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Explaining the 2001–02 Infant Mortality Increase: Data From the Linked Birth/Infant Death Data Set

By Marian F. MacDorman, Ph.D.; Joyce A. Martin, M.P.H.; T.J. Mathews, M.S.; Donna L. Hoyert, Ph.D.; and Stephanie J. Ventura, M.A., Division of Vital Statistics

Abstract

The U.S. infant mortality rate increased from 6.8 infant deaths per 1,000 live births in 2001 to 7.0 in 2002, the first increase in more than 40 years. From 2001 to 2002 infant mortality rates increased for very low birthweight infants as well as for preterm and very preterm infants. Although infant mortality rates for very low birthweight infants increased, most of the increase in the infant mortality rate from 2001 to 2002 was due to a change in the *distribution* of births by birthweight and, more specifically, to an increase in infants born weighing less than 750 grams (1 lb 10½ oz). The majority of infants born weighing less than 750 grams die within the first year of life; thus, these births contribute disproportionately to the overall infant mortality rate. Increases in births at less than 750 grams occurred for non-Hispanic white, non-Hispanic black, and Hispanic women. Most of the increase occurred among mothers 20–34 years of age. Although multiple births contributed disproportionately, most of the increase in births at less than 750 grams occurred among singletons.

Three hypotheses were evaluated to assess their possible impact on the increase in less than 750-gram births: first, possible changes in the reporting of births or fetal deaths; second, possible changes in the risk profile of births; and third, possible changes in medical management of pregnancy. Although each of these factors may have contributed to the increase, the relative effects of these and other factors remain unclear. More-detailed studies are needed to further explain the 2001–02 infant mortality increase.

Keywords: infant mortality • infant health • birthweight

Introduction

The infant mortality rate increased from 6.8 infant deaths per 1,000 live births in 2001 to 7.0 in 2002. Final data confirmed the earlier-reported increase in the infant mortality rate that was based on preliminary data (1–4) (figure 1). Historically, infant mortality has generally declined throughout the 20th century (3,5,6). This unexpected increase is the first increase in the U.S. infant mortality rate in more than 40 years (since 1958) (1–3). Although this finding was first reported in February 2004 (1,2), more-detailed infant mortality data from the linked birth/infant death data set (linked file) needed to analyze the factors contributing to the increase have just recently become available (4). In the linked file, the information from the death certificate is linked to information from the birth certificate for each infant under 1 year of age who died in the 50 States, the District of

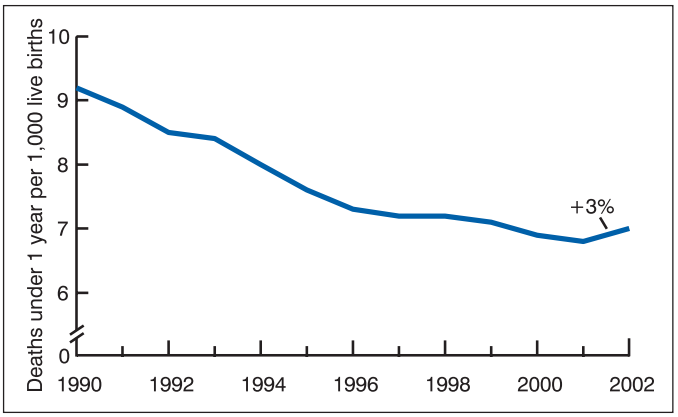

Figure 1. Infant mortality rate: United States, 1990–2002

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Table A. Number of infant deaths and infant mortality rates, by age at death and by race and Hispanic origin of mother: United States, 2001–02 linked files

	Infant deaths		Neonatal deaths[1]						Postneonatal deaths[1]	
			Total		Early		Late			
	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001
	Rate per 1,000 live births									
Total	7.0	6.8	4.7	4.5	3.7	3.6	0.9	0.9	2.3	2.3
White	5.8	5.7	3.9	3.8	3.1	3.0	0.8	0.8	1.9	1.9
Black	13.8	13.3	9.3	8.9	7.6	7.3	1.7	1.6	4.5	4.4
American Indian	8.6	9.7	4.6	4.2	3.2	3.1	1.4	1.1	4.0	5.4
Asian or Pacific Islander	4.8	4.7	3.4	3.1	2.7	2.5	0.7	0.6	1.4	1.6
Hispanic	5.6	5.4	3.8	3.6	3.0	2.9	0.8	0.8	1.8	1.8
Non-Hispanic white	5.8	5.7	3.9	3.8	3.0	3.0	0.8	0.8	1.9	1.9
Non-Hispanic black	13.9	13.5	9.3	9.0	7.6	7.4	1.8	1.6	4.6	4.5
	Number									
Total	27,970	27,523	18,791	18,275	15,020	14,622	3,771	3,653	9,179	9,248
White	18,395	18,087	12,352	12,078	9,804	9,571	2,548	2,506	6,044	6,009
Black	8,201	8,084	5,533	5,396	4,506	4,425	1,027	971	2,668	2,688
American Indian	366	404	195	176	137	129	58	47	171	228
Asian or Pacific Islander	1,006	947	710	624	573	496	138	128	296	323
Hispanic	4,927	4,630	3,360	3,105	2,673	2,439	687	666	1,567	1,526
Non-Hispanic white	13,327	13,300	8,853	8,817	7,002	6,979	1,851	1,839	4,474	4,483
Non-Hispanic black	8,031	7,938	5,399	5,293	4,386	4,337	1,014	956	2,632	2,645

[1]Neonatal is less than 28 days of age, early neonatal is less than 7 days, late neonatal is 7–27 days, and postneonatal is 28 days through 11 months.

Columbia, and selected U.S. Territories. 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 uses linked birth/infant death data and fetal death data to examine the factors that may have contributed to the recent increase in infant mortality in the United States. The first section of the report includes a summary of findings for selected variables, including age at death, maternal race and Hispanic origin, maternal age, and leading causes of death, followed by a more-detailed examination of trends by birthweight, period of gestation, and plurality. The second section of the report evaluates three hypotheses that have been suggested as possible explanations for the increase: possible changes in reporting for births and/or fetal deaths; changes in the risk profile of births; and changes in the medical management of pregnancy.

Findings by Selected Variables

Consistent with results reported earlier, the 2001–02 infant mortality increase calculated from the linked file was concentrated among neonatal deaths (under 28 days of age) and primarily among early neonatal deaths (under 7 days of age) (1,2,4). The total neonatal mortality rate was 4.7 in 2002, compared with 4.5 in 2001, while the postneonatal mortality rate remained stable at 2.3 (table A). The 2002 final fetal mortality rate was 6.4 (fetal deaths of 20 weeks or more gestation per 1,000 live births and fetal deaths), compared with 6.5 in 2001.

When examined by maternal race and Hispanic origin, the overall infant mortality increase was spread across most race and Hispanic origin groups (table A). With the exception of American Indian mothers, infant mortality rates increased for all race/ethnic groups from 2001 to 2002, although the increase was statistically significant only for infants of black mothers (4).

The overall infant mortality increase was not concentrated among mothers of a particular age group (table B). Infant mortality rates were up slightly for singleton deliveries and down for multiple deliveries, although the differences were not statistically significant (table C). Differences for twins and triplet and higher order births were not statistically significant.

When examined by cause of death, infant mortality rates increased significantly for two of the five leading causes of death: Disorders related to short gestation and low birthweight, not elsewhere classified; and Newborn affected by maternal complications of pregnancy (table D). In 2002 nearly all infant deaths from these two causes (98 percent and 95 percent, respectively) occurred to very low birthweight infants (less than 1,500 grams). This, together with the finding that the infant mortality increase appears to be concentrated among early neonatal deaths, suggests that birthweight might be an important variable to examine in greater detail.

Table B. Infant mortality rates by maternal age: United States, 1999–2002 linked files

		Maternal age in years						
Years	Total	Less than 20	20–24	25–29	30–34	35–39	40–44	45–54
2002	7.0	10.4	7.8	6.0	5.6	6.5	8.3	11.3
2001	6.8	10.0	7.6	6.1	5.4	6.5	8.2	13.1
2000	6.9	9.9	7.6	6.1	5.6	6.4	7.8	11.4
1999	7.0	10.3	7.8	6.0	5.8	6.5	8.5	13.4

NOTE: Infant mortality rates are per 1,000 live births in specified group.

Birthweight

Birthweight is one of the most important predictors of an infant's survival chances. Infant mortality rates are much higher for infants born at low birthweight (less than 2,500 grams) or very low birthweight (less than 1,500 grams) than for heavier babies (figure 2 and table 1). In 2002 the infant mortality rate for low birthweight infants (59.5) was 25 times that for infants born weighing 2,500 grams or more (2.4). Similarly, the infant mortality rate for very low birthweight infants (250.8) was 105 times higher than the rate for infants born weighing 2,500 grams or more.

Because of their much higher risk of infant mortality, low birthweight and very low birthweight infants contribute greatly to the total infant mortality rate. In 2002 more than two-thirds (68.0 percent) of all infant deaths in the United States occurred to the 7.8 percent of infants who were born at low birthweight (tables 2 and 3). Similarly, more than one-half (53.9 percent) of all infant deaths occurred to the 1.5 percent of infants born at very low birthweight.

The overall infant mortality rate can be partitioned into two key components:

- Distribution of births by birthweight
- Birthweight-specific infant mortality rates (the mortality rate for infants at a given weight)

The infant mortality rate can increase when the percentage of low birthweight births increases or the birthweight-specific mortality rates increase.

From 1985 to 2001 the United States was in the unusual situation of experiencing an overall decline in the infant mortality rate, while the percentage of low birthweight and very low birthweight births increased. The infant mortality rate declined by 36 percent during this period, from 10.6 in 1985 to 6.8 in 2001 (3). Declines in birthweight-specific infant mortality rates occurred for both low birthweight and heavier infants (7,8). At the same time, the percentage of low birthweight births increased by 13 percent (from 6.8 percent in 1985 to 7.7 percent in 2001), and the percentage of very low birthweight births increased by 21 percent (from 1.21 percent to 1.46 percent) (9). The overall decline in infant mortality occurred because the rapid decline in birthweight-specific infant mortality rates from 1985 to 2001 had a larger impact on the overall infant mortality rate than the increase in the percentage of low birthweight and very low birthweight births (10). So, despite the increase in low birthweight and very low birthweight births during this period, the overall infant mortality rate declined from 1985 to 2001.

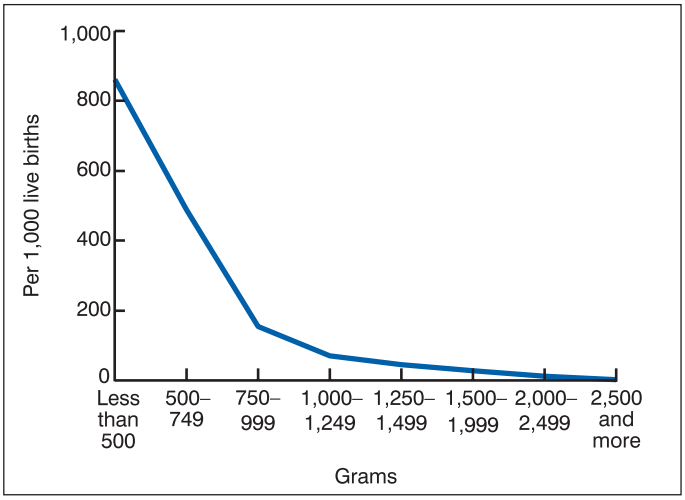

Figure 2. Infant mortality rates by birthweight: United States, 2002

In 2002 the long-term trend of increases in low birthweight and very low birthweight births continued. From 2001 to 2002 the percentage of low birthweight births increased from 7.7 to 7.8, and the percentage of very low birthweight births was 1.46 in 2001 compared with 1.48 in 2002. However, 2002 saw a reversal of the long-term trend of declining birthweight-specific infant mortality rates. The infant mortality rate for infants with birthweights of 2,500 grams or more was unchanged at 2.4 in 2001 and 2002, while the rate for moderately low birthweight infants (1,500–2,499 grams) was 15.2 in 2001 compared with 15.1 in 2002 (table 1). In contrast, the birthweight-specific infant mortality rate for very low birthweight infants (less than 1,500 grams)

Table C. Live births and infant, neonatal, and postneonatal deaths and mortality rates, by plurality: United States, 2001–02 linked files

Plurality	Live births		Infant deaths		Neonatal deaths						Postneonatal deaths	
					Total		Early		Late			
	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001
					Rate per 1,000 live births							
All pluralities	...	...	7.0	6.8	4.7	4.5	3.7	3.6	0.9	0.9	2.3	2.3
Singletons	...	...	6.1	6.0	3.9	3.8	3.1	3.0	0.8	0.8	2.2	2.2
Multiples	...	...	32.3	32.4	27.1	26.9	23.1	22.8	4.0	4.1	5.2	5.5
Twins	...	...	30.2	29.7	25.2	24.4	21.4	20.7	3.8	3.7	5.0	5.3
Triplets and higher order	...	...	67.5	75.1	58.6	67.7	51.9	57.3	6.8	10.4	8.8	7.4
					Number							
All pluralities	4,021,825	4,026,036	27,970	27,523	18,791	18,275	15,020	14,622	3,771	3,653	9,179	9,248
Singletons	3,889,276	3,897,299	23,691	23,358	15,203	14,812	11,962	11,687	3,241	3,126	8,488	8,546
Multiples	132,549	128,737	4,278	4,165	3,587	3,462	3,058	2,935	529	527	691	702
Twins	125,147	121,266	3,779	3,603	3,153	2,956	2,674	2,507	479	449	626	647
Triplets and higher order	7,402	7,471	500	561	434	506	384	428	50	78	65	55

... Category not applicable.

NOTE: Neonatal is less than 28 days of age, early neonatal is less than 7 days, late neonatal is 7–27 days, and postneonatal is 28 days through 11 months.

Table D. Infant mortality rates and deaths for the five leading causes of infant death in 2002, by birthweight: United States, 1999–2002 linked files

Year and cause of death (Based on the *International Classification of Diseases, Tenth Revision*, 1992)	Infant mortality rates per 100,000 live births					Number of infant deaths				
		Birthweight					Birthweight			
		Less than 2,500 grams					Less than 2,500 grams			
	Total	Total less than 2,500 grams	Less than 1,500 grams	1,500–2,499 grams	2,500 grams and over	Total[1]	Total less than 2,500 grams	Less than 1,500 grams	1,500–2,499 grams	2,500 grams and over
All causes:										
2002	695.4	5,954.4	25,075.8	1,514.8	238.6	27,970	18,758	14,885	3,873	8,840
2001	683.6	5,859.6	24,436.9	1,515.9	242.0	27,523	18,151	14,345	3,806	8,989
2000	688.9	5,939.8	24,427.8	1,577.8	247.0	27,960	18,299	14,366	3,933	9,259
1999	703.7	6,048.4	24,696.4	1,596.2	251.6	27,864	18,273	14,380	3,893	9,197
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99):										
2002	140.0	1,040.8	2,410.5	722.8	62.6	5,630	3,279	1,431	1,848	2,319
2001	137.6	1,011.8	2,247.8	722.8	63.7	5,538	3,134	1,319	1,815	2,366
2000	141.8	1,071.2	2,338.0	772.3	64.7	5,756	3,300	1,375	1,925	2,425
1999	138.4	1,008.6	2,196.6	724.9	65.6	5,480	3,047	1,279	1,768	2,396
Disorders related to short gestation and low birthweight, not elsewhere classified (P07):										
2002	115.3	1,414.3	7,430.8	17.4	0.9	4,636	4,455	4,411	44	32
2001	109.5	1,361.8	7,105.0	18.9	0.8	4,408	4,218	4,171	47	31
2000	108.4	1,360.4	7,053.2	17.3	0.9	4,401	4,191	4,148	43	34
1999	110.5	1,385.2	7,118.7	16.4	1.4	4,377	4,185	4,145	40	51
Sudden infant death syndrome (R95):										
2002	57.1	146.6	161.4	143.1	49.4	2,295	462	96	366	1,831
2001	55.5	139.4	159.4	134.7	48.5	2,236	432	94	338	1,801
2000	62.1	169.1	175.1	167.7	53.3	2,522	521	103	418	1,998
1999	66.8	178.1	187.2	175.9	57.5	2,643	538	109	429	2,103
Newborn affected by maternal complications of pregnancy (P01):										
2002	42.4	505.6	2,589.7	21.7	0.9	1,704	1,593	1,537	56	33
2001	37.3	459.1	2,353.6	16.1	0.6	1,501	1,422	1,382	40	23
2000	34.3	423.9	2,140.8	18.9	0.7	1,391	1,306	1,259	47	26
1999	35.0	432.6	2,188.0	13.5	0.8	1,387	1,307	1,274	33	28
Newborn affected by complications of placenta, cord and membranes (P02):										
2002	25.2	285.2	1,418.1	22.2	2.2	1,013	899	842	57	82
2001	25.2	283.0	1,417.4	17.8	3.0	1,014	877	832	45	112
2000	25.7	293.8	1,445.3	22.1	2.6	1,042	905	850	55	99
1999	25.7	288.6	1,392.8	25.0	2.8	1,017	872	811	61	101

[1]Not stated birthweight included in total but not shown separately.

increased significantly from 244.4 infant deaths per 1,000 live births in 2001 to 250.8 in 2002. When the very low birthweight category is further subdivided into 250-gram groupings (table 1), the increase seems to be concentrated among the smallest infants (less than 1,000 grams), although the differences for these more-detailed birthweight groupings did not achieve statistical significance. Given that infant mortality rates for very low birthweight infants have declined since statistics on this measure have been available (7,8,10–14), the 2002 increase in the infant mortality rate for very low birthweight infants is noteworthy.

Changes in the distribution of births by birthweight also contributed to the 2001–02 infant mortality increase. Table 3 shows the number and percentage of births by detailed birthweight categories. Between 2001 and 2002 the number of births with birthweights of less than 500 grams increased by 5.1 percent, from 6,450 in 2001 to 6,780 in 2002—an increase of 330 births. The number of births with 500–749-gram birthweights increased by 1.9 percent or 209 births. Figure 3 shows the percentage of births that were less than 500 and 500–749 grams in 1995 and 1999–2002. Of the 5 years studied, 2002 had the highest proportion of births at less than 500 grams and less than 750 grams.

Births at less than 750 grams have very high mortality rates, so small changes in their numbers or a change in distribution can have a large impact on the overall infant mortality rate, independent of changes in birthweight-specific infant mortality rates. In fact, if we substitute the number of births at less than 500 and 500–749 grams in 2001 for those in 2002 and apply the 2002 mortality rates, the increase in the infant mortality rate between 2001 and 2002 would be reduced by 81 percent. In other words, 81 percent of the total increase in the infant mortality rate between 2001 and 2002 is accounted for by the increase in the number of births at less than 750 grams.

As discussed above, between 2001 and 2002 there were increases in both the percentage of low birthweight births and in infant mortality rates for very low birthweight infants (less than 1,500 grams). But what proportion of the overall increase in infant mortality from 2001 to 2002 was accounted for by each of these factors? A number of different analytical techniques exist to answer this question, including direct standardization of rates (15) and the Kitagawa method, which is a further development of direct standardization that more precisely quantifies the relative contribution of changes in variable-specific rates

and in population composition to the total change in rates in cases where both are changing simultaneously (16). When direct standardization is applied to these data, the results indicate that virtually all (98 percent) of the increase in the infant mortality rate between 2001 and 2002 was due to the change in the birthweight distribution—mostly the result of the increase in births at less than 750 grams as shown previously. The results from the Kitagawa method are nearly identical (analyses available upon request).

Period of gestation

Period of gestation is closely (though not perfectly) associated with infant birthweight, and patterns for this variable are generally similar to those for birthweight. Period of gestation is generally classified into three categories: preterm (less than 37 completed weeks of gestation), term (37–41 weeks), and post-term (42 weeks or more). The preterm category can be further subdivided into very preterm (less than 32 weeks) and moderately preterm (32–36 weeks).

From 2001 to 2002 there was a 3 percent increase in the infant mortality rate for preterm infants, from 36.9 in 2001 to 37.9 in 2002 (table 4). The infant mortality rate also increased for very preterm infants, from 181.0 in 2001 to 186.4 in 2002. The change in the infant mortality rate for moderately preterm infants was not statistically significant (8.9 in 2001 compared with 9.2 in 2002). The infant mortality rate for term infants was the same in 2001 as in 2002 (2.5), and the rate for post-term infants was not significantly different (3.0 in 2001 compared with 3.1 in 2002). When more-detailed gestational age groupings were examined for preterm infants, rates appeared to be up for all categories, although differences were not statistically significant (table 4).

As with low birthweight infants, preterm and very preterm infants have a large impact on the total U.S. infant mortality rate because of their much higher risk of infant mortality. For example, in 2002 the infant mortality rate for preterm infants (37.9) was 15 times, and the rate for very preterm infants (186.4) was 75 times the rate for term infants (2.5). Because of their elevated risk of infant mortality, more than two-thirds (67.4 percent) of all infant deaths in the United States in 2002 occurred to the 12.1 percent of infants born preterm, and over one-half (53.7 percent) occurred to the 2.0 percent of infants born very preterm (tables 5 and 6). As with birthweight, a more-detailed examination of gestational age distributions between 2001 and 2002 shows increases in the number of infants born at the shortest gestations—from 9,338 to 9,510, an increase of 172 births (1.8 percent) at less than 24 weeks of gestation, and from 19,785 to 19,994, an increase of 159 births (0.8 percent) for 24–27 weeks of gestation (table 6).

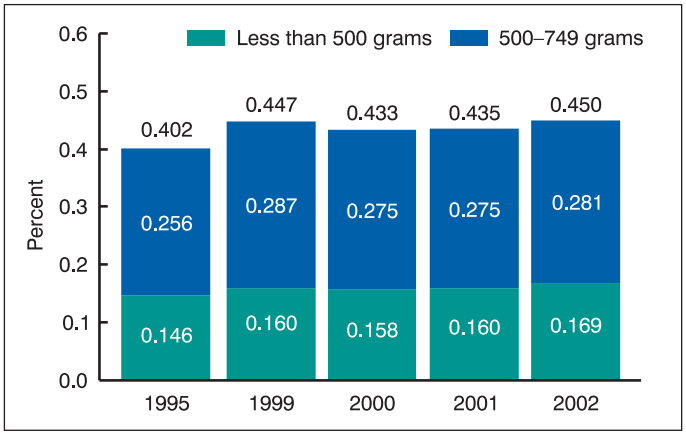

Figure 3. Percentage of live births less than 750 grams: 1995 and 1999–2002

The same analytical techniques used in the birthweight analysis previously discussed can also be applied to data by period of gestation. The purpose of this analysis is to assess the relative contribution of the change in the distribution of births by gestational age and the change in gestational-age-specific infant mortality rates to the change in the total infant mortality rate. Direct standardization and the Kitagawa method (16) applied to detailed gestational age data tabulated in 2-week intervals yield identical results: 61 percent of the increase in the infant mortality rate from 2001 to 2002 can be accounted for by changes in the distribution of births by gestational age, and 39 percent is due to the change in gestational-age-specific infant mortality rates (analyses available upon request).

Plurality

Increases in the number and percentage of multiple births over the past two decades have contributed to increases in the percentage of preterm and low birthweight births (9). Thus, an examination of trends and patterns of multiple births is essential to any analysis of the 2001–02 infant mortality increase. From 2001 to 2002 the percentage of multiple births increased by 3 percent (from 3.2 percent to 3.3 percent of total births). Of the 132,549 multiple births in 2002, about 94 percent (125,147) were twin births, and the remaining 6 percent (7,402) were triplet or higher order multiple births (table C).

The number of multiple births weighing less than 500 grams increased by 96 births, from 1,601 in 2001 to 1,697 in 2002 (table 7). As discussed previously, the total number of births less than 500 grams increased by 330 from 2001 to 2002; thus, the increase in multiple births less than 500 grams accounted for 29 percent of the overall increase. The number of multiple births born weighing 500–749 grams increased by 55 births from 2001 to 2002 and accounted for more than one-fourth (26 percent) of the overall increase for 500–749-gram births.

The infant mortality rate for single births was 6.1 in 2002, compared with 6.0 in 2001. The infant mortality rate for multiple births was 32.3 in 2002, compared with 32.4 in 2001 (table D). The percentage contribution of single and multiple births to the overall infant mortality increase from 2001 to 2002 can be assessed by relating the number of single and multiple infant deaths to the overall number of births for each year. The results indicate that singleton births accounted for 75 percent, and multiple births 25 percent, of the total increase in the infant mortality rate from 2001 to 2002. Because the infant mortality rate for multiple births did not increase from 2001 to 2002, the contribution of the multiple births reflects the 3 percent increase in the overall number of multiple births from 2001 to 2002, coupled with the increase in the number of less than 750-gram multiple births.

Evaluating Various Hypotheses for the Increase in Less Than 750-gram Births From 2001 to 2002

This section evaluates three hypotheses that have been suggested to explain the increase in less than 750-gram births from 2001 to 2002:

- The potential influence of changes in the reporting of births or fetal deaths
- The potential influence of changes in the risk profile of births
- The potential influence of changes in medical management of pregnancy

The potential influence of reporting changes

Improvements in neonatal medicine over the past two decades have led to increased survival of infants born extremely preterm (less than 28 weeks of gestation) and at extremely low birthweights (less than 1,000 grams) (17–20). This had led to a shift in what doctors consider the limits of viability for these infants, as the mean gestational age for which survival was 50 percent fell from 26 to 24 weeks (19,20). Improvements in pregnancy outcomes for infants at the borderline of viability may have influenced perceptions such that a borderline delivery that previously might have been reported as a fetal death may now be reported as a live birth. Because these very high risk infants are likely to succumb within the first few hours or days of life, any significant shift in reporting could result in an increase in the infant mortality rate.

The expected impact of a shift from fetal death to live birth would be a decline in the proportion of fetal deaths and a concomitant increase in the proportion of live births for very small infants. From 2001 to 2002 the proportions of deliveries at less than 500 grams increased among live births, fetal deaths, and perinatal deaths. Deliveries of 500–749 grams rose among births and perinatal deaths but declined among fetal deaths, although none of the changes in the 500–749-gram category were statistically significant (figures 3–5). The increase in less than 500-gram fetal deaths is part of a longer-term trend; the number and rate of fetal deaths at less than 500-gram birthweights increased significantly from 1990 to 2000 and from 2001 to 2002 (figure 4). However, could other changes in fetal death reporting during this time period have had an influence?

The formal definitions of live birth and fetal death used in the United States are listed in the Model State Vital Statistics Act and Regulations, are consistent with those promulgated by the World Health Organization (WHO), and have not changed over the past decade (21,22).

Definitions of live birth and fetal death

"Live birth" is the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of the pregnancy, which, after such expulsion or extraction, breathes, or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of the voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached. Heartbeats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps.

"Fetal death" is death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of the pregnancy, which is not an induced termination of pregnancy. The death is indicated by the fact that, after such expulsion or extraction, the fetus does not breathe, or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of the voluntary muscles. Heartbeats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps.

The reporting of live births of all gestational ages is required by all U.S. jurisdictions and is considered complete. Although reporting requirements for fetal deaths vary somewhat by jurisdiction, the majority require reporting of fetal deaths at 20 weeks of gestation or greater

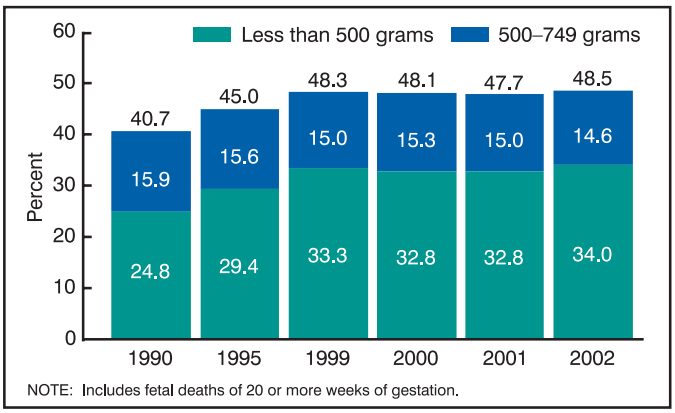

Figure 4. Percentage of fetal deaths less than 750 grams: Selected years

(approximate birthweight equivalent of 350 grams). However, there is substantial evidence that fetal deaths, particularly early fetal deaths (20–27 weeks of gestation), are underreported. This is illustrated by the fact that States that require reporting of fetal deaths of all periods of gestation tend to report significantly larger proportions of early fetal deaths compared with those States that require reporting at 20 weeks or more. Improvements in the completeness of reporting of early fetal deaths by States that do not report all periods of gestation could be shown by a narrowing of the gap between States that require reporting of all gestational ages and those that do not. In fact, an analysis of fetal death data for 1990–2002 indicates that this gap did narrow substantially (figure 6), suggesting that reporting of early fetal deaths has improved over this time period. Therefore, the increase in fetal deaths at less than 500 grams may at least in part be associated with the improved reporting of fetal deaths.

In summary, the impact of changes in the reporting of live births and fetal deaths on trends in perinatal statistics is difficult to assess. Between 2001 and 2002 there was a significant increase in both fetal deaths and live births delivered at less than 500 grams, which seems to argue against a shift in reporting of events from fetal deaths to live births. However, there also appears to be a trend toward gradually improved reporting of fetal deaths at 20–27 weeks of gestation. Direct evidence of a shift in reporting from fetal to infant death is lacking, and

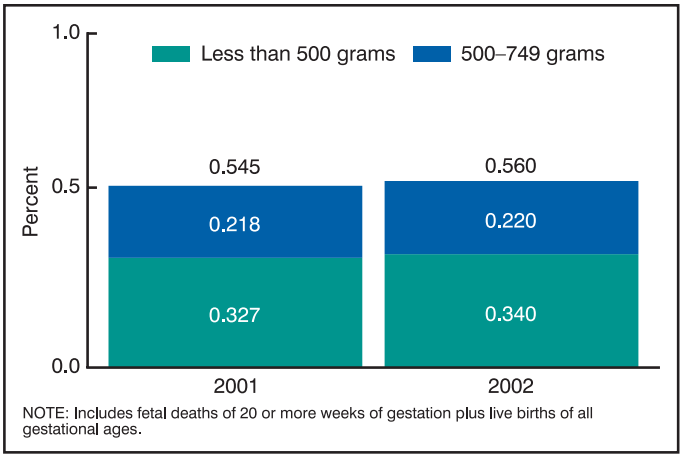

Figure 5. Percentage of perinatal events less than 750 grams: 2001 and 2002

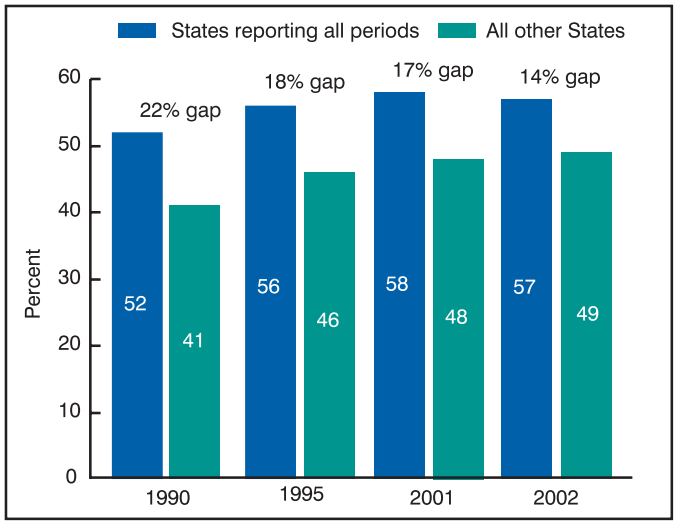

Figure 6. Percentage of all fetal deaths 20 or more weeks that occur at 20–27 weeks: States reporting all periods of gestation and all other States, selected years

there is no way to know from these data whether such a shift occurred. Thus, although changes in reporting cannot be discounted as a factor, it appears plausible that at least part of the increase in less than 750-gram births is real (i.e., more of these very high risk births occurred in 2002 than in 2001).

The potential influence of changes in the risk profile of births

Another hypothesis that has been suggested to explain the increase in births at less than 750 grams is a possible change in the risk profile of births. Several maternal demographic and health characteristics are associated with an increased risk of poor birth outcome (4), and changes in the distribution of these maternal characteristics could influence the rate of at-risk infants delivered each year. For example, risk tends to be highest among infants born to black mothers and lowest among births to non-Hispanic white and Hispanic mothers (4,9). By age, risk of poor birth outcome is typically highest among infants born to the youngest and oldest mothers, with the lowest risk seen among births to women 20–34 years of age (4,9,23).

Between 2001 and 2002 the number and percentage of births delivered at less than 500 grams increased among the three largest race/ethnic groups: non-Hispanic white, non-Hispanic black, and Hispanic (table 3). Each of these groups contributed substantially to the overall increase. Births of 500–749 grams increased for non-Hispanic white and Hispanic mothers but declined among non-Hispanic black mothers. Among singleton births only, the pattern is similar; that is, the three largest race/ethnic groups each contributed to the increase in less than 500-gram births, but the rise in the number of 500–749-gram infants was limited to non-Hispanic white and Hispanic mothers. Among multiple births, however, most of the rise can be attributed to the increase in births at less than 750 grams to non-Hispanic white women (data not shown).

The number and rate of births at less than 500 grams rose for most age groups between 2001 and 2002. However, births to women under 35 years of age contributed most (82 percent) of the increase in births

Table E. Number and percentage of births less than 500 grams, 500–749 grams, and less than 750 grams, by age of mother: United States, 2001 and 2002 linked files

Age of mother	2002		2001		Change in number, 2002–2001
Less than 500 grams	Number	Percent	Number	Percent	
All ages	6,780	0.17	6,450	0.16	330
Under 20 years	958	0.22	907	0.20	51
20–34 years	4,835	0.16	4,615	0.15	220
35 years and older	987	0.18	928	0.17	59
500–749 grams					
All ages	11,290	0.28	11,081	0.28	209
Under 20 years	1,651	0.38	1,723	0.38	–72
20–34 years	7,964	0.26	7,615	0.25	349
35 years and older	1,675	0.30	1,741	0.32	–66
Less than 750 grams					
All ages	18,070	0.45	17,531	0.44	539
Under 20 years	2,609	0.60	2,630	0.58	–21
20–34 years	12,799	0.42	12,230	0.40	569
35 years and older	2,662	0.48	2,669	0.49	–7

at less than 500 grams (table E). The increase in the 500–749-gram category was wholly attributable to increases in births to women 20–34 years. Indeed, among teenagers and women 35 years of age and over, there was a net decline in the number of less than 750-gram births between 2001 and 2002. A similar trend by maternal age was found for births in both singleton and multiple deliveries (data not shown).

Thus, increases in births at less than 750 grams were not concentrated among either teen or older mothers but predominately occurred among mothers 20–34 years of age—a group traditionally considered to be at low risk for poor birth outcome.

An increase in certain medical risk factors during pregnancy can endanger the health of the mother and, in turn, the infant (24–26). Between 2001 and 2002 rates of maternal anemia, diabetes, and chronic hypertension rose slightly (9,27). A nonsignificant increase in the rate of pregnancy-associated hypertension was also reported. The small rise in these risk factors for mothers overall suggests that women giving birth in 2002 may have been at slightly greater risk of poor birth outcome than their 2001 counterparts. Still, these conditions were relatively rare, each accounting for less than 4 percent of total births (9). Also, rates for these medical risk factors have risen in recent years (9) with no corresponding rise in infant mortality. (Of course, as noted previously, low birthweight and preterm rates have also been on the rise.) When only mothers of less than 750-gram singleton infants were examined, small, nonsignificant increases were observed for diabetes, chronic hypertension, pregnancy-associated hypertension, and eclampsia. However, the interpretation of these findings is unclear because these conditions are associated with an increased risk of medical intervention to deliver the infant early via induction of labor or cesarean delivery (discussed in the next section).

The rate of premature rupture of membranes (PROM) was down significantly from 2001 to 2002 (from 23.8 to 23.1 per 1,000 live births) (9,27), while the PROM rate for less than 750-gram singleton births was down, though not significantly (from 182.6 to 176.7 per 1,000). Although unchanged overall, the rate of abruptio placenta was up, though not significantly, among less than 750-gram births (from 68.2 to 72.5 per

1,000). As with the medical risk factors, the interpretation of these findings for less than 750-gram infants is unclear because these conditions also are associated with an increased risk of medical intervention to deliver the infant early.

The potential influence of changes in medical management of pregnancy

Substantial changes in perinatal technologies that may have a positive impact on survival in utero (e.g., fetal imaging, prevention of perinatal infections, and treatment of maternal medical conditions such as diabetes and chronic hypertension) have occurred in recent years. Other changes among live births include increases in induction of labor (figure 7) and in cesarean delivery rates (figure 8) (9,28,29). Induction and cesarean delivery rates have increased for preterm and very preterm infants as well as for term infants. From 1990 to 2000 the percentage of preterm births with induction of labor doubled from 7 percent to 14 percent, although it has leveled off since then. Increases in the percentage of preterm inductions are noteworthy because infants born preterm have higher rates of death and disability than those born at term.

Figure 8 shows trends in the percentage of total and preterm births delivered by cesarean. The percentage of total births delivered by cesarean declined from 1990 to 1996 and then increased by nearly one-fourth, from 21 percent in 1996 to 26 percent in 2002. In contrast, the percentage of preterm births delivered by cesarean increased slowly during the early part of the decade and then more rapidly during the second half of the decade. Overall, the percentage of preterm births delivered by cesarean increased from 29 percent in 1990 to 38 percent in 2002—an increase of nearly one-third. Increases were more rapid for very preterm than for moderately preterm births. In 2002 nearly one-half (48 percent) of very preterm births were cesarean deliveries, an increase of more than one-third (37 percent) since 1990.

Changes in the medical management of pregnancy appear to have had an impact on the overall gestational age distribution of births, shifting more births away from the post-term and into the term and preterm gestational age categories (figure 9) (30). From 1990 to 2002 the percentage of preterm births increased from 10.6 percent to 12.1 percent, while the percentage of post-term births declined from 11.3 percent to 6.7 percent (9). Improvements in diagnostic tools, such as Doppler ultrasound, may have had an impact on this increase (31,32) because they may have led to improved diagnosis of pregnancy abnormalities, which may then have led to intervention. Recent studies have also suggested a trend toward more aggressive management of various medical conditions during pregnancy, such as premature rupture of membranes (33,34), oligohydramnios (35), hypertension (36,37), and diabetes (36).

Our purpose here is to assess the possible effect of changes in the medical management of pregnancy on the 2001–02 increase in births at less than 750 grams. Although the percentage of preterm births with induced labor increased rapidly from 1990 to 2000, it did not increase from 2000 to 2002, and, thus, cannot be implicated as a factor in the 2001–02 infant mortality increase. Therefore, this analysis will concentrate on the possible effects of changes in cesarean rates.

If a cesarean is performed on a woman who is in labor, it probably would have little impact on the infant's birthweight and gestational age because the woman was likely to deliver the infant soon anyway. However, when a cesarean is performed on a woman not in labor,

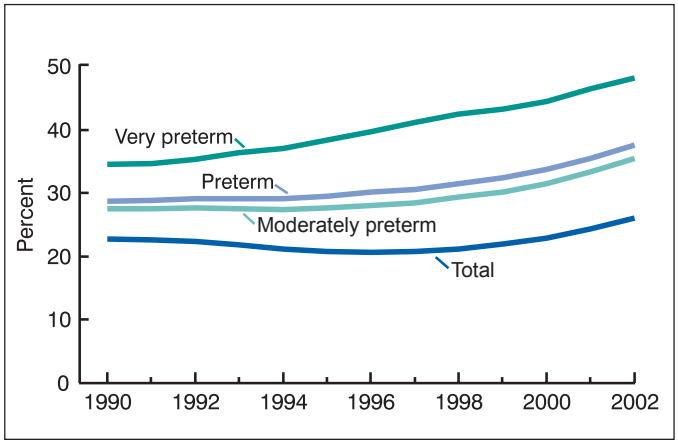

Figure 8. Percentage of total and preterm births delivered by cesarean: United States, 1990–2002

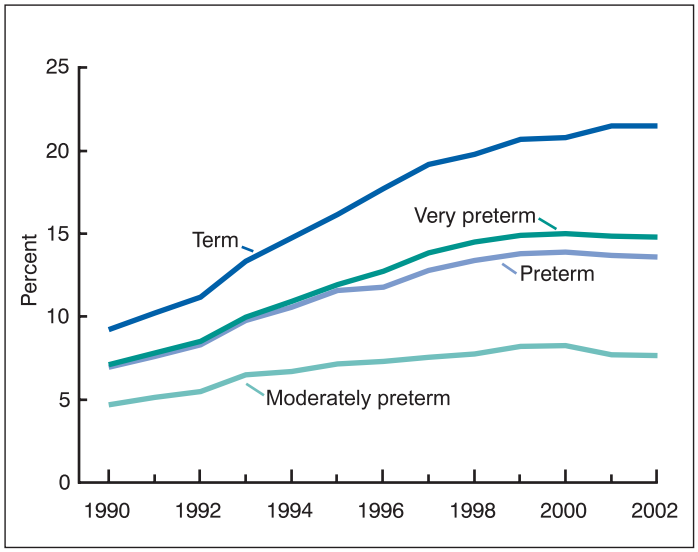

Figure 7. Percentage of term and preterm births with induced labor: United States, 1990–2002

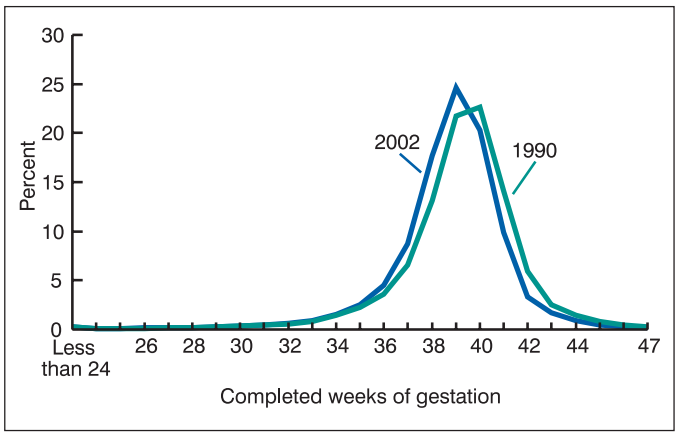

Figure 9. Distribution of births by gestational age: United States, 1990 and 2002

it has the potential to affect the infant's birthweight and gestational age because it is unknown how much longer the pregnancy might have continued had the cesarean not been performed. The U.S. Standard Certificate of Birth used in 2001 and 2002 did not contain an item on whether a trial of labor was performed for a cesarean delivery, but this information will be available from the revised birth certificate that was implemented in two States in 2003 (38). These data, when available, will shed further light on this issue.

Table 8 shows the number of births by method of delivery and birthweight for 2001 and 2002. The section on birthweight discussed how an increase of 330 births weighing less than 500 grams and an increase of 209 births weighing 500–749 grams contributed substantially to the increase in the infant mortality rate from 2001 to 2002. Table 8 shows an increase from 2001 to 2002 of 178 births weighing less than 500 grams delivered by cesarean and an increase of 174 births weighing 500–749 grams delivered by cesarean. In other words, these small infants were disproportionately likely to be cesarean deliveries. Thus, an increase in cesareans for births weighing less than 750 grams may have contributed substantially to the overall increase in the number of births weighing less than 750 grams to the extent that the women giving birth were not in labor. Of the total increase in less than 750-gram births from 2001 to 2002, about two-thirds (65 percent) were among cesareans, and about one-third were among vaginal deliveries.

Summary and Conclusions

In summary, the increase in the infant mortality rate from 2001 to 2002 was not concentrated in any particular maternal age or race/ethnic group but, rather, was widely distributed among most groups. The increase was primarily driven by an increase in the number of less than 750-gram (1 lb 10½ oz) births, and, in particular, in the number of less than 500-gram (1 lb 1 oz) births. The shift in the birthweight distribution toward smaller infants accounted for virtually all (98 percent) of the increase in the infant mortality rate from 2001 to 2002. Although changes in the birthweight distribution had a greater overall impact on the infant mortality increase, the significant increase in the infant mortality rate for very low birthweight infants is also of concern. Although plural births contributed disproportionately to the overall increase, three-quarters of the increase was due to changes among singletons. Increases in births at less than 750 grams were not concentrated among either teen or older mothers but predominately occurred among mothers 20–34 years of age—a group traditionally considered to be at low risk for poor birth outcome.

When analyzed by gestational age, infant mortality rates also increased significantly for preterm and very preterm infants. Changes in gestational-age-specific infant mortality rates accounted for 39 percent of the total infant mortality increase from 2001 to 2002. However, the larger effect was from changes in the distribution of births by gestational age (toward earlier gestational ages), which accounted for 61 percent of the overall increase in the infant mortality rate from 2001 to 2002. The causes of death that increased from 2001 to 2002 are those primarily associated with very low birthweight and very preterm delivery.

Three hypotheses were examined as potential explanations of the increase in births at less than 750 grams. Although there was some evidence of improvements in reporting of early fetal deaths over time, it is difficult to find direct evidence of substantial shifts in reporting between fetal deaths and live births between 2001 and 2002. However, such shifts cannot be ruled out, and more-detailed clinical studies may be needed to answer this question definitively. Increases in preterm cesarean delivery may have had an impact, although it is unclear to what degree these increases reflect actual changes in the medical management of pregnancy or are due to (nonsignificant) increases in births at less than 750 grams to mothers with specific medical conditions (such as diabetes, hypertension, and abruptio placenta).

Improvements in perinatal medicine, independent of changes in the medical management of pregnancy, could have also enhanced survival in utero and resulted in a true shift from death before delivery to death after delivery. Unfortunately, a shift in survival in utero is difficult, if not impossible, to adequately measure, in part because of possible changes in the reporting of births or fetal deaths discussed above.

Another factor, not reported on 2002 birth certificates but which is associated with an increased risk of poor birth outcome, is the use of assisted reproductive technologies (ART). ART use has been increasing in the United States in recent years, and in 2001 an estimated 1 percent of U.S. births were conceived using ART (39). ART use has been associated with both multiple gestation pregnancy and an increased risk of preterm and low birthweight delivery among singletons (40,41).

Provisional estimates of infant mortality for 2003 suggest that the final 2003 infant mortality rate may be lower than the 2002 rate (42), although the provisional data are subject to reporting inconsistencies with considerable variation in the resulting estimate. Still, the increase in the infant mortality rate between 2001 and 2002 is of importance. In 2000 the United States ranked 27th in the world in infant mortality, with a rate more than twice that of the lowest ranked countries (43). Part of the reason for this unenviable ranking is the United States' relatively high rates of preterm and low birthweight delivery compared with those from other developed countries (44,45). Thus, the prevention of preterm and low birthweight delivery, and especially very preterm and very low birthweight delivery, should be central to efforts to further lower the U.S. infant mortality rate.

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List of Detailed Tables

Table 1. Infant and neonatal mortality rates, by birthweight and by race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Low birthweight (less than 2,500 grams)										
			Very low birthweight (less than 1,500 grams)						Moderately low birthweight (1,500–2,499 grams)			
		Total low birthweight	Total very low birthweight	Less than 500 grams	500–749 grams	750–999 grams	1,000–1,249 grams	1,250–1,499 grams	Total moderately low birthweight	1,500–1,999 grams	2,000–2,499 grams	2,500 grams or more
						Infant mortality rate[1]						
All races:[2]												
2002	7.0	59.5	250.8	862.0	489.6	155.1	70.3	45.7	15.1	26.5	11.5	2.4
2001	6.8	58.6	244.4	855.0	476.5	154.0	73.8	45.6	15.2	27.2	11.3	2.4
2000	6.9	59.4	244.3	846.1	476.3	155.8	77.3	45.6	15.8	28.3	11.7	2.5
1999	7.0	60.5	247.0	856.0	485.5	151.6	69.9	48.7	16.0	28.8	11.8	2.5
Non-Hispanic white:												
2002	5.8	53.4	239.4	887.8	503.5	164.6	72.9	43.9	14.9	25.4	11.6	2.2
2001	5.7	52.2	229.9	872.3	494.5	156.6	77.0	43.5	14.7	26.8	10.8	2.3
2000	5.7	52.8	229.5	859.8	492.2	159.0	80.8	43.2	15.6	26.9	12.0	2.3
1999	5.8	53.4	229.7	873.6	489.8	150.2	72.1	52.4	16.0	28.2	12.0	2.3
Non-Hispanic black:												
2002	13.9	76.5	272.1	853.2	466.0	140.2	65.4	43.4	15.4	27.0	11.6	3.9
2001	13.5	75.7	269.7	848.3	452.6	148.4	68.3	42.6	15.1	25.8	11.4	3.8
2000	13.6	75.6	265.7	836.7	455.3	140.7	72.2	44.5	15.9	27.9	11.8	3.9
1999	14.1	78.2	270.5	857.5	463.4	139.4	66.6	42.2	16.5	27.6	12.6	4.0
Hispanic:												
2002	5.6	56.7	241.8	817.8	504.9	157.3	72.0	50.3	16.1	29.3	12.1	2.0
2001	5.4	54.9	232.6	812.5	478.6	148.6	72.1	53.4	16.5	30.5	12.3	1.9
2000	5.6	56.1	235.6	822.1	477.9	163.4	75.5	49.2	16.5	32.8	11.6	2.1
1999	5.7	57.2	247.0	817.7	515.6	176.9	70.8	48.9	15.4	31.4	10.6	2.1
						Neonatal mortality rate[1]						
All races:[2]												
2002	4.7	48.6	220.3	839.0	424.5	116.4	52.4	32.2	8.8	17.3	6.1	0.8
2001	4.5	47.6	213.8	838.0	410.8	115.7	50.0	34.0	8.8	17.4	6.0	0.9
2000	4.6	48.5	214.5	828.3	415.7	118.3	54.1	33.0	9.3	18.5	6.3	0.9
1999	4.7	49.5	217.8	841.4	424.4	113.5	51.7	34.4	9.3	18.7	6.3	0.9
Non-Hispanic white:												
2002	3.9	44.1	213.7	864.5	447.9	130.0	57.1	33.0	9.0	17.4	6.3	0.8
2001	3.8	43.3	206.2	859.2	438.5	127.7	57.6	34.3	9.0	17.8	6.2	0.8
2000	3.8	43.6	204.8	842.3	439.2	126.8	60.7	34.0	9.7	18.3	6.9	0.9
1999	3.8	44.0	205.1	860.0	437.4	119.3	54.4	39.8	9.8	19.4	6.7	0.9
Non-Hispanic black:												
2002	9.3	60.9	233.2	830.5	386.6	95.7	40.3	25.3	7.1	14.2	4.8	1.1
2001	9.0	59.7	228.3	828.1	373.4	94.3	38.1	27.2	7.1	13.9	4.7	1.1
2000	9.2	60.1	227.4	817.1	380.1	94.5	42.7	28.6	7.6	15.0	5.0	1.2
1999	9.6	62.7	233.1	839.2	387.8	92.4	44.1	26.0	8.1	15.4	5.5	1.1
Hispanic:												
2002	3.8	46.8	212.7	792.5	442.3	118.5	58.6	36.7	10.4	21.0	7.2	0.8
2001	3.6	44.7	203.5	792.3	420.7	113.6	48.8	40.3	10.4	20.9	7.2	0.7
2000	3.8	45.9	206.9	805.7	424.9	127.6	53.5	32.6	10.3	24.1	6.2	0.8
1999	3.9	47.5	219.7	804.7	461.5	136.4	56.6	34.4	9.6	21.4	6.0	0.9

[1]Infant mortality rates are deaths less than 1 year, and neonatal mortality rates are deaths less than 28 days per 1,000 live births in specified group.
[2]Includes races other than white and black and origin not stated.

Table 2. Number and percentage distribution of infant and neonatal deaths, by birthweight, according to race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Low birthweight (less than 2,500 grams)											
			Very low birthweight (less than 1,500 grams)						Moderately low birthweight (1,500–2,499 grams)				
		Total low birthweight	Total very low birthweight	Less than 500 grams	500–749 grams	750–999 grams	1,000–1,249 grams	1,250–1,499 grams	Total moderately low birthweight	1,500–1,999 grams	2,000–2,499 grams	2,500 grams or more	Not stated
Infant						Number of deaths							
All races:[1]													
2002	27,970	18,758	14,885	5,844	5,528	1,831	956	726	3,873	1,636	2,237	8,840	371
2001	27,523	18,151	14,345	5,515	5,283	1,826	1,001	719	3,806	1,658	2,148	8,989	383
2000	27,960	18,299	14,365	5,420	5,325	1,861	1,033	726	3,933	1,721	2,212	9,259	403
1999	27,864	18,273	14,380	5,408	5,507	1,779	930	756	3,893	1,714	2,179	9,197	395
Non-Hispanic white:													
2002	13,327	8,487	6,519	2,437	2,383	875	478	346	1,968	817	1,151	4,723	116
2001	13,300	8,238	6,323	2,334	2,249	876	515	348	1,915	846	1,069	4,906	157
2000	13,461	8,249	6,232	2,176	2,330	853	527	346	2,016	853	1,163	5,050	163
1999	13,522	8,335	6,278	2,219	2,344	825	476	415	2,056	894	1,162	5,055	133
Non-Hispanic black:													
2002	8,031	5,943	5,029	2,185	1,878	527	255	184	914	402	512	1,962	126
2001	7,938	5,855	4,966	2,071	1,905	545	266	179	890	390	500	1,971	114
2000	8,212	6,015	5,053	2,150	1,858	561	288	195	962	431	530	2,071	126
1999	8,327	6,112	5,136	2,182	1,960	547	266	182	975	421	554	2,062	154
Hispanic:													
2002	4,927	3,263	2,504	875	985	328	172	144	759	321	438	1,621	43
2001	4,630	3,034	2,283	808	867	295	168	144	752	324	428	1,551	45
2000	4,564	2,942	2,231	755	866	320	160	131	709	328	381	1,583	41
1999	4,362	2,793	2,176	711	893	311	143	119	615	291	325	1,514	55
Neonatal[2]													
All races:[1]													
2002	18,791	15,324	13,078	5,688	4,792	1,374	712	512	2,247	1,067	1,180	3,103	363
2001	18,275	14,752	12,548	5,406	4,555	1,373	679	535	2,204	1,058	1,146	3,164	359
2000	18,733	14,929	12,615	5,306	4,648	1,413	722	526	2,314	1,125	1,189	3,427	377
1999	18,700	14,960	12,684	5,316	4,814	1,332	688	534	2,276	1,114	1,162	3,366	374
Non-Hispanic white:													
2002	8,853	7,008	5,819	2,373	2,120	691	374	260	1,189	559	630	1,730	115
2001	8,817	6,836	5,673	2,299	1,994	714	385	275	1,168	561	607	1,831	150
2000	8,924	6,814	5,560	2,132	2,080	680	396	272	1,254	580	674	1,955	155
1999	8,987	6,871	5,606	2,184	2,093	655	359	315	1,265	613	652	1,990	126
Non-Hispanic black:													
2002	5,399	4,733	4,311	2,127	1,558	360	157	107	423	211	212	542	124
2001	5,293	4,618	4,203	2,021	1,571	346	148	114	417	210	207	563	112
2000	5,552	4,782	4,323	2,100	1,551	377	170	125	459	232	227	647	123
1999	5,634	4,903	4,426	2,136	1,640	362	176	112	477	234	243	582	149
Hispanic:													
2002	3,360	2,695	2,203	848	863	247	140	105	491	230	261	624	41
2001	3,105	2,469	1,997	788	761	226	114	108	471	222	249	596	40
2000	3,078	2,404	1,960	740	770	250	113	87	444	241	203	633	40
1999	2,982	2,320	1,936	699	799	240	114	84	384	198	186	610	52
Infant						Percent[3]							
All races:[1]													
2002	100.0	67.97	53.93	21.17	20.03	6.63	3.46	2.63	14.03	5.93	8.11	32.03	. . .
2001	100.0	66.88	52.86	20.32	19.47	6.73	3.69	2.65	14.02	6.11	7.91	33.12	. . .
2000	100.0	66.40	52.13	19.67	19.32	6.75	3.75	2.63	14.27	6.25	8.03	33.60	. . .
1999	100.0	66.52	52.35	19.69	20.05	6.48	3.39	2.75	14.17	6.24	7.93	33.48	. . .
Non-Hispanic white:													
2002	100.0	64.24	49.35	18.45	18.04	6.62	3.62	2.62	14.90	6.18	8.71	35.75	. . .
2001	100.0	62.68	48.11	17.76	17.11	6.67	3.92	2.65	14.57	6.44	8.13	37.33	. . .
2000	100.0	62.03	46.86	16.36	17.52	6.41	3.96	2.60	15.16	6.41	8.75	37.98	. . .
1999	100.0	62.25	46.89	16.57	17.51	6.16	3.56	3.10	15.36	6.68	8.68	37.75	. . .
Non-Hispanic black:													
2002	100.0	75.18	63.62	27.64	23.76	6.67	3.23	2.33	11.56	5.09	6.48	24.82	. . .
2001	100.0	74.83	63.47	26.47	24.35	6.97	3.40	2.29	11.38	4.98	6.39	25.19	. . .
2000	100.0	74.39	62.49	26.59	22.98	6.94	3.56	2.41	11.90	5.33	6.55	25.61	. . .
1999	100.0	74.78	62.84	26.70	23.98	6.69	3.25	2.23	11.93	5.15	6.78	25.23	. . .

See footnotes at end of table.

Table 2. Number and percentage distribution of infant and neonatal deaths, by birthweight, according to race and Hispanic origin of mother: United States, 1999–2002 linked files—Con.

Characteristic	Total	Low birthweight (less than 2,500 grams)											
			Very low birthweight (less than 1,500 grams)						Moderately low birthweight (1,500–2,499 grams)				
		Total low birthweight	Total very low birthweight	Less than 500 grams	500–749 grams	750–999 grams	1,000–1,249 grams	1,250–1,499 grams	Total moderately low birthweight	1,500–1,999 grams	2,000–2,499 grams	2,500 grams or more	Not stated
Infant—Con.							Percent[3]						
Hispanic:													
2002	100.0	66.81	51.27	17.92	20.17	6.72	3.52	2.95	15.54	6.57	8.97	33.19	. . .
2001	100.0	66.18	49.80	17.62	18.91	6.43	3.66	3.14	16.40	7.07	9.34	33.82	. . .
2000	100.0	65.05	49.33	16.69	19.15	7.07	3.54	2.90	15.68	7.25	8.42	35.00	. . .
1999	100.0	64.85	50.52	16.51	20.73	7.22	3.32	2.76	14.28	6.76	7.55	35.15	. . .
Neonatal[2]													
All races:[1]													
2002	100.0	83.16	70.97	30.87	26.00	7.46	3.86	2.78	12.19	5.79	6.40	16.84	. . .
2001	100.0	82.34	70.04	30.17	25.42	7.66	3.79	2.99	12.30	5.91	6.40	17.66	. . .
2000	100.0	81.33	68.72	28.91	25.32	7.70	3.93	2.87	12.61	6.13	6.48	18.67	. . .
1999	100.0	81.63	69.21	29.01	26.27	7.27	3.75	2.91	12.42	6.08	6.34	18.37	. . .
Non-Hispanic white:													
2002	100.0	80.20	66.59	27.16	24.26	7.91	4.28	2.98	13.61	6.40	7.21	19.80	. . .
2001	100.0	78.87	65.46	26.53	23.01	8.24	4.44	3.17	13.48	6.47	7.00	21.13	. . .
2000	100.0	77.71	63.41	24.31	23.72	7.75	4.52	3.10	14.30	6.61	7.69	22.29	. . .
1999	100.0	77.54	63.27	24.65	23.62	7.39	4.05	3.55	14.28	6.92	7.36	22.46	. . .
Non-Hispanic black:													
2002	100.0	89.73	81.73	40.32	29.54	6.82	2.98	2.03	8.02	4.00	4.02	10.27	. . .
2001	100.0	89.13	81.12	39.01	30.32	6.68	2.86	2.20	8.05	4.05	4.00	10.87	. . .
2000	100.0	88.08	79.63	38.68	28.57	6.94	3.13	2.30	8.45	4.27	4.18	11.92	. . .
1999	100.0	89.39	80.69	38.94	29.90	6.60	3.21	2.04	8.70	4.27	4.43	10.61	. . .
Hispanic:													
2002	100.0	81.20	66.37	25.55	26.00	7.44	4.22	3.16	14.79	6.93	7.86	18.80	. . .
2001	100.0	80.56	65.14	25.71	24.82	7.37	3.72	3.52	15.38	7.24	8.12	19.44	. . .
2000	100.0	79.15	64.52	24.36	25.35	8.23	3.72	2.86	14.63	7.93	6.68	20.85	. . .
1999	100.0	79.18	66.08	23.86	27.27	8.19	3.89	2.87	13.10	6.76	6.35	20.82	. . .

. . . Category not applicable.

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

[2]Neonatal is less than 28 days of age.

[3] Infant and neonatal deaths with not stated birthweight are subtracted from the total number of infant deaths used as denominators for percentage computations.

Table 3. Number and percentage distribution of births, by birthweight, according to race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Low birthweight (less than 2,500 grams)							Moderately low birthweight (1,500–2,499 grams)				
		Total low birthweight	Very low birthweight (less than 1,500 grams)										
			Total very low birthweight	Less than 500 grams	500–749 grams	750–999 grams	1,000–1,249 grams	1,250–1,499 grams	Total moderately low birthweight	1,500–1,999 grams	2,000–2,499 grams	2,500 grams or more	Not stated
						Number of births							
All races:[1]													
2002	4,021,825	315,028	59,361	6,780	11,290	11,803	13,599	15,889	255,667	61,705	193,962	3,705,556	1,241
2001	4,026,036	309,760	58,702	6,450	11,081	11,847	13,572	15,752	251,058	60,858	190,200	3,714,965	1,311
2000	4,058,882	308,074	58,810	6,406	11,181	11,942	13,355	15,926	249,264	60,864	188,400	3,748,046	2,762
1999	3,959,417	302,113	58,227	6,318	11,344	11,738	13,314	15,513	243,886	59,599	184,287	3,654,764	2,540
Non-Hispanic white:													
2002	2,298,168	159,001	27,225	2,745	4,733	5,316	6,554	7,877	131,776	32,175	99,601	2,138,605	562
2001	2,326,606	157,715	27,508	2,676	4,547	5,595	6,689	8,001	130,207	31,597	98,610	2,168,207	684
2000	2,362,982	156,130	27,151	2,531	4,735	5,363	6,517	8,005	128,979	31,688	97,291	2,205,071	1,781
1999	2,346,450	156,046	27,334	2,540	4,785	5,494	6,601	7,914	128,712	31,648	97,064	2,189,322	1,082
Non-Hispanic black:													
2002	578,366	77,690	18,485	2,561	4,030	3,760	3,898	4,236	59,205	14,890	44,315	500,481	195
2001	589,940	77,325	18,407	2,441	4,206	3,668	3,896	4,196	58,918	15,123	43,795	512,404	211
2000	604,367	79,574	19,017	2,570	4,081	3,990	3,990	4,386	60,557	15,474	45,083	524,556	237
1999	588,981	78,130	18,989	2,545	4,229	3,921	3,990	4,304	59,141	15,233	43,908	510,522	329
Hispanic:													
2002	876,654	57,541	10,359	1,070	1,951	2,085	2,390	2,863	47,182	10,952	36,230	818,987	126
2001	851,867	55,253	9,815	995	1,809	1,988	2,336	2,687	45,438	10,630	34,808	796,501	113
2000	815,883	52,407	9,474	918	1,813	1,956	2,120	2,667	42,933	10,000	32,933	763,302	174
1999	764,339	48,821	8,812	869	1,731	1,759	2,015	2,438	40,009	9,259	30,750	715,221	297
						Percent[2]							
All races:[1]													
2002	100.0	7.84	1.48	0.17	0.28	0.29	0.34	0.40	6.36	1.53	4.82	92.16	. . .
2001	100.0	7.70	1.46	0.16	0.28	0.29	0.34	0.39	6.24	1.51	4.73	92.30	. . .
2000	100.0	7.60	1.45	0.16	0.28	0.29	0.33	0.39	6.15	1.50	4.64	92.40	. . .
1999	100.0	7.64	1.47	0.16	0.29	0.30	0.34	0.39	6.16	1.51	4.66	92.36	. . .
Non-Hispanic white:													
2002	100.0	6.92	1.18	0.12	0.21	0.23	0.29	0.34	5.74	1.40	4.33	93.08	. . .
2001	100.0	6.78	1.18	0.12	0.20	0.24	0.29	0.34	5.60	1.36	4.24	93.22	. . .
2000	100.0	6.61	1.15	0.11	0.20	0.23	0.28	0.34	5.46	1.34	4.12	93.39	. . .
1999	100.0	6.65	1.17	0.11	0.20	0.23	0.28	0.34	5.49	1.35	4.14	93.35	. . .
Non-Hispanic black:													
2002	100.0	13.44	3.20	0.44	0.70	0.65	0.67	0.73	10.24	2.58	7.66	86.56	. . .
2001	100.0	13.11	3.12	0.41	0.71	0.62	0.66	0.71	9.99	2.56	7.43	86.89	. . .
2000	100.0	13.17	3.15	0.43	0.68	0.66	0.66	0.73	10.02	2.56	7.46	86.83	. . .
1999	100.0	13.27	3.23	0.43	0.72	0.67	0.68	0.73	10.05	2.59	7.46	86.73	. . .
Hispanic:													
2002	100.0	6.56	1.18	0.12	0.22	0.24	0.27	0.33	5.38	1.25	4.13	93.44	. . .
2001	100.0	6.49	1.15	0.12	0.21	0.23	0.27	0.32	5.33	1.25	4.09	93.51	. . .
2000	100.0	6.42	1.16	0.11	0.22	0.24	0.26	0.33	5.26	1.23	4.04	93.58	. . .
1999	100.0	6.39	1.15	0.11	0.23	0.23	0.26	0.32	5.24	1.21	4.02	93.61	. . .

. . . Category not applicable.

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

[2]Births with not stated birthweight are subtracted from the total number of births used as denominators for percentage computations.

Table 4. Infant and neonatal mortality rates, by period of gestation and by race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Preterm (less than 37 weeks)							Term (37–41 weeks)	Post-term (42 weeks or more)
		Total preterm	Very preterm (less than 32 weeks)			Moderately preterm (32–36 weeks)				
			Total very preterm	Less than 28 weeks	28–31 weeks	Total moderately preterm	32–35 weeks	36 weeks		
					Infant mortality rate[1]					
All races:[2]										
2002	7.0	37.9	186.4	414.5	47.6	9.2	11.9	5.7	2.5	3.1
2001	6.8	36.9	181.0	406.1	46.0	8.9	11.6	5.4	2.5	3.0
2000	6.9	37.9	180.9	406.4	46.8	9.4	12.0	6.0	2.6	2.9
1999	7.0	38.2	183.3	407.8	47.7	9.1	11.8	5.8	2.7	2.9
Non-Hispanic white:										
2002	5.8	33.2	179.9	431.4	46.5	8.9	11.8	5.6	2.3	2.9
2001	5.7	32.5	175.0	413.9	47.6	8.7	11.6	5.2	2.3	2.8
2000	5.7	33.0	173.4	415.7	47.6	9.3	12.2	5.8	2.4	2.6
1999	5.8	33.1	172.7	410.1	48.4	9.2	12.2	5.6	2.4	2.6
Non-Hispanic black:										
2002	13.9	57.3	212.9	412.0	53.1	11.1	13.5	7.5	4.1	4.9
2001	13.5	55.2	206.7	408.3	47.9	9.9	12.0	6.9	4.1	5.3
2000	13.6	56.2	202.9	402.0	48.9	11.2	13.3	8.2	4.1	4.9
1999	14.1	57.6	208.8	407.6	51.1	10.6	12.6	7.7	4.3	4.6
Hispanic:										
2002	5.6	30.7	160.9	375.4	43.6	8.0	10.7	4.6	2.1	2.5
2001	5.4	29.4	152.4	371.6	39.3	8.1	10.5	4.8	2.1	2.0
2000	5.6	30.2	156.1	377.9	39.4	7.8	10.1	4.7	2.2	2.3
1999	5.7	30.7	163.3	395.5	40.6	7.9	10.3	4.6	2.2	2.5
					Neonatal mortality rate[1]					
All races:[2]										
2002	4.7	30.8	163.0	375.5	33.7	5.2	7.1	2.8	0.9	1.0
2001	4.5	29.9	157.8	366.3	32.7	5.0	6.8	2.7	0.9	1.1
2000	4.6	30.7	158.6	368.5	33.8	5.3	7.1	3.0	1.0	1.1
1999	4.7	31.2	161.3	371.9	34.1	5.1	6.8	2.9	1.0	1.0
Non-Hispanic white:										
2002	3.9	27.4	160.1	397.2	34.3	5.4	7.4	3.0	0.9	0.9
2001	3.8	26.9	156.4	382.3	36.0	5.2	7.3	2.6	0.9	1.0
2000	3.8	27.2	154.5	383.3	35.8	5.7	7.8	3.1	0.9	1.0
1999	3.8	27.2	154.3	380.5	35.8	5.5	7.5	3.1	1.0	0.9
Non-Hispanic black:										
2002	9.3	45.4	181.6	365.9	33.8	5.0	6.6	2.6	1.2	1.3
2001	9.0	43.3	173.9	356.8	29.7	4.4	5.5	2.8	1.2	1.7
2000	9.2	44.4	172.9	356.0	31.3	5.0	6.4	2.8	1.4	1.7
1999	9.6	46.2	179.4	362.8	33.7	4.8	6.2	2.7	1.3	1.3
Hispanic:										
2002	3.8	24.9	140.6	338.2	32.6	4.8	6.8	2.2	0.9	1.0
2001	3.6	23.9	133.7	335.3	29.8	4.8	6.5	2.6	0.8	1.0
2000	3.8	24.5	137.0	340.8	29.8	4.5	6.0	2.6	0.9	1.0
1999	3.9	25.2	145.2	362.8	30.2	4.6	6.2	2.5	0.9	1.1

[1]Infant mortality rates are deaths less than 1 year, and neonatal mortality rates are deaths less than 28 days per 1,000 live births in specified group.

[2]Includes races other than white and black and origin not stated.

Table 5. Number and percentage distribution of infant and neonatal deaths, by period of gestation, according to race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Preterm (less than 37 weeks)									Term (37–41 weeks)	Post-term (42 weeks or more)	Not stated
		Total preterm	Very preterm (less than 32 weeks)					Moderately preterm (32–36 weeks)					
			Total very preterm	Extremely preterm (less than 28 weeks)				Total moderately preterm	32–35 weeks	36 weeks			
				Total extremely preterm	Less than 24 weeks	24–27 weeks	28–31 weeks						
Infant	Number of deaths												
All races:[1]													
2002	27,970	18,207	14,515	12,208	7,339	4,870	2,307	3,692	2,666	1,026	8,002	824	937
2001	27,523	17,596	14,059	11,828	7,133	4,695	2,231	3,537	2,580	957	8,221	809	894
2000	27,960	17,698	14,034	11,757	6,944	4,812	2,277	3,664	2,631	1,033	8,418	851	995
1999	27,864	17,603	14,092	11,808	7,099	4,709	2,284	3,511	2,533	978	8,479	826	956
Non-Hispanic white:													
2002	13,327	8,342	6,415	5,332	3,059	2,273	1,083	1,927	1,371	556	4,307	428	249
2001	13,300	8,134	6,280	5,165	3,040	2,124	1,115	1,854	1,348	506	4,458	436	273
2000	13,461	8,079	6,131	5,023	2,843	2,180	1,108	1,948	1,396	552	4,618	441	323
1999	13,522	8,112	6,186	5,050	2,931	2,118	1,136	1,926	1,388	538	4,683	434	292
Non-Hispanic black:													
2002	8,031	5,817	4,949	4,264	2,709	1,555	685	867	627	240	1,771	179	264
2001	7,938	5,695	4,907	4,271	2,668	1,603	636	788	565	223	1,807	203	234
2000	8,212	5,872	4,975	4,300	2,681	1,619	675	897	636	261	1,871	208	259
1999	8,327	5,934	5,096	4,401	2,768	1,634	695	838	598	240	1,895	192	305
Hispanic:													
2002	4,927	3,050	2,371	1,955	1,150	805	416	680	512	168	1,450	161	266
2001	4,630	2,803	2,147	1,782	1,035	747	365	656	488	168	1,447	126	254
2000	4,564	2,706	2,112	1,763	1,019	744	349	594	442	152	1,439	147	271
1999	4,362	2,620	2,047	1,714	988	725	333	573	431	142	1,352	149	241
Neonatal[2]													
All races:[1]													
2002	18,791	14,787	12,692	11,061	7,087	3,974	1,631	2,095	1,602	493	2,936	270	798
2001	18,275	14,239	12,255	10,669	6,897	3,772	1,586	1,983	1,513	470	2,989	293	754
2000	18,733	14,366	12,301	10,660	6,731	3,930	1,641	2,065	1,558	507	3,221	318	828
1999	18,700	14,376	12,406	10,771	6,894	3,878	1,635	1,970	1,476	494	3,228	289	808
Non-Hispanic white:													
2002	8,853	6,871	5,710	4,910	2,988	1,922	800	1,161	866	295	1,636	137	208
2001	8,817	6,720	5,612	4,770	2,979	1,791	842	1,108	851	257	1,708	156	233
2000	8,924	6,656	5,464	4,631	2,778	1,853	833	1,192	892	300	1,832	161	274
1999	8,987	6,675	5,527	4,685	2,868	1,816	842	1,148	851	297	1,905	155	253
Non-Hispanic black:													
2002	5,399	4,610	4,221	3,786	2,596	1,190	435	389	306	83	510	47	232
2001	5,293	4,476	4,127	3,732	2,546	1,185	395	349	259	90	546	66	207
2000	5,552	4,636	4,240	3,808	2,577	1,232	432	396	308	88	619	74	222
1999	5,634	4,757	4,377	3,918	2,665	1,253	459	381	296	85	558	55	264
Hispanic:													
2002	3,360	2,480	2,071	1,761	1,092	669	310	408	326	82	603	62	215
2001	3,105	2,277	1,885	1,608	996	612	277	392	301	91	566	61	201
2000	3,078	2,198	1,854	1,590	986	603	264	344	260	84	592	66	223
1999	2,982	2,155	1,820	1,572	953	619	248	335	258	77	566	66	195
Infant	Percent[3]												
All races:[1]													
2002	100.0	67.35	53.69	45.16	27.15	18.02	8.53	13.66	9.86	3.80	29.60	3.05	. . .
2001	100.0	66.08	52.80	44.42	26.79	17.63	8.38	13.28	9.69	3.60	30.87	3.04	. . .
2000	100.0	65.63	52.05	43.60	25.75	17.85	8.44	13.59	9.76	3.83	31.22	3.16	. . .
1999	100.0	65.42	52.37	43.88	26.38	17.50	8.49	13.05	9.41	3.64	31.51	3.07	. . .
Non-Hispanic white:													
2002	100.0	63.79	49.05	40.77	23.39	17.38	8.28	14.73	10.49	4.25	32.93	3.27	. . .
2001	100.0	62.44	48.21	39.65	23.34	16.30	8.56	14.23	10.34	3.89	34.22	3.35	. . .
2000	100.0	61.49	46.66	38.23	21.64	16.59	8.43	14.83	10.62	4.20	35.15	3.36	. . .
1999	100.0	61.31	46.76	38.17	22.15	16.01	8.59	14.56	10.49	4.07	35.40	3.28	. . .
Non-Hispanic black:													
2002	100.0	74.89	63.72	54.90	34.88	20.02	8.82	11.17	8.07	3.10	22.80	2.30	. . .
2001	100.0	73.92	63.69	55.44	34.63	20.81	8.25	10.23	7.33	2.89	23.46	2.63	. . .
2000	100.0	73.83	62.56	54.07	33.71	20.36	8.49	11.28	8.00	3.29	23.52	2.62	. . .
1999	100.0	73.98	63.53	54.87	34.51	20.37	8.66	10.45	7.45	2.99	23.62	2.39	. . .

See footnotes at end of table.

Table 5. Number and percentage distribution of infant and neonatal deaths, by period of gestation, according to race and Hispanic origin of mother: United States, 1999–2002 linked files—Con.

Characteristic	Total	Preterm (less than 37 weeks)									Term (37–41 weeks)	Post-term (42 weeks or more)	Not stated
		Total preterm	Very preterm (less than 32 weeks)					Moderately preterm (32–36 weeks)					
			Total very preterm	Extremely preterm (less than 28 weeks)				Total moderately preterm	32–35 weeks	36 weeks			
				Total extremely preterm	Less than 24 weeks	24–27 weeks	28–31 weeks						
Infant—Con.						Percent[3]							
Hispanic:													
2002	100.0	65.44	50.86	41.94	24.67	17.27	8.92	14.58	10.98	3.60	31.11	3.45	. . .
2001	100.0	64.05	49.07	40.72	23.65	17.07	8.35	14.98	11.14	3.84	33.07	2.88	. . .
2000	100.0	63.03	49.19	41.06	23.74	17.33	8.13	13.84	10.30	3.55	33.52	3.42	. . .
1999	100.0	63.58	49.67	41.58	23.97	17.59	8.09	13.91	10.47	3.45	32.81	3.62	. . .
Neonatal[2]													
All races:[1]													
2002	100.0	82.18	70.54	61.47	39.39	22.09	9.06	11.64	8.91	2.74	16.32	1.50	. . .
2001	100.0	81.27	69.95	60.89	39.36	21.53	9.05	11.32	8.64	2.68	17.06	1.67	. . .
2000	100.0	80.24	68.70	59.54	37.59	21.95	9.17	11.53	8.70	2.83	17.99	1.78	. . .
1999	100.0	80.35	69.34	60.20	38.53	21.67	9.14	11.01	8.25	2.76	18.04	1.62	. . .
Non-Hispanic white:													
2002	100.0	79.48	66.05	56.79	34.56	22.23	9.26	13.43	10.02	3.42	18.92	1.58	. . .
2001	100.0	78.29	65.38	55.57	34.70	20.86	9.81	12.91	9.92	3.00	19.90	1.82	. . .
2000	100.0	76.95	63.17	53.54	32.12	21.42	9.63	13.78	10.32	3.47	21.18	1.86	. . .
1999	100.0	76.43	63.28	53.64	32.84	20.79	9.64	13.14	9.74	3.40	21.81	1.77	. . .
Non-Hispanic black:													
2002	100.0	89.21	81.69	73.28	50.24	23.03	8.43	7.52	5.92	1.60	9.87	0.91	. . .
2001	100.0	88.01	81.14	73.37	50.06	23.30	7.76	6.86	5.09	1.76	10.73	1.30	. . .
2000	100.0	86.98	79.55	71.45	48.35	23.11	8.11	7.43	5.78	1.65	11.62	1.39	. . .
1999	100.0	88.59	81.50	72.96	49.63	23.33	8.55	7.09	5.51	1.58	10.39	1.02	. . .
Hispanic:													
2002	100.0	78.84	65.86	55.99	34.72	21.27	9.87	12.98	10.36	2.62	19.18	1.97	. . .
2001	100.0	78.40	64.90	55.37	34.30	21.07	9.53	13.50	10.37	3.15	19.48	2.10	. . .
2000	100.0	76.97	64.93	55.68	34.54	21.12	9.25	12.04	9.11	2.94	20.72	2.31	. . .
1999	100.0	77.31	65.29	56.40	34.19	22.21	8.89	12.02	9.26	2.76	20.30	2.37	. . .

. . . Category not applicable.

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

[2]Neonatal is less than 28 days of age.

[3]Infant and neonatal deaths with not stated period of gestation are subtracted from the total number of infant deaths used as denominators for percentage computations.

Table 6. Number and percentage distribution of live births, by period of gestation, according to race and Hispanic origin of mother: United States, 1999–2002 linked files

Characteristic	Total	Preterm (less than 37 weeks)											
			Very preterm (less than 32 weeks)										
				Extremely preterm (less than 28 weeks)				Moderately preterm (32–36 weeks)					
		Total preterm	Total very preterm	Total extremely preterm	Less than 24 weeks	24–27 weeks	28–31 weeks	Total moderately preterm	32–35 weeks	36 weeks	Term (37–41 weeks)	Post-term (42 weeks or more)	Not stated
						Number of births							
All races:[1]													
2002	4,021,825	480,849	77,877	29,454	9,510	19,944	48,423	402,972	224,368	178,604	3,231,562	268,096	41,318
2001	4,026,036	476,299	77,676	29,123	9,338	19,785	48,553	398,623	222,645	175,978	3,235,790	274,065	39,882
2000	4,058,882	467,244	77,558	28,931	9,271	19,660	48,627	389,686	218,932	170,754	3,256,070	292,209	43,359
1999	3,959,417	460,853	76,897	28,959	9,387	19,572	47,938	383,956	215,529	168,427	3,170,780	284,844	42,940
Non-Hispanic white:													
2002	2,298,168	251,141	35,662	12,360	3,757	8,603	23,302	215,479	116,568	98,911	1,885,188	149,898	11,941
2001	2,326,606	250,160	35,887	12,479	3,733	8,746	23,408	214,273	116,272	98,001	1,908,845	155,422	12,179
2000	2,362,982	244,943	35,364	12,083	3,565	8,518	23,281	209,579	114,125	95,454	1,934,500	168,723	14,816
1999	2,346,450	245,159	35,809	12,313	3,624	8,689	23,496	209,350	113,630	95,720	1,917,885	168,364	15,042
Non-Hispanic black:													
2002	578,366	101,443	23,244	10,349	3,651	6,698	12,895	78,199	46,305	31,894	435,923	36,896	4,104
2001	589,940	103,251	23,733	10,460	3,672	6,788	13,273	79,518	47,147	32,391	443,809	38,585	4,295
2000	604,367	104,394	24,518	10,697	3,735	6,962	13,821	79,876	47,925	31,951	452,617	42,684	4,672
1999	588,981	103,034	24,401	10,799	3,875	6,924	13,602	78,633	47,484	31,149	439,816	41,462	4,669
Hispanic:													
2002	876,654	99,517	14,737	5,207	1,588	3,619	9,530	84,780	47,999	36,781	692,314	64,998	19,825
2001	851,867	95,383	14,092	4,796	1,456	3,340	9,296	81,291	46,341	34,950	674,020	63,839	18,625
2000	815,883	89,706	13,531	4,665	1,448	3,217	8,866	76,175	43,583	32,592	645,011	63,102	18,064
1999	764,339	85,363	12,536	4,333	1,642	2,991	8,203	72,827	41,797	31,030	603,348	58,360	17,268
						Percent[2]							
All races:[1]													
2002	100.0	12.08	1.96	0.74	0.24	0.50	1.22	10.12	5.64	4.49	81.18	6.74	. . .
2001	100.0	11.95	1.95	0.73	0.23	0.50	1.22	10.00	5.59	4.41	81.18	6.88	. . .
2000	100.0	11.64	1.93	0.72	0.23	0.49	1.21	9.70	5.45	4.25	81.09	7.28	. . .
1999	100.0	11.77	1.96	0.74	0.24	0.50	1.22	9.80	5.50	4.30	80.96	7.27	. . .
Non-Hispanic white:													
2002	100.0	10.98	1.56	0.54	0.16	0.38	1.02	9.43	5.10	4.33	82.46	6.56	. . .
2001	100.0	10.81	1.55	0.54	0.16	0.38	1.01	9.26	5.02	4.23	82.48	6.72	. . .
2000	100.0	10.43	1.51	0.51	0.15	0.36	0.99	8.93	4.86	4.07	82.38	7.19	. . .
1999	100.0	10.52	1.54	0.53	0.16	0.37	1.01	8.98	4.87	4.11	82.26	7.22	. . .
Non-Hispanic black:													
2002	100.0	17.66	4.05	1.80	0.64	1.17	2.25	13.62	8.06	5.55	75.91	6.42	. . .
2001	100.0	17.63	4.05	1.79	0.63	1.16	2.27	13.58	8.05	5.53	75.78	6.59	. . .
2000	100.0	17.41	4.09	1.78	0.62	1.16	2.30	13.32	7.99	5.33	75.47	7.12	. . .
1999	100.0	17.63	4.18	1.85	0.66	1.18	2.33	13.46	8.13	5.33	75.27	7.10	. . .
Hispanic:													
2002	100.0	11.61	1.72	0.61	0.19	0.42	1.11	9.89	5.60	4.29	80.80	7.59	. . .
2001	100.0	11.45	1.69	0.58	0.17	0.40	1.12	9.76	5.56	4.19	80.89	7.66	. . .
2000	100.0	11.24	1.70	0.58	0.18	0.40	1.11	9.55	5.46	4.09	80.85	7.91	. . .
1999	100.0	11.43	1.68	0.58	0.22	0.40	1.10	9.75	5.59	4.15	80.76	7.81	. . .

. . . Category not applicable.

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

[2]Births with not stated period of gestation are subtracted from the total number of births used as denominators for percentage computations.

Table 7. Infant mortality rates, births, and infant deaths, by birthweight and plurality: United States, 2001–02 linked files

Birthweight in grams	Infant mortality rates[1]		Births		Infant deaths	
	2002	2001	2002	2001	2002	2001
			All pluralities			
Total	7.0	6.8	4,021,825	4,026,036	27,970	27,523
Less than 2,500	59.5	58.6	315,028	309,760	18,759	18,151
Less than 1,500	250.8	244.4	59,361	58,702	14,886	14,345
Less than 500	861.9	855.0	6,780	6,450	5,845	5,515
500–749	489.6	476.8	11,290	11,081	5,529	5,283
750–999	155.1	154.1	11,803	11,847	1,831	1,826
1,000–1,249	70.3	73.8	13,599	13,572	955	1,001
1,250–1,499	45.7	45.6	15,889	15,752	726	719
1,500–2,499	15.1	15.2	255,667	251,058	3,873	3,806
1,500–1,999	26.5	27.2	61,705	60,858	1,636	1,658
2,000–2,499	11.5	11.3	193,962	190,200	2,237	2,148
2,500 or more	2.4	2.4	3,705,556	3,714,965	8,840	8,989
Not stated	...	...	1,241	1,311	371	383
			Singletons			
Total	6.1	6.0	3,889,276	3,897,299	23,691	23,358
Less than 2,500	61.6	60.3	238,694	236,156	14,703	14,243
Less than 1,500	257.3	250.8	43,704	43,400	11,247	10,885
Less than 500	847.7	845.3	5,083	4,849	4,309	4,099
500–749	477.2	468.0	8,722	8,568	4,162	4,010
750–999	157.6	156.1	8,989	9,007	1,417	1,406
1,000–1,249	78.0	78.9	9,893	9,788	772	772
1,250–1,499	53.3	53.5	11,017	11,188	587	598
1,500–2,499	17.7	17.4	194,990	192,756	3,456	3,357
1,500–1,999	33.9	33.7	41,882	41,954	1,420	1,414
2,000–2,499	13.3	12.9	153,108	150,802	2,036	1,943
2,500 or more	2.4	2.4	3,649,433	3,659,953	8,678	8,806
Not stated	...	...	1,149	1,190	311	308
			Multiples			
Total	32.3	32.4	132,549	128,737	4,278	4,265
Less than 2,500	53.1	53.1	76,334	73,604	4,056	3,908
Less than 1,500	232.4	226.0	15,657	15,302	3,639	3,458
Less than 500	905.1	884.4	1,697	1,601	1,536	1,416
500–749	532.3	506.6	2,568	2,513	1,367	1,273
750–999	147.1	147.9	2,814	2,840	414	420
1,000–1,249	49.4	60.5	3,706	3,784	183	229
1,250–1,499	28.5	26.3	4,872	4,564	139	120
1,500–2,499	6.9	7.7	60,677	58,302	417	449
1,500–1,999	10.9	12.9	19,823	18,904	216	244
2,000–2,499	4.9	5.2	40,854	39,398	201	205
2,500 or more	2.9	3.3	56,123	55,012	162	182
Not stated	...	...	92	121	60	75

... Category not applicable.

[1]Rates per 1,000 live births.

Table 8. Number and percentage of births, by method of delivery and birthweight: United States, 2001–02 linked files

Birthweight in grams	2002			2001			Difference in number of cesarean births, 2002–2001	Cesarean delivery rate[1,2]		Percent difference in cesarean delivery rate, 2002–2001
	Total[3]	Vaginal	Cesarean	Total[3]	Vaginal	Cesarean		2002	2001	
Total	4,021,825	2,958,478	1,043,847	4,026,036	3,028,053	978,419	65,428	26.1	24.4	7.0
Less than 1,500	59,361	25,716	33,535	58,702	26,327	32,210	1,325	56.6	55.0	2.9
Less than 500	6,780	5,633	1,125	6,450	5,473	947	178	16.6	14.8	12.2
500–999	23,093	9,644	13,410	22,928	9,895	12,974	436	58.2	56.7	2.6
500–749	11,290	5,629	5,643	11,081	5,579	5,469	174	50.1	49.5	1.2
750–999	11,803	4,015	7,767	11,847	4,316	7,505	262	65.9	63.5	3.8
1,000–1,249	13,599	4,595	8,985	13,572	4,777	8,766	219	66.2	64.7	2.3
1,250–1,499	15,889	5,844	10,015	15,752	6,182	9,523	492	63.2	60.6	4.3
1,500–2,499	255,667	149,921	104,853	251,058	152,505	97,598	7,255	41.2	39.0	5.6
1,500–1,999	61,705	28,366	33,164	60,858	29,242	31,373	1,791	53.9	51.8	4.1
2,000–2,499	193,962	121,555	71,689	190,200	123,263	66,225	5,464	37.1	34.9	6.3
2,500 or more	3,705,556	2,782,115	905,336	3,714,965	2,848,513	848,467	56,869	24.6	23.0	7.0
Not stated	1,241	726	123	1,311	708	144	–21	14.5	16.9	–14.2

[1]Percentage of births delivered by cesarean delivery.

[2]Births with not stated method of delivery are subtracted from the total number of births used as denominators for percentage computations.

[3]Births with not stated method of delivery included in totals but not shown separately.

Technical Notes

Data in this report are based on the period linked birth/infant death data sets (linked files) and the fetal death data sets. In the linked files the information from the death certificate is linked to the information from the birth certificate for each infant under 1 year of age who died in the 50 States, the District of Columbia, and selected U.S. Territories (4). 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 and trends.

Numbers of births and deaths from the linked file differ slightly from those available from the mortality and natality files. The linked denominator file includes a few late-filed births that were needed to link to infant mortality records; thus, the number of births from the linked file is slightly higher than that from the natality file (9). The number of infant deaths from the linked file differs slightly from the number from the main mortality file (3), primarily because of geographic coverage differences between the two files. 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 DC.

The number of births by birthweight may also differ slightly from those published from the natality file (9) because an additional imputation is performed for birthweight in the linked file. For the linked file, not stated birthweight was imputed for 1,814 records or 0.04 percent of the birth records in 2002 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 (3.85 percent before imputation) than for live births (0.07 percent before imputation). The imputation reduced the percentage of not stated records to 1.42 percent for infant deaths and 0.04 percent for births. All analyses in this report were performed separately on unimputed and on imputed birthweight data; because the imputation made no appreciable difference, the imputed values were retained.

More-detailed information on the linked file is available elsewhere, including information on linkage methodology, weighting, cause of death classification (4), and tests to determine the statistical significance of differences in rates and percentage distributions (4,9). Except as otherwise noted, statements in the text that a rate or percentage is higher or lower than another indicate that the difference between the two is statistically significant. Birth certificate data may underreport or incorrectly report medical risk factor and complications of labor and delivery prevalence because of a lack of adherence to uniform definitions and difficulty in interpreting data from medical records (46,47). Definitions of medical terms are also available elsewhere (9).

Contents

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National Center for Health Statistics

Director, Edward J. Sondik, Ph.D.
Deputy Director, Jack R. Anderson

Division of Vital Statistics

Director, Charles J. Rothwell

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HEALTH & HUMAN SERVICES

Centers for Disease Control and Prevention
National Center for Health Statistics
3311 Toledo Road
Hyattsville, Maryland 20782

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