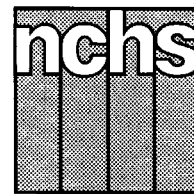




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Infant Mortality Statistics from the Linked Birth/Infant Death Data Set—1995 Period Data

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Abstract

Objectives—This report presents infant mortality statistics from the linked birth/infant death data set (linked file)—1995 period data by a variety of maternal and infant characteristics. Trends in birthweight-specific infant mortality rates from 1985–95 are also discussed.

Methods—Descriptive tabulations of data from the linked file are presented. The data include infant deaths in 1995, which are linked to their corresponding birth certificates, whether the birth occurred in 1995 or 1994. The denominator used to compute infant mortality rates is the National Center for Health Statistics (NCHS) natality file, which includes all births in 1995. Data are weighted to compensate for the 2.5 percent of infant death records that could not be linked to their corresponding birth certificates.

Results—In general, mortality rates were lowest for infants born to Asian and Pacific Islander mothers, followed by white, American Indian, and black mothers. Rates for infants of Hispanic origin mothers were slightly lower than or comparable to those for infants of white mothers, except for infants of Puerto Rican mothers who had higher infant mortality rates. Infant mortality rates were higher for those infants whose mothers began prenatal care after the first trimester of pregnancy, were teenagers or 40 years of age or older, did not complete high school, were unmarried, or smoked during pregnancy. Infant mortality was also higher for male infants, multiple births, and infants born preterm or at low birthweight. In 1995, 63 percent of all infant deaths occurred to the 7.3 percent of infants born at low birthweight. From 1985–95, birthweight-specific infant mortality rates declined most rapidly for infants weighing 750–1,499 grams at birth. The leading causes of infant death varied considerably by race and Hispanic origin. For infants of black mothers, Disorders related to short gestation and unspecified low birthweight was the leading cause of infant death, with an infant mortality rate 4.5 times higher than that for infants of white mothers. For infants of American Indian mothers, rates for Sudden infant death syndrome were 2.9 times and for Accidents and adverse effects 3.6 times higher than those for infants of white mothers. For infants of Hispanic mothers, mortality rates from Sudden infant death syndrome were one-third lower than those for infants of white mothers.

Keywords: infant mortality • infant health • birthweight • maternal characteristics

Introduction

This report presents infant mortality data from the 1995 period linked file. In the linked file the information from the death certificate is linked to the information from the birth certificate for each infant under 1 year of age who dies in the 50 States and the District of Columbia, Puerto Rico, the Virgin Islands, and Guam. 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. This report presents infant mortality data by race and Hispanic origin of the mother, birthweight, period of gestation, sex of infant, plurality, trimester of pregnancy prenatal care began, maternal age, maternal educational attainment, live-birth order, marital status, mother's place of birth, maternal smoking during pregnancy, age at death, and underlying cause of death. Other variables that are available on the linked file data tapes (1), but which are not discussed in this report include: father's age, race, and Hispanic origin; Apgar score; birth attendant; place

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of delivery; alcohol use during pregnancy; weight gain during pregnancy; medical risk factors; method of delivery; obstetric procedures; complications of labor/delivery; and abnormal conditions of newborn.

Methods

Data shown in this report are based on birth and infant death certificates registered in all States and the District of Columbia. As part of the Vital Statistics Cooperative Program (VSCP), each State provided matching birth and death certificate numbers for each infant under 1 year of age who died in the State in 1995. When the birth and death occurred in different States, the State of death was responsible for contacting the State of birth identified on the death certificate to obtain the original birth certificate number. NCHS used the matching birth and death certificate numbers provided by the States to extract final edited data from the NCHS natality and mortality statistical files. These data were linked to form a single statistical record, thereby establishing a national linked record file.

After the initial linkage, NCHS returned computer 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 1995, 97.5 percent of all infant death records were successfully matched to their corresponding birth records.

Differences between period and cohort data

The 1995 period linked file differs from NCHS linked files for 1983–91, which used a birth cohort format. Beginning with 1995 data, linked files will be produced first using a period format and then subsequently using a birth cohort format. For the 1995 *period* linked file, the numerator consists of all infant deaths occurring in 1995 that have been linked to their corresponding birth certificates, whether the birth occurred in 1995 or in 1994. For the 1995 *birth cohort* linked file, the numerator consists of deaths to infants *born* in 1995 whether the death occurred in 1995 or 1996. The denomi-

nator for both files is the 1995 natality file, which contains all U.S. births occurring in 1995. The release of linked file data in two different formats allows NCHS to meet customer demands for more timely linked files while still meeting the needs of data users who prefer the birth cohort format. While the birth cohort format has methodological advantages, it creates substantial delays in data availability, since it is necessary to wait until the close of the following data year to include all infant deaths to the birth cohort. Beginning with 1995 data, the period linked file will form the basis for all official NCHS linked file statistics (except for special cohort studies).

Weighting

Beginning with 1995 data, a record weight was added to the linked file to compensate for the 2.5 percent of infant death records that could not be linked to their corresponding birth certificates. The percent of records linked varied considerably by State (from 84–100 percent, with all but three States—California, Ohio, and Oklahoma—at 95 percent or higher). The percent linked also varied by age at death, from 96.5 percent for infants who died during the first day of life, to 98.0 percent for infants who died during the postneonatal period (28 days–11 months of age). The number of infant deaths in the linked file were weighted to equal the sum of the linked plus unlinked infant deaths by State of residence at birth and age at death (less than 1 day, 1–27 days, and 28 days–11 months). The addition of the weight greatly reduced the potential for bias in comparing infant mortality rates by characteristics.

The 1995 linked file includes 28,767 unweighted infant death records. An additional 750 records could not be linked to their corresponding birth certificates because the birth certificate could not be identified. Thus, the linked file was weighted to match the total of 29,517 linked plus unlinked records. Since the data included in this report are tabulated by place of residence of the mother, 12 infant deaths to mothers whose usual place of residence is outside of the United States were excluded from tables shown in this report, leading to a weighted total of 29,505 infant deaths.

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

Although the time periods are the same, numbers of infant deaths and infant mortality rates in the 1995 period linked file are not identical to the numbers in the 1995 vital statistics mortality file (2). Although the overall infant mortality rate of 7.6 for 1995 is the same between the two data sources, infant mortality rates by characteristics, such as race, Hispanic origin, and cause of death, are not identical. The differences in numbers of infant deaths between the two files can be traced to three different causes:

- geographic coverage differences
- additional quality control
- weighting

Differences in geographic coverage are due to the fact that for the vital statistics mortality file all deaths occurring in the 50 States and the District of Columbia are included regardless of the place of birth of the infant. In contrast, to be included in the linked file, both the birth and death must occur in the 50 States and the District of Columbia. Also, the linkage process subjects infant death records to an additional round of quality control review. Every year, a few records are voided from the file at this stage because they are found to be fetal deaths, deaths at ages greater than 1 year, or duplicate death certificates. Finally, although every effort has been made to design weights that will accurately reflect the distribution of deaths by characteristics, weighting may contribute to small differences in numbers and rates by specific variables between these two data sets.

Data by maternal and infant characteristics

This report represents the first presentation of data from the 1995 period linked file. Descriptive tabulations of infant mortality rates are presented 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. Thus, teenage mothers are more likely to also 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 analysis, and is the aim of the current report.

Race and Hispanic origin data—Infant mortality rates are presented for detailed race and Hispanic origin groups. The linked file is particularly useful for computing accurate infant mortality rates for these groups because the race of the mother from the birth certificate is used in both the numerator and denominator of the infant mortality rate. In contrast, for the vital statistics mortality data—the more “traditional” source of infant mortality data—race information for the denominator is the race of the mother as reported on the birth certificate, whereas the race information for the numerator is the race of the decedent as reported on the death certificate (2). Race information reported on the birth certificate is generally considered to be more accurate than that on the death certificate (3,4). On the birth certificate, race of each parent is usually reported by the mother at the time of delivery, whereas on the death certificate, race of the deceased infant is reported by the funeral director based on information provided by an informant or on observation. This difference in the method of reporting race data has a larger impact for races other than white, and can lead to differences in race-specific infant mortality rates between the two data sources (3,4).

This report presents for the first time infant mortality rates for more detailed Asian and Pacific Islander groups. Beginning with 1992 data, NCHS contracted with the seven States with the highest Asian and Pacific Islander populations to code more detailed race data for five additional Asian and Pacific Islander groups, including Vietnamese, Asian Indian, Korean, Samoan, and Guamanian. The States coding these data for 1995 are: California, Hawaii, Illinois, New Jersey,

New York, Texas, and Washington. More than 60 percent of the U.S. population for each of these additional Asian and Pacific Islander groups lived in the seven-State reporting area: Asian Indian, Korean, and Vietnamese, 62–66 percent; Guamanian, 74 percent; and Samoan, 84 percent (5,6).

Race and Hispanic origin of the mother are reported as separate items on the birth certificate; thus, a mother of Hispanic origin may be of any race. Race and ethnic differentials in infant mortality rates by characteristics may reflect differences in income, educational levels, access to health care, health insurance, and other factors.

Birthweight data—Infant mortality rates for detailed birthweight categories, together with the percent decline in birthweight-specific infant mortality rates from 1985–95 are presented in [table 5](#). The 1985 file is not comparable to the 1995 file because the 1985 file is a birth cohort, while the 1995 file is based on period data (discussed previously), and because weighting (discussed previously) and imputation of not stated birthweight were added to the 1995 (but not the 1985) file. In 1995, for the first time, not stated birthweight was imputed for 2,379 records or 0.06 percent of the birth records included in the linked file. If birthweight was not stated and the period of gestation was known, birthweight was assigned the value from the previous record with the same period of gestation, race, sex, and plurality. If birthweight and period of gestation were both unknown (1,678 records in 1995) the not stated value for birthweight was retained. This imputation was done to improve the accuracy of birthweight-specific infant mortality rates, since the percent of records with not stated birthweight was higher for infant deaths (3.1 percent before imputation) than for surviving infants (0.1 percent before imputation). Because there is a high level of interest in the comparison of birthweight-specific infant mortality over time, the percent changes shown in [table 5](#) were computed by comparing the unweighted, unimputed data for 1985 to the unweighted, unimputed data for 1995. It was felt that this methodology was preferable to comparing unweighted, unimputed data for 1985 with the weighted and imputed

1995 data, since using rates computed based on different methodologies could lead to artifactual differences in infant mortality rates between the two periods.

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 additional information on the measurement of marital status, period of gestation, and birthweight are presented in the [Technical notes](#).

Results and Discussion

Infant mortality by race and Hispanic origin of mother

In 1995, the overall infant mortality rate from the linked file was 7.6 infant deaths per 1,000 live births, the same as the rate derived from the vital statistics mortality data (2). A detailed discussion of trends in infant mortality is included in another report (2). Mortality rates varied considerably by race of mother ([table A](#)). Mortality rates were lowest for infants born to Asian and Pacific Islander mothers (5.3), followed by white (6.3), American Indian (9.0), and black (14.6) mothers. When these differentials are examined by age at death, it is apparent that the high mortality rate for infants of American Indian mothers is due primarily to a postneonatal mortality rate, which is 2.3 times that for infants of white mothers. For infants of black mothers, both neonatal and postneonatal mortality rates are 2.3 times those for infants of white mothers.

Among the Asian groups enumerated in the seven-State reporting area, infant mortality rates ranged from 3.5 for infants of Korean mothers to 5.8 for Vietnamese mothers ([table B](#)). Among the Pacific Islander groups, infant mortality rates were lower for infants of Hawaiian mothers (6.5) than for infants of Samoan (12.4) mothers. It was not possible to compute reliable rates for infants of Guamanian mothers because of the small number of infant deaths.

Table A. Infant, neonatal, and postneonatal deaths and mortality rates by specified race or national origin of mother: United States, 1995 linked file

[Rate per 1,000 live births in specified group]

Race of mother	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant mortality rate	Neonatal mortality rate	Postneonatal mortality rate
All races	3,899,589	29,505	19,186	10,319	7.6	4.9	2.6
White	3,098,885	19,529	12,700	6,829	6.3	4.1	2.2
Black	603,139	8,793	5,798	2,994	14.6	9.6	5.0
American Indian ¹	37,278	337	147	190	9.0	3.9	5.1
Asian or Pacific Islander	160,287	845	540	305	5.3	3.4	1.9
Chinese	27,380	104	63	41	3.8	2.3	1.5
Japanese	8,901	47	29	18	5.3	3.3	*
Hawaiian	5,787	38	23	14	6.6	4.0	*
Filipino	30,551	171	104	68	5.6	3.4	2.2
Other Asian or Pacific Islander	87,668	485	321	164	5.5	3.7	1.9

* Figure does not meet standard of reliability or precision.
¹Includes Aleuts and Eskimos.

Table B. Infant, neonatal, and postneonatal deaths and mortality rates by race or national origin of mother: Total of 7 States, 1995 linked file

[Rate per 1,000 live births in specified group]

Race of mother	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant mortality rate	Neonatal mortality rate	Postneonatal mortality rate
All races	1,542,630	10,712	6,930	3,782	6.9	4.5	2.5
Total Asian or Pacific Islander	111,986	576	368	205	5.1	3.3	1.8
Asian:							
Chinese	21,107	75	45	30	3.6	2.1	1.4
Japanese	7,003	34	21	13	4.9	3.0	*
Filipino	24,961	134	81	52	5.4	3.2	2.1
Vietnamese	11,710	68	50	18	5.8	4.3	*
Asian Indian	12,025	64	45	19	5.3	3.7	*
Korean	8,457	30	20	10	3.5	2.4	*
Pacific Islander:							
Hawaiian	5,373	35	21	13	6.5	3.9	*
Samoan	1,613	20	12	7	12.4	*	*
Guamanian	517	2	1	1	*	*	*
Remaining Asian or Pacific Islander	19,220	114	72	42	5.9	3.7	2.2
White	1,225,992	7,332	4,798	2,534	6.0	3.9	2.1
Black	197,206	2,754	1,743	1,011	14.0	8.8	5.1
American Indian ¹	7,446	51	20	31	6.8	2.7	4.2

* Figure does not meet standard of reliability or precision.
¹Includes Aleuts and Eskimos.

NOTE: States included are California, Hawaii, Illinois, New Jersey, New York, Texas, and Washington.

Mortality rates for infants born to Hispanic origin mothers ranged from 5.3 for Cuban mothers to 8.9 for Puerto Rican mothers (table C). For infants of Puerto Rican mothers, the neonatal mortality rate was 53 percent higher than for non-Hispanic white mothers. Postneonatal mortality was also 27 percent higher for infants of Puerto Rican than for infants of non-Hispanic white mothers, although the difference was not statistically significant.

Infant mortality by selected infant and maternal characteristics

Infant mortality rates by a variety of infant and maternal characteristics are presented in table 1 for infants of white, black, American Indian, and Asian and Pacific Islander mothers and in table 2 for infants of Hispanic mothers.

Sex of infant—The infant mortality rate for all races combined was 8.3 for male infants, 22 percent higher than the rate of 6.8 for female infants. Infant mortality rates were higher for male than for female infants for each race and

Hispanic origin group, although the percent higher varied slightly by race and ethnicity.

Multiple births—The infant mortality rate was 35.5 for plural births, about five times the rate of 6.8 for single births. The risk of infant death increases with increasing number of infants in the pregnancy (7). Multiple pregnancy can lead to an accentuation of maternal risks and complications associated with pregnancy (8). Multiple births are also much more likely to be born preterm and at low birthweight, and thus at higher risk for infant death (7–9).

Table C. Infant, neonatal, and postneonatal deaths and mortality rates by Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file

[Rate per 1,000 live births in specified group]

Hispanic origin and race of mother	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant mortality rate	Neonatal mortality rate	Postneonatal mortality rate
All origins ¹	3,899,589	29,505	19,186	10,319	7.6	4.9	2.6
Total Hispanic	679,768	4,263	2,806	1,457	6.3	4.1	2.1
Mexican	469,615	2,833	1,850	982	6.0	3.9	2.1
Puerto Rican	54,824	487	335	152	8.9	6.1	2.8
Cuban	12,473	66	45	21	5.3	3.6	1.7
Central and South American	94,996	524	347	177	5.5	3.7	1.9
Other and unknown Hispanic	47,860	353	229	125	7.4	4.8	2.6
Non-Hispanic total ²	3,160,495	24,696	15,955	8,741	7.8	5.0	2.8
Non-Hispanic white	2,382,638	14,957	9,632	5,325	6.3	4.0	2.2
Non-Hispanic black	587,781	8,611	5,671	2,941	14.7	9.6	5.0
Not stated	59,326	546	425	120	...	...	...

... Category not applicable.

¹Origin of mother not stated included in "All origins" but not distributed among origins.

²Includes races other than white and black.

Birthweight and period of gestation—Birthweight and period of gestation are the two most important predictors of an infant’s subsequent health and survival. Infants born too small and too soon have a much greater risk of death and disability than those born at term (37–41 weeks of gestation) or with birthweights of 2,500 grams or more. The percent of infants born at low birthweight (less than 2,500 grams) ranged from a low of 6 percent for births to Chinese mothers to a high of 16 percent for births to black mothers (tables 3 and 4). The percent of preterm births (those born before 37 weeks of gestation) ranged from a low of 7 percent for births to Chinese mothers to a high of 18 percent for births to black mothers. Infant mortality rates were much higher for low birthweight infants than for infants with birthweights of 2,500 grams or more for all race and ethnic groups studied. Overall, the infant mortality rate for very low birthweight infants (those with birthweights of less than 1,500 grams) was 268.4, 89 times the rate of 3.0 for infants with birthweights of 2,500 grams or more. The rate for moderately low birthweight infants (those with birthweights of 1,500–2,499 grams) was 18.2, about six times the rate for infants with birthweights of 2,500 grams or more. Similarly, very preterm infants (those born at less than 28 weeks of gestation) had 136 times the mortality risk of infants born at term (37–41 weeks of gestation), and moderately preterm infants (those born at 28–36 weeks of gestation) were five

times more likely to die in infancy than infants born at term. The relationship between birthweight and infant death is discussed in more detail in the next section.

Prenatal care—The timing and quality of prenatal care received by the mother during pregnancy are also important to the infant’s subsequent health and survival (10). In general, infant mortality is lower for women who begin prenatal care in the first trimester of pregnancy than for those who begin care after the first trimester or not at all. However, for all races combined, infants of mothers who began prenatal care in the third trimester had a lower infant mortality rate (7.5) than those who began care in the second trimester (8.0). This is because women who began prenatal care in the third trimester had to have a period of gestation of at least 7 months, thereby reducing the probability that the infant would be born preterm or at low birthweight (11). Because the relationship between month of pregnancy prenatal care began and period of gestation is complex, prenatal care data for the purposes of this report are grouped into two groups: mothers beginning prenatal care in the first trimester and those beginning prenatal care after the first trimester or not at all.

Proportions of mothers beginning prenatal care in the first trimester of pregnancy ranged from a low of 67 percent for infants of American Indian mothers to a high of 89 percent for infants of Cuban mothers (tables 3 and

4). For all races combined, infants of mothers who began prenatal care during the first trimester of pregnancy had an infant mortality rate of 6.6, substantially lower than the rate of 9.9 for infants of mothers beginning care after the first trimester or not at all. For each race and Hispanic-origin group, infants of mothers who began prenatal care during the first trimester had lower infant mortality rates than infants of mothers who began care after the first trimester or not at all, although for infants of Mexican and Central and South American mothers, the differences were not statistically significant. For infants of Cuban mothers there were not enough infant deaths in the “after first trimester” category to compute reliable rates.

Maternal age—The percent of births to teenage mothers ranged from a low of 1 percent for Chinese mothers to a high of 23–24 percent for black and Puerto Rican mothers (tables 3 and 4). Infant mortality exhibits a curvilinear relationship with maternal age with rates being highest for teenage mothers, lowest for mothers in their late twenties and early thirties, and again higher for mothers in their forties. Infant mortality rates were higher for infants of teenage mothers than for infants of mothers in their twenties for all race and ethnic groups, although the differences were not statistically significant for infants of black, American Indian, and Asian and Pacific Islander mothers. For Cuban mothers there were not enough infant deaths to teenage mothers to be able to compute reliable

rates. Infant mortality rates were also higher for women in their forties than for women in their twenties and thirties for all race and ethnic groups for whom there was sufficient data to compute reliable rates. Rates could not be computed for women in their forties for Puerto Rican, Cuban, and American Indian mothers. Recent studies suggest that the higher mortality risk for younger mothers may be related to the preponderance of teenage mothers who are from disadvantaged backgrounds, while for older mothers, both biological and sociological factors may play a role (12–15).

Maternal education—The percent of births to mothers who had completed high school or more ranged from a low of 41 percent for Mexican mothers to a high of 97 percent for Japanese mothers (tables 3 and 4). In general, infant mortality rates decrease with increasing levels of maternal education (tables 1 and 2). These differentials may reflect in part socioeconomic differences because women with more education tend to have higher family income levels (16). However, for all races combined and for white mothers, infant mortality rates were lower for infants of mothers with 0–8 years of education than for infants of mothers with 9–11 years of education, due in part to the very different population composition of the women with 0–8 years of education, most of whom were born outside the 50 States and the District of Columbia (17). In general, infants of women born outside the 50 States and the District of Columbia have lower infant mortality rates than infants of women born in the 50 States and the District of Columbia (see section on Nativity). Differences in infant mortality rates between mothers with 0–8 years and 9–11 years of education were not statistically significant for the other race and Hispanic origin groups.

Live-birth order—The proportion of women with fourth- and higher-order births ranged from a low of 3 percent for Chinese mothers to a high of 20 percent for American Indian mothers. Infant mortality rates generally increase with increasing birth order, although first births were also at higher risk compared with second births for the total population, white, black, Hispanic, and non-Hispanic white mothers.

Marital status—The percent of births to unmarried women ranged from a low of 8 percent for Chinese mothers to a high of 70 percent for black mothers. For all races combined, the infant mortality rate was 11.0 for unmarried women, higher than the rate of 5.9 for married women. Infant mortality rates were higher for infants of unmarried than of married women for all of the race and ethnic groups studied, although the differences were not statistically significant for infants of American Indian and Cuban mothers. Marital status interacts with a wide variety of other factors, such as the degree of economic and social support for the mother and child; whether or not the pregnancy was wanted; as well as maternal age, educational level, and prenatal care attendance (18–20).

Nativity—The percent of births to mothers born in the 50 States and the District of Columbia ranged from a low of 8–9 percent for Central and South American and Chinese mothers to a high of 95–98 percent for American Indian, Hawaiian, and non-Hispanic white mothers. The overall infant mortality rate for infants of mothers born in the 50 States and the District of Columbia was 7.8, higher than the rate of 5.8 for infants of mothers born elsewhere. A variety of different hypotheses have been advanced to account for this difference. These include possible differences in level of familial integration and social support for new mothers between women born in the 50 States and the District of Columbia and those born elsewhere (21–22), and differences in the characteristics of women born in the 50 States and the District of Columbia and those born elsewhere with regard to socioeconomic and educational status and risk behaviors such as smoking and alcohol use (22–23).

Maternal smoking—The percentage of women who smoked during pregnancy ranged from a low of 1 percent for Chinese mothers to a high of 21 percent for American Indian mothers. For all races combined, the infant mortality rate for smokers (11.5) was substantially higher than the rate for nonsmokers (7.1). Infant mortality rates were higher for mothers who smoked during pregnancy for all race and ethnic groups, except for infants of Cuban and Central and South

American women for whom there were insufficient numbers of infant deaths to be able to compute reliable rates for smokers. Smoking increases the risk of low birthweight, preterm delivery, intrauterine growth retardation, and infant mortality (24–25).

Birthweight-specific infant mortality

Birthweight is one of the most important predictors of the subsequent health and survival of an infant. In 1995, 63 percent of all infant deaths occurred to the 7.3 percent of infants born at low birthweight. More than 9 of 10 infants with birthweights of less than 500 grams die within the first year of life—most within the first few days of life (table 5 and figure 1). An infant's chances of survival increase rapidly thereafter with increasing birthweight. At birthweights of 1,250–1,499 grams, about 95 out of 100 infants now survive the first year of life. Infant mortality rates are lowest for white infants at birthweights of 4,000–4,499 grams and for black infants at birthweights of 3,500–3,999 grams, with small increases among the heaviest infants. Infant mortality rates are lower for black than for white infants at individual birthweight categories under 2,500 grams, but are higher at birthweights of 2,500 grams or more.

From 1985–95, infant mortality rates declined most rapidly (by 50–56 percent) for infants weighing 750–1,499 grams at birth, and by 35–39 percent for infants with birthweights between 1,500–2,499 grams. Infant mortality rates declined by 31 percent for infants at birthweights of 500–749 grams and, coincidentally, for those weighing 2,500 grams or more. In contrast, mortality rates for infants born at less than 500 grams birthweight declined by less than 2 percent during the decade, reflecting the limited success of intensive efforts made to save these very small infants. For the few infants who do survive at these very low birthweights, many suffer lifetime disabilities such as blindness, mental retardation, and neurological disorders, necessitating increased levels of medical and parental care (26–28).

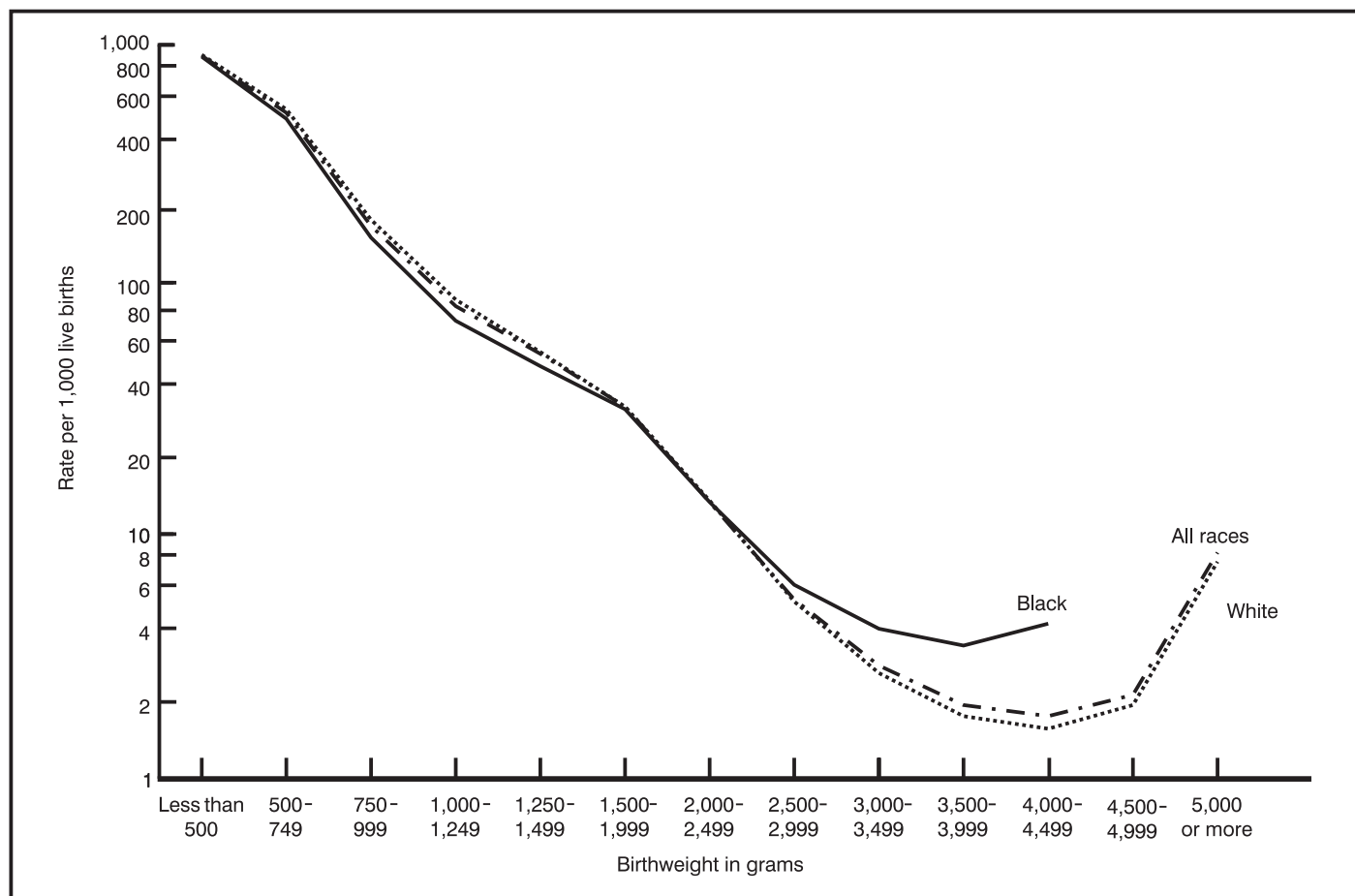


Figure 1. Infant mortality rates by birthweight: United States, 1995 linked file

Leading causes of infant death

Infant mortality rates for the five leading causes of death by race and ethnicity are presented in table 6. For the total population, Congenital anomalies was the leading cause of infant death in 1995, followed by Disorders relating to short gestation and unspecified low birthweight (low birthweight), Sudden infant death syndrome (SIDS), Respiratory distress syndrome (RDS), and Newborn affected by maternal complications of pregnancy (maternal complications). For infants of white mothers, Congenital anomalies was the leading cause of infant death, followed by SIDS and low birthweight. For infants of black mothers, mortality rates from Congenital anomalies were 15 percent higher than for infants of white mothers. For low birthweight, the rate was 294.5 for infants of black mothers, 4.5 times the rate of 65.8 for infants of white mothers. For SIDS, RDS, and maternal complications, rates were 2.3–2.7 times higher for infants of black than for infants of white mothers.

The high mortality rates for infants of black mothers from low birthweight made it the leading cause of death for infants of black mothers in 1995.

For infants of American Indian mothers, mortality rates were much higher than those for infants of white mothers for SIDS and for Accidents and adverse effects. The SIDS rate for infants of American Indian mothers was 206.6, 2.9 times the rate of 72.3 for infants of white mothers. In 1995, SIDS accounted for nearly one-fourth of all infant deaths to American Indian mothers. As most SIDS deaths occur during the postneonatal period, the high SIDS rate for infants of American Indian mothers accounts for much of the elevated risk of postneonatal mortality for infants of American Indian mothers. Infant mortality rates from Accidents and adverse effects were also substantially higher for infants of American Indian mothers than for infants of white mothers. Accidents and adverse effects was tied with low birthweight for the third leading cause of

death for infants of American Indian mothers. The rate was 61.7 for infants of American Indian mothers, 3.6 times the rate of 17.1 for infants of white mothers. American Indian infant mortality rates for Congenital anomalies and low birthweight were slightly lower or comparable to those for infants of white mothers.

For infants of Asian and Pacific Islander mothers, infant mortality rates were lower than those for white mothers for each of the five leading causes of infant death. The most notable finding for infants of Hispanic mothers was their much lower infant mortality rate from SIDS. The SIDS rate for infants of Hispanic mothers was 47.7, about one-third lower than the rate of 72.3 for infants of white mothers.

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List of detailed tables

1. Infant mortality rates, live births, and infant deaths by selected characteristics and specified race of mother: United States, 1995 linked file 9
2. Infant mortality rates, live births, and infant deaths by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file 13
3. Percent of live births with selected maternal and infant characteristics by specified race of mother: United States, 1995 linked file 17
4. Percent of live births with selected maternal and infant characteristics by Hispanic origin of mother and race of mother for mothers of non-Hispanic origin: United States, 1995 linked file 17
5. Live births, infant, neonatal, and postneonatal deaths and mortality rates by race of mother and birthweight: United States, 1995 linked file, and percent change in birthweight-specific infant mortality rates, 1985 birth cohort-1995 period linked files 18
6. Infant deaths and mortality rates for the 5 leading causes of infant death by race and Hispanic origin of mother: United States, 1995 linked file 19

Table 1. Infant mortality rates, live births, and infant deaths by selected characteristics and specified race of mother: United States, 1995 linked file

[Rates per 1,000 live births in specified group]

Characteristics	All races	Race of mother			
		White	Black	American Indian ¹	Asian/Pacific Islander
Infant mortality rates					
Total	7.6	6.3	14.6	9.0	5.3
Age at death					
Total neonatal	4.9	4.1	9.6	4.0	3.4
Early neonatal	4.0	3.3	8.0	3.3	2.7
Late neonatal	0.9	0.8	1.6	0.6	0.7
Postneonatal	2.6	2.2	5.0	5.1	1.9
Sex					
Male	8.3	7.0	15.8	8.3	5.8
Female	6.8	5.6	13.3	9.8	4.8
Plurality					
Single births	6.8	5.6	13.3	8.4	5.0
Plural births	35.5	31.1	58.5	36.8	22.0
Birthweight					
Less than 1,500 grams	268.4	260.6	285.6	236.7	239.8
1,500–2,499 grams	18.2	18.3	18.2	21.4	16.6
2,500 grams or more	3.0	2.7	4.5	5.4	2.2
Period of gestation					
Less than 28 weeks	421.1	431.7	408.4	372.0	396.9
28–36 weeks	15.9	15.3	17.8	16.1	14.8
37–41 weeks	3.1	2.8	4.7	5.2	2.3
42 weeks or more	3.5	3.2	5.5	6.1	1.8
Trimester of pregnancy prenatal care began					
First trimester	6.6	5.6	13.0	7.9	4.9
After first trimester or no care	9.9	8.1	15.6	10.0	5.8
Second trimester	8.0	7.0	11.7	7.7	5.0
Third trimester	7.5	6.7	10.0	9.4	5.6
No prenatal care	37.9	28.9	53.3	36.8	25.6
Age of mother					
Under 20 years	10.8	9.4	14.5	9.9	8.2
20–24 years	8.4	7.0	14.2	8.9	6.0
25–29 years	6.5	5.4	14.2	8.5	4.5
30–34 years	6.2	5.2	14.7	8.3	4.5
35–39 years	7.3	6.0	16.8	10.5	6.1
40–49 years	9.0	7.8	18.1	*	8.1
Educational attainment of mother					
0–8 years	8.1	7.4	16.1	12.8	6.4
9–11 years	10.4	8.8	15.6	11.8	6.0
12 years	8.0	6.6	14.5	8.0	5.7
13–15 years	6.3	5.2	12.3	5.6	5.0
16 years	4.7	4.2	11.3	*	4.0
Live-birth order					
1	7.3	6.2	13.9	7.1	4.8
2	6.8	5.8	13.1	9.7	4.8
3	7.5	6.2	14.3	9.4	6.4
4	9.5	7.6	16.7	9.2	6.5
5 or more	12.7	9.6	21.4	12.7	8.9

See footnotes at end of table.

Table 1. Infant mortality rates, live births, and infant deaths by selected characteristics and specified race of mother: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All races	Race of mother			
		White	Black	American Indian ¹	Asian/ Pacific Islander
Marital status					
Married.	5.9	5.5	12.4	7.8	4.8
Unmarried.	11.0	8.8	15.5	10.0	7.5
Mother's place of birth					
Born in the 50 States and D.C.	7.8	6.3	14.6	9.1	6.3
Born elsewhere.	5.8	5.5	10.9	*	5.0
Maternal smoking during pregnancy²					
Smoker	11.5	9.8	22.1	12.6	11.1
Nonsmoker	7.1	5.7	13.5	7.6	5.0
Live births					
Total	3,899,589	3,098,885	603,139	37,278	160,287
Sex					
Male	1,996,355	1,588,427	306,115	19,002	82,811
Female.	1,903,234	1,510,458	297,024	18,276	77,476
Plurality					
Single births.	3,797,880	3,018,184	585,787	36,489	157,420
Plural births.	101,709	80,701	17,352	789	2,867
Birthweight					
Less than 1,500 grams	53,026	33,043	18,093	414	1,476
1,500–2,499 grams	232,950	160,040	61,242	2,052	9,616
2,500 grams or more	3,611,935	2,904,634	523,420	34,775	149,106
Not stated	1,678	1,168	384	37	89
Period of gestation					
Less than 28 weeks	27,478	15,736	10,890	207	645
28–36 weeks	396,977	282,822	94,824	4,357	14,974
37–41 weeks	3,103,152	2,500,946	443,354	28,339	130,513
42 weeks or more	335,513	271,485	49,048	3,946	11,034
Not stated	36,469	27,896	5,023	429	3,121
Trimester of pregnancy prenatal care began					
First trimester.	3,094,402	2,538,067	407,723	24,232	124,380
After first trimester or no care	713,044	498,267	171,487	12,092	31,198
Second trimester	551,366	390,867	127,360	8,658	24,481
Third trimester	114,986	79,729	27,026	2,646	5,585
No prenatal care	46,692	27,671	17,101	788	1,132
Not stated	92,143	62,551	23,929	954	4,709
Age of mother					
Under 20 years.	512,115	355,489	139,621	7,967	9,038
20–24 years.	965,547	743,123	183,435	11,969	27,020
25–29 years.	1,063,539	873,022	133,535	8,571	48,411
30–34 years.	904,666	754,662	96,084	5,777	48,143
35–39 years.	383,745	316,166	42,507	2,488	22,584
40–49 years.	69,977	56,423	7,957	506	5,091

See footnotes at end of table.

Table 1. Infant mortality rates, live births, and infant deaths by selected characteristics and specified race of mother: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All races	Race of mother			
		White	Black	American Indian ¹	Asian/Pacific Islander
Educational attainment of mother					
Live births					
0–8 years	237,980	204,203	20,220	1,637	11,920
9–11 years	629,572	456,596	149,357	10,415	13,204
12 years	1,307,228	1,014,383	234,646	14,874	43,325
13–15 years	845,110	673,968	130,720	7,327	33,095
16 years or more	820,325	707,280	56,093	2,253	54,699
Not stated	59,374	42,455	12,103	772	4,044
Live-birth order					
1	1,610,453	1,287,470	237,638	13,627	71,718
2	1,243,433	1,008,994	171,623	9,927	52,889
3	617,755	491,536	99,694	6,195	20,330
4	237,647	179,355	47,604	3,577	7,111
5 or more	162,421	109,574	42,006	3,792	7,049
Not stated	27,880	21,956	4,574	160	1,190
Marital status					
Married	2,645,613	2,313,893	181,650	15,946	134,124
Unmarried	1,253,976	784,992	421,489	21,332	26,163
Mother's place of birth					
Born in the 50 States and D.C	3,169,962	2,567,203	540,759	35,811	26,189
Born elsewhere	719,995	525,840	59,178	1,374	133,603
Not stated	9,632	5,842	3,202	93	495
Maternal smoking during pregnancy ²					
Smoker	427,035	361,287	56,107	6,412	3,229
Nonsmoker	2,636,094	2,044,659	474,991	24,311	92,133
Not stated	45,789	35,172	8,075	869	1,673
Infant deaths					
Total	29,505	19,529	8,793	337	846
Age at death					
Total neonatal	19,186	12,700	5,798	147	540
Early neonatal	15,483	10,101	4,822	124	435
Late neonatal	3,703	2,599	976	24	104
Postneonatal	10,319	6,829	2,994	190	306
Sex					
Male	16,580	11,118	4,828	158	477
Female	12,924	8,411	3,965	179	369
Plurality					
Single births	25,891	17,022	7,778	308	783
Plural births	3,614	2,507	1,015	29	63
Birthweight					
Less than 1,500 grams	14,230	8,610	5,167	98	354
1,500–2,499 grams	4,241	2,923	1,114	44	160
2,500 grams or more	10,680	7,795	2,376	187	323
Not stated	353	200	136	8	9

See footnotes at end of table.

Table 1. Infant mortality rates, live births, and infant deaths by selected characteristics and specified race of mother: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All races	Race of mother			
		White	Black	American Indian ¹	Asian/Pacific Islander
Period of gestation		Infant deaths			
Less than 28 weeks	11,572	6,793	4,447	77	256
28–36 weeks	6,308	4,325	1,692	70	221
37–41 weeks	9,493	6,960	2,083	146	303
42 weeks or more	1,169	856	269	24	20
Not stated	963	595	301	21	45
Trimester of pregnancy prenatal care began					
First trimester	20,384	14,282	5,300	192	609
After first trimester or no care	7,037	4,060	2,675	121	182
Second trimester	4,405	2,722	1,494	67	122
Third trimester	863	537	270	25	31
No prenatal care	1,769	801	911	29	29
Not stated	2,085	1,187	819	24	55
Age of mother					
Under 20 years	5,527	3,346	2,028	79	74
20–24 years	8,064	5,195	2,602	106	162
25–29 years	6,871	4,691	1,890	73	217
30–34 years	5,620	3,943	1,415	48	215
35–39 years	2,789	1,911	714	26	137
40–49 years	633	442	144	6	41
Educational attainment of mother					
0–8 years	1,932	1,510	326	21	76
9–11 years	6,570	4,037	2,332	123	79
12 years	10,433	6,670	3,398	119	247
13–15 years	5,318	3,505	1,605	41	167
16 years or more	3,824	2,953	636	15	221
Not stated	1,427	855	496	20	56
Live-birth order					
1	11,683	7,950	3,295	97	341
2	8,421	5,823	2,249	96	253
3	4,664	3,048	1,427	58	131
4	2,247	1,372	796	33	46
5 or more	2,060	1,052	897	48	63
Not stated	430	284	129	4	12
Marital status					
Married	15,659	12,630	2,257	124	648
Unmarried	13,846	6,899	6,536	214	197
Mother's place of birth					
Born in the 50 States and D.C	24,637	16,271	7,873	327	166
Born elsewhere	4,183	2,868	644	7	663
Not stated	686	390	276	3	16
Maternal smoking during pregnancy²					
Smoker	4,893	3,536	1,239	81	36
Nonsmoker	18,623	11,583	6,391	185	463
Not stated	729	467	234	8	19

* Figure does not meet standards of reliability or precision.

¹Includes Aleuts and Eskimos.

²Excludes data from California, Indiana, New York State (but includes New York City), and South Dakota, which did not require reporting of tobacco use during pregnancy.

NOTE: Infant deaths are weighted so numbers may not exactly add to totals due to rounding. Not stated responses were included in totals but not distributed among groups for rate computations.

Table 2. Infant mortality rates, live births, and infant deaths by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file

[Rates per 1,000 live births in specified group]

Characteristics	All origins ¹	Origin of mother									
		Hispanic						Non-Hispanic			
		Total	Mexican	Puerto Rican	Cuban	Central and South American	Other and unknown Hispanic	Total ²	White	Black	Not stated
Infant mortality rates											
Total	7.6	6.3	6.0	8.9	5.3	5.5	7.4	7.8	6.3	14.7	...
Age at death											
Total neonatal	4.9	4.1	3.9	6.1	3.6	3.7	4.8	5.0	4.0	9.6	...
Early neonatal	4.0	3.3	3.1	4.9	2.2	3.0	4.1	4.1	3.2	8.0	...
Late neonatal	0.9	0.8	0.8	*	1.3	0.7	0.7	1.0	0.8	1.6	...
Postneonatal	2.6	2.1	2.1	2.8	1.7	1.9	2.6	2.8	2.2	5.0	...
Sex											
Male	8.3	6.8	6.6	10.0	5.1	5.9	7.9	8.6	7.0	15.9	...
Female	6.8	5.7	5.5	7.7	5.5	5.1	6.9	7.0	5.5	13.4	...
Plurality											
Single births	6.8	5.7	5.5	8.1	4.6	5.1	6.8	7.0	5.6	13.3	...
Plural births	35.5	35.4	36.4	42.9	*	29.0	31.4	35.5	30.1	58.8	...
Birthweight											
Less than 1,500 grams	268.4	263.2	264.4	276.8	209.5	244.0	275.1	267.9	257.9	285.1	...
1,500–2,499 grams	18.2	17.7	19.2	15.1	*	15.2	13.7	18.3	18.4	18.2	...
2,500 grams or more	3.0	2.5	2.5	2.8	1.8	2.0	3.0	3.1	2.7	4.6	...
Period of gestation											
Less than 28 weeks	421.1	388.9	386.0	430.7	333.3	347.6	423.0	424.8	443.2	407.5	...
28–36 weeks	15.9	13.0	12.9	13.8	*	12.3	13.7	16.4	16.0	17.9	...
37–41 weeks	3.1	2.7	2.7	3.2	2.1	2.3	3.3	3.1	2.8	4.7	...
42 weeks or more	3.5	2.9	3.0	*	*	*	*	3.6	3.2	5.6	...
Trimester of pregnancy prenatal care began											
First trimester	6.6	5.8	5.8	7.2	4.9	5.0	6.3	6.7	5.6	13.1	...
After first trimester											
or no care	9.9	6.5	6.2	10.8	*	5.2	7.7	11.1	9.2	15.7	...
Second trimester	8.0	5.6	5.3	9.7	*	4.8	5.9	8.9	7.8	11.8	...
Third trimester	7.5	5.2	5.6	*	*	*	*	8.5	7.8	10.1	...
No prenatal care	37.9	19.8	17.2	41.9	*	20.8	33.4	44.8	36.6	53.5	...
Age of mother											
Under 20 years	10.8	8.1	7.2	12.4	*	8.4	9.8	11.6	10.1	14.5	...
20–24 years	8.4	5.9	5.6	8.4	*	5.2	8.0	9.0	7.4	14.2	...
25–29 years	6.5	5.3	5.4	5.7	*	4.5	6.0	6.6	5.3	14.3	...
30–34 years	6.2	5.9	5.9	9.1	*	4.8	5.8	6.2	5.1	14.8	...
35–39 years	7.3	7.2	7.3	9.4	*	6.6	7.4	7.2	5.8	17.0	...
40–49 years	9.0	9.9	10.3	*	*	10.9	*	8.9	7.3	18.6	...
Educational attainment of mother											
0–8 years	8.1	6.1	6.2	10.2	*	5.2	6.1	12.2	11.7	16.8	...
9–11 years	10.4	6.8	6.1	11.5	*	6.4	8.7	12.0	10.3	15.7	...
12 years	8.0	6.1	5.8	7.6	*	6.1	6.9	8.3	6.7	14.6	...
13–15 years	6.3	5.4	5.5	6.7	*	3.9	5.7	6.4	5.2	12.4	...
16 years and over	4.7	4.4	4.4	5.8	*	3.5	4.7	4.7	4.2	11.4	...
Live-birth order											
1	7.3	6.4	6.0	8.9	6.4	5.8	8.3	7.4	6.1	14.0	...
2	6.8	5.5	5.5	7.9	*	4.7	5.5	7.0	5.8	13.1	...
3	7.5	5.8	5.7	8.0	*	4.6	6.8	7.9	6.3	14.4	...
4	9.5	7.1	6.7	10.5	*	6.5	9.3	10.1	7.8	16.9	...
5 or more	12.7	8.8	8.4	12.4	*	9.7	*	14.0	10.1	21.4	...

See footnotes at end of table.

Corrected data appear in shaded area.

Table 2. Infant mortality rates, live births, and infant deaths by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All origins ¹	Origin of mother									
		Hispanic						Non-Hispanic			
		Total	Mexican	Puerto Rican	Cuban	Central and South American	Other and unknown Hispanic	Total ²	White	Black	Not stated
Infant mortality rates											
Married	5.9	5.6	5.7	6.8	4.7	4.7	5.8	6.0	5.4	12.5	...
Unmarried	11.0	7.2	6.5	10.2	7.1	6.5	9.4	12.1	9.5	15.6	...
Mother's place of birth											
U.S. born	7.8	7.2	6.9	8.9	5.6	5.9	7.4	7.8	6.2	14.6	...
Foreign born	5.8	5.6	5.4	8.6	5.1	5.5	5.9	6.1	5.1	11.2	...
Maternal smoking during pregnancy ³											
Smoker	11.5	12.2	12.8	12.0	*	*	12.2	11.4	9.7	22.2	...
Nonsmoker	7.1	6.2	6.0	8.6	5.3	5.3	6.9	7.2	5.5	13.6	...
Live births											
Total	3,899,589	679,768	469,615	54,824	12,473	94,996	47,860	3,160,495	2,382,638	587,781	59,326
Sex											
Male	1,996,355	346,782	239,432	28,163	6,391	48,495	24,301	1,619,189	1,222,878	298,366	30,384
Female	1,903,234	332,986	230,183	26,661	6,082	46,501	23,559	1,541,306	1,159,760	289,415	28,942
Plurality											
Single births	3,797,880	666,728	461,072	53,541	12,137	93,168	46,810	3,073,597	2,316,218	570,819	57,555
Plural births	101,709	13,040	8,543	1,283	336	1,828	1,050	86,898	66,420	16,962	1,771
Birthweight											
Less than 1,500 grams	53,026	7,607	4,762	997	148	1,082	618	44,504	24,969	17,736	915
1,500–2,499 grams	232,950	35,207	22,559	4,173	662	4,813	3,000	194,224	122,942	60,057	3,519
2,500 grams or more	3,611,935	636,774	442,189	49,624	11,660	89,083	44,218	2,920,601	2,234,018	509,635	54,560
Not stated	1,678	180	105	30	3	18	24	1,166	709	353	332
Period of gestation											
Less than 28 weeks	27,478	3,906	2,451	534	78	538	305	23,087	11,610	10,676	485
28–36 weeks	396,977	68,871	46,210	6,728	1,172	9,514	5,247	322,561	211,113	92,929	5,545
37–41 weeks	3,103,152	534,935	368,562	42,457	10,240	76,051	37,625	2,521,356	1,936,644	431,627	46,861
42 weeks or more	335,513	59,489	42,135	4,585	932	7,668	4,169	271,219	209,121	47,781	4,805
Not stated	36,469	12,567	10,257	520	51	1,225	514	22,272	14,150	4,768	1,630
Trimester of pregnancy prenatal care began											
First trimester	3,094,402	466,655	317,262	38,083	11,003	66,402	33,905	2,583,121	2,041,702	397,959	44,626
After first trimester or no care	713,044	192,861	142,086	13,395	1,338	24,284	11,758	511,520	302,908	167,209	8,663
Second trimester	551,366	144,041	104,664	10,573	1,083	18,717	9,004	400,731	244,830	124,185	6,594
Third trimester	114,986	35,800	27,302	2,106	195	4,222	1,975	77,714	43,605	26,240	1,472
No prenatal care	46,692	13,020	10,120	716	60	1,345	779	33,075	14,473	16,784	597
Not stated	92,143	20,252	10,267	3,346	132	4,310	2,197	65,854	38,028	22,613	6,037
Age of mother											
Under 20 years	512,115	121,636	88,100	12,893	965	10,062	9,616	385,076	232,735	136,729	5,403
20–24 years	965,547	208,211	151,485	16,848	2,400	23,554	13,924	745,674	529,499	179,209	11,662
25–29 years	1,063,539	178,258	122,606	12,990	3,642	27,361	11,659	869,005	684,135	129,752	16,276
30–34 years	904,666	115,063	72,487	8,172	3,873	22,029	8,502	772,754	627,126	93,126	16,849
35–39 years	383,745	46,964	28,937	3,305	1,346	9,881	3,495	329,153	263,469	41,265	7,628
40–49 years	69,977	9,636	6,000	616	247	2,109	664	58,833	45,674	7,700	1,508

See footnotes at end of table.

Corrected data appear in shaded area.

Table 2. Infant mortality rates, live births, and infant deaths by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All origins ¹	Origin of mother									
		Hispanic						Non-Hispanic			
		Total	Mexican	Puerto Rican	Cuban	Central and South American	Other and unknown Hispanic	Total ²	White	Black	Not stated
Live births											
Educational attainment of mother											
0–8 years	237,980	160,533	132,205	3,625	275	20,317	4,111	75,982	44,094	18,839	1,465
9–11 years	629,572	186,658	138,421	16,991	1,515	18,190	11,541	436,958	268,882	145,939	5,956
12 years	1,307,228	193,851	124,685	17,912	3,902	30,224	17,128	1,096,170	811,034	229,514	17,207
13–15 years	845,110	84,313	47,972	10,192	3,426	14,112	8,611	748,481	581,551	127,846	12,316
16 years and over	820,325	40,810	18,522	4,659	3,295	9,484	4,850	764,771	653,952	54,848	14,744
Not stated	59,374	13,603	7,810	1,445	60	2,669	1,619	38,133	23,125	10,795	7,638
Live-birth order											
1	1,610,453	261,379	176,500	21,952	5,479	37,630	19,818	1,326,279	1,012,498	231,599	22,795
2	1,243,433	199,842	135,708	16,031	4,407	29,265	14,431	1,025,260	797,171	167,349	18,331
3	617,755	118,755	83,261	9,111	1,829	16,624	7,930	490,147	367,528	97,184	8,853
4	237,647	53,363	39,274	3,908	454	6,504	3,223	181,071	124,401	46,496	3,213
5 or more	162,421	39,687	30,305	2,914	250	4,124	2,094	120,268	68,666	41,151	2,466
Not stated	27,880	6,742	4,567	908	54	849	364	17,470	12,374	4,002	3,668
Marital status											
Married	2,645,613	402,166	290,784	21,924	9,504	53,137	26,817	2,200,642	1,878,710	176,112	42,805
Unmarried	1,253,976	277,602	178,831	32,900	2,969	41,859	21,043	959,853	503,928	411,669	16,521
Mother's place of birth											
U.S. born	3,169,962	260,104	179,895	33,357	4,463	7,165	35,224	2,856,512	2,266,284	533,115	53,346
Foreign born	719,995	418,055	289,069	21,308	8,006	87,700	11,972	297,020	112,814	51,783	4,920
Not stated	9,632	1,609	651	159	4	131	664	6,963	3,540	2,883	1,060
Maternal smoking during pregnancy ³											
Smoker	427,035	17,501	7,684	5,087	473	1,150	3,107	405,064	340,732	55,255	4,470
Nonsmoker	2,636,094	389,913	238,834	43,671	10,936	61,651	34,821	2,224,551	1,647,770	464,561	21,630
Not stated	45,789	4,723	1,752	1,361	51	916	643	38,200	28,227	7,642	2,866
Infant deaths											
Total	29,505	4,263	2,833	487	66	524	353	24,696	14,957	8,611	546
Age at death											
Total neonatal	19,186	2,806	1,850	335	45	347	229	15,955	9,632	5,671	425
Early neonatal	15,483	2,230	1,458	266	28	283	195	12,899	7,659	4,713	355
Late neonatal	3,703	576	393	69	16	64	34	3,056	1,973	958	71
Postneonatal	10,319	1,457	982	152	21	177	125	8,741	5,325	2,941	120
Sex											
Male	16,580	2,362	1,569	283	32	287	191	13,919	8,576	4,735	299
Female	12,924	1,901	1,264	205	34	237	162	10,777	6,381	3,876	247
Plurality											
Single births	25,891	3,802	2,522	432	56	471	320	21,610	12,959	7,614	480
Plural births	3,614	462	311	55	10	53	33	3,085	1,998	997	66
Birthweight											
Less than 1,500 grams	14,231	2,002	1,259	276	31	264	170	11,924	6,439	5,057	304
1,500–2,499 grams	4,241	624	434	63	13	73	41	3,547	2,261	1,091	70
2,500 grams or more	10,680	1,594	1,120	140	21	180	132	8,933	6,112	2,330	153
Not stated	353	42	19	7	–	6	10	291	143	134	20

See footnotes at end of table.

Corrected data appear in shaded area.

Table 2. Infant mortality rates, live births, and infant deaths by selected characteristics and Hispanic origin of mother and by race of mother for mothers of non-Hispanic origin: United States, 1995 linked file—Con.

[Rates per 1,000 live births in specified group]

Characteristics	All origins ¹	Origin of mother										
		Hispanic						Non-Hispanic				
		Total	Mexican	Puerto Rican	Cuban	Central and South American	Other and unknown Hispanic	Total ²	White	Black	Not stated	
		Infant deaths										
Period of gestation												
Less than 28 weeks	11,572	1,519	946	230	26	187	129	9,808	5,146	4,351	245	
28–36 weeks	6,307	892	597	93	14	117	72	5,304	3,369	1,659	112	
37–41 weeks	9,492	1,453	998	134	22	175	125	7,915	5,437	2,042	125	
42 weeks or more	1,169	173	127	13	3	18	11	977	666	267	19	
Not stated	963	226	165	18	–	27	16	691	339	292	45	
Trimester of pregnancy prenatal care began												
First trimester	20,384	2,705	1,829	274	54	334	214	17,397	11,416	5,212	281	
After first trimester or no care	7,037	1,250	881	144	8	127	90	5,694	2,774	2,632	92	
Second trimester	4,405	806	555	102	7	90	53	3,555	1,907	1,468	43	
Third trimester	863	186	152	12	1	9	11	657	338	266	20	
No prenatal care	1,769	258	174	30	–	28	26	1,482	529	898	29	
Not stated	2,085	308	123	69	4	62	49	1,604	767	767	173	
Age of mother												
Under 20 years	5,527	986	634	160	12	85	94	4,476	2,342	1,987	65	
20–24 years	8,064	1,226	844	142	8	122	111	6,725	3,928	2,552	113	
25–29 years	6,871	941	656	74	18	123	70	5,773	3,645	1,850	157	
30–34 years	5,620	676	427	74	20	106	49	4,818	3,186	1,378	126	
35–39 years	2,789	339	210	31	7	65	26	2,384	1,524	701	66	
40–49 years	633	95	62	7	–	23	3	521	333	143	18	
Educational attainment of mother												
0–8 years	1,932	987	817	37	1	106	25	929	518	317	17	
9–11 years	6,570	1,274	848	195	13	117	100	5,239	2,758	2,293	58	
12 years	10,433	1,180	725	137	16	184	118	9,128	5,433	3,346	126	
13–15 years	5,318	457	266	68	19	55	49	4,796	3,012	1,582	65	
16 years and over	3,824	179	81	27	16	33	23	3,587	2,733	623	59	
Not stated	1,427	186	96	23	0	29	38	1,019	504	450	222	
Live-birth order												
1	11,683	1,667	1,053	196	35	219	164	9,829	6,179	3,232	187	
2	8,421	1,108	744	126	19	139	80	7,187	4,654	2,200	125	
3	4,664	688	475	73	8	77	54	3,896	2,318	1,401	79	
4	2,247	377	262	41	2	42	30	1,836	975	784	35	
5 or more	2,060	351	256	36	–	40	18	1,685	693	883	24	
Not stated	430	71	42	16	1	6	6	262	138	112	96	
Marital status												
Married	15,659	2,269	1,667	150	45	251	156	13,094	10,146	2,205	296	
Unmarried	13,846	1,994	1,165	337	21	273	197	11,602	4,812	6,406	250	
Mother's place of birth												
U.S. born	24,636	1,873	1,246	298	25	42	261	22,378	14,138	7,781	386	
Foreign born	4,183	2,333	1,557	184	41	481	71	1,810	575	580	40	
Not stated	686	57	31	5	–	1	21	508	244	251	120	
Maternal smoking during pregnancy ³												
Smoker	4,893	213	98	61	4	12	38	4,633	3,298	1,225	47	
Nonsmoker	18,623	2,425	1,423	374	58	329	241	16,027	9,110	6,300	171	
Not stated	729	72	34	15	–	13	9	590	347	219	67	

. . . Category not applicable. – Quantity zero. * Figure does not meet standards of reliability or precision.

¹Origin of mother not stated included in "All origins" but not distributed among origins.

²Includes races other than white and black.

³Excludes data from California, Indiana, New York State (but includes New York City), and South Dakota, which do not require reporting of tobacco use during pregnancy.

NOTE: Infant deaths are weighted so numbers may not exactly add to totals due to rounding. Not stated responses were included in totals but not distributed among groups for rate computations.

Corrected data appear in shaded area.

Table 3. Percent of live births with selected maternal and infant characteristics by specified race of mother: United States, 1995 linked file

Characteristic	All races	White	Black	American Indian ¹	Asian or Pacific Islander					
					Total	Chinese	Japanese	Hawaiian	Filipino	Other
Birthweight:										
Less than 1,500 grams	1.3	1.1	3.0	1.1	0.9	0.7	0.9	0.9	1.1	0.9
Less than 2,500 grams	7.3	6.2	13.1	6.6	6.9	5.3	7.3	6.8	7.8	7.1
Preterm births ²	11.0	9.7	17.7	12.4	9.9	7.2	8.3	11.0	11.7	10.3
Prenatal care beginning in the first trimester	81.3	83.6	70.4	66.7	79.9	85.7	89.7	75.9	80.9	77.0
Births to mothers under 20 years	13.1	11.5	23.1	21.4	5.6	0.9	2.5	19.1	6.2	6.3
Fourth and higher order births	10.3	9.4	15.0	19.9	8.9	2.5	3.7	15.1	6.8	11.7
Births to unmarried mothers	32.2	25.3	69.9	57.2	16.3	7.9	10.8	49.0	19.5	16.2
Mothers completing 12 or more years of school	77.4	78.4	71.3	67.0	83.9	87.1	97.4	82.4	92.0	78.8
Mothers born in the 50 States and D.C	81.5	83.0	90.1	96.3	16.4	9.3	45.3	98.3	16.6	10.2
Mother smoked during pregnancy ³	13.9	15.0	10.6	20.9	3.4	0.8	5.2	15.9	3.4	2.7

¹Includes births to Aleuts and Eskimos.

²Born prior to 37 completed weeks of gestation.

³Excludes data for California, Indiana, New York State (but includes New York City), and South Dakota, which did not report tobacco use on the birth certificate.

Table 4. Percent of live births with selected maternal and infant characteristics by Hispanic origin of mother and race of mother for mothers of non-Hispanic origin: United States, 1995 linked file

Characteristic	All origins ¹	Origin of mother								
		Hispanic						Non-Hispanic		
		Total	Mexican	Puerto Rican	Cuban	Central and South American	Other and unknown Hispanic	Total ²	White	Black
Birthweight:										
Less than 1,500 grams	1.3	1.1	1.0	1.8	1.2	1.1	1.3	1.4	1.0	3.0
Less than 2,500 grams	7.3	6.3	5.8	9.4	6.5	6.2	7.5	7.5	6.2	13.2
Preterm births ³	11.0	10.9	10.6	13.4	10.1	10.7	11.7	11.0	9.4	17.8
Prenatal care beginning in the first trimester	81.3	70.8	69.1	74.0	89.2	73.2	74.3	83.5	87.1	70.4
Births to mothers under 20 years	13.1	17.9	18.8	23.5	7.7	10.6	20.1	12.2	9.8	23.3
Fourth and higher order births	10.3	13.8	15.0	12.7	5.7	11.3	11.2	9.6	8.1	15.0
Births to unmarried mothers	32.2	40.8	38.1	60.0	23.8	44.1	44.0	30.4	21.2	70.0
Mothers completing 12 or more years of school	77.4	47.9	41.4	61.4	85.6	58.3	66.2	83.6	86.7	71.4
Mothers born in the 50 States and D.C	81.5	38.4	38.4	61.0	35.8	7.6	74.6	90.6	95.3	91.1
Mother smoked during pregnancy ⁴	13.9	4.3	3.1	10.4	4.1	1.8	8.2	15.4	17.1	10.6

¹Includes origin not stated.

²Includes races other than white and black.

³Born prior to 37 completed weeks of gestation.

⁴Excludes data for California, Indiana, New York State (but includes New York City), and South Dakota, which did not report tobacco use on the birth certificate.

Table 5. Live births, infant, neonatal, and postneonatal deaths and mortality rates by race of mother and birthweight: United States, 1995 linked file, and percent change in birthweight-specific infant mortality rates, 1985 birth cohort—1995 period linked files

Race and birthweight	Live births	Infant deaths	Neonatal deaths	Postneonatal deaths	Infant mortality rate	Neonatal mortality rate	Postneonatal mortality rate	Percent change in infant mortality rate 1985–95 ¹
	Number				Rates per 1,000 live births			
All races ²	3,899,589	29,505	19,186	10,319	7.6	4.9	2.6	-28.8
Less than 2,500 grams	285,976	18,471	14,948	3,523	64.6	52.3	12.3	-32.9
Less than 1,500 grams	53,026	14,231	12,561	1,669	268.4	236.9	31.5	-32.9
Less than 500 grams	5,703	5,155	5,068	87	903.9	888.7	15.3	-1.9
500–749 grams	9,998	5,280	4,674	606	528.1	467.5	60.6	-31.0
750–999 grams	10,816	1,970	1,516	453	182.1	140.2	41.9	-55.2
1,000–1,249 grams	12,242	1,047	744	303	85.5	60.8	24.8	-55.8
1,250–1,499 grams	14,267	779	559	220	54.6	39.2	15.4	-49.7
1,500–1,999 grams	55,342	1,835	1,164	672	33.2	21.0	12.1	-39.4
2,000–2,499 grams	177,608	2,406	1,222	1,183	13.5	6.9	6.7	-35.0
2,500 grams or more	3,611,935	10,680	3,901	6,779	3.0	1.1	1.9	-31.0
2,500–2,999 grams	640,891	3,484	1,419	2,064	5.4	2.2	3.2	-30.3
3,000–3,499 grams	1,438,889	4,131	1,389	2,742	2.9	1.0	1.9	-33.3
3,500–3,999 grams	1,129,470	2,272	770	1,502	2.0	0.7	1.3	-34.5
4,000–4,499 grams	339,910	618	241	376	1.8	0.7	1.1	-35.7
4,500–4,999 grams	56,309	122	46	76	2.2	0.8	1.3	-43.2
5,000 grams or more	6,466	54	36	18	8.4	5.6	*	-42.7
Not stated	1,678	353	337	16	...	...	...	...
White	3,098,885	19,529	12,700	6,829	6.3	4.1	2.2	-29.4
Less than 2,500 grams	193,083	11,533	9,464	2,069	59.7	49.0	10.7	-36.1
Less than 1,500 grams	33,043	8,610	7,698	912	260.6	233.0	27.6	-36.0
Less than 500 grams	3,140	2,861	2,812	49	911.1	895.5	15.6	-1.7
500–749 grams	5,888	3,216	2,896	320	546.2	491.8	54.3	-30.3
750–999 grams	6,685	1,289	1,054	235	192.8	157.7	35.2	-56.2
1,000–1,249 grams	7,972	725	545	180	90.9	68.4	22.6	-57.6
1,250–1,499 grams	9,358	519	391	128	55.5	41.8	13.7	-54.6
1,500–1,999 grams	37,525	1,245	833	411	33.2	22.2	11.0	-43.3
2,000–2,499 grams	122,515	1,678	933	746	13.7	7.6	6.1	-36.4
2,500 grams or more	2,904,634	7,795	3,048	4,748	2.7	1.0	1.6	-33.3
2,500–2,999 grams	458,899	2,421	1,063	1,358	5.3	2.3	3.0	-32.0
3,000–3,499 grams	1,130,307	3,003	1,097	1,906	2.7	1.0	1.7	-33.3
3,500–3,999 grams	958,758	1,748	628	1,120	1.8	0.7	1.2	-30.8
4,000–4,499 grams	300,735	477	194	284	1.6	0.6	0.9	-40.0
4,500–4,999 grams	50,333	102	37	65	2.0	0.7	1.3	-39.4
5,000 grams or more	5,602	43	29	14	7.7	5.2	*	-32.4
Not stated	1,168	200	189	11	...	...	...	...
Black	603,139	8,793	5,798	2,994	14.6	9.6	5.0	-27.8
Less than 2,500 grams	79,335	6,282	4,989	1,293	79.2	62.9	16.3	-23.7
Less than 1,500 grams	18,093	5,167	4,483	685	285.6	247.8	37.9	-26.1
Less than 500 grams	2,421	2,166	2,131	36	894.7	880.2	14.9	-1.8
500–749 grams	3,800	1,897	1,637	260	499.2	430.8	68.4	-32.1
750–999 grams	3,748	611	412	199	163.0	109.9	53.1	-53.1
1,000–1,249 grams	3,801	283	173	110	74.5	45.5	28.9	-49.2
1,250–1,499 grams	4,323	210	130	80	48.6	30.1	18.5	-39.9
1,500–1,999 grams	15,384	498	266	232	32.4	17.3	15.1	-29.6
2,000–2,499 grams	45,858	617	241	376	13.5	5.3	8.2	-30.2
2,500 grams or more	523,420	2,376	678	1,698	4.5	1.3	3.2	-29.0
2,500–2,999 grams	141,444	880	285	595	6.2	2.0	4.2	-28.2
3,000–3,499 grams	228,037	934	227	706	4.1	1.0	3.1	-28.6
3,500–3,999 grams	122,168	425	112	313	3.5	0.9	2.6	-24.4
4,000–4,499 grams	27,133	118	42	76	4.3	1.5	2.8	-19.2
4,500–4,999 grams	4,038	9	6	3	*	*	*	*
5,000 grams or more	600	9	5	4	*	*	*	*
Not stated	384	136	132	4	...	...	...	...

* Figure does not meet standards of reliability or precision.

... Category not applicable.

¹Percent change from 1985–95 was computed based on unweighted and unimputed birthweight data for 1995 since comparable weighted and imputed birthweight data were not available for 1985.

²Includes races other than white and black.

NOTE: Infant deaths are weighted so numbers may not exactly add to totals due to rounding.

Table 6. Infant deaths and mortality rates for the 5 leading causes of infant death by race and Hispanic origin of mother: United States, 1995 linked file

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

Cause of death (Ninth Revision International Classification of Diseases, 1975)	All races ¹			White			Black			American Indian			Asian and Pacific Islander			Hispanic		
	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate	Rank	Number	Rate
All causes . . . . .	...	29,505	756.6	...	19,529	630.2	...	8,793	1,457.9	...	337	904.0	...	846	527.8	...	4,263	627.1
Congenital anomalies . . . 740-759	1	6,579	168.7	1	5,137	165.8	2	1,154	191.3	2	61	163.6	1	227	141.6	1	1,148	168.9
Disorders relating to short gestation and unspecified low birthweight 765	2	3,909	100.2	3	2,039	65.8	1	1,778	294.8	3	23	61.7	3	70	43.7	2	489	71.9
Sudden infant death syndrome. 798.0	3	3,402	87.2	2	2,241	72.3	3	1,005	166.6	1	77	206.6	2	80	49.9	3	324	47.7
Respiratory distress syndrome. 769	4	1,470	37.7	4	935	30.2	4	498	82.6	8	7	*	4	29	18.1	4	213	31.3
Newborn affected by maternal complications of pregnancy. 761	5	1,307	33.5	5	836	27.0	5	438	72.6	6	12	*	6	21	13.1	5	162	23.8

* Figure does not meet standards of reliability or precision.

... Category not applicable.

¹Includes races other than white and black.

NOTE: For American Indians, Accidents and adverse effects was tied for the third leading cause of infant death, with 23 deaths, and a rate of 61.7. Pneumonia and influenza was the fifth leading cause of infant death for American Indians, however, with only 14 deaths, a reliable infant mortality rate could not be computed. For Asian and Pacific Islanders, Complications of placenta, cord, and membranes was tied for the fourth leading cause of infant death, with 29 deaths and a rate of 18.1.

Technical notes

Marital status

National estimates of births to unmarried women are based on two methods of determining marital status. For 1995 data, birth certificates in 45 States and the District of Columbia included a question about the mother's marital status. The mother's marital status is inferred in five States (California, Connecticut, Michigan, Nevada, and New York) by comparing the parents' and child's surnames and other information concerning the father. For these States, a birth is inferred as nonmarital if any of these factors, listed in priority-of-use order, is present: a paternity acknowledgment was received, the father's name is missing, or the father's and mother's current surnames are different. In addition, criteria that are particularly applicable for a given State are also applied as necessary; see Technical notes in *Report of Final Natality Statistics, 1995* for additional details (29).

Period of gestation and birthweight

The 1989 revision of the U.S. Standard Certificate of Live Birth included a new item, "clinical estimate of gestation." This item is being compared with length of gestation computed from the date the last normal menstrual period (LMP) began when the latter appears to be inconsistent with birthweight. This is done for normal weight births of apparently short gestations and very low birthweight births reported to be full term. The clinical estimate was also used if the LMP date was not reported. The period of gestation for 5.1 percent of the births in 1995 was based on the clinical estimate of gestation. For 97 percent of these records, the clinical estimate was used because the LMP date was not reported. For the remaining 3 percent, the clinical estimate was used because it was consistent with the reported birthweight, whereas the LMP-based gestation was not. In cases where the reported birthweight was inconsistent with both the LMP-computed gestation and the clinical estimate of gestation, the LMP-computed gestation was used and birthweight was reclassified as "not stated." This was

necessary for fewer than 300 births or less than 0.01 percent of all birth records in 1995 (29).

Cause-of-death classification

The mortality statistics presented here were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify causes of death by the current *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death* (30). Cause-of-death data presented in this publication were coded by procedures outlined in annual issues of the *NCHS Instruction Manual* (31). 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 that initiated the sequence of events leading directly to death or as the circumstances of the accident or violence that produced the fatal injury. 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 rules. Generally, more medical information is reported on death certificates than is directly reflected in the underlying cause of death.

The cause-of-death ranking for infants in table 6 is based on the List of 61 Selected Causes of Infant Death and HIV Infection. The group titles Certain conditions originating in the perinatal period and Symptoms, signs, and ill-defined conditions are not ranked from the List of 61 Selected Causes of Infant Death. In addition, 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, Pneumonia and influenza), its component parts are not ranked (in this case, Pneumonia, and Influenza).

Computation of rates

Infant mortality rates are the most commonly used index for measuring the

risk of dying during the first year of life. 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. Infant mortality rates use the number of live births in the denominator to approximate the population at risk of dying before the first birthday. For all variables, not stated responses were shown in frequencies tables, but were dropped before rates were computed.

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 non-sampling 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 (32). 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 binomial distribution. When the number of events is large, the relative standard error 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. Estimates of relative standard errors (RSE's) and 95-percent confidence intervals are shown below.

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

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

where D is the number of deaths and

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

where B is the number of births.

For example, for 1995, the number of infant deaths to Chinese mothers was 104 while the number of live births was 27,380 yielding an infant mortality rate of 3.8 infant deaths per 1,000 live births.

The RSE of the deaths =

$$100 \cdot \sqrt{\frac{1}{104}} = 9.81$$

while the RSE of the births =

$$100 \cdot \sqrt{\frac{1}{27,380}} = 0.60$$

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

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

The RSE of the IMR for Chinese mothers =

$$100 \cdot \sqrt{\frac{1}{104} + \frac{1}{27,380}} = 9.82$$

Binomial distribution—When the number of events is 100 or greater, the binomial distribution is used to estimate the 95-percent confidence intervals as follows:

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

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

Thus, for Chinese mothers:

$$\text{Lower: } 3.8 - 1.96 \cdot 3.8 \cdot \frac{9.82}{100} = 3.1$$

$$\text{Upper: } 3.8 + 1.96 \cdot 3.8 \cdot \frac{9.82}{100} = 4.5$$

Thus the chances are 95 out of 100 that the true IMR for infants of Chinese mothers lies somewhere in the 3.1–4.5 interval.

Poisson distribution—When the number of events in the numerator is less than 100, the 95-percent confidence interval for the rate can be estimated based on the Poisson distribution using the values in table I.

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

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

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

$$D_{adj} = \frac{(D \cdot B)}{(D + B)}$$

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

For example, for Japanese mothers the infant mortality rate was 5.3, the number of infant deaths was 47, and the number of live births was 8,901.

$$D_{adj} = \frac{(47 \cdot 8,901)}{(47 + 8,901)} = 47$$

Therefore, the 95-percent confidence interval (using the formula for 1–99 infant deaths) =

$$\text{Lower: } 5.3 \cdot 0.73476 = 3.9$$

$$\text{Upper: } 5.3 \cdot 1.32979 = 7.0$$

Comparison of two infant mortality rates—If either of the two rates to be compared is based on less 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-percent level. If they do not overlap, the difference is statistically significant. If both of the two rates (R_1 and R_2) to be compared are based on 100 or more deaths, the following z-test may be used to define a significance test statistic:

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

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 on data tapes from the National Technical Information Service (NTIS) and on CD-ROM from NTIS and the Government Printing Office (GPO). Data are also available in selected issues of the *Vital and Health Statistics*, Series 20 reports, and the *Monthly Vital Statistics Reports* and supplements through NCHS. Additional unpublished tabulations are available from NCHS or through our Internet site at www.cdc.gov/nchswww.

Table I. Lower and upper 95 percent confidence limit factors for a death rate based on a Poisson variable of 1–99 deaths

Number of deaths	L(0.95,D _{adj})	U(0.95,D _{adj})	Number of deaths	L(0.95,D _{adj})	U(0.95,D _{adj})
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	1.2335
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			

Contents

Abstract 1
 Introduction 1
 Methods 2
 Results and discussion 3
 References 7
 List of detailed tables 8
 Technical notes 20

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