



## Infant Mortality in the United States: Provisional Data From the 2022 Period Linked Birth/Infant Death File

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### Abstract

**Objectives**—This report presents provisional 2022 data on infant mortality rates using the U.S. linked birth/infant death files. Infant mortality rates are shown by infant age at death, maternal race and Hispanic origin and age, gestational age and sex of the newborn, state of residence of the mother, and 10 leading causes of infant death.

**Methods**—Data are from the period linked birth/infant death files, which link infant deaths with the corresponding birth certificates. Comparisons are made between provisional 2022 and final 2021 data. The linked birth/infant files are based on 100% of birth certificates and 98%–99% of infant death certificates registered in all states and the District of Columbia. For 2022, 1.4% of infant deaths remained unlinked. Infant deaths in states with less than 100% of infant death records linked to their respective birth records are weighted.

**Results**—The provisional infant mortality rate for the United States in 2022 was 5.60 infant deaths per 1,000 live births, 3% higher than the rate in 2021 (5.44). The neonatal mortality rate increased 3% from 3.49 to 3.58, and the postneonatal mortality rate by 4% (from 1.95 to 2.02) from 2021 to 2022. Mortality rates increased significantly among infants of American Indian and Alaska Native non-Hispanic (7.46 to 9.06) and White non-Hispanic (4.36 to

4.52) women. From 2021 to 2022, infant mortality rates increased significantly for infants of women ages 25–29, from 5.15 to 5.37. Mortality rates increased significantly for total preterm (less than 37 weeks of gestation) and early preterm (less than 34 weeks of gestation) infants. The mortality rate increased significantly only for male infants from 2021 to 2022. Infant mortality rates increased in four states and declined in one state. Mortality rates increased for 2 of the 10 leading causes of death: maternal complications and bacterial sepsis.

**Keywords:** infant mortality rates • infant health • National Vital Statistics System

### Introduction

This is the first report to present provisional data on infant mortality rates by selected maternal and infant health characteristics for the United States based on the period linked birth/infant death file. This file uses variables available from the birth certificate to conduct more detailed analyses of infant mortality patterns. The linked birth/infant death data set also is the preferred source for examining infant mortality by race and Hispanic origin. Infant mortality rates by race and Hispanic origin are more accurately measured from the birth certificate compared with the death certificate. This report expands on items presented in the Quarterly Provisional Estimates of Infant

Mortality, which present provisional estimates by age at death and cause of death, based on infant deaths from provisional and final mortality and birth files (1). This report describes changes in infant mortality rates from 2021 to 2022 by infant age at death, maternal race and Hispanic origin, maternal age, infant sex, gestational age of the newborn, state of residence, and the 10 leading causes of infant death. Provisional data for 2022 are compared with final data for 2021 (2).

### Methods

The linked period birth/infant death data are collected through the National Vital Statistics System. Findings are based on all linked birth/infant death records received and processed by the National Center for Health Statistics for the calendar year 2022 as of July 27, 2023; these records represent almost 100% of linked period file birth/infant death records reported for 2022. In 2022 provisional linked birth/infant death data, 98.6% of infant death records were linked to the corresponding birth certificates. The number of infant deaths in the linked file for the 50 states and the District of Columbia was weighted to equal the sum of the linked plus unlinked infant deaths by state of occurrence of birth and age at death (younger than 7 days, 7–27 days, and 28 days to younger than 1 year). The provisional data file differs from the final file in that it does not undergo the more comprehensive



data quality review conducted for final data, which focuses on consistency between cause of death and variables such as age at death and infant sex. As a result, infant mortality rates presented in this report may differ slightly from those based on final data.

Hispanic origin and race are reported separately on the birth certificate (3). Data shown by Hispanic origin include all people of Hispanic origin of any race. Data for non-Hispanic people are shown separately for each single-race group. Data by race are based on the revised standards issued by the Office of Management and Budget in 1997 (4). The race and Hispanic-origin groups shown are: single-race American Indian and Alaska Native non-Hispanic (subsequently, American Indian and Alaska Native), single-race Asian non-Hispanic (subsequently, Asian), single-race Black non-Hispanic (subsequently, Black), single-race Native Hawaiian or Other Pacific Islander non-Hispanic (subsequently, Native Hawaiian or Other Pacific Islander), single-race White non-Hispanic (subsequently, White), and Hispanic.

Gestational age is based on the obstetric estimate of gestation and is shown for seven categories: less than 28 weeks of gestation, less than 34 weeks of gestation, less than 37 weeks of gestation, 34–36 weeks of gestation, 37–38 weeks of gestation, 39–40 weeks of gestation, and 41 weeks of gestation or more.

Infant mortality rates by state are based on the mother's state of residence. The small number of infant deaths in some states by year can limit the ability to detect statistically significant changes between years and between states.

Provisional data for 2022 are compared with final data for 2021 (2). Differences between rates reported in the text are statistically significant at the 0.05 level unless otherwise noted. For information on the methods used to test for statistical significance, see the 2021 user guide (5).

## Results

### Total infant mortality rate and infant mortality rate by age at death

- The provisional number of linked birth/infant deaths for the United States in 2022 was 20,538, an increase of 3% from 2021 (19,928) (Table 1).
- The provisional infant mortality rate for 2022 was 5.60 infant deaths per 1,000 live births, 3% higher than the rate in 2021 (5.44) (Figure 1). The provisional neonatal mortality rate (infant deaths at less than 28 days) was 3.58, 3% higher than the 2021 rate of 3.49. The provisional postneonatal mortality rate (infant deaths from 28 days through 364 days) for 2022 was 2.02, 4% higher than the rate in 2021 (1.95).

### Maternal race and Hispanic origin

- Among race and Hispanic-origin groups, the mortality rate increased from 2021 to 2022 for infants of American Indian and Alaska Native (7.46 infant deaths per 1,000 live births to 9.06) and White (4.36 to 4.52) women (Table 1, Figure 2).
- Increases in mortality rates for infants of Black (10.55 to 10.86), Native Hawaiian or Other Pacific Islander (7.76 to 8.50), and Hispanic (4.79 to 4.88) women, and the decrease for infants of Asian (3.69 to 3.50) women from 2021 to 2022 were not statistically significant.

### Maternal age

- The provisional infant mortality rate for infants of women ages 25–29 increased from 2021 to 2022 (5.15 infant deaths per 1,000 live births to 5.37) (Table 1).
- Mortality rates did not increase significantly for infants of females younger than age 20 (9.22 to 9.89), 20–24 (6.87 to 7.12), 30–34 (4.48 to 4.58), and 35–39 (4.92 to 4.97)

from 2021 to 2022. No statistically significant change was seen in the rate for infants of women ages 40 and older (6.74 to 6.71).

### Gestational age

- Mortality rates increased among all preterm infants (less than 37 weeks of gestation) from 2021 to 2022, from 33.59 deaths per 1,000 live births to 34.69, and among early preterm infants (less than 34 weeks of gestation) from 103.08 to 107.61. Increases in rates for infants born extremely preterm (less than 28 weeks) (353.76 to 363.17) and late preterm (34–36 weeks) (8.11 to 8.28) were not significant (Table 1).
- Increases in mortality rates for early-term (37–38 weeks) (3.14 to 3.22), full-term (39–40 weeks) (1.59 to 1.66), and late-term (41 weeks or more) (1.62 to 1.86) infants were not significant.

### Infant sex

- Mortality rates increased from 2021 to 2022 among male infants (5.83 infant deaths per 1,000 live births to 6.06). The increase in the rate for females (from 5.02 to 5.12) was not significant (Table 1).

### State of residence

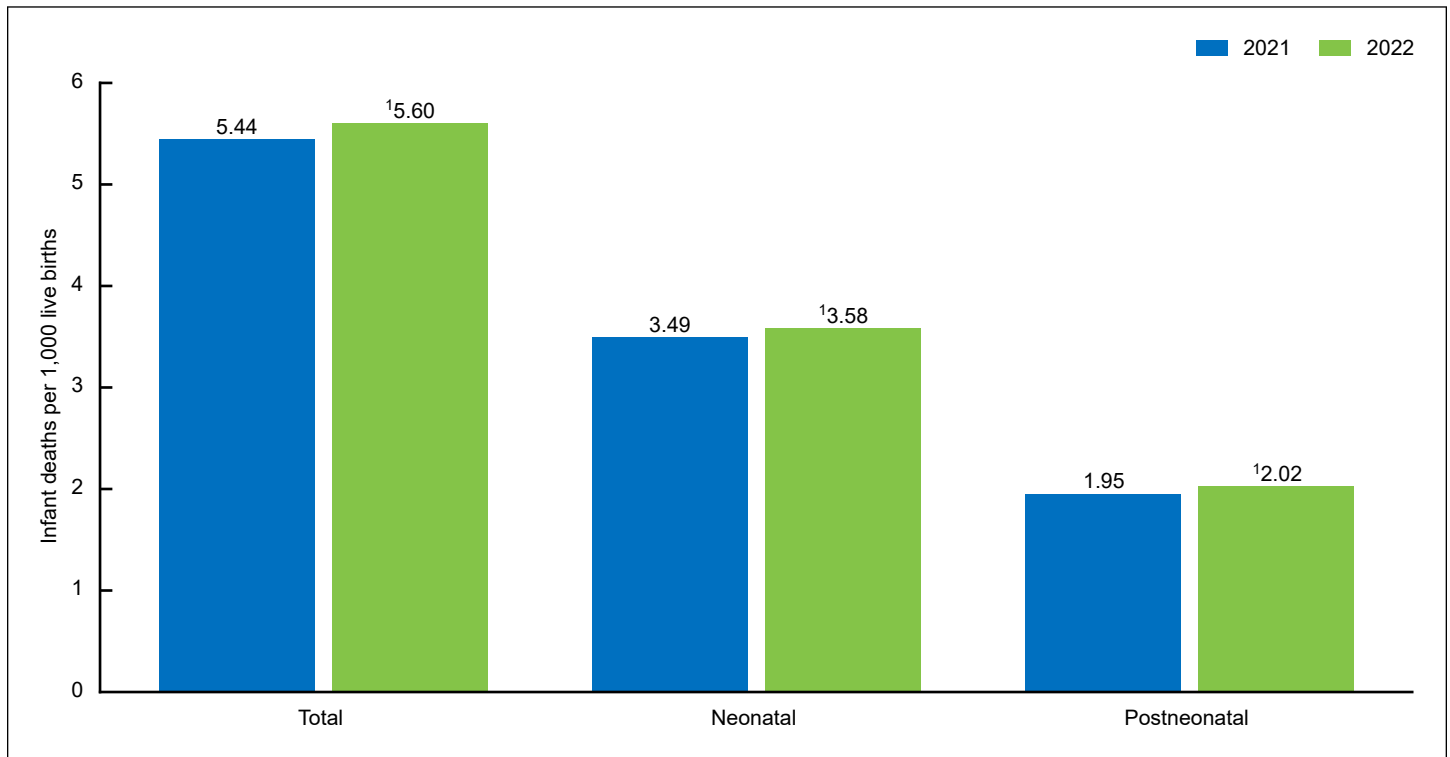
- Compared with 2021, the infant mortality rate in 2022 declined significantly in one state (Nevada) and increased in four states (Georgia, Iowa, Missouri, and Texas). Changes in the remaining states and the District of Columbia were not significant (Table 2).

### Leading causes of death

- From 2021 to 2022, among the 10 leading causes of death, the infant mortality rate increased for maternal complications (from 30.4 infant deaths per 100,000 live births to 33.0) and bacterial sepsis of newborn (from 15.3 to 17.4) (Table 3).

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Figure 1. Infant mortality rate, by age at death: United States, 2021 final and 2022 provisional

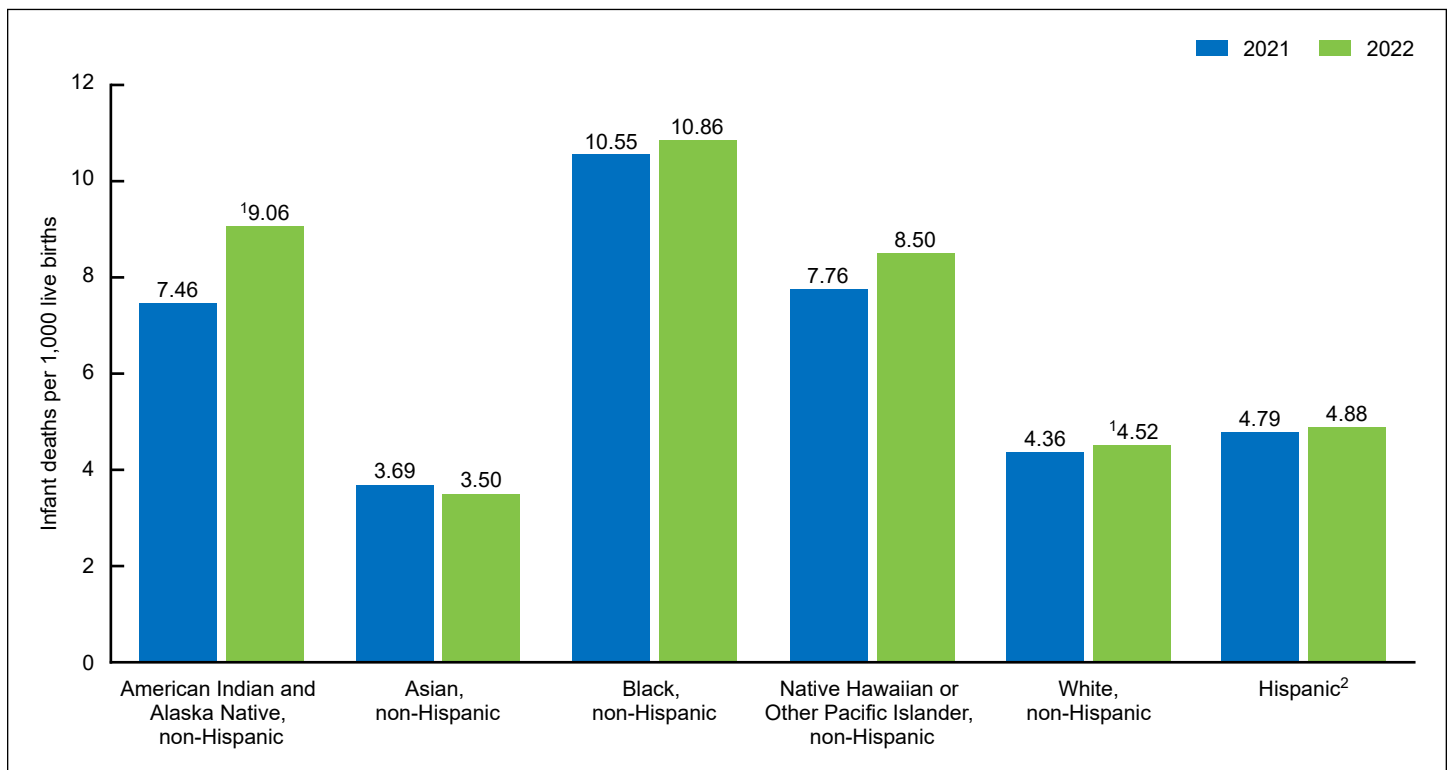


<sup>1</sup>Significantly different from 2021.

NOTES: Total rate is number of infant deaths per 1,000 live births. Neonatal rate is number of deaths before 28 days per 1,000 live births. Postneonatal rate is number of deaths from 28 through 364 days per 1,000 live births.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

Figure 2. Infant mortality rate, by race and Hispanic origin: United States, 2021 final and 2022 provisional



<sup>1</sup>Significantly different from 2021.

<sup>2</sup>People of Hispanic origin may be of any race.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

- Declines in rates for disorders related to short gestation and low birth weight (80.7 to 78.4); complications of placenta, cord and membranes (18.1 to 17.2); diseases of the circulatory system (10.9 to 9.8); and neonatal hemorrhage (9.4 to 9.2) were not significant.
- Increases in rates for unintentional injuries (35.5 to 36.8) and respiratory distress of the newborn (11.3 to 12.5) were not significant. Infant mortality rates for congenital malformations (108.9 to 109.1) and sudden infant death syndrome (39.8 to 39.8) were essentially unchanged.

## Summary

The infant mortality rate for the United States rose 3% from 2021 to 2022, the first year-to-year increase in the rate since 2001 to 2002 (6). From 2002 to 2021, the infant mortality rate declined 22%. From 2021 to 2022, increases in mortality rates were observed for neonatal and postneonatal infant deaths, infants born to American Indian and Alaska Native and White women, and infants born to women ages 25–29. Rates also increased for infants born preterm, male infants, and for infants in four states (Georgia, Iowa, Missouri, and Texas). Mortality rates increased significantly for 2 of the 10 leading causes of death: maternal complications and bacterial sepsis. Although not statistically significant, rates generally increased for most other race and Hispanic origin, maternal age, and gestational age groups, as well as for female infants, in a majority of states, and for 3 of the 10 leading causes of death.

This report, the first based on provisional data from the linked birth/infant death file, provides more timely information than reports based on final linked birth/infant death file data and provides detail by maternal and infant characteristics, such as maternal race and Hispanic origin and gestational age, which are unavailable in provisional mortality data releases.

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Table 1. Infant deaths, births, and infant mortality rates, by selected characteristics: United States, final 2021 and provisional 2022

Characteristic	2021			2022			Percent change
	Deaths	Births	Rate <sup>1</sup>	Deaths	Births	Rate <sup>1</sup>	
Total	19,928	3,664,292	5.44	20,538	3,667,758	5.60	†3
Age at death							
Neonatal <sup>2</sup>	12,797	3,664,292	3.49	13,120	3,667,758	3.58	†3
Postneonatal <sup>3</sup>	7,131	3,664,292	1.95	7,418	3,667,758	2.02	†4
Race and Hispanic origin							
Non-Hispanic:							
American Indian and Alaska Native							
Alaska Native	195	26,124	7.46	233	25,721	9.06	†21
Asian	788	213,813	3.69	767	218,994	3.50	-5
Black	5,463	517,889	10.55	5,552	511,439	10.86	3
Native Hawaiian or Other Pacific Islander							
Other Pacific Islander	74	9,531	7.76	86	10,122	8.50	10
White	8,236	1,887,656	4.36	8,311	1,840,739	4.52	†4
Hispanic	4,246	885,916	4.79	4,578	937,421	4.88	2
Maternal age							
Younger than 20	1,373	148,850	9.22	1,440	145,614	9.89	7
20–24	4,455	648,484	6.87	4,547	638,685	7.12	4
25–29	5,275	1,023,989	5.15	5,437	1,013,417	5.37	†4
30–34	4,999	1,115,055	4.48	5,127	1,118,787	4.58	2
35–39	2,911	592,179	4.92	3,017	606,598	4.97	1
40 and older	915	135,735	6.74	970	144,657	6.71	0
Period of gestation (weeks) <sup>4</sup>							
Less than 37							
Less than 34	12,896	383,979	33.59	13,201	380,548	34.69	†3
Less than 28	10,618	103,004	103.08	10,887	101,167	107.61	†4
34–36	8,323	23,527	353.76	8,487	23,369	363.17	3
37 or more							
37–38	2,278	280,975	8.11	2,314	279,381	8.28	2
39–40	3,310	1,052,935	3.14	3,457	1,074,082	3.22	3
41 or more	3,248	2,046,786	1.59	3,363	2,027,670	1.66	4
	288	177,600	1.62	340	182,787	1.86	15
Infant sex							
Female	8,998	1,790,876	5.02	9,174	1,793,312	5.12	2
Male	10,930	1,873,416	5.83	11,364	1,874,446	6.06	†4

†Significant change in rate from 2021 to 2022 ( $p < 0.05$ ).

<sup>1</sup>Deaths per 1,000 live births.

<sup>2</sup>Deaths before 28 days per 1,000 live births.

<sup>3</sup>Deaths from 28 through 364 days per 1,000 live births.

<sup>4</sup>Gestational age based on the obstetric estimate.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

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Table 2. Infant deaths, births, and infant mortality rates, by state of residence: United States, final 2021 and provisional 2022 data

State	2021			2022			Percent change
	Deaths	Births	Rate <sup>1</sup>	Deaths	Births	Rate <sup>1</sup>	
Alabama	439	58,054	7.56	389	58,149	6.69	-12
Alaska	69	9,367	7.37	62	9,359	6.62	-10
Arizona	426	77,916	5.47	485	78,547	6.17	13
Arkansas	309	35,965	8.59	272	35,471	7.67	-11
California	1,713	420,608	4.07	1,724	419,104	4.11	1
Colorado	314	62,949	4.99	283	62,383	4.54	-9
Connecticut	166	35,670	4.65	150	35,332	4.25	-9
Delaware	50	10,482	4.77	81	10,816	7.49	57
District of Columbia	59	8,660	6.81	44	8,075	5.45	-20
Florida	1,275	216,260	5.90	1,342	224,433	5.98	1
Georgia	776	124,073	6.25	892	126,130	7.07	†13
Hawaii	73	15,620	4.67	90	15,535	5.79	24
Idaho	115	22,427	5.13	118	22,391	5.27	3
Illinois	743	132,189	5.62	718	128,350	5.59	-1
Indiana	540	79,946	6.75	570	79,649	7.16	6
Iowa	147	36,835	3.99	190	36,506	5.20	†30
Kansas	184	34,705	5.30	200	34,401	5.81	10
Kentucky	321	52,214	6.15	302	52,315	5.77	-6
Louisiana	416	57,437	7.24	416	56,479	7.37	2
Maine	60	12,006	5.00	77	12,093	6.37	27
Maryland	409	68,285	5.99	415	68,782	6.03	1
Massachusetts	223	69,137	3.23	228	68,584	3.32	3
Michigan	653	104,980	6.22	657	102,321	6.42	3
Minnesota	311	64,425	4.83	288	64,015	4.50	-7
Mississippi	330	35,156	9.39	316	34,675	9.11	-3
Missouri	406	69,453	5.85	467	68,985	6.77	†16
Montana	55	11,231	4.90	52	11,175	4.65	-5
Nebraska	135	24,609	5.49	142	24,345	5.83	6
Nevada	194	33,686	5.76	149	33,193	4.49	†-22
New Hampshire	50	12,625	3.96	42	12,077	3.48	-12
New Jersey	362	101,497	3.57	367	102,893	3.57	0
New Mexico	102	21,391	4.77	127	21,614	5.88	23
New York	876	210,742	4.16	885	207,774	4.26	2
North Carolina	809	120,466	6.72	789	121,562	6.49	-3
North Dakota	28	10,112	2.77	42	9,567	4.39	59
Ohio	916	129,791	7.06	912	128,231	7.11	1
Oklahoma	345	48,410	7.13	333	48,332	6.89	-3
Oregon	155	40,914	3.79	177	39,493	4.48	18
Pennsylvania	712	132,622	5.37	741	130,252	5.69	6
Rhode Island	45	10,464	4.30	40	10,269	3.90	-9
South Carolina	415	57,185	7.26	390	57,820	6.75	-7
South Dakota	69	11,369	6.07	87	11,201	7.77	28
Tennessee	505	81,717	6.18	544	82,265	6.61	7
Texas	1,977	373,594	5.29	2,228	389,741	5.72	†8
Utah	214	46,712	4.58	230	45,768	5.03	10
Vermont	*	5,384	*	26	5,316	4.89	*
Virginia	571	95,825	5.96	594	95,630	6.21	4
Washington	366	83,911	4.36	362	83,333	4.34	-1
West Virginia	117	17,198	6.80	124	16,929	7.32	8
Wisconsin	331	61,781	5.36	347	60,049	5.78	8
Wyoming	34	6,237	5.45	34	6,049	5.62	3

†Significant change in rate from 2021 to 2022 ( $p < 0.05$ ).

\* Figure does not meet National Center for Health Statistics standards of reliability or precision; based on fewer than 20 deaths in the numerator.

<sup>1</sup>Deaths per 1,000 live births.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

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Table 3. Infant deaths and infant mortality rates, by 10 leading causes of infant death: United States, final 2021 and provisional 2022

Cause of death ( <i>International Classification of Diseases, 10th Revision</i> code)	2021		2022		Percent change
	Deaths	Rate <sup>1</sup>	Deaths	Rate <sup>1</sup>	
Congenital malformations . . . . . (Q00–Q99)	3,990	108.9	4,000	109.1	0
Short gestation and low birthweight, not elsewhere classified . . . . . (P07)	2,957	80.7	2,876	78.4	-3
Sudden infant death syndrome . . . . . (R95)	1,458	39.8	1,458	39.8	0
Accidents (unintentional injuries) . . . . . (V01–X59)	1,300	35.5	1,349	36.8	4
Maternal complications of pregnancy . . . . . (P01)	1,113	30.4	1,209	33.0	†9
Complications of placenta, cord and membranes . . . . . (P02)	663	18.1	631	17.2	-5
Bacterial sepsis of newborn . . . . . (P36)	560	15.3	637	17.4	†14
Respiratory distress of newborn . . . . . (P22)	413	11.3	458	12.5	11
Diseases of the circulatory system . . . . . (I00–I99)	399	10.9	358	9.8	-10
Neonatal hemorrhage . . . . . (P50–P52, P54)	344	9.4	336	9.2	-2

†Significant change in rate from 2021 to 2022 ( $p < 0.05$ ).

<sup>1</sup>Deaths per 100,000 live births.

SOURCE: National Center for Health Statistics, National Vital Statistics System, linked birth/infant death file.

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