13.1% for non-Hispanic black women) mean that some racial and ethnic groups are disproportionately impacted by the high infant mortality rates for low birthweight infants (Table 3).

From 2005 to 2013, infant mortality rates for the total population declined for the broader birthweight categories of less than 2,500 grams, less than 1,500 grams, and 2,500 grams or more, and for detailed birthweight categories of 500–749, 750–999, 1,000–1,249, 1,250–1,499, 1,500–1,999, 2,000–2,499, 2,500–2,999, and 3,000–3,499 grams (Table 4). Changes for other detailed birthweight categories were not statistically significant.

## Maternal age

Infant mortality rates varied by maternal age. In 2013, infants of mothers under 20 (8.52) and mothers aged 40–54 (7.77) were more likely to die in the first year of life compared with other ages (Table 1). Among mothers under 20, infant mortality rates were 12. for under 15, 8.51 for 15–17, and 8.46 for 18–19. Infants of moth aged 30–34 had the lowest infant mortality rate (4.87). There were no significant changes from 2012 (29) to 2013 by age group.

The relationship between maternal age and infant mortality is complex. Both younger and older mothers are more likely to have adverse birth outcomes, such as early gestational age and low birthweight (2), which may increase the risk of infant mortality. In addition, multiple births (2) and chronic conditions (30) are more common with advanced maternal age.

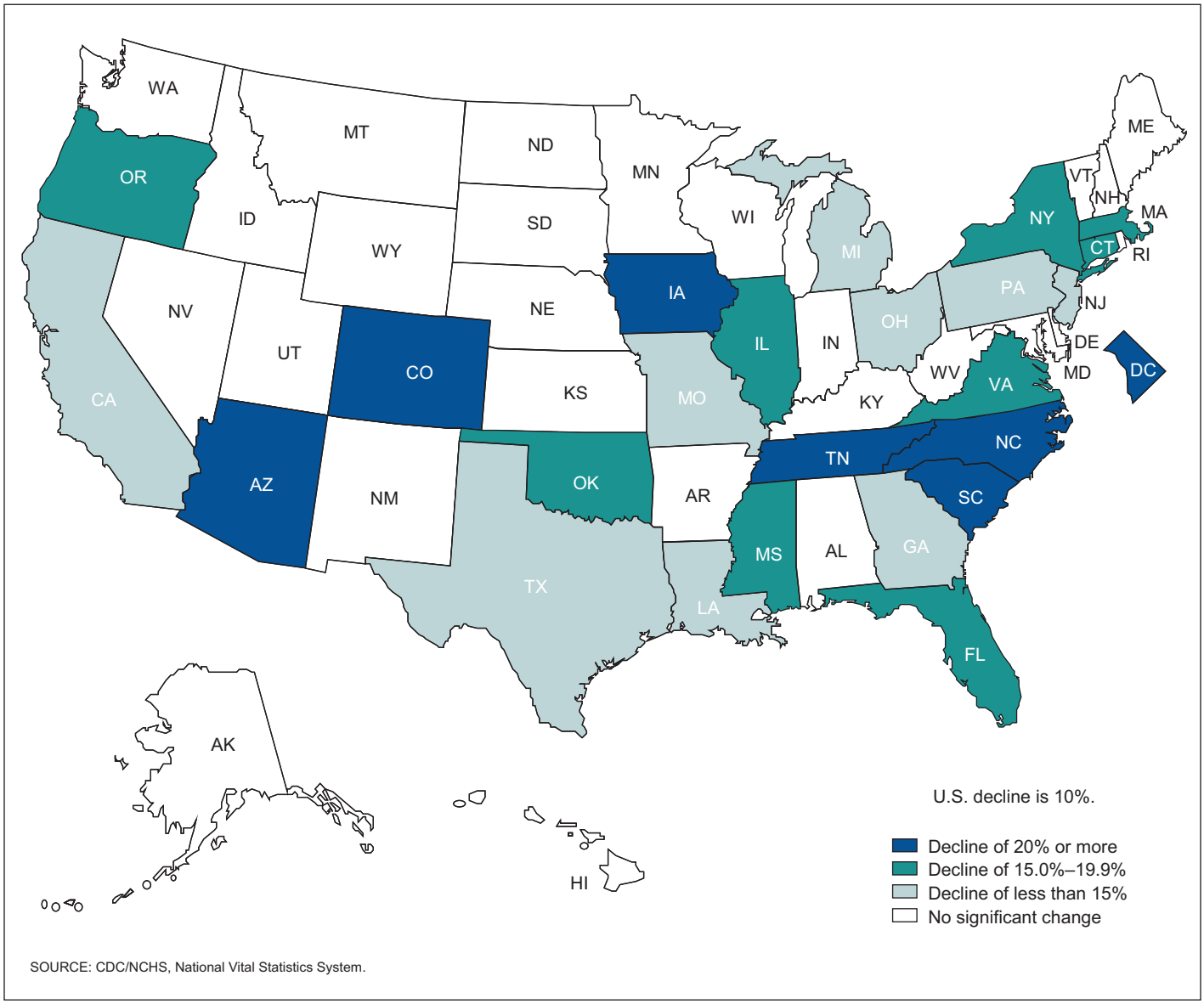



**Figure 3. Percent change in infant mortality rate, by state: United States, 2005–2013**

## Live-birth order

In 2013, as in previous years, infant mortality rates were higher for first births than for second births, and then generally increased as birth order increased (Table 1). In 2013, the infant mortality rate for first births (6.02) was 17% higher than for second births (5.14). Birth order and maternal age have been examined together and have been shown to affect adverse pregnancy and birth outcomes (31,32).

## Marital status

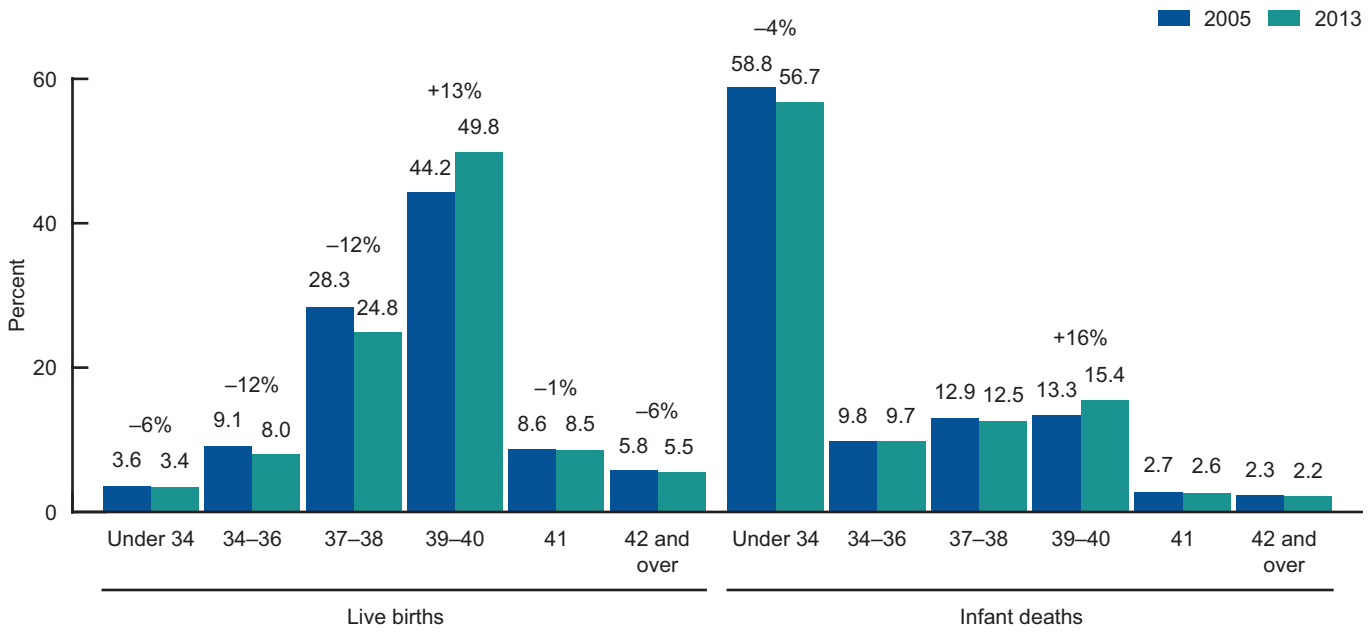
In 2013, the mortality rate for infants of unmarried mothers was 7.96 per 1,000, 73% higher than the rate for infants of married mothers (4.60) (Table 1). Infants of unmarried mothers had higher rates of mortality compared with married mothers across all race and Hispanic origin groups except Central and South American and Cuban populations.

Marital status may be a marker for the presence or absence of financial, social, and emotional resources (33). Infants of mothers who are not married have been shown to be at higher risk of poor outcomes (34).

## Nativity

In 2013, the infant mortality rate for mothers born in the 50 states and D.C. (6.28 per 1,000) was 39% higher than the rate for mothers born elsewhere (4.51) (Table 1). Among race and Hispanic origin groups, mothers born in the 50 states and D.C. had higher infant mortality rates than mothers born elsewhere for non-Hispanic white (31% higher), non-Hispanic black (66% higher), API (32% higher), and Hispanic populations (19% higher).

A number of hypotheses have been suggested to account for the lower infant mortality rate among infants of mothers born outside of the 50 states and D.C., including possible differences in migration selectivity, social support, and risk behaviors (35,36); however, these




NOTE: Percent change indicates significant change between 2005 and 2013.
SOURCE: CDC/NCHS, National Vital Statistics System.

**Figure 4. Percent distribution of live births and infant deaths, by gestational age: United States, 2005 and 2013**

differences can vary depending on race and ethnicity (37) and other socioeconomic indicators (38).

## Leading causes of infant death

Infant mortality rates for the five leading causes of infant death are presented in Table 5 by race and Hispanic origin of mother. The leading cause of infant death in the United States in 2013 was Congenital malformations, deformations and chromosomal abnormalities (congenital malformations), accounting for 20% of all infant deaths. Disorders relating to short gestation and low birthweight, not elsewhere classified (low birthweight) was the second leading cause, accounting for 18% of all infant deaths. Newborn affected by maternal complications of pregnancy (maternal complications) was the third leading cause, with 7% of infant deaths, followed by Sudden infant death syndrome (SIDS) (7%), and Accidents (unintentional injuries) (5%). Together, the five leading causes accounted for 57% of all infant deaths in the United States in 2013. The order of the top five leading causes changed slightly from 2012 to 2013. In 2012, SIDS was the third leading cause, followed by maternal complications, whereas in 2013, maternal complications was third and SIDS was fourth. For 2012–2013, there were no significant changes in infant mortality rates for the leading causes of death. During 2005–2013, the infant mortality rate declined by 10% for congenital malformations, by 6% for low birthweight, and by 26% for SIDS. In contrast, the infant mortality rate for unintentional injuries increased by 11% during 2005–2013.

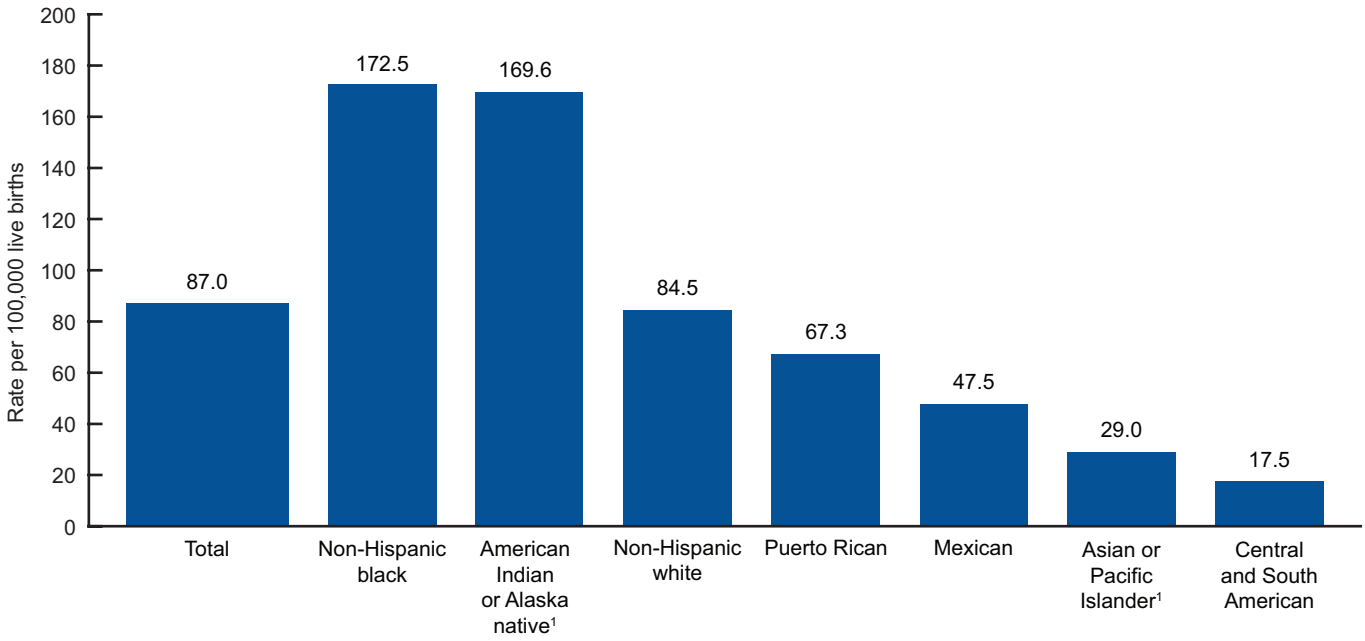
In 2013, as in previous years, the rank order of leading causes of infant death varied substantially by race and Hispanic origin of the mother. For all groups except non-Hispanic black and Puerto Rican women, congenital malformations was the leading cause of infant death, followed by low birthweight. For non-Hispanic black and Puerto Rican women, these two categories were reversed.

When differences in cause-specific infant mortality rates were examined by race and ethnicity, infant mortality rates from congenital malformations were 34% higher for AIAN, and 23% higher for non-Hispanic black than for non-Hispanic white women. Infant mortality rates from congenital malformations were 23% lower for API and 21% lower for Mexican than for non-Hispanic white women.

Infants of non-Hispanic black women had the highest mortality rates from low birthweight. The rate for non-Hispanic black women was 2.5 times that for non-Hispanic white women. The rate for Puerto Rican women was 77% higher than for non-Hispanic white women.

For maternal complications (which include incompetent cervix, premature rupture of membranes, and multiple pregnancy, for example), infants of non-Hispanic black women had the highest mortality rates—nearly 3 times those for non-Hispanic white women. Non-Hispanic black women have a much higher percentage of preterm births (Table 3), which may help to explain the high infant mortality rates from maternal complications, as this cause occurs predominantly among preterm infants. Infant mortality rates from maternal complications were 62% higher for Puerto Rican women than for non-Hispanic white women.

SIDS rates for non-Hispanic black women were 83% higher, and rates for AIAN women were 95% higher than for non-Hispanic white women. In contrast, SIDS rates were 44% lower for Mexican, 53% lower for Puerto Rican, and 64% lower for API women than for non-Hispanic white women. As most SIDS deaths occur during the postneonatal period, the high SIDS rates for infants of non-Hispanic black and AIAN women accounted for much of their elevated risk of postneonatal mortality.




[1]Includes persons of Hispanic and non-Hispanic origin.
SOURCE: CDC/NCHS, National Vital Statistics System.

**Figure 5. Sudden unexpected infant death rates, by race and Hispanic origin of mother: United States, 2013**

For unintentional injuries, the non-Hispanic black rate was more than twice the non-Hispanic white rate. Infant mortality rates from unintentional injuries were 75% higher for AIAN and 28% higher for Puerto Rican women than for non-Hispanic white women. In contrast, infant mortality rates from unintentional injuries were 41% lower for Mexican than for non-Hispanic white women.

## Preterm-related causes of death

To more fully assess the impact of preterm birth on infant mortality, CDC researchers have developed a grouping of *preterm-related* causes of death. A cause of death was considered preterm-related if 75% or more of infants whose deaths were attributed to that cause were born at under 37 weeks of gestation, and the cause of death was a direct consequence of preterm birth based on a clinical evaluation and review of the literature (39,40).

The preterm-related cause-of-death grouping includes Disorders related to short gestation and low birthweight not elsewhere classified, and most of the Maternal complications of pregnancy category from the five leading causes of death. Also included are a variety of other causes of death closely associated with prematurity such as Respiratory distress of newborn, Bacterial sepsis of newborn, Necrotizing enterocolitis of newborn, and others. The comprehensive list of preterm-related cause-of-death categories (ICD–10 codes) is shown in the note on Table 6. Even this comprehensive grouping probably underestimates the total impact of preterm-related infant mortality, as some cause-of-death categories (notably those beginning with the words "Other" and "All other") had a high percentage of preterm infant deaths but lacked sufficient specificity to be able to establish the etiologic connection to prematurity with any degree of certainty.

Table 6 shows trends in preterm-related infant mortality by race and Hispanic origin of mother. In 2013, 8,470 out of a total of 23,446 infant deaths (36.1%) in the United States were preterm-related. The impact of preterm-related infant deaths varied considerably by maternal race and ethnicity. In 2013, 44% of non-Hispanic black, and 41% of Puerto Rican infant deaths were due to preterm-related causes, while the percentage was somewhat lower for other racial and ethnic groups (Table 6).

Preterm-related infant mortality rates varied considerably by race and ethnicity of the mother (Table 6). The preterm-related infant mortality rate for non-Hispanic black women (490.9 per 100,000) was 3 times that for non-Hispanic white women (159.1). The preterm-related infant mortality rate was 52% higher for Puerto Rican women (241.6), and 28% higher for AIAN (204.4) women than for non-Hispanic white (159.1) women.

Although preterm-related infant mortality rates were highest for non-Hispanic black and Puerto Rican women, they also experienced the largest declines in recent years. From 2005 (the most recent overall U.S. infant mortality rate high) to 2013, preterm-related infant mortality rates declined by 22% for non-Hispanic black women, and by 30% for Puerto Rican women, compared with a 14% decline for non-Hispanic white women. Preterm-related infant mortality rates also declined by 10% for Mexican women, while changes for other race and ethnic groups were not statistically significant (Table 6).

## Sudden unexpected infant deaths

A special cause-of-death category for Sudden unexpected infant deaths (SUID) has recently been developed (41). This was developed in response to variations over time and between those who complete death certificates in how sudden unexpected infant deaths are reported on death certificates (41,42).

The SUID category combines ICD–10 codes for SIDS (R95), Other ill-defined and unspecified causes of mortality (R99), and Accidental suffocation and strangulation in bed (W75). This category is being increasingly used by researchers to produce more accurate comparisons in SUIDs over time and between geographic areas (41,42). SUID is among the leading health indicators measured in Healthy People 2020 (43).

In 2013, there were 3,422 SUIDs in the United States, comprising 14.6% of total infant deaths in that year. The SUID rate was 87.0 infant deaths per 100,000 live births in 2013, 10% lower than the rate of 97.2 in 2005, the most recent overall infant mortality rate high. SUID rates were twice as high for non-Hispanic black (172.5) and AIAN (169.6) women as for non-Hispanic white women (84.5). Compared with non-Hispanic white women, SUID rates were significantly lower for Puerto Rican (67.3), Mexican (47.5), API (29.0), and Central and South American (17.5) women (Table 7 and Figure 5).

## Contribution of leading causes of death to racial and ethnic infant mortality differences

The contribution of individual causes of death to racial and ethnic disparities in infant mortality can be assessed by relating differences in rates from individual causes of death to the overall infant mortality difference (10). When this is done, 54% of the higher infant mortality rate for non-Hispanic black women when compared with non-Hispanic white women is due to their higher infant mortality rate from preterm-related causes, and 15% is due to differences in SUIDs. For Puerto Rican women, nearly all (94%) of the difference in overall infant mortality rates between Puerto Rican and non-Hispanic white women was due to preterm-related causes of death. In contrast, for AIAN mothers, 33% of their elevated infant mortality rates when compared with non-Hispanic white women were due to differences in SUID, 18% to differences in preterm-related causes, and 16% due to differences in congenital anomalies.

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## List of Detailed Tables

**Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 2013 linked file**

| Characteristic | All origins[1] | Non-Hispanic | | | | Hispanic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | White | Black | American Indian or Alaska Native[2] | Asian or Pacific Islander | Total | Mexican | Puerto Rican | Cuban | Central and South American |
| | Infant mortality rates per 1,000 live births in specified group | | | | | | | | | |
| Total | 5.96 | 5.06 | 11.11 | 7.61 | 4.07 | 5.00 | 4.90 | 5.93 | 3.02 | 4.30 |
| Age at death (days) | | | | | | | | | | |
| Total neonatal | 4.04 | 3.34 | 7.46 | 4.11 | 2.99 | 3.55 | 3.51 | 4.23 | 2.28 | 3.12 |
| Early neonatal (under 7) | 3.28 | 2.68 | 6.11 | 3.11 | 2.49 | 2.88 | 2.87 | 3.56 | 1.86 | 2.43 |
| Late neonatal (7–27) | 0.76 | 0.66 | 1.35 | 1.00 | 0.50 | 0.67 | 0.63 | 0.67 | * | 0.69 |
| Postneonatal | 1.92 | 1.71 | 3.65 | 3.50 | 1.08 | 1.45 | 1.40 | 1.68 | * | 1.18 |
| Sex | | | | | | | | | | |
| Male | 6.51 | 5.63 | 11.97 | 8.34 | 4.49 | 5.36 | 5.16 | 6.15 | 3.29 | 4.89 |
| Female | 5.39 | 4.46 | 10.23 | 6.88 | 3.63 | 4.62 | 4.63 | 5.67 | 2.74 | 3.70 |
| Plurality | | | | | | | | | | |
| Single births | 5.24 | 4.39 | 9.78 | 7.17 | 3.47 | 4.56 | 4.48 | 5.45 | 2.58 | 3.87 |
| Plural births | 25.84 | 21.88 | 43.58 | 24.33 | 22.01 | 22.43 | 22.91 | 19.74 | * | 21.17 |
| Birthweight (grams) | | | | | | | | | | |
| Under 2,500 | 50.26 | 45.11 | 63.00 | 53.64 | 36.39 | 49.32 | 50.85 | 46.17 | 32.47 | 45.17 |
| Under 1,500 | 219.56 | 208.58 | 233.77 | 221.50 | 196.57 | 217.44 | 218.08 | 212.99 | 165.98 | 210.87 |
| 1,500–2,499 | 13.41 | 13.68 | 13.26 | 17.28 | 9.41 | 14.04 | 15.80 | 9.66 | * | 11.36 |
| 2,500 or over | 2.05 | 2.01 | 3.20 | 3.83 | 1.11 | 1.58 | 1.61 | 1.71 | * | 1.24 |
| Period of gestation (weeks) | | | | | | | | | | |
| Under 37 | 34.76 | 30.50 | 50.01 | 30.99 | 28.48 | 30.05 | 30.52 | 32.70 | 15.37 | 25.45 |
| Under 32 | 163.71 | 150.92 | 186.41 | 133.68 | 157.99 | 154.43 | 155.61 | 151.12 | 114.75 | 137.39 |
| 32–33 | 16.02 | 16.85 | 15.36 | * | 11.42 | 15.23 | 16.29 | * | * | 12.94 |
| 34–36 | 7.23 | 7.43 | 8.45 | 9.43 | 4.77 | 6.31 | 6.89 | 6.25 | * | 5.04 |
| 37–41 | 2.19 | 2.13 | 3.44 | 3.97 | 1.25 | 1.74 | 1.75 | 1.84 | * | 1.42 |
| 37–38 | 3.01 | 3.12 | 4.17 | 4.21 | 1.72 | 2.28 | 2.39 | 2.16 | * | 1.84 |
| 39–40 | 1.85 | 1.76 | 3.08 | 3.97 | 0.95 | 1.49 | 1.47 | 1.73 | * | 1.14 |
| 41 | 1.80 | 1.70 | 2.82 | * | 1.65 | 1.47 | 1.43 | * | * | * |
| 42 or over | 2.39 | 2.25 | 3.58 | * | 1.92 | 2.09 | 2.00 | * | * | * |
| Age of mother | | | | | | | | | | |
| Under 20 | 8.52 | 8.48 | 11.69 | 8.12 | 7.39 | 6.26 | 6.30 | 6.68 | * | 4.57 |
| 20–24 | 7.00 | 6.14 | 11.23 | 7.55 | 5.76 | 5.16 | 4.72 | 5.97 | * | 4.37 |
| 25–29 | 5.59 | 4.74 | 10.88 | 8.52 | 3.94 | 4.54 | 4.37 | 5.98 | * | 4.23 |
| 30–34 | 4.87 | 4.11 | 10.71 | 5.28 | 3.42 | 4.40 | 4.57 | 4.88 | * | 3.88 |
| 35–39 | 5.35 | 4.43 | 11.34 | 8.35 | 3.97 | 5.04 | 4.95 | 5.89 | * | 4.86 |
| 40–54 | 7.77 | 7.01 | 11.83 | * | 5.12 | 7.78 | 8.57 | * | * | 4.58 |
| Live-birth order | | | | | | | | | | |
| 1 | 6.02 | 5.01 | 11.39 | 7.23 | 4.12 | 5.48 | 5.60 | 5.70 | 2.48 | 4.69 |
| 2 | 5.14 | 4.46 | 10.04 | 6.91 | 3.55 | 4.23 | 4.12 | 5.71 | * | 3.52 |
| 3 | 5.84 | 5.28 | 10.26 | 6.16 | 4.13 | 4.49 | 4.36 | 5.02 | * | 3.80 |
| 4 | 6.73 | 6.09 | 11.13 | 6.76 | 5.60 | 5.15 | 4.69 | 7.73 | * | 4.83 |
| 5 or over | 9.11 | 7.49 | 14.82 | 13.83 | 6.64 | 6.96 | 6.35 | 8.45 | * | 6.83 |
| Marital status | | | | | | | | | | |
| Married | 4.60 | 4.15 | 9.10 | 5.96 | 3.74 | 4.65 | 4.69 | 5.13 | 3.19 | 4.03 |
| Unmarried | 7.96 | 7.25 | 11.92 | 8.45 | 5.73 | 5.31 | 5.10 | 6.37 | 2.86 | 4.57 |
| Mother's place of birth | | | | | | | | | | |
| Born in the 50 states or the District of Columbia | 6.28 | 5.09 | 11.65 | 7.81 | 4.94 | 5.42 | 5.17 | 6.16 | 3.86 | 4.04 |
| Born elsewhere | 4.51 | 3.88 | 7.04 | * | 3.73 | 4.54 | 4.60 | 5.22 | 2.21 | 4.34 |

See footnotes at end of table.

**Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 2013 linked file—Con.**

| Characteristic | All origins[1] | Non-Hispanic | | | | Hispanic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | White | Black | American Indian or Alaska Native[2] | Asian or Pacific Islander | Total | Mexican | Puerto Rican | Cuban | Central and South American |
| | | | | | Live births | | | | | |
| Total | 3,932,181 | 2,129,196 | 583,834 | 45,991 | 265,673 | 901,033 | 545,202 | 68,302 | 18,854 | 131,305 |
| Sex | | | | | | | | | | |
| Male | 2,012,954 | 1,092,625 | 296,426 | 23,609 | 137,008 | 459,931 | 278,486 | 34,800 | 9,727 | 66,909 |
| Female | 1,919,227 | 1,036,571 | 287,408 | 22,382 | 128,665 | 441,102 | 266,716 | 33,502 | 9,127 | 64,396 |
| Plurality | | | | | | | | | | |
| Single births | 3,795,157 | 2,047,990 | 560,865 | 44,799 | 256,997 | 878,879 | 532,849 | 66,073 | 18,205 | 128,045 |
| Plural births | 137,024 | 81,206 | 22,969 | 1,192 | 8,676 | 22,154 | 12,353 | 2,229 | 649 | 3,260 |
| Birthweight (grams) | | | | | | | | | | |
| Under 2,500 | 316,597 | 149,019 | 76,716 | 3,449 | 22,232 | 64,048 | 36,207 | 6,433 | 1,386 | 9,010 |
| Under 1,500 | 56,585 | 24,029 | 17,303 | 614 | 3,210 | 11,111 | 6,273 | 1,155 | 241 | 1,527 |
| 1,500–2,499 | 260,012 | 124,990 | 59,413 | 2,835 | 19,022 | 52,937 | 29,934 | 5,278 | 1,145 | 7,483 |
| 2,500 or over | 3,614,942 | 1,980,055 | 507,053 | 42,536 | 243,413 | 836,940 | 508,972 | 61,864 | 17,468 | 122,286 |
| Not stated | 642 | 122 | 65 | 6 | 28 | 45 | 23 | 5 | * | 9 |
| Period of gestation (weeks) | | | | | | | | | | |
| Under 37 | 447,361 | 216,449 | 94,869 | 6,002 | 26,962 | 101,839 | 58,780 | 8,898 | 2,668 | 15,364 |
| Under 32 | 75,464 | 32,957 | 21,657 | 965 | 4,032 | 15,535 | 8,862 | 1,608 | 305 | 2,249 |
| 32–33 | 58,039 | 28,019 | 12,764 | 794 | 3,239 | 13,066 | 7,551 | 1,209 | 338 | 2,010 |
| 34–36 | 313,858 | 155,473 | 60,448 | 4,243 | 19,691 | 73,238 | 42,367 | 6,081 | 2,025 | 11,105 |
| 37–41 | 3,265,630 | 1,787,743 | 458,758 | 36,735 | 227,053 | 750,641 | 457,561 | 55,524 | 15,263 | 108,432 |
| 37–38 | 974,162 | 493,500 | 159,554 | 11,881 | 71,027 | 237,124 | 142,623 | 17,611 | 5,086 | 34,821 |
| 39–40 | 1,957,937 | 1,096,277 | 259,803 | 20,914 | 135,434 | 442,537 | 271,687 | 32,296 | 8,930 | 63,182 |
| 41 | 333,531 | 197,966 | 39,401 | 3,940 | 20,592 | 70,980 | 43,251 | 5,617 | 1,247 | 10,429 |
| 42 or over | 215,510 | 123,435 | 29,568 | 3,179 | 11,481 | 47,924 | 28,455 | 3,838 | 917 | 7,437 |
| Not stated | 3,680 | 1,569 | 639 | 75 | 177 | 629 | 406 | 42 | 6 | 72 |
| Age of mother | | | | | | | | | | |
| Under 20 | 276,203 | 108,603 | 63,109 | 5,788 | 5,141 | 94,174 | 60,466 | 8,080 | 868 | 7,661 |
| 20–24 | 896,745 | 431,540 | 185,662 | 14,970 | 27,250 | 237,705 | 146,491 | 21,289 | 4,162 | 24,738 |
| 25–29 | 1,120,777 | 637,710 | 153,903 | 12,673 | 70,886 | 244,243 | 147,783 | 18,072 | 5,892 | 36,128 |
| 30–34 | 1,036,927 | 620,788 | 112,650 | 8,142 | 95,865 | 196,417 | 115,279 | 13,119 | 4,584 | 36,337 |
| 35–39 | 483,873 | 269,221 | 53,546 | 3,591 | 52,872 | 102,663 | 60,020 | 6,277 | 2,670 | 20,983 |
| 40–54 | 117,656 | 61,334 | 14,964 | 827 | 13,659 | 25,831 | 15,163 | 1,465 | 678 | 5,458 |
| Live-birth order | | | | | | | | | | |
| 1 | 1,546,163 | 882,604 | 219,026 | 15,640 | 119,546 | 306,339 | 173,297 | 26,513 | 8,866 | 44,763 |
| 2 | 1,244,087 | 699,878 | 166,905 | 12,299 | 94,619 | 268,700 | 156,453 | 21,195 | 6,570 | 42,885 |
| 3 | 653,641 | 331,146 | 101,365 | 8,438 | 32,962 | 179,412 | 115,654 | 11,562 | 2,312 | 25,510 |
| 4 | 276,565 | 125,576 | 49,127 | 4,733 | 10,711 | 86,400 | 59,038 | 5,048 | 673 | 10,767 |
| 5 or over | 193,210 | 81,969 | 42,299 | 4,626 | 6,931 | 56,909 | 38,897 | 3,670 | 382 | 6,879 |
| Not stated | 18,515 | 8,023 | 5,112 | 255 | 904 | 3,273 | 1,863 | 314 | 51 | 501 |
| Marital status | | | | | | | | | | |
| Married | 2,336,308 | 1,505,551 | 166,543 | 15,448 | 220,611 | 421,282 | 261,981 | 24,170 | 9,399 | 65,469 |
| Unmarried | 1,595,873 | 623,645 | 417,291 | 30,543 | 45,062 | 479,751 | 283,221 | 44,132 | 9,455 | 65,836 |
| Mother's place of birth | | | | | | | | | | |
| Born in the 50 states or the District of Columbia | 3,043,697 | 1,992,041 | 496,298 | 43,008 | 60,123 | 444,023 | 263,492 | 49,491 | 9,325 | 22,527 |
| Born elsewhere | 875,478 | 132,560 | 83,288 | 2,887 | 204,185 | 455,182 | 281,086 | 18,197 | 9,512 | 108,500 |
| Not stated | 13,006 | 4,595 | 4,248 | 96 | 1,365 | 1,828 | 624 | 614 | 17 | 278 |

See footnotes at end of table.

**Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 2013 linked file—Con.**

| Characteristic | All origins[1] | Non-Hispanic | | | | Hispanic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | White | Black | American Indian or Alaska Native[2] | Asian or Pacific Islander | Total | Mexican | Puerto Rican | Cuban | Central and South American |
| | Infant deaths | | | | | | | | | |
| Total | 23,446 | 10,766 | 6,488 | 350 | 1,082 | 4,507 | 2,672 | 405 | 57 | 565 |
| Age at death (days) | | | | | | | | | | |
| Total neonatal | 15,893 | 7,119 | 4,355 | 189 | 794 | 3,200 | 1,911 | 289 | 43 | 410 |
| Early neonatal (under 7) | 12,900 | 5,706 | 3,567 | 143 | 662 | 2,598 | 1,565 | 243 | 35 | 319 |
| Late neonatal (7–27) | 2,993 | 1,413 | 788 | 46 | 132 | 602 | 346 | 46 | 8 | 91 |
| Postneonatal | 7,553 | 3,647 | 2,133 | 161 | 288 | 1,308 | 761 | 115 | 14 | 155 |
| Sex | | | | | | | | | | |
| Male | 13,108 | 6,147 | 3,548 | 197 | 615 | 2,467 | 1,436 | 214 | 32 | 327 |
| Female | 10,339 | 4,619 | 2,939 | 154 | 467 | 2,040 | 1,236 | 190 | 25 | 238 |
| Plurality | | | | | | | | | | |
| Single births | 19,905 | 8,989 | 5,487 | 321 | 892 | 4,011 | 2,389 | 360 | 47 | 496 |
| Plural births | 3,541 | 1,777 | 1,001 | 29 | 191 | 497 | 283 | 44 | 10 | 69 |
| Birthweight (grams) | | | | | | | | | | |
| Under 2,500 | 15,912 | 6,722 | 4,833 | 185 | 809 | 3,159 | 1,841 | 297 | 45 | 407 |
| Under 1,500 | 12,424 | 5,012 | 4,045 | 136 | 631 | 2,416 | 1,368 | 246 | 40 | 322 |
| 1,500–2,499 | 3,488 | 1,710 | 788 | 49 | 179 | 743 | 473 | 51 | 5 | 85 |
| 2,500 or over | 7,397 | 3,984 | 1,621 | 163 | 269 | 1,323 | 818 | 106 | 12 | 152 |
| Not stated | 137 | 59 | 33 | 3 | 4 | 24 | 12 | 2 | * | 6 |
| Period of gestation (weeks) | | | | | | | | | | |
| Under 37 | 15,552 | 6,601 | 4,744 | 186 | 768 | 3,060 | 1,794 | 291 | 41 | 391 |
| Less than 32 | 12,354 | 4,974 | 4,037 | 129 | 637 | 2,399 | 1,379 | 243 | 35 | 309 |
| 32–33 | 930 | 472 | 196 | 17 | 37 | 199 | 123 | 10 | 2 | 26 |
| 34–36 | 2,268 | 1,155 | 511 | 40 | 94 | 462 | 292 | 38 | 4 | 56 |
| 37–41 | 7,151 | 3,799 | 1,577 | 146 | 284 | 1,305 | 802 | 102 | 14 | 154 |
| 37–38 | 2,933 | 1,538 | 666 | 50 | 122 | 540 | 341 | 38 | 6 | 64 |
| 39–40 | 3,617 | 1,925 | 800 | 83 | 128 | 661 | 399 | 56 | 8 | 72 |
| 41 | 601 | 336 | 111 | 13 | 34 | 104 | 62 | 8 | * | 18 |
| 42 or over | 515 | 278 | 106 | 13 | 22 | 100 | 57 | 8 | 1 | 10 |
| Not stated | 227 | 89 | 62 | 5 | 8 | 44 | 20 | 3 | 1 | 10 |
| Age of mother | | | | | | | | | | |
| Under 20 | 2,353 | 921 | 738 | 47 | 38 | 590 | 381 | 54 | 4 | 35 |
| 20–24 | 6,274 | 2,648 | 2,085 | 113 | 157 | 1,227 | 691 | 127 | 9 | 108 |
| 25–29 | 6,262 | 3,020 | 1,674 | 108 | 279 | 1,109 | 646 | 108 | 15 | 153 |
| 30–34 | 5,055 | 2,553 | 1,206 | 43 | 328 | 864 | 527 | 64 | 16 | 141 |
| 35–39 | 2,588 | 1,193 | 607 | 30 | 210 | 517 | 297 | 37 | 11 | 102 |
| 40–54 | 914 | 430 | 177 | 8 | 70 | 201 | 130 | 14 | 2 | 25 |
| Live-birth order | | | | | | | | | | |
| 1 | 9,303 | 4,425 | 2,494 | 113 | 493 | 1,678 | 970 | 151 | 22 | 210 |
| 2 | 6,398 | 3,123 | 1,675 | 85 | 336 | 1,136 | 645 | 121 | 16 | 151 |
| 3 | 3,819 | 1,747 | 1,040 | 52 | 136 | 806 | 504 | 58 | 9 | 97 |
| 4 | 1,862 | 765 | 547 | 32 | 60 | 445 | 277 | 39 | 2 | 52 |
| 5 or over | 1,760 | 614 | 627 | 64 | 46 | 396 | 247 | 31 | 7 | 47 |
| Not stated | 305 | 92 | 105 | 4 | 10 | 48 | 29 | 4 | 1 | 7 |
| Marital status | | | | | | | | | | |
| Married | 10,750 | 6,244 | 1,515 | 92 | 824 | 1,958 | 1,228 | 124 | 30 | 264 |
| Unmarried | 12,696 | 4,522 | 4,973 | 258 | 258 | 2,549 | 1,444 | 281 | 27 | 301 |
| Mother's place of birth | | | | | | | | | | |
| Born in the 50 states or the District of Columbia | 19,116 | 10,136 | 5,783 | 336 | 297 | 2,406 | 1,363 | 305 | 36 | 91 |
| Born elsewhere | 3,947 | 514 | 586 | 13 | 762 | 2,068 | 1,294 | 95 | 21 | 471 |
| Not stated | 384 | 115 | 118 | 1 | 24 | 33 | 16 | 5 | * | 3 |

* Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.
[1]Includes other and unknown Hispanic origin not stated, not shown separately.
[2]Includes Aleut and Eskimo persons.
NOTES: Infant deaths are weighted so numbers may not exactly add to totals due to rounding. Not stated responses were included in totals but not distributed among groups for rate computations. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. See reference 3.

**Table 2. Infant mortality rates, by race and Hispanic origin of mother: United States and each state, Puerto Rico, and Guam, 2011–2013 linked files**

[By place of residence]

| | Total | Race and Hispanic origin of mother | | | | | Ratio of rate, non-Hispanic black and non-Hispanic white |
|---|---|---|---|---|---|---|---|
| | | Non-Hispanic white | Non-Hispanic black | American Indian or Alaska Native[1] | Asian or Pacific Islander | Hispanic | |
| | Infant mortality rates per 1,000 live births in specified group | | | | | | |
| United States[2] | 6.01 | 5.06 | 11.25 | 8.07 | 4.16 | 5.09 | 2.2 |
| Alabama | 8.57 | 6.92 | 12.90 | * | * | 5.00 | 1.9 |
| Alaska | 4.90 | 3.64 | * | 8.08 | * | * | * |
| Arizona | 5.67 | 4.72 | 11.05 | 8.50 | 5.06 | 5.61 | 2.3 |
| Arkansas | 7.41 | 6.70 | 10.89 | * | * | 6.15 | 1.6 |
| California | 4.66 | 3.92 | 9.35 | 5.91 | 3.76 | 4.59 | 2.4 |
| Colorado | 5.06 | 4.18 | 9.59 | * | 5.32 | 5.89 | 2.3 |
| Connecticut | 5.07 | 3.71 | 10.24 | * | * | 6.08 | 2.8 |
| Delaware | 7.64 | 5.60 | 12.82 | * | * | 5.14 | 2.3 |
| District of Columbia | 7.33 | * | 11.12 | * | * | 5.51 | * |
| Florida | 6.24 | 5.04 | 10.79 | * | 3.68 | 4.55 | 2.1 |
| Georgia | 6.69 | 5.06 | 10.02 | * | 3.90 | 4.74 | 2.0 |
| Hawaii | 5.50 | 4.36 | * | * | 5.66 | 6.01 | * |
| Idaho | 5.38 | 5.04 | * | * | * | 6.68 | * |
| Illinois | 6.35 | 4.81 | 12.93 | * | 4.67 | 5.27 | 2.7 |
| Indiana | 7.19 | 6.46 | 12.87 | * | 5.17 | 6.09 | 2.0 |
| Iowa | 4.77 | 4.59 | 10.74 | * | * | 2.65 | 2.3 |
| Kansas | 6.34 | 5.54 | 14.18 | * | * | 6.84 | 2.6 |
| Kentucky | 6.68 | 6.40 | 9.78 | * | * | 6.75 | 1.5 |
| Louisiana | 8.35 | 6.15 | 12.02 | * | 6.36 | 4.83 | 2.0 |
| Maine | 6.92 | 6.77 | * | * | * | * | * |
| Maryland | 6.60 | 4.06 | 11.06 | * | 4.46 | 5.19 | 2.7 |
| Massachusetts | 4.21 | 3.45 | 6.90 | * | 3.32 | 5.51 | 2.0 |
| Michigan | 6.84 | 5.30 | 13.13 | 8.88 | 4.34 | 5.98 | 2.5 |
| Minnesota | 4.95 | 4.27 | 8.85 | 11.29 | 4.58 | 5.38 | 2.1 |
| Mississippi | 9.25 | 6.76 | 12.41 | * | * | 6.35 | 1.8 |
| Missouri | 6.49 | 5.44 | 12.18 | * | 4.20 | 6.08 | 2.2 |
| Montana | 5.82 | 5.25 | * | 9.81 | * | * | * |
| Nebraska | 5.16 | 4.47 | 9.92 | * | * | 5.66 | 2.2 |
| Nevada | 5.31 | 5.15 | 9.52 | * | 3.96 | 4.45 | 1.8 |
| New Hampshire | 4.76 | 4.39 | * | * | * | * | * |
| New Jersey | 4.68 | 3.20 | 10.34 | * | 3.78 | 4.37 | 3.2 |
| New Mexico | 5.89 | 5.20 | * | 5.87 | * | 6.07 | * |
| New York | 5.02 | 4.02 | 8.95 | 8.28 | 3.37 | 4.99 | 2.2 |
| North Carolina | 7.20 | 5.44 | 12.57 | 10.61 | 4.31 | 5.56 | 2.3 |
| North Dakota | 6.29 | 5.52 | * | 13.23 | * | * | * |
| Ohio | 7.60 | 6.31 | 13.57 | * | 4.22 | 6.92 | 2.2 |
| Oklahoma | 7.17 | 6.51 | 12.50 | 6.97 | 7.59 | 6.54 | 1.9 |
| Oregon | 4.95 | 4.72 | 8.29 | 10.17 | 4.07 | 4.75 | 1.8 |
| Pennsylvania | 6.73 | 5.21 | 12.66 | * | 4.19 | 6.99 | 2.4 |
| Rhode Island | 6.45 | 4.99 | 9.45 | * | * | 7.22 | 1.9 |
| South Carolina | 7.23 | 5.25 | 11.48 | * | * | 4.96 | 2.2 |
| South Dakota | 6.96 | 5.70 | * | 11.47 | * | * | * |
| Tennessee | 7.16 | 6.09 | 11.73 | * | 3.92 | 5.25 | 1.9 |
| Texas | 5.77 | 5.07 | 10.73 | * | 3.78 | 5.25 | 2.1 |
| Utah | 5.16 | 4.82 | 12.89 | * | 7.53 | 5.12 | 2.7 |
| Vermont | 4.55 | 4.44 | * | * | * | * | * |
| Virginia | 6.49 | 4.84 | 11.74 | * | 4.97 | 5.79 | 2.4 |
| Washington | 4.78 | 4.41 | 8.75 | 8.74 | 4.37 | 4.15 | 2.0 |
| West Virginia | 7.11 | 6.99 | 12.01 | * | * | * | 1.7 |
| Wisconsin | 6.06 | 5.01 | 14.00 | 8.03 | 6.72 | 5.23 | 2.8 |
| Wyoming | 5.67 | 5.67 | * | * | * | * | * |
| Puerto Rico | 8.25 | --- | --- | --- | --- | --- | * |
| Guam | 11.14 | * | * | * | 11.36 | * | * |

*Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.

-- Data not available.

[1] Includes Aleut and Eskimo persons.

[2] Excludes data for Puerto Rico and Guam.

NOTES: Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

**Table 3. Percentage of live births with selected maternal and infant characteristics, by race and Hispanic origin of mother: United States, 2013 linked file**

| Characteristic | All races and origins[1] | Non-Hispanic | | | | Hispanic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | White | Black | American Indian or Alaska Native[2] | Asian or Pacific Islander | Total[1] | Mexican | Puerto Rican | Cuban | Central and South American |
| Birthweight: | | | | | | | | | | |
| Under 1,500 grams | 1.44 | 1.13 | 2.96 | 1.30 | 1.20 | 1.23 | 1.15 | 1.69 | 1.28 | 1.16 |
| Under 2,500 grams | 8.1 | 7.0 | 13.1 | 7.5 | 8.4 | 7.1 | 6.6 | 9.4 | 7.4 | 6.9 |
| Preterm births[3] | 11.4 | 10.2 | 16.3 | 13.1 | 10.2 | 11.3 | 10.8 | 13.0 | 14.2 | 11.7 |
| Births to mothers under 20 | 7.0 | 5.1 | 10.8 | 12.6 | 1.9 | 10.5 | 11.1 | 11.8 | 4.6 | 5.8 |
| Fourth and higher order births | 12.0 | 9.8 | 15.8 | 20.5 | 6.7 | 16.0 | 18.0 | 12.8 | 5.6 | 13.5 |
| Births to unmarried mothers | 40.6 | 29.3 | 71.5 | 66.4 | 17.0 | 53.2 | 51.9 | 64.6 | 50.1 | 50.1 |
| Mothers born in the 50 states or the District of Columbia | 77.7 | 93.8 | 85.6 | 93.7 | 22.7 | 49.4 | 48.4 | 73.1 | 49.5 | 17.2 |

[1]Includes other and unknown Hispanic and origin not stated, not shown separately.
[2]Includes Aleut and Eskimo persons.
[3]Born prior to 37 completed weeks of gestation.
NOTES: Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

**Table 4. Live births, infant, neonatal, and postneonatal deaths, and mortality rates, by race and Hispanic origin of mother and birthweight: United States, 2013 linked file, and percent change in birthweight-specific infant mortality, 2005 and 2013 linked files**

| Race and birthweight (grams) | Number in 2013 | | | | Mortality rate per 1,000 live births in 2013 | | | Percent change in infant mortality rate 2005–2013 |
|---|---|---|---|---|---|---|---|---|
| | Live births | Infant deaths | Neonatal deaths | Postneonatal deaths | Infant | Neonatal | Postneonatal | |
| All races[1] | 3,932,181 | 23,446 | 15,893 | 7,553 | 5.96 | 4.04 | 1.92 | †–13.1 |
| Under 2,500 | 316,597 | 15,912 | 13,147 | 2,765 | 50.26 | 41.53 | 8.73 | †–12.4 |
| Under 1,500 | 56,585 | 12,424 | 11,068 | 1,357 | 219.56 | 195.60 | 23.98 | †–10.4 |
| Under 500 | 6,634 | 5,659 | 5,535 | 124 | 853.03 | 834.34 | 18.69 | –0.4 |
| 500–749 | 10,010 | 3,947 | 3,378 | 569 | 394.31 | 337.46 | 56.84 | †–15.8 |
| 750–999 | 11,164 | 1,391 | 1,094 | 297 | 124.60 | 97.99 | 26.60 | †–17.2 |
| 1,000–1,249 | 12,812 | 790 | 594 | 196 | 61.66 | 46.36 | 15.30 | †–13.5 |
| 1,250–1,499 | 15,965 | 637 | 466 | 171 | 39.90 | 29.19 | 10.71 | †–14.5 |
| 1,500–1,999 | 61,386 | 1,515 | 1,020 | 495 | 24.68 | 16.62 | 8.06 | †–8.2 |
| 2,000–2,499 | 198,626 | 1,973 | 1,059 | 914 | 9.93 | 5.33 | 4.60 | †–8.8 |
| 2,500 or over | 3,614,942 | 7,397 | 2,610 | 4,787 | 2.05 | 0.72 | 1.32 | †–10.9 |
| 2,500–2,999 | 716,305 | 2,594 | 982 | 1,612 | 3.62 | 1.37 | 2.25 | †–13.6 |
| 3,000–3,499 | 1,530,243 | 2,894 | 946 | 1,948 | 1.89 | 0.62 | 1.27 | †–12.1 |
| 3,500–3,999 | 1,055,367 | 1,472 | 510 | 962 | 1.39 | 0.48 | 0.91 | –5.4 |
| 4,000–4,499 | 269,759 | 352 | 129 | 223 | 1.30 | 0.48 | 0.83 | –10.3 |
| 4,500–4,999 | 38,852 | 62 | 31 | 31 | 1.60 | 0.80 | 0.80 | –27.6 |
| 5,000 or over | 4,416 | 23 | 12 | 11 | 5.21 | * | * | 17.1 |
| Not stated | 642 | 137 | 136 | 1 | ... | ... | ... | ... |
| Non-Hispanic white | 2,129,196 | 10,766 | 7,119 | 3,647 | 5.06 | 3.34 | 1.71 | †–12.2 |
| Under 2,500 | 149,019 | 6,723 | 5,604 | 1,119 | 45.12 | 37.61 | 7.51 | †–10.3 |
| Under 1,500 | 24,029 | 5,012 | 4,513 | 499 | 208.58 | 187.81 | 20.77 | †–8.2 |
| Under 500 | 2,401 | 2,074 | 2,040 | 34 | 863.81 | 849.65 | 14.16 | 0.4 |
| 500–749 | 3,900 | 1,621 | 1,437 | 185 | 415.64 | 368.46 | 47.44 | †–11.9 |
| 750–999 | 4,569 | 625 | 502 | 123 | 136.79 | 109.87 | 26.92 | †–16.0 |
| 1,000–1,249 | 5,610 | 382 | 306 | 76 | 68.09 | 54.55 | 13.55 | –9.0 |
| 1,250–1,499 | 7,549 | 310 | 228 | 81 | 41.07 | 30.20 | 10.73 | –7.2 |
| 1,500–1,999 | 29,952 | 734 | 515 | 219 | 24.51 | 17.19 | 7.31 | –4.7 |
| 2,000–2,499 | 95,038 | 977 | 576 | 401 | 10.28 | 6.06 | 4.22 | –7.1 |
| 2,500 or over | 1,980,055 | 3,984 | 1,456 | 2,528 | 2.01 | 0.74 | 1.28 | †–9.9 |
| 2,500–2,999 | 335,712 | 1,307 | 523 | 783 | 3.89 | 1.56 | 2.33 | †–10.2 |
| 3,000–3,499 | 803,280 | 1,551 | 516 | 1,035 | 1.93 | 0.64 | 1.29 | †–11.5 |
| 3,500–3,999 | 635,922 | 886 | 316 | 570 | 1.39 | 0.50 | 0.90 | –1.4 |
| 4,000–4,499 | 177,001 | 204 | 81 | 124 | 1.15 | 0.46 | 0.70 | –14.2 |
| 4,500–4,999 | 25,587 | 30 | 17 | 13 | 1.17 | * | * | –36.8 |
| 5,000 or over | 2,553 | 6 | 3 | 3 | * | * | * | * |
| Not stated | 122 | 59 | 59 | – | ... | ... | ... | ... |
| Non-Hispanic black | 583,834 | 6,488 | 4,355 | 2,133 | 11.11 | 7.46 | 3.65 | †–18.5 |
| Under 2,500 | 76,716 | 4,833 | 3,880 | 952 | 63.00 | 50.58 | 12.41 | †–15.7 |
| Under 1,500 | 17,303 | 4,045 | 3,511 | 534 | 233.77 | 202.91 | 30.86 | †–12.0 |
| Under 500 | 2,440 | 2,043 | 1,979 | 64 | 837.30 | 811.07 | 26.23 | –1.7 |
| 500–749 | 3,482 | 1,265 | 1,020 | 245 | 363.30 | 292.94 | 70.36 | †–18.5 |
| 750–999 | 3,555 | 377 | 273 | 103 | 106.05 | 76.79 | 28.97 | †–21.1 |
| 1,000–1,249 | 3,786 | 209 | 141 | 68 | 55.20 | 37.24 | 17.96 | –13.0 |
| 1,250–1,499 | 4,040 | 151 | 97 | 54 | 37.38 | 24.01 | 13.37 | †–19.9 |
| 1,500–1,999 | 14,491 | 347 | 195 | 152 | 23.95 | 13.46 | 10.49 | –11.0 |
| 2,000–2,499 | 44,922 | 440 | 175 | 266 | 9.79 | 3.90 | 5.92 | †–12.9 |
| 2,500 or over | 507,053 | 1,621 | 441 | 1,180 | 3.20 | 0.87 | 2.33 | †–9.1 |
| 2,500–2,999 | 144,705 | 649 | 175 | 473 | 4.48 | 1.21 | 3.27 | †–11.6 |
| 3,000–3,499 | 226,785 | 651 | 168 | 484 | 2.87 | 0.74 | 2.13 | –8.3 |
| 3,500–3,999 | 109,933 | 250 | 74 | 177 | 2.27 | 0.67 | 1.61 | –6.2 |
| 4,000–4,499 | 21,989 | 52 | 14 | 38 | 2.36 | * | 1.73 | –8.2 |
| 4,500–4,999 | 3,177 | 13 | 7 | 6 | * | * | * | * |
| 5,000 or over | 464 | 6 | 3 | 3 | * | * | * | * |
| Not stated | 65 | 33 | 33 | – | ... | ... | ... | ... |

See footnotes at end of table.

**Table 4. Live births, infant, neonatal, and postneonatal deaths, and mortality rates, by race and Hispanic origin of mother and birthweight: United States, 2013 linked file, and percent change in birthweight-specific infant mortality, 2005 and 2013 linked files—Con.**

| Race and birthweight (grams) | Number in 2013 | | | | Mortality rate per 1,000 live births in 2013 | | | Percent change in infant mortality rate 2005–2013 |
|---|---|---|---|---|---|---|---|---|
| | Live births | Infant deaths | Neonatal deaths | Postneonatal deaths | Infant | Neonatal | Postneonatal | |
| American Indian or Alaska Native[2] | 45,991 | 350 | 189 | 161 | 7.61 | 4.11 | 3.50 | –5.6 |
| Under 2,500 | 3,449 | 185 | 147 | 38 | 53.64 | 42.62 | 11.02 | 0.4 |
| Under 1,500 | 614 | 136 | 119 | 17 | 221.50 | 193.81 | * | –6.3 |
| Under 500 | 57 | 48 | 48 | – | 842.11 | 842.11 | * | 6.2 |
| 500–749 | 85 | 47 | 41 | 6 | 552.94 | 482.35 | * | 22.7 |
| 750–999 | 111 | 19 | 14 | 5 | * | * | * | * |
| 1,000–1,249 | 161 | 11 | 6 | 5 | * | * | * | * |
| 1,250–1,499 | 200 | 10 | 9 | 1 | * | * | * | * |
| 1,500–1,999 | 650 | 25 | 19 | 6 | 38.46 | * | * | 25.2 |
| 2,000–2,499 | 2,185 | 24 | 9 | 15 | 10.98 | * | * | –19.6 |
| 2,500 or over | 42,536 | 163 | 39 | 123 | 3.83 | 0.92 | 2.89 | –13.5 |
| 2,500–2,999 | 7,743 | 47 | 18 | 29 | 6.07 | * | 3.75 | –15.3 |
| 3,000–3,499 | 17,428 | 62 | 8 | 54 | 3.56 | * | 3.10 | –14.0 |
| 3,500–3,999 | 12,875 | 39 | 9 | 30 | 3.03 | * | 2.33 | –5.6 |
| 4,000–4,499 | 3,685 | 10 | 2 | 8 | * | * | * | * |
| 4,500–4,999 | 682 | 2 | 1 | 1 | * | * | * | * |
| 5,000 or over | 123 | 2 | 1 | 1 | * | * | * | * |
| Not stated | 6 | 3 | 3 | – | ... | ... | ... | ... |
| Asian or Pacific Islander | 265,673 | 1,082 | 794 | 288 | 4.07 | 2.99 | 1.08 | †–16.8 |
| Under 2,500 | 22,232 | 809 | 681 | 128 | 36.39 | 30.63 | 5.76 | †–17.6 |
| Under 1,500 | 3,210 | 631 | 574 | 57 | 196.57 | 178.82 | 17.76 | †–17.3 |
| Under 500 | 323 | 284 | 281 | 3 | 879.26 | 869.97 | * | 3.4 |
| 500–749 | 493 | 198 | 173 | 25 | 401.62 | 350.91 | 50.71 | †–20.5 |
| 750–999 | 618 | 75 | 62 | 13 | 121.36 | 100.32 | * | –15.9 |
| 1,000–1,249 | 759 | 39 | 28 | 11 | 51.38 | 36.89 | * | –29.8 |
| 1,250–1,499 | 1,017 | 34 | 29 | 5 | 33.43 | 28.52 | * | –30.9 |
| 1,500–1,999 | 4,053 | 71 | 49 | 22 | 17.52 | 12.09 | 5.43 | –33.8 |
| 2,000–2,499 | 14,969 | 108 | 59 | 49 | 7.21 | 3.94 | 3.27 | 0.7 |
| 2,500 or over | 243,413 | 269 | 109 | 160 | 1.11 | 0.45 | 0.66 | †–22.9 |
| 2,500–2,999 | 61,779 | 94 | 39 | 55 | 1.52 | 0.63 | 0.89 | †–38.5 |
| 3,000–3,499 | 111,955 | 114 | 46 | 67 | 1.02 | 0.41 | 0.60 | –19.0 |
| 3,500–3,999 | 56,981 | 43 | 19 | 24 | 0.75 | * | 0.42 | –10.7 |
| 4,000–4,499 | 11,074 | 15 | 5 | 10 | * | * | * | * |
| 4,500–4,999 | 1,431 | 3 | – | 3 | * | * | * | * |
| 5,000 or over | 193 | – | – | – | * | * | * | * |
| Not stated | 28 | 4 | 4 | – | ... | ... | ... | ... |
| Hispanic | 901,033 | 4,507 | 3,199 | 1,308 | 5.00 | 3.55 | 1.45 | †–11.0 |
| Under 2,500 | 64,048 | 3,160 | 2,644 | 515 | 49.34 | 41.28 | 8.04 | †–11.5 |
| Under 1,500 | 11,111 | 2,416 | 2,173 | 243 | 217.44 | 195.57 | 21.87 | †–11.3 |
| Under 500 | 1,294 | 1,096 | 1,073 | 22 | 846.99 | 829.21 | 17.00 | –1.1 |
| 500–749 | 1,967 | 769 | 659 | 109 | 390.95 | 335.03 | 55.41 | †–18.6 |
| 750–999 | 2,254 | 285 | 232 | 53 | 126.44 | 102.93 | 23.51 | †–15.6 |
| 1,000–1,249 | 2,472 | 143 | 110 | 33 | 57.85 | 44.50 | 13.35 | –18.6 |
| 1,250–1,499 | 3,124 | 124 | 99 | 25 | 39.69 | 31.69 | 8.00 | †–21.8 |
| 1,500–1,999 | 12,000 | 328 | 237 | 91 | 27.33 | 19.75 | 7.58 | –9.4 |
| 2,000–2,499 | 40,937 | 415 | 235 | 181 | 10.14 | 5.74 | 4.42 | –7.1 |
| 2,500 or over | 836,940 | 1,323 | 531 | 793 | 1.58 | 0.63 | 0.95 | †–16.0 |
| 2,500–2,999 | 165,323 | 480 | 213 | 267 | 2.90 | 1.29 | 1.62 | †–19.0 |
| 3,000–3,499 | 369,017 | 512 | 196 | 317 | 1.39 | 0.53 | 0.86 | †–15.2 |
| 3,500–3,999 | 238,082 | 242 | 86 | 157 | 1.02 | 0.36 | 0.66 | †–18.4 |
| 4,000–4,499 | 55,524 | 67 | 25 | 41 | 1.21 | 0.45 | 0.74 | –2.4 |
| 4,500–4,999 | 7,910 | 13 | 6 | 7 | * | * | * | * |
| 5,000 or over | 1,084 | 9 | 5 | 4 | * | * | * | * |
| Not stated | 45 | 24 | 24 | – | ... | ... | ... | ... |

† Significant at $p < 0.05$.
* Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.
... Category not applicable.
– Quantity zero.
[1]Includes races other than white or black.
[2]Includes Aleut and Eskimo persons.
NOTES: Infant deaths are weighted so numbers may not exactly add to totals due to rounding. Neonatal is under 28 days and postneonatal is 28 days to under age 1 year. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

## Table 5. Infant deaths and mortality rates for the five leading causes of infant death, by race and Hispanic origin of mother: United States, 2013 linked file

[Rates per 100,000 live births in specified group]

| Cause of death (based on *International Classification of Diseases, 10th Revision*, 1992) | All races | | | Non-Hispanic white | | | Non-Hispanic black | | | American Indian or Alaska Native | | | Asian or Pacific Islander[1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | Number | Rate | Rank | Number | Rate | Rank | Number | Rate | Rank | Number | Rate | Rank | Number | Rate |
| All causes | … | 23,446 | 596.3 | … | 10,766 | 505.6 | … | 6,488 | 1,111.3 | … | 350 | 761.0 | … | 1,082 | 407.3 |
| Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99) | 1 | 4,778 | 121.5 | 1 | 2,443 | 114.7 | 2 | 827 | 141.6 | 1 | 71 | 154.4 | 1 | 236 | 88.8 |
| Disorders related to short gestation and low birth weight, not elsewhere classified (P07) | 2 | 4,213 | 107.1 | 2 | 1,585 | 74.4 | 1 | 1,522 | 260.7 | 2 | 44 | 95.7 | 2 | 193 | 72.6 |
| Newborn affected by maternal complications of pregnancy (P01) | 3 | 1,597 | 40.6 | 4 | 635 | 29.8 | 3 | 505 | 86.5 | 5 | 19 | * | 3 | 97 | 36.5 |
| Sudden infant death syndrome (R95) | 4 | 1,561 | 39.7 | 3 | 854 | 40.1 | 4 | 428 | 73.3 | 3 | 36 | 78.3 | 5 | 38 | 14.3 |
| Accidents (unintentional injuries) (V01–X59) | 5 | 1,150 | 29.2 | 5 | 583 | 27.4 | 5 | 371 | 63.5 | 4 | 22 | 47.8 | 9 | 18 | * |

| Cause of death (based on *International Classification of Diseases, 10th Revision*, 1992) | Total Hispanic[2] | | | Mexican[3] | | | Puerto Rican[4] | | | Central and South American[5] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | Number | Rate | Rank | Number | Rate | Rank | Number | Rate | Rank | Number | Rate |
| All causes | … | 4,507 | 500.2 | … | 2,672 | 490.1 | … | 405 | 593.0 | … | 565 | 430.3 |
| Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99) | 1 | 1,166 | 129.4 | 1 | 754 | 138.3 | 2 | 66 | 96.6 | 1 | 158 | 120.3 |
| Disorders related to short gestation and low birth weight, not elsewhere classified (P07) | 2 | 794 | 88.1 | 2 | 446 | 81.8 | 1 | 90 | 131.8 | 2 | 106 | 80.7 |
| Newborn affected by maternal complications of pregnancy (P01) | 3 | 298 | 33.1 | 3 | 178 | 32.6 | 3 | 33 | 48.3 | 3 | 40 | 30.5 |
| Sudden infant death syndrome (R95) | 4 | 195 | 21.6 | 4 | 123 | 22.6 | 6 | 13 | * | 7 | 11 | * |
| Accidents (unintentional injuries) (V01–X59) | 6 | 151 | 16.8 | 6 | 88 | 16.1 | 4 | 24 | 35.1 | 10 | 10 | * |

… Category not applicable.
* Figure does not meet standards of reliability or precision; based on fewer than 20 deaths in the numerator.
[1]Newborn affected by complications of placenta, cord and membranes (P02) was the fourth leading cause of death, with 43 deaths and a rate of 16.2.
[2]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 168 deaths and a rate of 18.6.
[3]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 100 deaths and a rate of 18.3.
[4]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 15 deaths.
[5]Newborn affected by complications of placenta, cord and membranes (P02) was the fourth leading cause of death, with 24 deaths and a rate of 18.3. Bacterial sepsis of newborn (P36) was the fifth leading cause of death, with 20 deaths and a rate of 15.2.
NOTE: Reliable cause-specific infant mortality rates cannot be computed for Cuban infants because of the small number of infant deaths (57). Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race.

**Table 6. Number and percentage of preterm-related infant deaths and preterm-related infant mortality rates, by race and Hispanic origin of mother: United States, 2000–2013 linked files**

| Year | All races | Non-Hispanic white | Non-Hispanic black | American Indian or Alaska native | Asian or Pacific Islander | Total Hispanic[1] | Mexican | Puerto Rican | Central and South American |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Number of preterm-related infant deaths | | | | | |
| 2013 | 8,470 | 3,387 | 2,866 | 94 | 410 | 1,581 | 901 | 165 | 219 |
| 2012 | 8,465 | 3,390 | 2,844 | 99 | 404 | 1,610 | 933 | 193 | 185 |
| 2011 | 8,500 | 3,314 | 2,887 | 89 | 424 | 1,680 | 971 | 201 | 246 |
| 2010 | 8,650 | 3,433 | 2,874 | 92 | 402 | 1,724 | 1,041 | 196 | 207 |
| 2009 | 9,341 | 3,624 | 3,294 | 108 | 386 | 1,781 | 1,045 | 210 | 252 |
| 2008 | 9,952 | 3,843 | 3,466 | 97 | 418 | 2,009 | 1,303 | 222 | 229 |
| 2007 | 10,498 | 4,104 | 3,755 | 111 | 430 | 1,956 | 1,276 | 208 | 269 |
| 2006 | 10,303 | 4,134 | 3,709 | 100 | 358 | 1,868 | 1,229 | 221 | 252 |
| 2005 | 10,364 | 4,206 | 3,655 | 86 | 401 | 1,880 | 1,266 | 218 | 241 |
| 2004 | 10,180 | 4,171 | 3,641 | 83 | 378 | 1,752 | 1,192 | 195 | 238 |
| 2003 | 10,331 | 4,358 | 3,615 | 91 | 364 | 1,761 | 1,163 | 200 | 256 |
| 2002 | 9,965 | 4,342 | 3,581 | 90 | 321 | 1,540 | 1,018 | 190 | 192 |
| 2001 | 9,767 | 4,289 | 3,561 | 79 | 280 | 1,436 | 951 | 196 | 189 |
| 2000 | 9,673 | 4,141 | 3,586 | 96 | 298 | 1,411 | 929 | 189 | 170 |
| | | | | Percent of total infant deaths that are preterm-related | | | | | |
| 2013 | 36.1 | 31.5 | 44.2 | 26.9 | 37.9 | 35.1 | 33.7 | 40.7 | 38.8 |
| 2012 | 35.8 | 31.5 | 43.6 | 25.6 | 36.5 | 34.7 | 33.5 | 41.9 | 33.9 |
| 2011 | 35.4 | 30.4 | 43.3 | 23.4 | 38.3 | 35.5 | 34.3 | 38.2 | 41.5 |
| 2010 | 35.2 | 30.7 | 42.5 | 23.8 | 38.2 | 34.7 | 34.0 | 41.6 | 32.8 |
| 2009 | 35.4 | 30.8 | 43.6 | 26.2 | 34.9 | 33.7 | 31.6 | 42.7 | 37.9 |
| 2008 | 35.4 | 30.7 | 43.9 | 23.3 | 36.6 | 34.5 | 34.1 | 44.1 | 30.9 |
| 2007 | 36.0 | 31.6 | 45.0 | 24.3 | 35.4 | 33.4 | 32.6 | 39.4 | 34.6 |
| 2006 | 36.1 | 32.1 | 45.0 | 25.3 | 32.6 | 33.2 | 32.0 | 41.2 | 33.7 |
| 2005 | 36.5 | 32.0 | 45.9 | 23.8 | 35.5 | 34.0 | 33.0 | 41.4 | 34.0 |
| 2004 | 36.5 | 32.1 | 46.3 | 22.4 | 35.3 | 33.4 | 32.2 | 40.7 | 35.7 |
| 2003 | 36.9 | 32.9 | 46.1 | 24.2 | 34.1 | 34.2 | 32.4 | 41.8 | 37.4 |
| 2002 | 35.6 | 32.6 | 44.6 | 24.6 | 31.9 | 31.3 | 29.9 | 40.3 | 30.1 |
| 2001 | 35.5 | 32.2 | 44.9 | 19.6 | 29.6 | 31.0 | 29.8 | 39.9 | 31.3 |
| 2000 | 34.6 | 30.8 | 43.7 | 27.7 | 30.5 | 30.9 | 29.4 | 39.6 | 32.3 |
| | | | | Preterm-related infant mortality rate[2] | | | | | |
| 2013 | 215.4 | 159.1 | 490.9 | 204.4 | 154.3 | 175.5 | 165.3 | 241.6 | 166.8 |
| 2012 | 214.1 | 158.9 | 487.4 | 214.8 | 148.1 | 177.4 | 167.9 | 287.3 | 140.4 |
| 2011 | 215.0 | 154.4 | 495.8 | 191.7 | 167.0 | 183.0 | 171.3 | 299.9 | 180.6 |
| 2010 | 216.3 | 158.8 | 487.3 | 196.7 | 162.8 | 182.4 | 174.0 | 295.3 | 145.1 |
| 2009 | 226.1 | 163.8 | 540.4 | 221.9 | 153.7 | 178.2 | 161.9 | 306.6 | 169.5 |
| 2008 | 234.3 | 169.5 | 556.3 | 195.8 | 165.1 | 192.9 | 190.3 | 321.7 | 147.2 |
| 2007 | 243.2 | 177.6 | 598.7 | 224.5 | 169.0 | 184.0 | 176.7 | 303.7 | 158.4 |
| 2006 | 241.5 | 179.1 | 600.9 | 209.6 | 148.5 | 179.8 | 171.1 | 330.2 | 152.4 |
| 2005 | 250.4 | 184.5 | 626.1 | 191.9 | 173.5 | 190.8 | 182.6 | 344.2 | 159.4 |
| 2004 | 247.6 | 181.6 | 629.1 | 188.9 | 165.0 | 185.1 | 175.9 | 318.5 | 165.8 |
| 2003 | 252.6 | 187.7 | 627.6 | 211.4 | 164.6 | 193.0 | 177.7 | 342.5 | 188.8 |
| 2002 | 247.8 | 188.9 | 619.2 | 212.4 | 152.2 | 175.7 | 162.2 | 330.6 | 152.4 |
| 2001 | 242.6 | 184.3 | 603.6 | 188.7 | 139.8 | 168.6 | 155.6 | 340.5 | 155.7 |
| 2000 | 238.3 | 175.2 | 593.3 | 230.4 | 148.6 | 172.9 | 159.6 | 325.2 | 150.0 |

[1]Includes Cuban and other and unknown Hispanic persons. Data for Cuban persons were not shown separately because of small numbers of infant deaths.
[2]Rate per 100,000 live births in specified group.
NOTES: Preterm-related deaths are those where the infant was born preterm (before 37 completed weeks of gestation) with the underlying cause of death assigned to one of the following *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* categories: K550, P000, P010, P011, P015, P020, P021, P027, P070–P073, P102, P220–229, P250–279, P280, P281, P360–369, P520–523, P77. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

**Table 7. Number and percentage of SUID and SUID mortality rates, by race and Hispanic origin of mother: United States, 2000 and 2005–2013 linked files**

| Year | All races and origins | Non-Hispanic white | Non-Hispanic black | American Indian or Alaska native | Asian or Pacific Islander | Total Hispanic[1] | Mexican | Puerto Rican | Central and South American |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Number of SUIDs | | | | |
| 2013 | 3,422 | 1,799 | 1,007 | 78 | 77 | 444 | 259 | 46 | 23 |
| 2012 | 3,454 | 1,769 | 1,028 | 96 | 89 | 461 | 254 | 61 | 48 |
| 2011 | 3,399 | 1,798 | 944 | 94 | 96 | 459 | 257 | 80 | 45 |
| 2010 | 3,603 | 1,872 | 1,042 | 85 | 98 | 499 | 302 | 55 | 43 |
| 2009 | 3,996 | 2,079 | 1,170 | 104 | 92 | 530 | 297 | 79 | 49 |
| 2008 | 4,191 | 2,105 | 1,224 | 89 | 106 | 639 | 390 | 58 | 59 |
| 2007 | 4,213 | 2,197 | 1,225 | 121 | 95 | 562 | 364 | 58 | 55 |
| 2006 | 3,959 | 2,067 | 1,133 | 109 | 104 | 531 | 349 | 70 | 48 |
| 2005 | 4,021 | 2,148 | 1,108 | 88 | 112 | 541 | 371 | 58 | 57 |
| 2000 | 3,814 | 1,951 | 1,155 | 74 | 98 | 491 | 328 | 64 | 56 |
| | | | | | Percent of total infant deaths that are SUIDs | | | | |
| 2013 | 14.6 | 16.7 | 15.5 | 22.3 | 7.1 | 9.9 | 9.7 | 11.4 | 4.1 |
| 2012 | 14.6 | 16.4 | 15.7 | 24.8 | 8.0 | 9.9 | 9.1 | 13.2 | 8.8 |
| 2011 | 14.2 | 16.5 | 14.2 | 24.7 | 8.7 | 9.7 | 9.1 | 15.2 | 7.6 |
| 2010 | 14.7 | 16.7 | 15.4 | 22.0 | 9.3 | 10.1 | 9.9 | 11.7 | 6.8 |
| 2009 | 15.1 | 17.6 | 15.5 | 25.2 | 8.3 | 10.0 | 9.0 | 16.1 | 7.4 |
| 2008 | 14.9 | 16.8 | 15.5 | 21.3 | 9.3 | 11.0 | 10.2 | 11.5 | 8.0 |
| 2007 | 14.5 | 16.9 | 14.7 | 26.5 | 7.8 | 9.6 | 9.3 | 11.0 | 7.1 |
| 2006 | 13.9 | 16.0 | 13.7 | 27.6 | 9.5 | 9.4 | 9.1 | 13.1 | 6.4 |
| 2005 | 14.2 | 16.4 | 13.9 | 24.4 | 9.9 | 9.8 | 9.7 | 11.0 | 8.1 |
| 2000 | 13.6 | 14.5 | 14.1 | 21.4 | 10.0 | 10.8 | 10.4 | 13.4 | 10.6 |
| | | | | | SUID mortality rate[2] | | | | |
| 2013 | 87.0 | 84.5 | 172.5 | 169.6 | 29.0 | 49.3 | 47.5 | 67.3 | 17.5 |
| 2012 | 87.4 | 82.9 | 176.2 | 208.3 | 32.6 | 50.8 | 45.7 | 90.8 | 36.4 |
| 2011 | 86.0 | 83.8 | 162.1 | 202.5 | 37.8 | 50.0 | 45.4 | 119.4 | 33.0 |
| 2010 | 90.1 | 86.6 | 176.7 | 181.8 | 39.7 | 52.8 | 50.5 | 82.9 | 30.1 |
| 2009 | 96.7 | 94.0 | 191.9 | 213.7 | 36.6 | 53.0 | 46.0 | 115.4 | 33.0 |
| 2008 | 98.7 | 92.8 | 196.5 | 179.7 | 41.9 | 61.4 | 56.9 | 84.0 | 37.9 |
| 2007 | 97.6 | 95.1 | 195.3 | 244.7 | 37.3 | 52.9 | 50.4 | 84.7 | 32.4 |
| 2006 | 92.8 | 89.5 | 183.6 | 228.4 | 43.1 | 51.1 | 48.6 | 104.6 | 29.0 |
| 2005 | 97.2 | 94.2 | 189.8 | 196.4 | 48.5 | 54.9 | 53.5 | 91.6 | 37.7 |
| 2000 | 94.0 | 82.6 | 191.1 | 177.6 | 48.9 | 60.2 | 56.4 | 110.1 | 49.4 |

[1]Includes Cuban and other and unknown Hispanic persons. Data for Cuban persons were not shown separately because of small numbers of infant deaths.
[2]Rate per 100,000 live births in specified group.
NOTES: SUIDs are sudden unexpected infant deaths. *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* codes R95, R99, and W75. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with the 1977 Office of Management and Budget standards. Persons of Hispanic origin may be of any race. In this table, Hispanic women are classified only by place of origin; non-Hispanic women are classified by race. Forty-four states and the District of Columbia reported multiple-race data on the birth certificate for 2013. The multiple-race data for these states were bridged to the single-race categories of the 1977 standards for comparability with other states; see references 2 and 3.

# Technical Notes

## Differences between period and cohort data

From 1983 through 1991, the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS) produced linked files in a birth cohort format (44). Beginning with 1995 data, linked files are produced first using a period format. The 2013 period linked file contains a numerator file that consists of all infant deaths occurring in 2013 that have been linked to their corresponding birth certificates, whether the birth occurred in 2012 or in 2013. The birth cohort linked file contains a numerator file that consists of all infant deaths to babies born in a single year, whether the death occurred in that year or the next. Beginning with 1995 data, the period linked file is the basis for all official NCHS linked file statistics.

## Weighting

In 2013, a record weight was added to the linked file to compensate for the 1.0% of infant death records that could not be linked to their corresponding birth certificates. This procedure was initiated in 1995. Records for Puerto Rico and Guam were not weighted. The percentage of records linked varied by registration area (from 95.6%–100.0%, with all but Texas at 98.0% or higher) (Table I). The number of infant deaths in the linked file for the 50 states and the District of Columbia (D.C.) was weighted to equal the sum of the linked plus unlinked infant deaths by state of occurrence of birth and age of death (under 7 days, 7–27 days, and 28 days to under 1 year). The addition of the weight reduced the potential for bias in comparing infant mortality rates by characteristics.

The 2013 linked file started with 23,465 infant death records. Of these 23,465 records, 23,242 were linked; 223 were unlinked because corresponding birth certificates could not be identified. The 23,465 linked and unlinked records contained records of infants whose mothers' usual place of residence was outside of the United States. These records were excluded to derive a weighted total of 23,446 infant deaths for 2013.

## Comparison of infant mortality data between the linked file and the vital statistics mortality file

The overall infant mortality rate from the 2013 period linked file of 5.96 is the same as that from the 2013 vital statistics mortality file (5.96) (45). The number of infant deaths in the linked file (23,242) differs slightly from the number in the mortality file (23,440) (45). Differences in numbers of infant deaths between the two data sources are primarily due to geographic coverage differences. For the vital statistics mortality file, all deaths occurring in the 50 states and D.C. are included regardless of the place of birth of the infant. In contrast, to be included in the U.S. linked file, both the birth and death must occur in the 50 states and D.C. (the territory linked file is a separate file). Also, weighting of the linked file may contribute to small differences in numbers and rates by specific variables between these two data sets.

**Table I. Percentage of infant death records that were linked to their corresponding birth records: United States and each state, Puerto Rico, and Guam, 2013 linked file**

| State | Percent linked by state of occurrence of death |
|---|---|
| United States[1] | 99.0 |
| Alabama | 100.0 |
| Alaska | 100.0 |
| Arizona | 99.1 |
| Arkansas | 100.0 |
| California | 98.2 |
| Colorado | 100.0 |
| Connecticut | 99.4 |
| Delaware | 100.0 |
| District of Columbia | 100.0 |
| Florida | 100.0 |
| Georgia | 99.7 |
| Hawaii | 100.0 |
| Idaho | 100.0 |
| Illinois | 100.0 |
| Indiana | 99.3 |
| Iowa | 99.3 |
| Kansas | 100.0 |
| Kentucky | 98.7 |
| Louisiana | 98.7 |
| Maine | 98.9 |
| Maryland | 100.0 |
| Massachusetts | 99.0 |
| Michigan | 99.7 |
| Minnesota | 100.0 |
| Mississippi | 100.0 |
| Missouri | 99.3 |
| Montana | 100.0 |
| Nebraska | 100.0 |
| Nevada | 100.0 |
| New Hampshire | 100.0 |
| New Jersey | 98.0 |
| New Mexico | 98.4 |
| New York (excluding New York City) | 99.2 |
| New York City | 99.5 |
| North Carolina | 99.6 |
| North Dakota | 100.0 |
| Ohio | 98.7 |
| Oklahoma | 100.0 |
| Oregon | 100.0 |
| Pennsylvania | 99.4 |
| Rhode Island | 100.0 |
| South Carolina | 100.0 |
| South Dakota | 100.0 |
| Tennessee | 99.7 |
| Texas | 95.6 |
| Utah | 100.0 |
| Vermont | 100.0 |
| Virginia | 99.7 |
| Washington | 100.0 |
| West Virginia | 98.7 |
| Wisconsin | 100.0 |
| Wyoming | 100.0 |
| Puerto Rico | 100.0 |
| Guam | 96.8 |

[1]Excludes data for Puerto Rico and Guam.

## Marital status

National estimates of births to unmarried women are based on two methods of determining marital status. In 2013, marital status was based on a direct question in 49 states, D.C., and New York City. New York (excluding New York City) used inferential procedures to compile birth statistics by marital status; a birth is categorized as nonmarital if either of these factors, listed in priority-of-use order, is present: a paternity acknowledgement was received or the father's name is missing (3).

## Multiple race

For the birth certificates in the 2013 data year, multiple race was reported by 44 states, D.C., and Guam (both revised and non-revised): Alaska, California, Colorado, Delaware, D.C., Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine (revised after January 1, 2013), Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, and Wyoming (3). Data from the vital records of the remaining states and territories followed the 1977 Office of Management and Budget standards in which a single race is reported (46,47).

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. Multiple race is imputed to a single race (one of the following: American Indian or Alaska Native, Asian or Pacific Islander, black, or white) according to the combination of races, Hispanic origin, sex, and age indicated on the birth certificate using methods described elsewhere (3,8,48).

## Period of gestation

The primary measure used to determine the gestational age of the newborn is the interval between the first day of the mother's last normal menstrual period (LMP) and the date of birth. It is subject to error for several reasons, including imperfect maternal recall or misidentification of the LMP because of postconception bleeding, delayed ovulation, or intervening early miscarriage. When the LMP date was not reported or was inconsistent with birthweight, the obstetric estimate of gestation was used (5.5% of births) (2,3). Beginning in 2014, gestational age will be based on the obstetric estimate of gestation (49).

## Birthweight

For the linked file, not stated birthweight was imputed for 3,812 records or 0.10% of the birth records in 2013 when birthweight was not stated but the period of gestation was known. In this case, birthweight was assigned the value from the previous record with the same period of gestation, maternal race, sex, and plurality. If birthweight and period of gestation were both unknown, the not stated value for birthweight was retained. This imputation was done to improve the accuracy of birthweight-specific infant mortality rates because the percentage of records with not stated birthweight was higher for infant deaths (4.20% before imputation) than for live births (0.10% before imputation). The imputation reduced the percentage of not stated records to 0.59% for infant deaths, and 0.02% for births. The not stated birthweight cases in the natality/birth file, as distinct from the linked file, are not imputed (3).

## Cause-of-death classification

The mortality statistics presented in this report were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify and code causes of death in accordance with the current revision of the *International Statistical Classification of Diseases and Related Health Problems* (ICD). The ICD provides the basic guidance used in virtually all countries to code and classify causes of death. The ICD not only details disease classification but also provides definitions, tabulation lists, the format of the death certificate, and the rules for coding cause of death. Cause of death data presented in this report were coded by procedures outlined in annual issues of the *NCHS Instruction Manual* (50,51).

In this report, tabulations of cause-of-death statistics are based solely on the underlying cause of death. The underlying cause is defined by WHO as "the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury" (5). It is selected from the conditions entered by the physician in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the physician, the underlying cause is determined by the sequence of conditions on the certificate, provisions of the ICD, and associated selection and modification rules. Generally, more medical information is reported on death certificates than is directly reflected in the underlying cause of death. This is captured in NCHS multiple cause-of-death statistics (45,52).

About every 10 to 20 years, the ICD is revised to take into account advances in medical knowledge. Effective with deaths occurring in 1999, the United States began using the 10th Revision (ICD–10) (5); during the period 1979–1998, causes were coded and classified according to the 9th Revision (ICD–9) (52).

Changes in classification of causes of death due to these revisions may result in discontinuities in cause-of-death trends. Measures of this discontinuity are essential to the interpretation of mortality trends, and are discussed in detail in other NCHS publications (4,53,54).

## Tabulation lists and cause-of-death ranking

The cause-of-death rankings for ICD–10 are based on the List of 130 Selected Causes of Infant Death. The tabulation lists and rules for ranking leading causes of death are published in the *NCHS Instruction Manual, part 9, ICD–10 Cause-of-death Lists for Tabulating Mortality Statistics, Effective 1999* (55). Briefly, category titles that begin with the words "Other" and "All other" are not ranked to determine the leading causes of death. When one of the titles that represents a subtotal is ranked [for example, Influenza and pneumonia (J10–J18)], its component parts are not ranked [in this case, Influenza (J10–J11) and Pneumonia (J12–18)].

## Preterm-related causes of death

Preterm-related causes of death are those causes that have a direct etiological connection to preterm birth. For an underlying cause of death to be considered preterm-related, 75% or more of infants whose deaths were attributed to that cause had to be born preterm, and the cause of death had to be a direct consequence of preterm birth based on a clinical evaluation and review of the literature (39). The cause-of-death categories included in this grouping are shown in the note in Table 6. Causes that are incidental to preterm birth (for example, a Motor vehicle accident to a preterm infant) are not included. This grouping of preterm-related causes probably underestimates the total impact of preterm-related infant death, as some ICD categories (notably those beginning with the words "Other" and "All other") had a high percentage of preterm infant deaths but lacked sufficient specificity to be able to establish the etiologic connection to prematurity with any degree of certainty. Further details on the development of this cause-of-death grouping are available in related publications (39,40).

## Sudden unexpected infant death

Recent studies have identified changes in how sudden unexplained infant deaths have been classified over time by medical examiners and coroners, with large decreases in sudden infant death syndrome (SIDS) accompanied by corresponding increases in cause unknown and accidental suffocation and strangulation in bed (41,56,57). To facilitate more consistent tracking of trends in these deaths, unaffected by classification differences, a special cause-of-death category has been developed for Sudden Unexpected Infant Deaths (SUID) (41,42). SUID is defined as, "The death of an infant less than one year of age in which investigation, autopsy, medical history review and appropriate laboratory testing fail to identify a specific cause of death. SUID includes cases that meet the definition of sudden infant death syndrome" (58). The SUID category combines ICD–10 codes for Sudden Infant Death Syndrome, or SIDS (R95), Accidental Suffocation and Strangulation in Bed, or ASSB (W75), and Unknown cause (R99) based on underlying cause of death. This category is currently being used as a key indicator by Healthy People 2020 Maternal, Infant, and Child Health outcomes (43), the Collaborative Improvement & Innovation Network to Reduce Infant Mortality (59), and *Child Health USA* (60).

## Computation of rates

Infant mortality rates are the most commonly used index for measuring the risk of dying during the first year of life. For the linked birth/infant death data set, they are calculated by dividing the number of infant deaths in a calendar year by the number of live births registered for the same period and are presented as rates per 1,000 or per 100,000 live births. Both the mortality file and the linked birth/infant death file use this computation method, but due to unique numbers of infant deaths, as explained in the section above on the comparison of these two files, the rates will often differ for specific variables (particularly for race and ethnicity). Infant mortality rates in the linked file use the number of live births in the denominator to approximate the population at risk of dying before the first birthday. In contrast to the infant mortality rates based on live births, infant death rates, used only in age-specific death rates with the mortality file, use the estimated population of persons under age 1 year as the denominator.

For all variables, not stated responses were shown in tables of frequencies but were subtracted before rates were computed. Rates per 1,000 live births display two digits after the decimal place to provide a more precise and sensitive measurement. For rates per 100,000 live births (by cause of death), the infant mortality rate is shown for one decimal place. Adding an additional decimal for rates per 100,000 does not increase precision as it does for rates per 1,000.

As stated previously, infant death records for the 50 states and D.C. in the U.S. linked file are weighted so that the infant mortality rates are not underestimated for those areas that did not successfully link all records.

## Random variation in infant mortality rates

The number of infant deaths and live births reported for an area represent complete counts of such events. As such, they are not subject to sampling error, although they are subject to nonsampling error in the registration process. However, when the figures are used for analytic purposes, such as the comparison of rates over time, for different areas, or among different subgroups, the number of events that actually occurred may be considered as one of a large series of possible results that could have arisen under the same circumstances (61). As a result, numbers of births, deaths, and infant mortality rates are subject to random variation. The probable range of values may be estimated from the actual figures according to certain statistical assumptions.

In general, distributions of vital events may be assumed to follow the normal distribution. When the number of events is large, the relative standard error (RSE) is usually small. When the number of events is small (i.e., fewer than 100) and the probability of such an event is small, considerable caution must be observed in interpreting the data. Such infrequent events may be assumed to follow a Poisson probability distribution (3,4). Estimates of RSEs and 95% confidence intervals are shown below.

The formula for the RSE of infant deaths and live births is:

$$\mathrm{RSE}(D)=100 \cdot \sqrt{\frac{1}{D}}$$ where $D$ is the number of deaths and

$$\mathrm{RSE}(B)=100 \cdot \sqrt{\frac{1}{B}}$$ where $B$ is the number of births.

For example, say that for Group A the number of infant deaths was 497 while the number of live births was 81,555, yielding an infant mortality rate of 6.09 infant deaths per 1,000 live births.

$$\text{The RSE of the deaths} = 100 \cdot \sqrt{\frac{1}{497}} = 4.49,$$

$$\text{while the RSE of the births} = 100 \cdot \sqrt{\frac{1}{81{,}555}} = 0.35.$$

The formula for the RSE of the infant mortality rate (IMR) is:

$$\mathrm{RSE(IMR)}=100 \cdot \sqrt{\frac{1}{D}+\frac{1}{B}}$$

The RSE of the IMR for the example above

$$= 100 \bullet \sqrt{\frac{1}{497} + \frac{1}{81{,}555}} = 4.50.$$

*Normal distribution*—When the number of events is greater than 100, the normal distribution is used to estimate the 95% confidence intervals as follows:

$$\text{Lower: } R_1 - 1.96 \bullet R_1 \bullet \frac{\text{RSE}(R_1)}{100}$$

$$\text{Upper: } R_1 + 1.96 \bullet R_1 \bullet \frac{\text{RSE}(R_1)}{100}$$

Thus, for Group A:

$$\text{Lower: } 6.09 - \left(1.96 \bullet 6.09 \bullet \frac{4.50}{100}\right) = 5.55$$

$$\text{Upper: } 6.09 + \left(1.96 \bullet 6.09 \bullet \frac{4.50}{100}\right) = 6.63$$

Thus, the chances are 95 out of 100 that the true IMR for Group A lies somewhere in the 5.55–6.63 interval.

*Poisson distribution*—When the number of events in the numerator is fewer than 100, the confidence interval for the rate can be estimated based on the Poisson distribution using the values in Table II.

$$\text{Lower: IMR} \bullet L\,(.95,\ D_{adj})$$

$$\text{Upper: IMR} \bullet U\,(.95,\ D_{adj})$$

where $D_{adj}$ is the adjusted number of infant deaths (rounded to the nearest integer) used to take into account the RSE of the number of infant deaths and live births, and is computed as follows:

$$D_{adj} = \frac{D \bullet B}{D + B}$$

$L(.95,\ D_{adj})$ and $U(.95,\ D_{adj})$ refer to the values in Table II corresponding to the value of $D_{adj}$.

For example, suppose that for Group B the number of infant deaths was 53, the number of live births was 9,241, and the infant mortality rate was 5.74.

$$D_{adj} = \frac{53 \bullet 9{,}241}{53 + 9{,}241} = 53$$

Therefore, the 95% confidence interval (using the formula in Table II for 1–99 infant deaths) =

$$\text{Lower: } 5.74 \bullet 0.74907 = 4.30$$

$$\text{Upper: } 5.74 \bullet 1.30802 = 7.51$$

*Comparison of two infant mortality rates*—If either of the two rates to be compared is based on fewer than 100 deaths, compute the confidence intervals for both rates and check to see if they overlap. If so, the difference is not statistically significant at the 95% level. If they do not overlap, the difference is statistically significant. If both of the two rates ($R_1$ and $R_2$) to be compared are based on 100 or more deaths, the following $z$ test may be used to define a significance test statistic:

$$Z = \frac{R_1 - R_2}{\sqrt{R_1^2\left(\frac{\text{RSE}(R_1)}{100}\right)^2 + R_2^2\left(\frac{\text{RSE}(R_2)}{100}\right)^2}}$$

If $|z| \geq 1.96$, then the difference is statistically significant at the 0.05 level, and if $|z| < 1.96$, the difference is not significant.

## Availability of linked file data

Linked file data are available for download at: http://www.cdc.gov/nchs/data_access/VitalStatsOnline.htm. Beginning with 2005, the public-use file no longer includes geographic detail; such files are available upon special request (see: http://www.cdc.gov/nchs/nvss/dvs_data_release.htm). Data are also available in issues of Vital and Health Statistics, Series 20, National Vital Statistics Reports, and Data Briefs from the NCHS website: http://www.cdc.gov/nchs/.

**Table II. Values of *L* and *U* for calculating 95% confidence limits for numbers of events and rates when the number of events is fewer than 100**

| *N* | *L* | *U* | *N* | *L* | *U* |
|---|---|---|---|---|---|
| 1 | 0.025 | 5.572 | 51 | 0.745 | 1.315 |
| 2 | 0.121 | 3.612 | 52 | 0.747 | 1.311 |
| 3 | 0.206 | 2.922 | 53 | 0.749 | 1.308 |
| 4 | 0.272 | 2.560 | 54 | 0.751 | 1.305 |
| 5 | 0.325 | 2.334 | 55 | 0.753 | 1.302 |
| 6 | 0.367 | 2.177 | 56 | 0.755 | 1.299 |
| 7 | 0.402 | 2.060 | 57 | 0.757 | 1.296 |
| 8 | 0.432 | 1.970 | 58 | 0.759 | 1.293 |
| 9 | 0.457 | 1.898 | 59 | 0.761 | 1.290 |
| 10 | 0.480 | 1.839 | 60 | 0.763 | 1.287 |
| 11 | 0.499 | 1.789 | 61 | 0.765 | 1.285 |
| 12 | 0.517 | 1.747 | 62 | 0.767 | 1.282 |
| 13 | 0.532 | 1.710 | 63 | 0.768 | 1.279 |
| 14 | 0.547 | 1.678 | 64 | 0.770 | 1.277 |
| 15 | 0.560 | 1.649 | 65 | 0.772 | 1.275 |
| 16 | 0.572 | 1.624 | 66 | 0.773 | 1.272 |
| 17 | 0.583 | 1.601 | 67 | 0.775 | 1.270 |
| 18 | 0.593 | 1.580 | 68 | 0.777 | 1.268 |
| 19 | 0.602 | 1.562 | 69 | 0.778 | 1.266 |
| 20 | 0.611 | 1.544 | 70 | 0.780 | 1.263 |
| 21 | 0.619 | 1.529 | 71 | 0.781 | 1.261 |
| 22 | 0.627 | 1.514 | 72 | 0.782 | 1.259 |
| 23 | 0.634 | 1.500 | 73 | 0.784 | 1.257 |
| 24 | 0.641 | 1.488 | 74 | 0.785 | 1.255 |
| 25 | 0.647 | 1.476 | 75 | 0.787 | 1.254 |
| 26 | 0.653 | 1.465 | 76 | 0.788 | 1.252 |
| 27 | 0.659 | 1.455 | 77 | 0.789 | 1.250 |
| 28 | 0.664 | 1.445 | 78 | 0.790 | 1.248 |
| 29 | 0.670 | 1.436 | 79 | 0.792 | 1.246 |
| 30 | 0.675 | 1.428 | 80 | 0.793 | 1.245 |
| 31 | 0.679 | 1.419 | 81 | 0.794 | 1.243 |
| 32 | 0.684 | 1.412 | 82 | 0.795 | 1.241 |
| 33 | 0.688 | 1.404 | 83 | 0.796 | 1.240 |
| 34 | 0.693 | 1.397 | 84 | 0.798 | 1.238 |
| 35 | 0.697 | 1.391 | 85 | 0.799 | 1.237 |
| 36 | 0.700 | 1.384 | 86 | 0.800 | 1.235 |
| 37 | 0.704 | 1.378 | 87 | 0.801 | 1.234 |
| 38 | 0.708 | 1.373 | 88 | 0.802 | 1.232 |
| 39 | 0.711 | 1.367 | 89 | 0.803 | 1.231 |
| 40 | 0.714 | 1.362 | 90 | 0.804 | 1.229 |
| 41 | 0.718 | 1.357 | 91 | 0.805 | 1.228 |
| 42 | 0.721 | 1.352 | 92 | 0.806 | 1.226 |
| 43 | 0.724 | 1.347 | 93 | 0.807 | 1.225 |
| 44 | 0.727 | 1.342 | 94 | 0.808 | 1.224 |
| 45 | 0.729 | 1.338 | 95 | 0.809 | 1.222 |
| 46 | 0.732 | 1.334 | 96 | 0.810 | 1.221 |
| 47 | 0.735 | 1.330 | 97 | 0.811 | 1.220 |
| 48 | 0.737 | 1.326 | 98 | 0.812 | 1.219 |
| 49 | 0.740 | 1.322 | 99 | 0.813 | 1.217 |
| 50 | 0.742 | 1.318 | | | |

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## Contents



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