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Infant Mortality Statistics from the 2010 Period Linked Birth/Infant Death Data Set

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Abstract

Objectives—This report presents 2010 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 6.14 infant deaths per 1,000 live births in 2010, 4% lower than the rate of 6.39 in 2009. The number of infant deaths was 24,572 in 2010, a decline of 1,836 infant deaths from 2009. From 2009 to 2010, the infant mortality rate declined

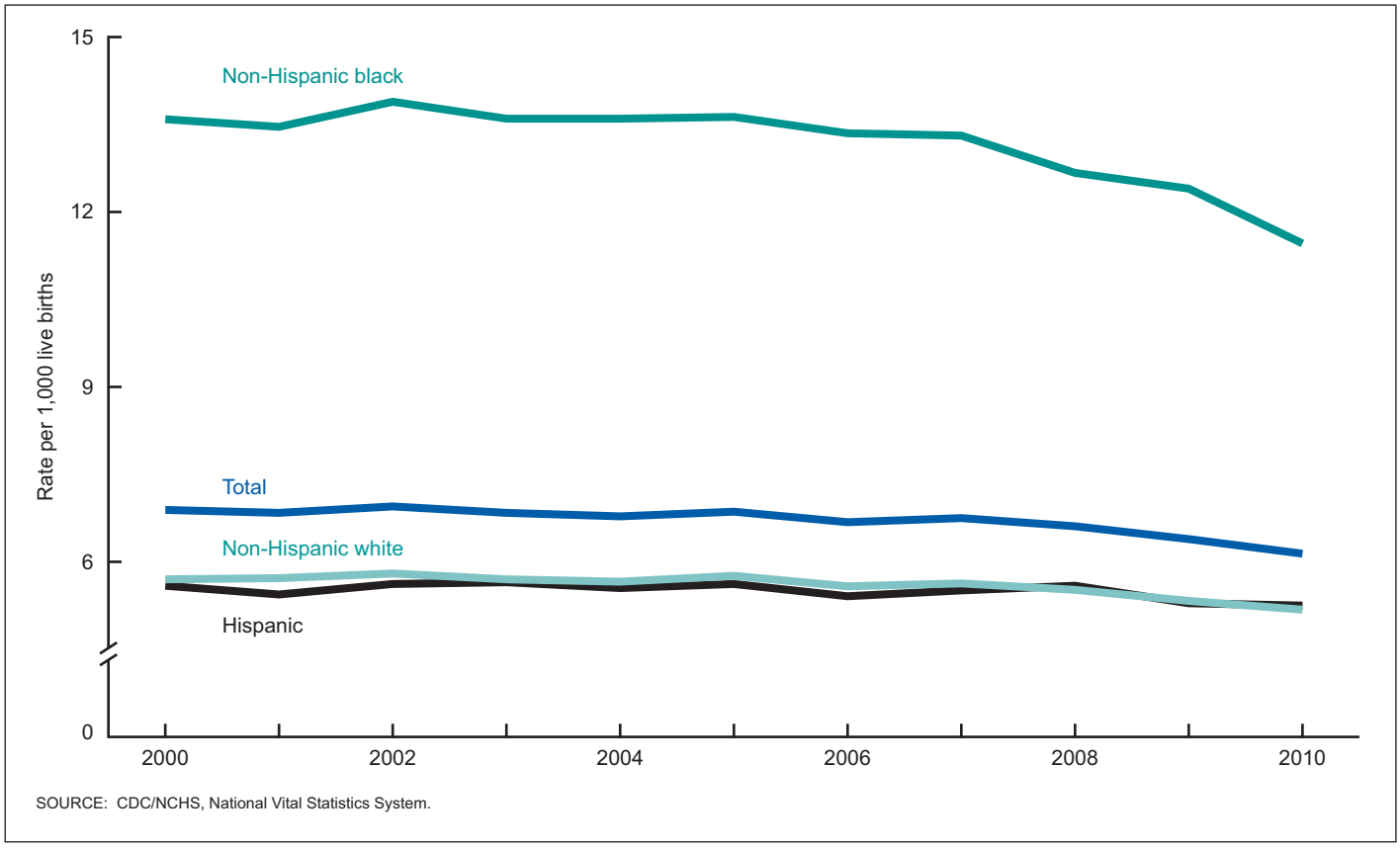

Figure 1. Infant mortality rates, by race and Hispanic origin of mother: United States, 2000–2010

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8% for non-Hispanic black mothers to 11.46, and 3% for non-Hispanic white mothers to 5.18. Asian or Pacific Islander mothers had the lowest rate in 2010 (4.27). From 2009 to 2010, the neonatal mortality rate declined by 3% to 4.05 neonatal deaths per 1,000 live births, while the postneonatal mortality rate declined 5% to 2.10. In 2010, infants born at 37–38 weeks of gestation (early term) had infant mortality rates that were 62% higher than those born at 39–41 weeks of gestation. For multiple births, the infant mortality rate was 25.41, almost five times the rate of 5.45 for singleton births. The three leading causes of infant death—congenital malformations, low birthweight, and sudden infant death syndrome—accounted for 46% of all infant deaths. In 2010, 35.2% of infant deaths were preterm-related.

Keywords: infant health • birthweight • gestational age • maternal characteristics

Introduction

This report presents infant mortality data from the 2010 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, District of Columbia (D.C.), Puerto Rico, Virgin Islands, or Guam during 2010 (1). Linked birth-infant death data are not available for American Samoa and the Commonwealth of the Northern Marianas. 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 1–6 and A–D, 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, the Virgin Islands, 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 2010 to the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). If 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 2010, 98.8% of all infant death records were successfully linked to their corresponding birth records. These records were weighted to adjust for the 1.2% 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 2010 (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, because the vast 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, Tenth 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 race information for the numerator is the race of the decedent as reported on the death certificate (2–4). Thus, standard infant mortality rates can be based on inconsistent information. In addition, 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). Thirty-eight states and D.C. reported multiple-race data on their birth certificates for either part or all of 2010, and 33 states reported in 2009. 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 2010 infant mortality rate from the linked file was 6.14 infant deaths per 1,000 live births, 4% lower than the rate of 6.39 in 2009 and 10% lower than the rate of 6.86 in 2005 (Tables A and B). The infant mortality rate plateaued from 2000 to 2007, and has declined from 2007 to 2010 (Table B).

From 2009 to 2010, the infant mortality rate declined 3% for non-Hispanic white women and 8% for non-Hispanic black women (Table B). Several groups had declines from 2005 to 2010: non-Hispanic black (16%), Puerto Rican (14%), API (13%), non-Hispanic white (10%), and Mexican women (7%) (Table B, Figure 3). The rate for total Hispanic women declined 7%.

The 2011 infant mortality rate from the preliminary mortality file was 6.05 (9). Details for 2011 will be analyzed in the 2011 linked birth/infant death publication.

Infant mortality by race and Hispanic origin of mother

Infant mortality rates continued to vary considerably by race and Hispanic origin of mother. In 2010, the highest rate, 11.46 per 1,000 live births, was for infants of non-Hispanic black mothers. Infants of API mothers had the lowest rate at 4.27. Rates were higher for infants of non-Hispanic black, AIAN (8.28), and Puerto Rican (7.10) mothers compared with non-Hispanic white mothers (5.18). Rates were below the non-Hispanic white rate for infants of API, Central and South American (4.43), and Cuban mothers (3.79) (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 (10,11).

The disparity in the infant mortality rate between non-Hispanic black and non-Hispanic white women has been more than double over the past decade. From 2007 to 2010, the infant mortality rate declined in both groups. The ratio in the infant mortality rate was 2.4 from 2000 to 2007, 2.3 in 2008 and 2009, and 2.2 in 2010 (Table B, Figure 1).

Age at death

Both neonatal and postneonatal mortality rates declined from 2009 to 2010 (Table B). The neonatal mortality rate declined 4%, from 4.18 to 4.05 deaths under age 28 days per 1,000 births. The postneonatal mortality rate declined 5%, from 2.21 to 2.10 deaths from age 28 days to under age 1 year per 1,000 live births.

From 2009 to 2010, the neonatal mortality rate declined 8% for non-Hispanic black women. From 2009 to 2010, postneonatal mortality rates declined 6% for non-Hispanic white and non-Hispanic black women (Table B). Changes for all other groups were not significant for both neonatal and postneonatal mortality.

Non-Hispanic black women had the highest neonatal mortality rate in 2010 at 7.45, 2.2 times that for non-Hispanic white women (3.35). Neonatal mortality rates were also higher for Puerto Rican (4.82), AIAN (4.28), and Mexican women (3.53) than for non-Hispanic white women. Neonatal mortality rates were lower for API (3.01) and

Table A. Infant, neonatal, and postneonatal deaths and mortality rates, by race and Hispanic origin of mother: United States, 2010 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]	3,999,386	24,572	16,193	8,379	6.14	4.05	2.10
Non-Hispanic white	2,162,406	11,192	7,251	3,941	5.18	3.35	1.82
Non-Hispanic black	589,808	6,758	4,395	2,363	11.46	7.45	4.01
American Indian or Alaska Native	46,760	387	200	187	8.28	4.28	4.00
Asian or Pacific Islander	246,886	1,053	744	309	4.27	3.01	1.25
Hispanic	945,180	4,964	3,396	1,567	5.25	3.59	1.66
Mexican	598,317	3,061	2,114	947	5.12	3.53	1.58
Puerto Rican	66,368	471	320	151	7.10	4.82	2.28
Cuban	16,882	64	48	16	3.79	2.84	*
Central and South American	142,692	632	428	203	4.43	3.00	1.42

* 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 add exactly to totals due to rounding. Neonatal is less than 28 days and postneonatal is 28 days to under 1 year. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB standards for comparability with other states; see references 2 and 3.

Table B. Infant, neonatal, and postneonatal mortality rates, by race and Hispanic origin of mother: United States, 2000–2010 linked files

Race and Hispanic origin of mother	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Percent change 2005 to 2010	Percent change 2009 to 2010
Infant mortality rate													
All races	6.89	6.84	6.95	6.84	6.78	6.86	6.68	6.75	6.61	6.39	6.14	†–10.5	†–3.9
Non-Hispanic white	5.70	5.72	5.80	5.70	5.66	5.76	5.58	5.63	5.52	5.33	5.18	†–10.1	†–2.8
Non-Hispanic black	13.59	13.46	13.89	13.60	13.60	13.63	13.35	13.31	12.67	12.40	11.46	†–15.9	†–7.6
American Indian or Alaska Native	8.30	9.65	8.64	8.73	8.45	8.06	8.28	9.22	8.42	8.47	8.28	2.7	–2.2
Asian or Pacific Islander	4.87	4.73	4.77	4.83	4.67	4.89	4.55	4.78	4.51	4.40	4.27	†–12.7	–3.0
Hispanic	5.59	5.44	5.62	5.65	5.55	5.62	5.41	5.51	5.59	5.29	5.25	†–6.6	–0.8
Mexican	5.43	5.22	5.42	5.49	5.47	5.53	5.34	5.42	5.58	5.12	5.12	†–7.4	0.0
Puerto Rican	8.21	8.53	8.20	8.18	7.82	8.30	8.01	7.71	7.29	7.18	7.10	†–14.5	–1.1
Cuban	4.54	4.28	3.72	4.57	4.55	4.42	5.08	5.18	4.90	5.77	3.79	–14.3	–34.3
Central and South American	4.64	4.98	5.06	5.04	4.65	4.68	4.52	4.57	4.76	4.47	4.43	–5.3	–0.9
Neonatal mortality rate													
All races	4.62	4.54	4.67	4.63	4.52	4.54	4.46	4.42	4.29	4.18	4.05	†–10.8	†–3.1
Non-Hispanic white	3.78	3.79	3.85	3.79	3.70	3.71	3.64	3.61	3.50	3.40	3.35	†–9.7	–1.5
Non-Hispanic black	9.19	8.97	9.33	9.26	9.13	9.13	8.95	8.74	8.28	8.13	7.45	†–18.4	†–8.4
American Indian or Alaska Native	4.39	4.20	4.60	4.55	4.26	4.04	4.30	4.55	4.18	4.38	4.28	5.9	–2.3
Asian or Pacific Islander	3.43	3.12	3.37	3.40	3.20	3.37	3.18	3.38	3.08	3.11	3.01	†–10.7	–3.2
Hispanic	3.77	3.64	3.83	3.92	3.83	3.86	3.74	3.72	3.76	3.56	3.59	†–7.0	0.8
Mexican	3.61	3.49	3.64	3.76	3.74	3.78	3.73	3.68	3.78	3.44	3.53	†–6.6	2.6
Puerto Rican	5.80	5.99	5.81	5.70	5.34	5.95	5.44	5.14	4.98	4.76	4.82	†–19.0	1.3
Cuban	3.20	2.50	3.23	3.36	2.81	3.05	3.60	3.65	3.23	3.61	2.84	–6.9	–21.3
Central and South American	3.26	3.36	3.45	3.65	3.43	3.23	3.12	3.14	3.19	3.17	3.00	–7.1	–5.4
Postneonatal mortality rate													
All races	2.27	2.30	2.28	2.22	2.25	2.32	2.22	2.33	2.32	2.21	2.10	†–9.5	†–5.0
Non-Hispanic white	1.92	1.93	1.95	1.91	1.96	2.05	1.94	2.02	2.02	1.93	1.82	†–11.2	†–5.7
Non-Hispanic black	4.40	4.48	4.55	4.34	4.47	4.50	4.40	4.57	4.39	4.27	4.01	†–10.9	†–6.1
American Indian or Alaska Native	3.94	5.45	4.04	4.18	4.19	4.02	3.98	4.67	4.24	4.09	4.00	–0.5	–2.2
Asian or Pacific Islander	1.44	1.61	1.40	1.43	1.47	1.51	1.37	1.40	1.43	1.29	1.25	†–17.2	–3.1
Hispanic	1.82	1.79	1.79	1.73	1.71	1.76	1.67	1.79	1.83	1.73	1.66	–5.7	–4.0
Mexican	1.82	1.73	1.78	1.73	1.73	1.75	1.61	1.75	1.80	1.67	1.58	†–9.7	–5.4
Puerto Rican	2.41	2.55	2.38	2.48	2.48	2.37	2.57	2.57	2.30	2.42	2.28	–3.8	–5.8
Cuban	*	1.71	*	*	1.74	1.37	1.42	1.53	1.62	2.10	*	*	*
Central and South American	1.38	1.61	1.60	1.39	1.22	1.46	1.41	1.43	1.57	1.30	1.42	–2.7	9.2

† 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 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB standards for comparability with other states; see references 2 and 3.

Central and South American women (3.00) compared with non-Hispanic white women (Tables A and B).

Infants of non-Hispanic black (4.01) and AIAN (4.00) women had the highest postneonatal mortality rates of any group—more than twice those for non-Hispanic white women (1.82) (Tables A and B). The postneonatal mortality rate was also higher for Puerto Rican women (2.28) than for non-Hispanic white women. In contrast, postneonatal mortality rates for Mexican (1.58), Central and South American (1.42), and API women (1.25) were lower than for non-Hispanic white women (Table A).

Infant mortality by state and race and ethnicity

Total infant mortality rates by state for 2005 and 2010 and the number of infant deaths for 2010 are presented in Table C. Rates declined in 16 states, D.C., and Puerto Rico (Figure 2). These declines ranged from 44% for D.C. to 6% for Texas. Seven states and D.C. had declines greater than 15%. While 41 states and D.C. had a lower number of infant deaths in 2010 than in 2009, only 4 states had a significantly lower infant mortality rate (Alaska, Georgia, Louisiana, and North Carolina).

To examine variations across states in more detail and to 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 2008–2010, infant mortality rates ranged from a high of 9.89 for Mississippi to a low of 4.24 for New Hampshire.

Infant mortality rates differ by state among race and Hispanic-origin groups. In 2008–2010, rates for infants of non-Hispanic black mothers could be reliably computed (20 or more infant deaths) in 38 states and D.C.; among these states, mortality rates ranged from a high of 14.52 in Ohio to a low of 6.97 in Washington. For infants of non-Hispanic white mothers, West Virginia had the highest infant mortality rate (7.61) and Alaska had the lowest rate (3.50). Among the

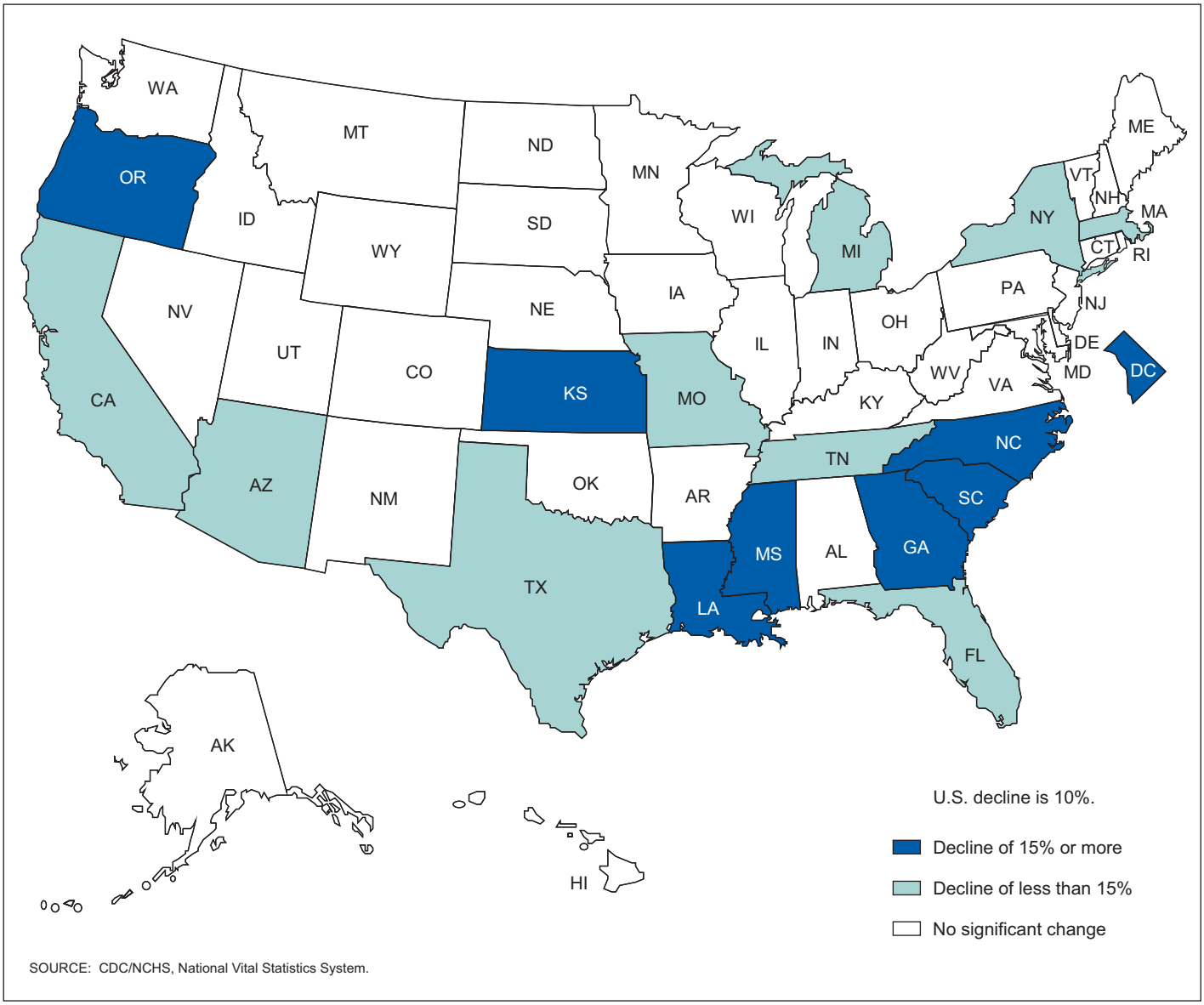


Figure 2. Percent change in infant mortality rate, by state: United States, 2005–2010

42 states and D.C. where infant mortality rates could be reliably computed for Hispanic mothers, Pennsylvania had the highest rate (8.55) and Louisiana had the lowest (3.26).

For infants of AIAN mothers, mortality rates for 2008–2010 could be reliably computed for only 15 states, and for API mothers, rates could only be computed for 29 states. For infants of AIAN mothers, mortality rates ranged from 16.58 in North Dakota to 4.95 in New Mexico. Infant mortality rates for infants of API mothers ranged from 7.73 in Utah to 2.90 in Georgia.

The data shown in Table 2 and described above illustrate the wide disparities that exist in infant mortality rates across states. One method for summarizing racial and ethnic disparities in infant mortality is to calculate the ratio between the infant mortality rates of two different race and ethnicity groups. The U.S. infant mortality rate ratio for non-Hispanic black relative to non-Hispanic white populations for the 3 years of 2008–2010 was 2.28. Keep in mind that 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 the non-Hispanic black population due to fewer than 20 infant deaths do not have a rate ratio shown here (12 states).

Areas with the highest rate ratios of 2.7 or greater for 2008–2010 were New Jersey (3.4), D.C. (3.2), Connecticut (2.9), Nebraska (2.9), and Maryland (2.8). Eleven areas had ratios less than 2.0 and greater than 1.0, and none had a ratio less than 1.0. West Virginia (1.3) had the lowest rate ratio (Table 2).

Table C. Infant mortality rates, number of infant deaths, and percent change: United States and each state, Puerto Rico, Virgin Islands, and Guam, 2005 and 2010 linked files

(By place of residence)

Area	Infant mortality rate per 1,000 live births		Percent change 2005 to 2010	Number of infant deaths in 2010
	2005	2010		
Total[1]	6.86	6.14	†–10.5	24,572
Alabama	9.53	8.73	–8.4	524
Alaska	5.93	3.57	–39.8	41
Arizona	6.85	5.94	†–13.3	520
Arkansas	7.83	7.24	–7.5	279
California	5.32	4.74	†–10.9	2,417
Colorado	6.44	5.91	–8.2	392
Connecticut	5.85	5.30	–9.4	200
Delaware	9.02	7.48	–17.1	85
District of Columbia	13.67	7.64	†–44.1	70
Florida	7.24	6.51	†–10.1	1,397
Georgia	8.07	6.34	†–21.4	849
Hawaii	6.58	6.21	–5.6	118
Idaho	5.98	4.78	–20.1	111
Illinois	7.38	6.84	–7.3	1,130
Indiana	8.04	7.62	–5.2	640
Iowa	5.44	4.86	–10.7	188
Kansas	7.37	6.20	†–15.9	252
Kentucky	6.73	6.81	1.2	380
Louisiana	9.85	7.55	†–23.4	471
Maine	6.87	5.40	–21.4	70
Maryland	7.30	6.83	–6.4	504
Massachusetts	5.13	4.39	†–14.4	320
Michigan	7.89	7.12	†–9.8	816
Minnesota	5.09	4.55	–10.6	312
Mississippi	11.46	9.62	†–16.1	385
Missouri	7.52	6.58	†–12.5	505
Montana	7.25	5.97	–17.7	72
Nebraska	5.66	5.25	–7.2	136
Nevada	5.66	5.51	–2.7	198
New Hampshire	5.27	3.88	–26.4	50
New Jersey	5.17	4.80	–7.2	513
New Mexico	6.17	5.60	–9.2	156
New York	5.82	5.08	†–12.7	1,242
North Carolina	8.81	7.09	†–19.5	867
North Dakota	5.96	6.81	14.3	62
Ohio	8.17	7.72	–5.5	1,074
Oklahoma	7.95	7.49	–5.8	399
Oregon	5.99	4.96	†–17.2	226
Pennsylvania	7.29	7.23	–0.8	1,036
Rhode Island	6.46	7.16	10.8	80
South Carolina	9.46	7.34	†–22.4	428
South Dakota	6.98	7.11	1.9	84
Tennessee	8.77	7.87	†–10.3	626
Texas	6.55	6.15	†–6.1	2,373
Utah	4.52	4.86	7.5	254
Vermont	6.49	4.18	–35.6	26
Virginia	7.47	6.83	–8.6	703
Washington	5.07	4.48	–11.6	388
West Virginia	8.16	7.33	–10.2	150
Wisconsin	6.54	5.84	–10.7	400
Wyoming	6.63	6.88	3.8	52
Puerto Rico	9.22	7.45	†–19.2	314
Virgin Islands	*	9.38	- - -	15
Guam	10.59	14.26	34.7	49

† Significant at $p < 0.05$.

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

- - - Data not available.

[1]Excludes data for Puerto Rico, Virgin Islands, and Guam.

Sex of infant

In the United States in 2010, the overall infant mortality rate for male infants was 6.70 per 1,000 births, 21% higher than the rate for female infants (5.56). In most countries, infant mortality rates are higher for male infants (12). Infant mortality rates were higher for male than female infants in each race and Hispanic-origin group, although the difference was not significant for infants of Cuban and Central and South American mothers (Table 1).

Multiple births

The infant mortality rate for infants born in multiple deliveries (i.e., twins, triplets, and higher-order births) in 2010 was 25.41, almost five times the rate of 5.45 for singleton births (Table 1). From 2009 to 2010, infant mortality rates declined by 3% for single births and by 7% for multiple births (13). Infant mortality rates for multiple births were higher than the rates for single births for all race and Hispanic-origin groups; rates for multiple births could not be reliably computed for Cuban mothers due to small numbers of events.

The risk of infant death increases with the increasing number of infants in the pregnancy. In 2010, the infant mortality rate for twins (24.03) was more than four times the rate for single births (5.45). The infant mortality rate for triplets (55.31) was 10 times, and the rate for quadruplets (115.02) was 21 times, the rate for single births. An infant mortality rate could not be computed for quintuplet or higher-order births due to the small number of events in that category.

The higher-risk profile of multiple births has a substantial impact on overall infant mortality (14,15). For example, in 2010 multiple births accounted for 3% of all live births, but for 14% 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 than those born at term (37–41 weeks of gestation) (16–21), 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 2010, two-thirds of all infant deaths (66.7%) occurred to the 12.0% of infants who were born preterm (Table D). Infant mortality rates are highest for very preterm infants (under 32 weeks), and the risk decreases sharply with increasing gestational age (Table 1, Figure 4) (18,22). In 2010, the infant mortality rate for very preterm infants (165.57) was 74 times the rate of 2.25 for term infants (Table D). The infant mortality rate for infants born at 32–33 weeks of gestation was 15.83, seven times the rate for term infants.

Although mortality decreases with increasing gestational age, even infants born only a few weeks early have a substantially increased risk of death and disability when compared with term infants (23–26). In 2010, the infant mortality rate for late preterm infants (34–36 weeks) was 7.15, three times the rate for infants born at term. Even within the term period, infants born at 37–38 weeks of gestation (early term) had mortality rates that were two-thirds higher than those born at 39–41 weeks of gestation.

Table D. Infant mortality rates and percent distribution of infant deaths and live births, by period of gestation: United States, 2000 and 2005–2010 linked files

	All gestational ages	Preterm (under 37 weeks)					Term (37–41 weeks)			Post-term (42 weeks or over)
		Total	Early preterm (under 34 weeks)			Late preterm	Total	Early term		
			Total	Under 32 weeks	32–33 weeks	34–36 weeks		37–38 weeks	39–41 weeks[1]	
					Infant mortality rate by gestational age[2]					
2010	6.14	34.22	99.97	165.57	15.83	7.15	2.25	3.03	1.87	2.70
2009	6.39	34.94	103.48	172.15	16.07	7.13	2.36	3.09	1.98	2.86
2008	6.61	35.76	105.71	175.45	17.58	7.40	2.44	3.13	2.08	2.69
2007	6.75	36.05	107.13	178.36	16.12	7.42	2.43	3.09	2.07	2.62
2006	6.68	35.15	105.31	175.94	16.19	7.08	2.39	3.02	2.05	2.80
2005	6.86	36.55	109.77	183.24	16.69	7.30	2.43	3.08	2.07	2.66
2000	6.89	37.88	109.75	180.95	17.37	7.96	2.59	3.38	2.24	2.91
					Percent distribution of infant deaths[3]					
2010	100.0	66.7	56.8	52.9	3.9	9.9	30.2	13.2	16.9	2.4
2009	100.0	67.0	57.3	53.3	3.9	9.7	30.5	13.4	17.1	2.5
2008	100.0	67.2	57.3	53.1	4.2	9.9	30.4	13.3	17.2	2.3
2007	100.0	68.2	58.2	54.4	3.8	10.0	29.6	13.2	16.4	2.2
2006	100.0	68.1	58.3	54.3	4.0	9.8	29.5	13.2	16.3	2.4
2005	100.0	68.6	58.8	54.9	3.9	9.8	29.1	12.9	16.3	2.3
2000	100.0	65.6	55.8	52.0	3.7	9.4	31.2	12.3	18.9	3.2
					Percent distribution of live births[3]					
2010	100.0	12.0	3.5	2.0	1.5	8.5	82.4	26.8	55.6	5.5
2009	100.0	12.2	3.5	2.0	1.5	8.7	82.3	27.6	54.7	5.5
2008	100.0	12.3	3.6	2.0	1.6	8.8	82.0	27.8	54.1	5.7
2007	100.0	12.7	3.6	2.0	1.6	9.0	81.7	28.6	53.1	5.6
2006	100.0	12.8	3.6	2.0	1.6	9.1	81.5	28.9	52.6	5.7
2005	100.0	12.7	3.6	2.0	1.6	9.1	81.4	28.3	53.1	5.8
2000	100.0	11.6	3.4	1.9	1.5	8.1	81.1	24.5	56.6	7.3

[1]Gestation of 39–40 weeks is full term and 41 weeks is late term.
[2]Rates are deaths under age 1 year per 1,000 live births in specified group.
[3]Infant deaths and live births with unknown gestational age are subtracted from the total number of events used as denominators for percentage computations.

From 2009 to 2010, the infant mortality rate declined significantly for gestational age groups under 32 and 39–41 weeks. Infant mortality rates for other gestational age groups were essentially unchanged from 2009 to 2010.

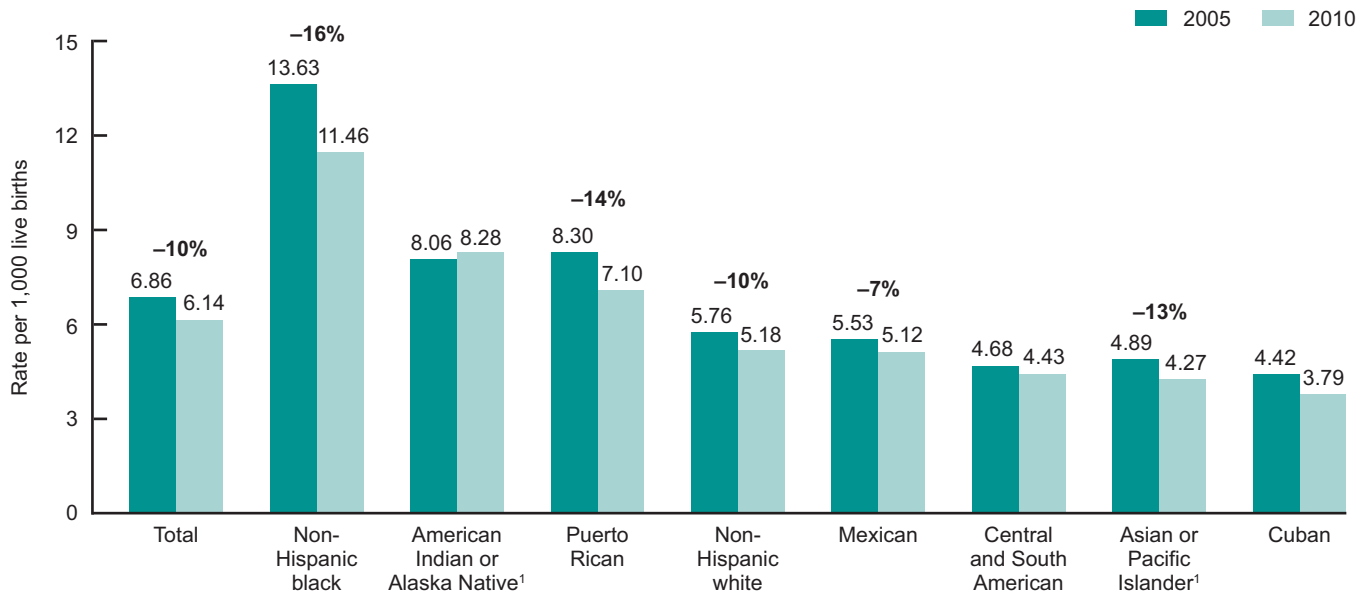
Large differences were observed in the percentage of preterm births by race and ethnicity, and these differences have a large impact on infant mortality rates (27,28). In 2010, the percentage of preterm births ranged from 10.7% of births to API women to 17.1% of births to non-Hispanic black women (Table 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 32–33 weeks of gestation, and for AIAN women for all age categories except under 32 weeks of gestation. Compared with non-Hispanic white women, infant mortality rates were lower for API women for gestational age groupings 34–36, 37–38, 39–41, and 37–41 weeks, and for Central and South American women for gestational age groupings 37–38, 39–41, and 37–41 weeks. Patterns were mixed for Mexican and Puerto Rican women.

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 12.0% in 2010, a decrease of 6% (Table D) (2). Declines were largest for late preterm and early term births (–7% each), followed by early preterm (–3%) births. The percentage of births at 39–41 weeks of gestation increased by 6% during this period. Similar to the changes for births, the percentage of infant deaths that were preterm declined from 68.6% in 2005 to 67.2% in 2010, while the percentage of term infant deaths increased from 29.1% in 2005 to 30.4% in 2010. Recent efforts to reduce nonindicated deliveries at under 39 weeks of gestation may have contributed to the recent decline in preterm and early term births (2,29–31).

Birthweight

Birthweight is another important predictor of infant health. It is closely associated with, but does not exactly correspond with, the period of gestation. Infant mortality rates are highest for the smallest infants and decrease sharply as birthweight increases. In 2010, infant mortality rates were 24 times higher for low birthweight (less than 2,500 grams) infants (50.98 per 1,000) than for infants with birthweights of 2,500 grams or more (2.13) (Table 1). The infant mortality rate for very low birthweight (less than 1,500 grams) infants was 222.15, more than 100 times the rate for infants with birthweights of 2,500 grams or more. Among the smallest infants (less than 500 grams, or 1 lb. 1 oz. or less) (Table 4), 84% were reported to have died within the first year of life. Reporting of deaths among



[1]Includes persons of Hispanic and non-Hispanic origin.
NOTE: Percent change indicates significant change between 2005 and 2010.
SOURCE: CDC/NCHS, National Vital Statistics System.

Figure 3. Infant mortality rates, by race and Hispanic origin of mother: United States, 2005 and 2010

these very small infants may be incomplete (32). Infant mortality rates were lowest at birthweights of 3,500–4,499 grams.

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 (47.0%) of all infant deaths in the United States in 2010 (Table 4). Conversely, 91.8% of infants born in the United States in 2010 weighed 2,500 grams or more, but these infants accounted for less than one-third (31.9%) of infant deaths. The large race and Hispanic-origin variations in the percentage of births at low birthweight (less than 2,500 grams)—from 6.5% for Mexican women to 13.6% for non-Hispanic black women—mean that some race and ethnicity groups are disproportionately affected by the high infant mortality rates for low birthweight infants (Table 3).

From 2005 to 2010, 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 or more grams, and for detailed birthweight categories of 500–749, 750–999, 1,000–1,249, 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 vary by maternal age. In 2010, infants of teenage mothers (8.84) and mothers aged 40–54 (7.75) were more likely to die in the first year of life. The lowest rate was for infants of mothers aged 30–34 (5.00) (Table 1), and the highest was among the youngest teenagers under age 15 (13.56). The rate for infants of mothers aged 15–17 was 8.94, and the rate for infants of mothers aged 18–19 was 8.72 in 2010 (data not shown). From 2009 to 2010, the rate dropped 4% for mothers aged 20–24 (7.15) and 25–29 (5.52), and decreased 7% for mothers aged 35–39 (5.44) (13).

Live-birth order

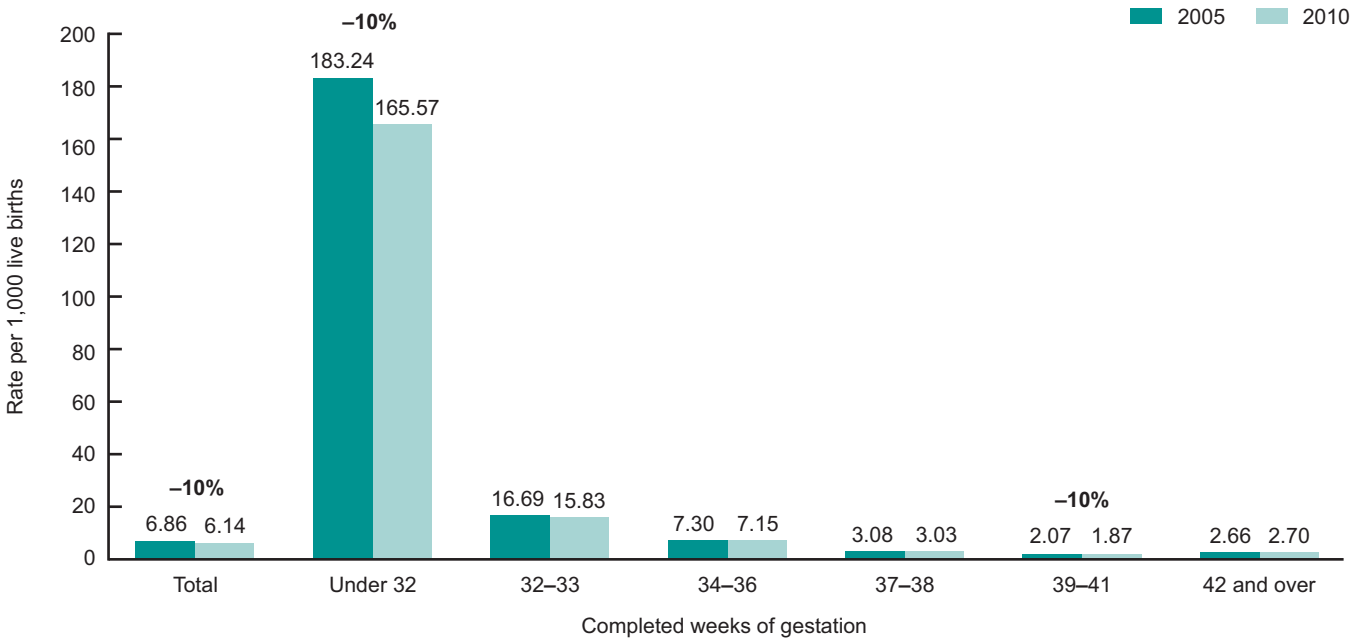
In 2010, as in earlier years, infant mortality rates were higher for first births than for second births and then generally increased as birth order increased (Table 1). In 2010, the infant mortality rate for first births (6.15) was 12% higher than for second births (5.44). The higher parities and, therefore, the highest-order births are more likely to be associated with older maternal age, multiple births, and lower socioeconomic status (33).

Marital status

Marital status may be a marker for the presence or absence of financial, social, and emotional resources (34,35). Infants of mothers who are not married have been shown to be at higher risk for poor outcomes (36). In 2010, the mortality rate for infants of unmarried mothers was 8.28 per 1,000, 77% higher than the rate for infants of married mothers (4.67) (Table 1). Within each race and Hispanic-origin group, infants of unmarried mothers had higher rates of mortality, and with the exception of AIAN, Cuban, and Central and South American infants, these differences were significant.

Nativity

In 2010, the infant mortality rate for mothers born in the 50 states and D.C. (6.48 per 1,000) was 38% higher than the rate for mothers born elsewhere (4.68) (Table 1). Among race and Hispanic-origin groups, mothers born in the 50 states and D.C. had higher



NOTE: Percent change indicates significant change between 2005 and 2010.
SOURCE: CDC/NCHS, National Vital Statistics System.

Figure 4. Infant mortality rates, by gestational age: United States, 2005 and 2010

infant mortality rates than mothers born elsewhere for non-Hispanic black (65%), non-Hispanic white (62%), and API (24%) populations (Table 1).

A variety of hypotheses have been advanced to account for the lower infant mortality rate among infants of mothers born outside the 50 states and D.C., including possible differences in migration selectivity, social support, and risk behaviors (37,38). Also, women born outside the 50 states and D.C. have been shown to have different characteristics than their U.S.-born counterparts with regard to socioeconomic and educational status (39).

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 2010 was Congenital malformations, deformations and chromosomal abnormalities (congenital malformations), accounting for 21% of all infant deaths. Disorders relating to short gestation and low birth weight, not elsewhere classified (low birthweight) was the second leading cause, accounting for 17% of all infant deaths, followed by Sudden infant death syndrome (SIDS), accounting for 8% of infant deaths. The fourth and fifth leading causes in 2010 were Newborn affected by maternal complications of pregnancy (maternal complications) (6%) and Accidents (unintentional injuries) (5%). Together, the five leading causes accounted for 57% of all infant deaths in the United States in 2010. The order of the top five leading causes was the same as in 2009 and 2008. From 2009 to 2010, the infant mortality rate from low birthweight declined by 5%, while changes for the other four leading causes were not statistically significant. From 2005 to 2010, the infant mortality rate declined by 5% for congenital malformations, by 9% for low birthweight, and by 8% for maternal complications (data not shown).

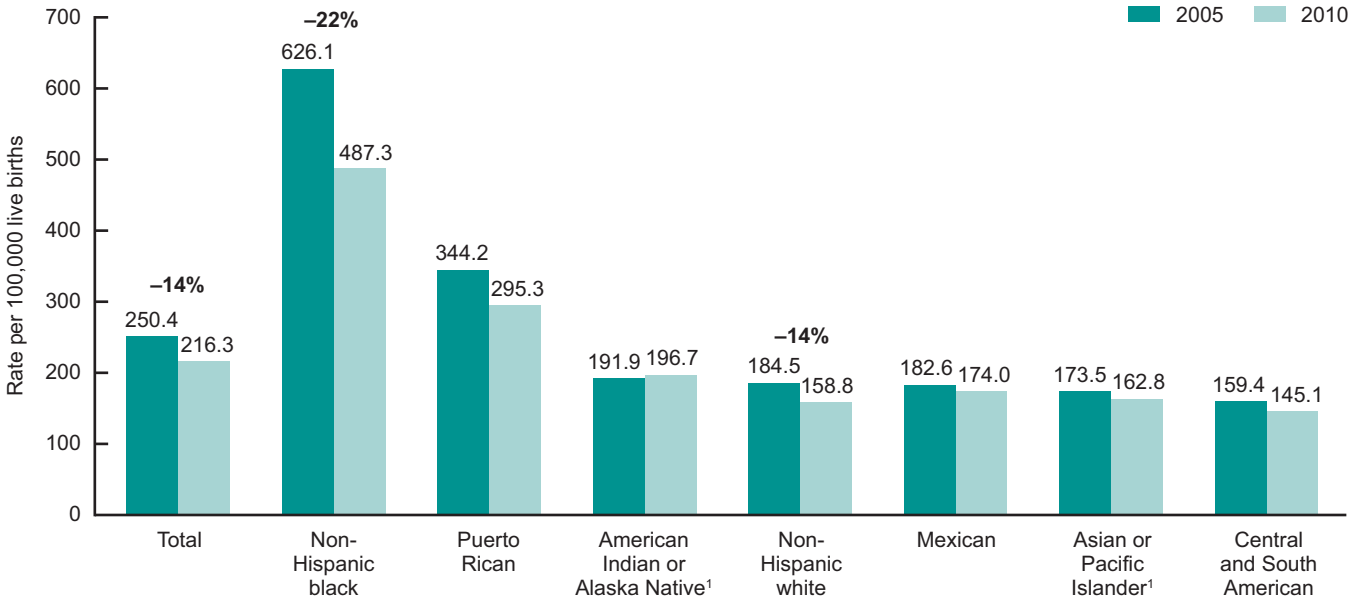
Race and ethnicity differences

In 2010, as in previous years, the rank order of leading causes of infant death varied substantially by race and Hispanic origin of the mother. Congenital malformations was the leading cause of infant death for all groups except for non-Hispanic black and Puerto Rican women, for whom low birthweight was the leading cause.

When differences between cause-specific infant mortality rates were examined by race and ethnicity, infant mortality rates from congenital malformations were 56% higher for AIAN, 32% higher for non-Hispanic black, and 19% higher for Mexican women than for non-Hispanic white women. Infant mortality rates from congenital malformations were 19% lower for API 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 more than three times the rate for non-Hispanic white women. The rate for Puerto Rican women was more than twice the rate for non-Hispanic white women.

SIDS rates for non-Hispanic black and AIAN women were almost twice those for non-Hispanic white women. In contrast, SIDS rates for Mexican women were 41% lower, and for API and Central and South American women were less than one-half those for non-Hispanic white women. Because 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.



1Includes persons of Hispanic and non-Hispanic origin.
NOTE: Percent change indicates significant change between 2005 and 2010.
SOURCE: CDC/NCHS, National Vital Statistics System.

Figure 5. Preterm-related infant mortality rates, by race and Hispanic origin of mother: United States, 2005 and 2010

For maternal complications (including incompetent cervix, premature rupture of membranes, and multiple pregnancy, for example), infants of non-Hispanic black women had the highest mortality rates—2.5 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 70% higher for Puerto Rican women than for non-Hispanic white women.

The infant mortality rate from unintentional injuries was about twice as high for non-Hispanic black and AIAN women than for non-Hispanic white women. The infant mortality rate from unintentional injuries was 45% lower for Mexican women and 53% lower for API women 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 (40,41).

The preterm-related cause-of-death grouping includes low birthweight 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 for 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 frequencies, percentages, and rates in preterm-related infant mortality from 2000 through 2010. In 2010, 8,650 out of a total of 24,572 infant deaths (35.2%) in the United States were preterm-related. The total preterm-related infant mortality rate was 216.3 per 100,000 live births in 2010. The percentage of infant deaths that were preterm-related increased from 34.6% in 2000 to a high of 36.9% in 2003. However, since 2003, the percentage of infant deaths that were preterm-related declined to 35.2% in 2010.

Race and ethnicity differences

Preterm-related infant mortality rates varied considerably by maternal race and ethnicity. In 2010, 42%–43% of infant deaths to non-Hispanic black and Puerto Rican women were due to preterm-related causes, while the percentage was somewhat lower for other racial and ethnic groups (Table 5). The preterm-related infant mortality rate for non-Hispanic black women (487.3) was three times that for non-Hispanic white women (158.8). The preterm-related infant mortality rate was 86% higher for Puerto Rican women (295.3), and 10% higher for Mexican women (174.0), than for non-Hispanic white women.

Although preterm-related infant mortality rates were highest for non-Hispanic black women, they also experienced the largest declines in recent years. From 2009 to 2010, preterm-related infant mortality

rates declined by 10% for non-Hispanic black women, but by only 4% for the total population. From 2005 to 2010, preterm-related infant mortality rates declined by 22% for non-Hispanic black women, and by 14% for the total population and for non-Hispanic white women (Figure 5). Changes for other race and ethnic groups were not statistically significant.

Preterm-related infant mortality explains much of the higher risk of infant mortality for non-Hispanic black and Puerto Rican women when compared with white women. In 2010, 71% of the difference in the overall infant mortality rates between Puerto Rican and non-Hispanic white women was due to preterm-related causes of death. About 52% of the difference in infant mortality rates between non-Hispanic black and non-Hispanic white women was due to these causes. In contrast, preterm-related infant mortality accounted for only 12% of the difference in infant mortality rates between AIAN and non-Hispanic white women, while congenital malformation accounted for 21%, SIDS for 13%, and unintentional injuries for 10% of the difference.

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List of Detailed Tables

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Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and by race and Hispanic origin of mother: United States, 2010 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 rate per 1,000 live births in specified group									
Total	6.14	5.18	11.46	8.28	4.27	5.25	5.12	7.10	3.79	4.43
Age at death										
Total neonatal	4.05	3.35	7.45	4.28	3.01	3.59	3.53	4.82	2.84	3.00
Early neonatal (under 7 days)	3.23	2.61	5.99	3.34	2.52	2.91	2.87	3.95	2.55	2.38
Late neonatal (7–27 days)	0.82	0.74	1.46	0.94	0.50	0.68	0.66	0.87	*	0.62
Postneonatal	2.10	1.82	4.01	4.00	1.25	1.66	1.58	2.28	*	1.42
Sex										
Male	6.70	5.62	12.55	9.17	4.91	5.73	5.59	8.36	3.71	4.64
Female	5.56	4.71	10.33	7.36	3.57	4.76	4.62	5.75	3.88	4.20
Plurality										
Single births	5.45	4.54	10.27	7.73	3.63	4.78	4.73	6.09	3.30	3.93
Plural births	25.41	20.99	41.51	27.69	23.46	24.95	23.06	36.06	*	23.75
Birthweight										
Less than 2,500 grams	50.98	45.46	63.27	57.29	35.98	51.73	53.11	52.63	41.26	47.35
Less than 1,500 grams	222.15	206.69	236.27	242.67	206.81	229.51	238.05	229.01	185.19	208.65
1,500–2,499 grams	13.42	13.67	13.39	18.56	8.24	14.34	15.04	10.51	*	14.77
2,500 grams or more	2.13	2.05	3.27	4.22	1.28	1.74	1.77	2.20	*	1.37
Period of gestation										
Less than 37 weeks	34.22	29.74	49.57	34.34	27.69	30.02	30.53	36.22	22.38	24.36
Less than 32 weeks	165.57	153.33	189.87	145.65	158.94	154.95	158.75	166.87	111.11	136.04
32–33 weeks	15.83	17.20	14.96	*	12.96	14.61	16.37	*	*	*
34–36 weeks	7.15	6.99	8.59	12.47	4.40	6.64	7.10	5.09	*	5.52
37–41 weeks	2.25	2.15	3.47	4.10	1.39	1.89	1.83	2.51	*	1.67
37–38 weeks	3.03	3.00	4.16	5.16	1.81	2.51	2.55	3.38	*	1.98
39–41 weeks	1.87	1.76	3.06	3.56	1.19	1.57	1.47	2.06	*	1.52
42 weeks or more	2.70	2.65	3.88	*	1.92	2.18	2.22	*	*	*
Age of mother										
Under 20 years	8.84	8.49	12.87	8.12	8.08	6.22	5.58	9.64	*	5.67
20–24 years	7.15	6.40	11.30	8.32	4.83	5.42	5.14	7.52	5.42	4.90
25–29 years	5.52	4.68	11.00	7.44	3.69	4.67	4.64	5.90	*	4.11
30–34 years	5.00	4.12	10.71	8.48	3.95	4.83	4.76	6.40	*	3.97
35–39 years	5.44	4.44	11.66	9.65	4.20	5.19	5.42	5.66	*	4.25
40–54 years	7.75	6.28	13.91	*	7.04	8.40	9.51	*	*	5.65
Live-birth order										
1	6.15	5.12	11.80	7.40	4.18	5.51	5.29	7.85	4.31	4.57
2	5.44	4.69	10.40	6.94	3.79	4.71	4.62	6.44	*	4.06
3	5.98	5.09	10.63	8.75	4.82	5.01	4.86	7.08	*	4.03
4	7.09	6.32	12.21	8.90	6.64	5.33	5.47	4.60	*	4.64
5 or more	8.87	7.88	13.61	13.26	4.87	6.84	6.53	8.22	*	6.56
Marital status										
Married	4.67	4.21	9.16	7.46	3.96	4.72	4.67	6.06	3.13	4.07
Unmarried	8.28	7.54	12.33	8.71	5.75	5.71	5.53	7.63	4.54	4.76
Mother's place of birth										
Born in the 50 states or D.C.	6.48	5.26	11.93	8.37	4.95	5.63	5.29	6.72	3.91	4.50
Born elsewhere	4.68	3.24	7.23	*	4.00	4.89	4.96	7.72	3.69	4.41

See footnotes at end of table.

Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and by race and Hispanic origin of mother: United States, 2010 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	3,999,386	2,162,406	589,808	46,760	246,886	945,180	598,317	66,368	16,882	142,692
Sex										
Male	2,046,935	1,109,384	300,487	23,672	127,837	481,328	304,777	33,849	8,627	72,254
Female	1,952,451	1,053,022	289,321	23,088	119,049	463,852	293,540	32,519	8,255	70,438
Plurality										
Single births	3,861,321	2,078,836	567,430	45,532	238,958	923,100	585,700	64,177	16,346	139,113
Plural births	138,065	83,570	22,378	1,228	7,928	22,080	12,617	2,191	536	3,579
Birthweight										
Less than 2,500 grams	326,801	154,797	80,134	3,578	21,012	66,068	38,955	6,365	1,236	9,356
Less than 1,500 grams	58,806	25,497	17,933	614	2,935	11,481	6,650	1,227	243	1,572
1,500–2,499 grams	267,995	129,300	62,201	2,964	18,077	54,587	32,305	5,138	993	7,784
2,500 grams or more	3,671,997	2,007,462	509,604	43,178	225,841	879,074	559,343	59,999	15,645	133,326
Not stated	588	147	70	4	33	38	19	4	1	10
Period of gestation										
Less than 37 weeks	478,790	232,688	100,797	6,349	26,359	111,273	67,602	8,891	2,234	16,752
Less than 32 weeks	78,442	34,148	22,305	1,023	3,794	16,786	9,921	1,630	396	2,389
32–33 weeks	61,159	29,120	13,773	835	3,240	14,030	8,550	1,170	288	2,037
34–36 weeks	339,189	169,420	64,719	4,491	19,325	80,457	49,131	6,091	1,550	12,326
37–41 weeks	3,296,523	1,805,706	458,956	37,093	209,322	778,938	495,445	53,493	13,853	117,637
37–38 weeks	1,073,793	556,830	169,752	12,408	69,217	263,816	165,770	18,048	5,100	39,471
39–41 weeks	2,222,730	1,248,876	289,204	24,685	140,105	515,122	329,675	35,445	8,753	78,166
42 weeks or more	218,794	122,120	29,094	3,250	10,928	53,333	34,178	3,856	772	8,078
Not stated	5,279	1,892	961	68	277	1,636	1,092	128	23	225
Age of mother										
Under 20 years	372,175	145,070	89,902	7,508	6,311	123,609	82,507	10,170	1,047	10,224
20–24 years	951,688	464,849	187,981	15,743	27,733	254,723	163,348	20,864	3,873	30,819
25–29 years	1,133,713	648,610	147,684	12,225	68,378	254,982	161,693	16,776	4,689	40,433
30–34 years	962,170	574,627	100,765	7,311	85,293	191,334	117,607	11,720	4,055	36,491
35–39 years	464,870	264,126	49,742	3,212	48,089	97,554	59,597	5,477	2,632	19,767
40–54 years	114,770	65,124	13,734	761	11,082	22,978	13,565	1,361	586	4,958
Live-birth order										
1	1,603,832	914,933	229,714	16,747	111,443	327,591	194,033	26,740	7,663	50,508
2	1,249,557	702,335	164,676	12,527	87,243	280,658	173,340	19,567	6,005	46,279
3	655,249	332,049	98,145	8,232	30,289	185,819	125,330	11,153	2,184	26,296
4	274,423	123,722	47,504	4,607	10,086	88,234	62,208	4,998	607	11,206
5 or more	187,225	78,977	40,492	4,448	6,359	56,289	39,830	3,405	284	6,860
Not stated	29,100	10,390	9,277	199	1,466	6,589	3,576	505	139	1,543
Marital status										
Married	2,365,915	1,534,865	162,121	16,090	204,817	440,769	287,114	23,104	8,952	68,737
Unmarried	1,633,471	627,541	427,687	30,670	42,069	504,411	311,203	43,264	7,930	73,955
Mother's place of birth										
Born in the 50 states or D.C.	3,055,817	2,024,558	507,138	43,841	52,889	418,237	251,650	49,112	8,191	21,802
Born elsewhere	930,135	132,745	78,326	2,833	192,621	525,319	346,113	16,835	8,667	120,590
Not stated	13,434	5,103	4,344	86	1,376	1,624	554	421	24	300

See footnotes at end of table.

Table 1. Infant mortality rates, live births, and infant deaths, by selected characteristics and by race and Hispanic origin of mother: United States, 2010 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	24,572	11,192	6,758	387	1,053	4,964	3,061	471	64	632
Age at death										
Total neonatal	16,193	7,251	4,394	200	744	3,396	2,114	320	48	428
Early neonatal (under 7 days)	12,900	5,654	3,533	156	622	2,750	1,717	262	43	340
Late neonatal (7–27 days)	3,293	1,597	861	44	123	646	397	58	5	88
Postneonatal	8,379	3,941	2,363	187	309	1,567	947	151	16	203
Sex										
Male	13,718	6,231	3,770	217	628	2,756	1,704	283	32	335
Female	10,854	4,961	2,988	170	425	2,208	1,357	187	32	296
Plurality										
Single births	21,063	9,438	5,830	352	867	4,413	2,770	391	54	547
Plural births	3,508	1,754	929	34	186	551	291	79	10	85
Birthweight										
Less than 2,500 grams	16,661	7,037	5,070	205	756	3,418	2,069	335	51	443
Less than 1,500 grams	13,064	5,270	4,237	149	607	2,635	1,583	281	45	328
1,500–2,499 grams	3,597	1,767	833	55	149	783	486	54	6	115
2,500 grams or more	7,821	4,121	1,668	182	290	1,531	988	132	13	183
Not stated	90	35	20	–	7	15	5	3	–	5
Period of gestation										
Less than 37 weeks	16,382	6,921	4,997	218	730	3,340	2,064	322	50	408
Less than 32 weeks	12,988	5,236	4,235	149	603	2,601	1,575	272	44	325
32–33 weeks	968	501	206	13	42	205	140	19	3	15
34–36 weeks	2,426	1,184	556	56	85	534	349	31	3	68
37–41 weeks	7,411	3,877	1,593	152	291	1,474	906	134	13	197
37–38 weeks	3,251	1,673	707	64	125	663	423	61	7	78
39–41 weeks	4,160	2,204	886	88	167	811	483	73	6	119
42 weeks or more	591	324	113	16	21	116	76	9	1	18
Not stated	187	71	55	–	10	34	13	6	–	8
Age of mother										
Under 20 years	3,289	1,231	1,157	61	51	769	460	98	5	58
20–24 years	6,801	2,973	2,125	131	134	1,380	839	157	21	151
25–29 years	6,254	3,037	1,625	91	252	1,191	750	99	13	166
30–34 years	4,809	2,370	1,079	62	337	925	560	75	19	145
35–39 years	2,529	1,172	580	31	202	506	323	31	5	84
40–54 years	889	409	191	11	78	193	129	11	1	28
Live-birth order										
1	9,866	4,685	2,710	124	466	1,804	1,026	210	33	231
2	6,798	3,293	1,712	87	331	1,322	800	126	16	188
3	3,921	1,689	1,043	72	146	931	609	79	9	106
4	1,945	782	580	41	67	470	340	23	3	52
5 or more	1,661	622	551	59	31	385	260	28	2	45
Not stated	381	121	164	4	12	51	27	5	1	10
Marital status										
Married	11,054	6,461	1,485	120	811	2,082	1,342	140	28	280
Unmarried	13,518	4,732	5,273	267	242	2,881	1,720	330	36	352
Mother's place of birth										
Born in the 50 states or D.C.	19,810	10,651	6,052	367	262	2,355	1,332	330	32	98
Born elsewhere	4,352	430	566	15	771	2,571	1,716	130	32	532
Not stated	410	112	140	5	20	37	12	11	*	2

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

– Quantity zero.

[1]Includes other and unknown Hispanic origin not stated, not shown separately.

[2]Includes Aleut and Eskimo.

NOTES: D.C. is District of Columbia. Infant deaths are weighted, so numbers may not add exactly 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 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB standards for comparability with other states; see references 2 and 3.

Table 2. Infant mortality rates, by race and Hispanic origin of mother: United States and each state, Puerto Rico, Virgin Islands, and Guam, 2008–2010 linked files

[By place of residence]

Area	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 rate per 1,000 live births in specified group						
United States[2]	6.39	5.34	12.19	8.39	4.39	5.38	2.28
Alabama	8.83	6.98	13.08	*	*	7.38	1.87
Alaska	5.49	3.50	*	9.24	*	*	*
Arizona	6.11	5.41	13.48	7.98	7.34	5.59	2.49
Arkansas	7.40	6.52	11.47	*	*	5.62	1.76
California	4.93	4.13	9.77	6.85	4.05	4.82	2.37
Colorado	6.12	5.26	12.71	*	5.70	6.65	2.42
Connecticut	5.60	4.00	11.76	*	4.78	6.67	2.94
Delaware	7.94	5.90	14.49	*	*	5.09	2.46
District of Columbia	9.72	4.32	13.87	*	*	5.03	3.21
Florida	6.90	5.45	12.20	*	5.13	5.04	2.24
Georgia	7.24	5.44	11.09	*	2.90	5.08	2.04
Hawaii	5.93	4.22	*	*	6.45	6.12	*
Idaho	5.34	4.96	*	*	*	6.80	*
Illinois	6.99	5.45	13.59	*	5.45	5.92	2.49
Indiana	7.42	6.50	14.09	*	6.09	6.80	2.17
Iowa	5.06	4.65	12.12	*	*	6.34	2.61
Kansas	6.89	6.34	13.06	*	5.72	6.50	2.06
Kentucky	6.86	6.66	10.49	*	*	4.74	1.58
Louisiana	8.48	6.55	11.92	*	7.00	3.26	1.82
Maine	5.52	5.54	*	*	*	*	*
Maryland	7.35	4.56	12.71	*	4.01	4.91	2.79
Massachusetts	4.84	3.78	9.24	*	4.19	6.75	2.44
Michigan	7.38	5.68	14.28	12.33	4.46	6.41	2.51
Minnesota	5.03	4.31	9.64	8.60	4.83	5.05	2.24
Mississippi	9.89	7.18	13.37	*	*	5.99	1.86
Missouri	6.94	5.97	12.81	*	3.97	5.47	2.15
Montana	6.45	6.07	*	8.84	*	*	*
Nebraska	5.37	4.61	13.46	*	*	5.48	2.92
Nevada	5.56	5.27	9.98	*	4.37	5.02	1.89
New Hampshire	4.24	4.18	*	*	*	*	*
New Jersey	5.18	3.58	12.16	*	3.12	4.76	3.40
New Mexico	5.49	5.50	*	4.95	*	5.29	*
New York	5.32	4.01	10.56	*	3.44	5.03	2.63
North Carolina	7.76	5.68	13.89	13.67	4.87	5.80	2.45
North Dakota	6.32	4.91	*	16.58	*	*	*
Ohio	7.71	6.33	14.52	*	4.49	6.72	2.29
Oklahoma	7.53	6.93	12.50	9.26	*	5.89	1.80
Oregon	4.99	4.78	9.46	7.73	5.35	4.61	1.98
Pennsylvania	7.24	5.53	12.59	*	4.83	8.55	2.28
Rhode Island	6.29	5.11	12.54	*	*	5.03	2.45
South Carolina	7.47	5.58	11.50	*	*	5.39	2.06
South Dakota	7.38	5.93	*	13.58	*	*	*
Tennessee	8.01	6.41	14.09	*	4.98	6.52	2.20
Texas	6.10	5.50	10.89	7.51	4.16	5.54	1.98
Utah	4.94	4.64	*	*	7.73	5.21	*
Vermont	4.99	4.97	*	*	*	*	*
Virginia	6.95	5.31	12.66	*	4.15	6.01	2.38
Washington	4.96	4.66	6.97	8.79	3.78	5.38	1.50
West Virginia	7.60	7.61	9.63	*	*	*	1.27
Wisconsin	6.26	5.26	13.90	8.02	6.44	5.61	2.64
Wyoming	6.61	5.94	*	*	*	8.38	*
Puerto Rico	7.88	---	---	---	---	---	---
Virgin Islands	6.70	*	*	*	*	*	*
Guam	10.82	*	*	*	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.

[2]Excludes data for Puerto Rico, Virgin Islands, and Guam.

NOTES: Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB 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, 2010 linked file

Characteristic	All races and origins[1]	Non-Hispanic		American Indian or Alaska Native[2]	Asian or Pacific Islander	Hispanic				
		White	Black			Total[1]	Mexican	Puerto Rican	Cuban	Central and South American
Birthweight:										
Less than 1,500 grams	1.47	1.18	3.04	1.30	1.20	1.21	1.11	1.85	1.44	1.10
Less than 2,500 grams	8.2	7.2	13.6	7.7	8.5	7.0	6.5	9.6	7.3	6.6
Preterm births[3]	12.0	10.8	17.1	13.6	10.7	11.8	11.3	13.4	13.3	11.8
Births to mothers under age 20	9.3	6.7	15.2	16.1	2.6	13.1	13.8	15.3	6.2	7.2
Fourth and higher-order births	11.6	9.4	15.2	19.4	6.7	15.4	17.2	12.8	5.3	12.8
Births to unmarried mothers	40.8	29.0	72.5	65.6	17.0	53.4	52.0	65.2	47.0	51.8
Mothers born in the 50 states and D.C.	76.7	93.8	86.6	93.9	21.5	44.3	42.1	74.5	48.6	15.3

[1]Includes other and unknown Hispanic and origin not stated, not shown separately.

[2]Includes Aleut and Eskimo.

[3]Born prior to 37 completed weeks of gestation.

NOTES: D.C. is District of Columbia. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and D.C. reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB 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, 2010 linked file, and percent change in birthweight-specific infant mortality, 2005–2010 linked files

Race, and birthweight in grams	Number in 2010				Mortality rate per 1,000 live births in 2010			Percent change in infant mortality rate 2005–2010
	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant	Neonatal	Postneonatal	
All races[1]	3,999,386	24,572	16,193	8,379	6.14	4.05	2.10	†–10.5
Less than 2,500 grams	326,801	16,661	13,420	3,241	50.98	41.06	9.92	†–11.2
Less than 1,500 grams	58,806	13,064	11,385	1,679	222.15	193.60	28.55	†–9.3
Less than 500 grams	6,557	5,489	5,367	122	837.12	818.51	18.61	–2.3
500–749 grams	10,636	4,516	3,793	723	424.60	356.62	67.98	†–9.3
750–999 grams	11,672	1,495	1,115	380	128.08	95.53	32.56	†–14.8
1,000–1,249 grams	13,443	864	635	229	64.27	47.24	17.03	†–9.8
1,250–1,499 grams	16,498	699	475	224	42.37	28.79	13.58	–9.2
1,500–1,999 grams	63,512	1,556	999	557	24.50	15.73	8.77	†–8.8
2,000–2,499 grams	204,483	2,041	1,036	1,005	9.98	5.07	4.91	†–8.4
2,500 grams or more	3,671,997	7,821	2,687	5,134	2.13	0.73	1.40	†–7.4
2,500–2,999 grams	744,711	2,828	1,107	1,721	3.80	1.49	2.31	†–9.3
3,000–3,499 grams	1,567,643	3,101	993	2,107	1.98	0.63	1.34	†–7.9
3,500–3,999 grams	1,055,553	1,456	431	1,024	1.38	0.41	0.97	–6.1
4,000–4,499 grams	263,145	344	99	245	1.31	0.38	0.93	–9.7
4,500–4,999 grams	36,729	72	44	28	1.96	1.20	0.76	–11.3
5,000 grams or more	4,216	20	12	8	4.74	*	*	6.5
Not stated	588	90	86	4	. . .	. . .	. . .	. . .
Non-Hispanic white	2,162,406	11,192	7,251	3,941	5.18	3.35	1.82	†–10.1
Less than 2,500 grams	154,797	7,036	5,743	1,294	45.45	37.10	8.36	†–9.6
Less than 1,500 grams	25,497	5,270	4,679	591	206.69	183.51	23.18	†–9.1
Less than 500 grams	2,399	2,028	1,991	37	845.35	829.93	15.42	–1.8
500–749 grams	4,160	1,819	1,576	243	437.26	378.85	58.41	†–7.3
750–999 grams	5,040	674	537	138	133.73	106.55	27.38	†–17.9
1,000–1,249 grams	6,220	433	339	94	69.61	54.50	15.11	–7.0
1,250–1,499 grams	7,678	315	236	79	41.03	30.74	10.29	–7.3
1,500–1,999 grams	30,973	778	540	239	25.12	17.43	7.72	–2.3
2,000–2,499 grams	98,327	989	524	464	10.06	5.33	4.72	†–9.0
2,500 grams or more	2,007,462	4,121	1,475	2,645	2.05	0.73	1.32	†–8.1
2,500–2,999 grams	351,981	1,374	569	805	3.90	1.62	2.29	†–9.9
3,000–3,499 grams	825,209	1,656	564	1,092	2.01	0.68	1.32	†–7.8
3,500–3,999 grams	632,972	832	247	584	1.31	0.39	0.92	–7.1
4,000–4,499 grams	170,781	213	65	148	1.25	0.38	0.87	–6.7
4,500–4,999 grams	24,044	36	22	13	1.50	0.91	*	–18.9
5,000 grams or more	2,475	10	8	2	*	*	*	*
Not stated	147	35	33	2	. . .	. . .	. . .	. . .
Non-Hispanic black	589,808	6,758	4,395	2,363	11.46	7.45	4.01	†–15.9
Less than 2,500 grams	80,134	5,070	3,923	1,147	63.27	48.96	14.31	†–15.3
Less than 1,500 grams	17,933	4,237	3,553	684	236.27	198.13	38.14	†–11.1
Less than 500 grams	2,390	1,951	1,896	55	816.32	793.31	23.01	–4.2
500–749 grams	3,696	1,462	1,145	317	395.56	309.79	85.77	†–11.2
750–999 grams	3,641	443	284	158	121.67	78.00	43.39	–9.5
1,000–1,249 grams	3,797	205	135	71	53.99	35.55	18.70	–14.9
1,250–1,499 grams	4,409	176	92	84	39.92	20.87	19.05	–14.4
1,500–1,999 grams	15,176	341	177	164	22.47	11.66	10.81	†–16.5
2,000–2,499 grams	47,025	492	194	298	10.46	4.13	6.34	–6.9
2,500 grams or more	509,604	1,668	452	1,215	3.27	0.89	2.38	†–7.1
2,500–2,999 grams	149,771	718	217	501	4.79	1.45	3.35	–5.5
3,000–3,499 grams	228,271	638	160	478	2.79	0.70	2.09	†–10.9
3,500–3,999 grams	107,633	243	55	187	2.26	0.51	1.74	–6.6
4,000–4,499 grams	20,821	54	12	42	2.59	*	2.02	0.8
4,500–4,999 grams	2,713	12	8	4	*	*	*	*
5,000 grams or more	395	3	–	3	*	*	*	*
Not stated	70	20	19	1	. . .	. . .	. . .	. . .

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, 2010 linked file, and percent change in birthweight-specific infant mortality, 2005–2010 linked files—Con.

Race, and birthweight in grams	Number in 2010				Mortality rate per 1,000 live births in 2010			Percent change in infant mortality rate 2005–2010
	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant	Neonatal	Postneonatal	
American Indian or Alaska Native[2]	46,760	387	200	187	8.28	4.28	4.00	2.7
Less than 2,500 grams	3,578	205	151	54	57.29	42.20	15.09	7.2
Less than 1,500 grams	614	149	127	22	242.67	206.84	35.83	2.6
Less than 500 grams	65	53	51	2	815.38	784.62	*	2.8
500–749 grams	118	56	48	8	474.58	406.78	*	5.3
750–999 grams	111	14	11	3	*	*	*	*
1,000–1,249 grams	127	14	10	4	*	*	*	*
1,250–1,499 grams	193	11	6	5	*	*	*	*
1,500–1,999 grams	716	26	12	14	36.31	*	*	18.2
2,000–2,499 grams	2,248	29	11	17	12.90	*	*	–5.5
2,500 grams or more	43,178	182	49	133	4.22	1.13	3.08	–4.7
2,500–2,999 grams	8,094	64	21	42	7.91	2.59	5.19	10.3
3,000–3,499 grams	17,598	68	16	51	3.86	*	2.90	–6.8
3,500–3,999 grams	12,905	44	11	33	3.41	*	2.56	6.2
4,000–4,499 grams	3,806	7	1	6	*	*	*	*
4,500–4,999 grams	664	–	–	–	*	*	*	*
5,000 grams or more	111	–	–	–	*	*	*	*
Not stated	4	–	–	–	. . .	. . .	. . .	. . .
Asian or Pacific Islander	246,886	1,053	744	309	4.27	3.01	1.25	†–12.7
Less than 2,500 grams	21,012	756	627	129	35.98	29.84	6.14	†–18.5
Less than 1,500 grams	2,935	607	541	66	206.81	184.33	22.49	†–13.0
Less than 500 grams	312	281	274	6	900.64	878.21	*	5.9
500–749 grams	442	197	174	23	445.70	393.67	52.04	–11.8
750–999 grams	574	65	47	17	113.24	81.88	*	–21.5
1,000–1,249 grams	684	36	25	11	52.63	36.55	*	–28.1
1,250–1,499 grams	923	28	20	8	30.34	21.67	*	–37.3
1,500–1,999 grams	3,768	58	39	19	15.39	10.35	*	†–41.8
2,000–2,499 grams	14,309	91	47	44	6.36	3.28	3.07	–11.2
2,500 grams or more	225,841	290	110	180	1.28	0.49	0.80	–11.1
2,500–2,999 grams	57,901	109	48	61	1.88	0.83	1.05	†–23.9
3,000–3,499 grams	103,775	125	38	86	1.20	0.37	0.83	–4.8
3,500–3,999 grams	52,702	48	21	26	0.91	0.40	0.49	8.3
4,000–4,499 grams	10,036	6	1	5	*	*	*	*
4,500–4,999 grams	1,249	3	2	1	*	*	*	*
5,000 grams or more	178	–	–	–	*	*	*	*
Not stated	33	7	7	–	. . .	. . .	. . .	. . .
Hispanic	945,180	4,964	3,396	1,567	5.25	3.59	1.66	†–6.6
Less than 2,500 grams	66,068	3,418	2,807	610	51.73	42.49	9.23	†–7.2
Less than 1,500 grams	11,481	2,635	2,326	308	229.51	202.60	26.83	†–6.4
Less than 500 grams	1,279	1,072	1,051	21	838.15	821.74	16.42	–2.2
500–749 grams	2,138	937	807	129	438.26	377.46	60.34	–8.8
750–999 grams	2,263	291	230	62	128.59	101.63	27.40	–14.1
1,000–1,249 grams	2,568	169	122	46	65.81	47.51	17.91	–7.3
1,250–1,499 grams	3,233	166	116	49	51.35	35.88	15.16	1.2
1,500–1,999 grams	12,639	351	229	122	27.77	18.12	9.65	–7.9
2,000–2,499 grams	41,948	432	252	179	10.30	6.01	4.27	–5.7
2,500 grams or more	879,074	1,531	574	957	1.74	0.65	1.09	†–7.4
2,500–2,999 grams	175,492	558	247	311	3.18	1.41	1.77	†–11.2
3,000–3,499 grams	389,943	594	199	395	1.52	0.51	1.01	–7.3
3,500–3,999 grams	247,331	289	93	195	1.17	0.38	0.79	–6.4
4,000–4,499 grams	57,263	63	19	44	1.10	*	0.77	–11.3
4,500–4,999 grams	7,996	20	10	10	2.50	*	*	*
5,000 grams or more	1,049	7	4	3	*	*	*	*
Not stated	38	15	15	–	. . .	. . .	. . .	. . .

† 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.

NOTES: Infant deaths are weighted, so numbers may not add exactly to totals due to rounding. Neonatal is under 28 days and postneonatal is 28 days to under 1 year. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB 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, 2010 linked file

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

Cause of death (based on *International Classification of Diseases, Tenth Revision,* 1992)	All races			Non-Hispanic white			Non-Hispanic black			American Indian or Alaska Native[1]			Asian or Pacific Islander[2]		
	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate
All causes	...	24,572	614.4	...	11,192	517.6	...	6,758	1,145.8	...	387	827.6	...	1,053	426.5
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	1	5,115	127.9	1	2,551	118.0	2	921	156.2	1	86	183.9	1	237	96.0
Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	2	4,151	103.8	2	1,525	70.5	1	1,528	259.1	2	46	98.4	2	184	74.5
Sudden infant death syndrome (R95)	3	2,058	51.5	3	1,077	49.8	3	577	97.8	3	42	89.8	4	55	22.3
Newborn affected by maternal complications of pregnancy (P01)	4	1,563	39.1	4	669	30.9	4	446	75.6	6	13	*	3	90	36.5
Accidents (unintentional injuries) (V01–X59)	5	1,107	27.7	5	602	27.8	5	312	52.9	4	27	57.7	6	32	13.0

Cause of death (based on *International Classification of Diseases, Tenth Revision*, 1992)	Total Hispanic[3]			Mexican[4]			Puerto Rican[5]			Central and South American[6]		
	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate
All causes	...	4,964	525.2	...	3,061	511.6	...	471	709.7	...	632	442.9
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	1	1,290	136.5	1	841	140.6	2	79	119.0	1	194	136.0
Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	2	803	85.0	2	464	77.6	1	103	155.2	2	103	72.2
Sudden infant death syndrome (R95)	4	297	31.4	4	177	29.6	3	36	54.2	4	26	18.2
Newborn affected by maternal complications of pregnancy (P01)	3	305	32.3	3	196	32.8	4	35	52.7	3	31	21.7
Accidents (unintentional injuries) (V01–X59)	6	134	14.2	6	92	15.4	8	12	*	12	8	*

... 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 fifth leading cause of death, with 21 deaths and a rate of 44.9.

[2]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 55 deaths and a rate of 22.3.

[3]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 202 deaths and a rate of 21.4.

[4]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 124 deaths and a rate of 20.7.

[5]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 17 deaths.

[6]Newborn affected by complications of placenta, cord and membranes (P02) was the fifth leading cause of death, with 22 deaths and a rate of 15.4.

NOTES: Reliable cause-specific infant mortality rates cannot be computed for Cuban persons because of the small number of infant deaths (64). Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB standards for comparability with other states; see references 2 and 3.

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, 2000–2010 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 preterm-related infant deaths					
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 preterm-related					
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]					
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. Cuban data 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 ICD-10 categories: K550, P000, P010, P011, P015, P020, P021, P027, P070–P073, P102, P220–229, P250–279, P280, P281, P360–369, P520–523, and P77. Race and Hispanic origin are reported separately on birth certificates. Race categories are consistent with 1977 Office of Management and Budget (OMB) 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. Thirty-eight states and the District of Columbia reported multiple-race data on the birth certificate for 2010. The multiple-race data for these states were bridged to the single-race categories of the 1977 OMB 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 National Center for Health Statistics (NCHS) produced linked files in a birth cohort format (42). Beginning with 1995 data, linked files are produced first using a period format. The 2010 period linked file contains a numerator file that consists of all infant deaths occurring in 2010 that have been linked to their corresponding birth certificates, whether the birth occurred in 2009 or in 2010. 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 2010, a record weight was added to the linked file to compensate for the 1.2% of infant death records that could not be linked to their corresponding birth certificates. This procedure was initiated in 1995. Records for Puerto Rico, the Virgin Islands, and Guam were not weighted. The percentage of records linked varied by registration area (95.8%–100.0% with all but three areas—Alaska, California, and Texas—at 97.5% or higher) (Table I). The number of infant deaths in the linked file for the 50 states and 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 2010 linked file started with 24,591 infant death records. Of these 24,591 records, 24,292 were linked; 299 were unlinked because corresponding birth certificates could not be identified. The 24,591 linked and unlinked records contained 19 records of infants whose mother's usual place of residence was outside of United States. These 19 records were excluded to derive a weighted total of 24,572 infant deaths for 2010.

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

The overall infant mortality rate from the 2010 period linked file of 6.14 is nearly the same as the 2010 vital statistics mortality file (6.15) (4). The number of infant deaths in the linked file (24,572) differs slightly from the number in the mortality file (24,586) (4). 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). Weighting of the linked file also may contribute to small differences in numbers and rates by specific variables between these two data sets.

Table I. Percentage of infant death records linked to corresponding birth records: United States and each state, Puerto Rico, Virgin Islands, and Guam, 2010 linked file

Area	Percent linked by state of occurrence of death
United States[1]	98.8
Alabama	100.0
Alaska	97.4
Arizona	97.5
Arkansas	98.9
California	97.4
Colorado	100.0
Connecticut	99.5
Delaware	100.0
District of Columbia	100.0
Florida	100.0
Georgia	98.0
Hawaii	100.0
Idaho	100.0
Illinois	99.2
Indiana	99.0
Iowa	100.0
Kansas	97.7
Kentucky	98.0
Louisiana	98.2
Maine	100.0
Maryland	100.0
Massachusetts	99.4
Michigan	99.1
Minnesota	100.0
Mississippi	99.7
Missouri	98.0
Montana	100.0
Nebraska	100.0
Nevada	99.0
New Hampshire	100.0
New Jersey	98.2
New Mexico	99.2
New York State	99.7
New York City	99.8
North Carolina	99.9
North Dakota	100.0
Ohio	98.8
Oklahoma	98.4
Oregon	99.6
Pennsylvania	99.7
Rhode Island	97.7
South Carolina	100.0
South Dakota	100.0
Tennessee	99.9
Texas	95.8
Utah	99.6
Vermont	100.0
Virginia	99.7
Washington	99.7
West Virginia	100.0
Wisconsin	100.0
Wyoming	100.0
Puerto Rico	91.9
Virgin Islands	100.0
Guam	100.0

[1]Excludes data for Puerto Rico, Virgin Islands, and Guam.

Marital status

National estimates of births to unmarried women are based on two methods of determining marital status. In 2010, marital status was based on a direct question in 49 states and D.C. New York 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 birth certificates in the 2010 data year, multiple race was reported by 38 states and D.C. (both revised and nonrevised): California, Colorado, Delaware, D.C., Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana (after January 1), Maryland, Michigan, Missouri, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina (after January 1), North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, and Wyoming (3). Data from the vital records of the remaining states followed the 1977 Office of Management and Budget standards in which a single race is reported (43,44).

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 (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 (3,8,45).

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 (6% of births) (2,3).

Birthweight

For the linked file, not-stated birthweight was imputed for 3,378 records, or 0.08% of the birth records, in 2010 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 (3.17% before imputation) than for live births (0.10% before imputation). The imputation reduced the percentage of not-stated records to 0.37% for infant deaths and 0.01% 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* (46,47).

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 (48,49).

About every 10–20 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 Tenth Revision (ICD–10) (5); during 1979–1998, causes were coded and classified according to the Ninth Revision (ICD–9) (50).

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 (4,51,52).

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 "NCHS Instruction Manual, Part 9, ICD–10 Cause-of-Death Lists for Tabulating Mortality Statistics, Effective 1999" (53). 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 for 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, because 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 (40,41).

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 (54). 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 (perhaps less 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:

$$\mathrm{RSE}(D) = 100 \bullet \sqrt{\frac{1}{D}},$$

where D is the number of deaths, and

$$\mathrm{RSE}(B) = 100 \bullet \sqrt{\frac{1}{B}},$$

where B is the number of births.

For example, suppose 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.

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

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

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

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

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:

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

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

Thus, for Group A:

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

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

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 less than 100, the confidence interval for the rate can be estimated based on the Poisson distribution using the values in Table II.

Lower: IMR • $L(0.95, D_{adj})$

Upper: IMR • $U(0.95, D_{adj})$

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:

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

$L(0.95, D_{adj})$ and $U(0.95, D_{adj})$ 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) is:

Lower: 5.74 • 0.74907 = 4.30

Upper: 5.74 • 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 rates to be compared (R_1 and R_2) are based on 100 or more deaths, the following z test may be used to define a significance test statistic:

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

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 less than 100

N	*L*	*U*	*N*	*L*	*U*
1	0.02532	5.57164	51	0.74457	1.31482
2	0.12110	3.61234	52	0.74685	1.31137
3	0.20622	2.92242	53	0.74907	1.30802
4	0.27247	2.56040	54	0.75123	1.30478
5	0.32470	2.33367	55	0.75334	1.30164
6	0.36698	2.17658	56	0.75539	1.29858
7	0.40205	2.06038	57	0.75739	1.29562
8	0.43173	1.97040	58	0.75934	1.29273
9	0.45726	1.89831	59	0.76125	1.28993
10	0.47954	1.83904	60	0.76311	1.28720
11	0.49920	1.78928	61	0.76492	1.28454
12	0.51671	1.74680	62	0.76669	1.28195
13	0.53246	1.71003	63	0.76843	1.27943
14	0.54671	1.67783	64	0.77012	1.27698
15	0.55969	1.64935	65	0.77178	1.27458
16	0.57159	1.62394	66	0.77340	1.27225
17	0.58254	1.60110	67	0.77499	1.26996
18	0.59266	1.58043	68	0.77654	1.26774
19	0.60207	1.56162	69	0.77806	1.26556
20	0.61083	1.54442	70	0.77955	1.26344
21	0.61902	1.52861	71	0.78101	1.26136
22	0.62669	1.51401	72	0.78244	1.25933
23	0.63391	1.50049	73	0.78384	1.25735
24	0.64072	1.48792	74	0.78522	1.25541
25	0.64715	1.47620	75	0.78656	1.25351
26	0.65323	1.46523	76	0.78789	1.25165
27	0.65901	1.45495	77	0.78918	1.24983
28	0.66449	1.44528	78	0.79046	1.24805
29	0.66972	1.43617	79	0.79171	1.24630
30	0.67470	1.42756	80	0.79294	1.24459
31	0.67945	1.41942	81	0.79414	1.24291
32	0.68400	1.41170	82	0.79533	1.24126
33	0.68835	1.40437	83	0.79649	1.23965
34	0.69253	1.39740	84	0.79764	1.23807
35	0.69654	1.39076	85	0.79876	1.23652
36	0.70039	1.38442	86	0.79987	1.23499
37	0.70409	1.37837	87	0.80096	1.23350
38	0.70766	1.37258	88	0.80203	1.23203
39	0.71110	1.36703	89	0.80308	1.23059
40	0.71441	1.36172	90	0.80412	1.22917
41	0.71762	1.35661	91	0.80514	1.22778
42	0.72071	1.35171	92	0.80614	1.22641
43	0.72370	1.34699	93	0.80713	1.22507
44	0.72660	1.34245	94	0.80810	1.22375
45	0.72941	1.33808	95	0.80906	1.22245
46	0.73213	1.33386	96	0.81000	1.22117
47	0.73476	1.32979	97	0.81093	1.21992
48	0.73732	1.32585	98	0.81185	1.21868
49	0.73981	1.32205	99	0.81275	1.21746
50	0.74222	1.31838			

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