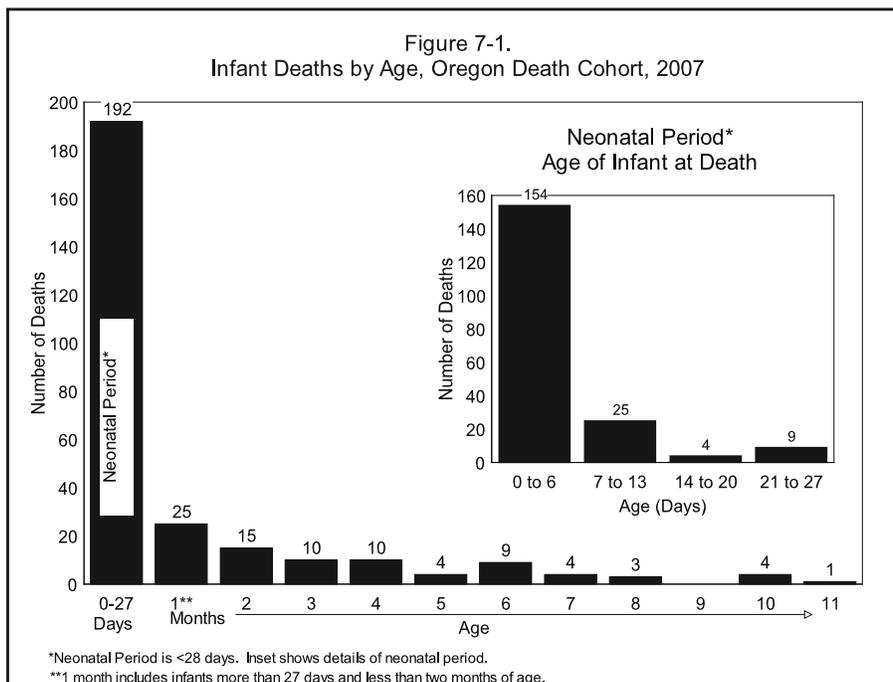


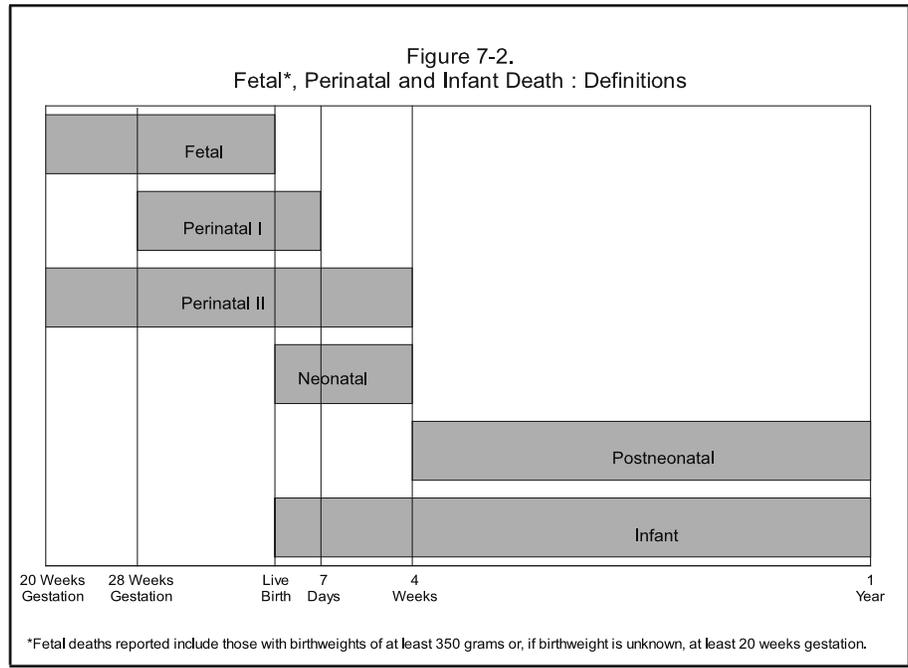
# Fetal and infant mortality

## Introduction

This report presents fetal and infant mortality data. Infant deaths are deaths that occur within one year of birth. Fetal deaths included in this report are for fetuses whose birth weight was at least 350 grams, or if birth weight was unknown, 20 weeks gestation or more. This definition applies to data after 1998. Although fetal and infant deaths are useful in statistically describing deaths within a given time frame, their fundamental purpose is to assist in discovering and evaluating preventive strategies to improve infant health. As an aid to understanding and monitoring health trends, this report divides fetal and infant deaths into five categories, which overlap and are not necessarily mutually exclusive: (1) fetal deaths, (2) perinatal deaths, (3) infant deaths, (4) neonatal deaths and (5) postneonatal deaths, as defined by the National Center for Health Statistics (see diagram, next page).

This report analyzes the above categories using three databases: (1) fetal deaths, (2) infant deaths and (3) births. National publications covering the subject may use one or any combination of these databases. As a result, death rates often vary slightly depending on which cohort was used as the source of the statistical data. Throughout this report,





some tables display rates and ratios based on small numbers of events. Rates and ratios based on fewer than five events are unreliable; therefore, use great caution in inferring causal relationships based solely on the data contained in these tables.

## Definitions and methodology

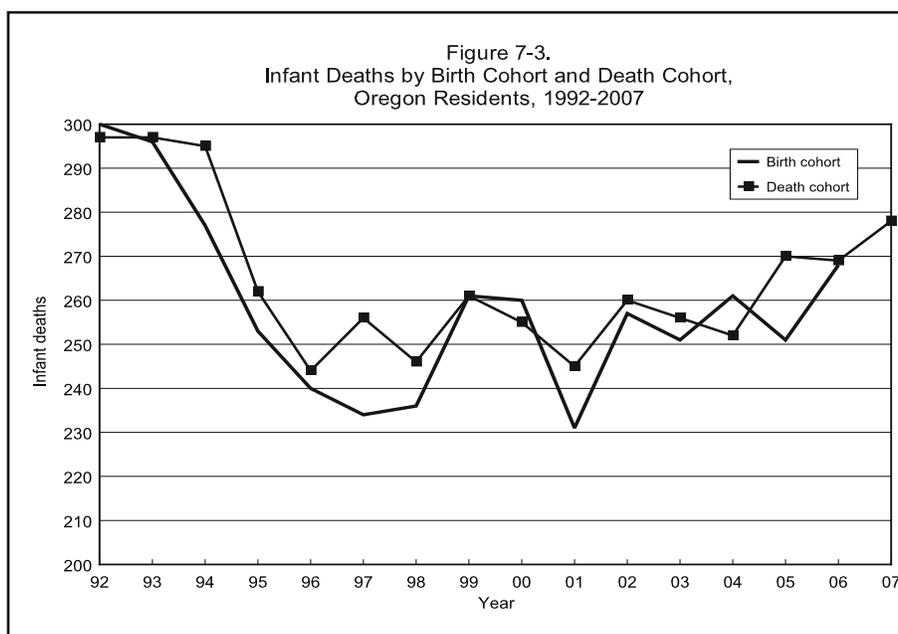
Before analyzing fetal and infant death data, it is necessary to define their different components.

- **Fetal deaths** are those that occur to fetuses whose birth weight is at least 350 grams or, if birth weight was unknown, after 20 weeks gestation, in which the developing fetus dies either in utero or during delivery. They are classified as “early” (20-27 weeks gestation) or “late” (28 or more weeks gestation). Oregon public health and safety laws require that they be reported.<sup>1</sup>
- **Infant deaths** are those that occur during a child’s first year (i.e., measured from birth through 364 days). Infant deaths include both neonatal and postneonatal deaths.

**Neonatal deaths** occur during the first 27 days of life. Neonatal deaths may be “early” (under 7 days) or “late” (7-27 days).

**Postneonatal deaths** occur from day 28 through day 364 after birth.

- **Perinatal deaths – definition I** includes fetal deaths at 28 weeks gestation or more, and infant deaths of less than 7 days.
- **Perinatal deaths – definition II** includes fetal deaths at 20 weeks gestation or more and infant deaths of less than 28 days.
- The **death cohort** for infant death or the **Infant Mortality Rate**<sup>2</sup> includes all infant deaths that occurred in any given calendar year, divided by the total number of babies born in the same calendar year. In this report, the death cohort consists of those infants who died in 2007 and could have been born in either 2006 or 2007. This measure is usually available sooner than the birth cohort as described below. Its focus and analysis are dependent on the items on the death certificate, such as age and residence of the infant and cause of death. Table 7-1 and 7-2 are based on a death cohort.
- The **birth cohort** for matched infant deaths (each death certificate matched to its corresponding birth certificate) is based on analysis of infants born in the same calendar year who die within one year of their birth. In this report, the birth cohort consists of those infants who were born in 2006 and died in either 2006 or 2007. Analysis based on a birth cohort is typically not as timely, but allows the analysis of characteristics from the birth certificate, such as mother's race, age,



and factors affecting the birth outcomes (i.e., birth weight, prenatal care, mother's use of tobacco). The rates may not exactly match, but the difference is usually tiny. Tables 7-8 through 7-18 are based on an infant birth cohort.

## Use of the 2007 death cohort

This report uses data from the 2007 death cohort in the first two tables and much of the discussion is on cause of death. Infant characteristics at the time of death are derived from death certificates. The characteristics of most interest are age at death, county of residence at death and underlying cause. Total age-specific and cause-specific mortality ratios are computed by dividing the number of infant deaths in a calendar year by the number of births in the same calendar year.

### Demographics

In 2007, 278 infants under age one died who were residents of Oregon. The infant mortality rate was 5.6 deaths per 1,000 births, and increased 1.8 percent from the previous year. The increase was not statistically significant. Oregon's infant death rate is 17.6 percent lower than the U.S. rate of 6.8 per 1,000 births. [Table 5-1]. As in previous years, most infants who died during 2007 were less than 28 days old. [Figure 7-1]. More than two-thirds of infant deaths (69.1%) occurred within the first four weeks of life. Fifty-five percent of infant deaths occur in the first week of life. Among counties, the infant death rate ranged from zero to 12.3. However there was no statistically significant variation in the infant death rate among counties. When the events for 2003-2007 are combined in a five-year aggregate, Baker, Klamath, and Douglas counties exhibit statistically significant higher rates of infant mortality. Only Washington County has an infant death rate significantly lower than the state rate.

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***During 2007, 278 infants under age one died.***

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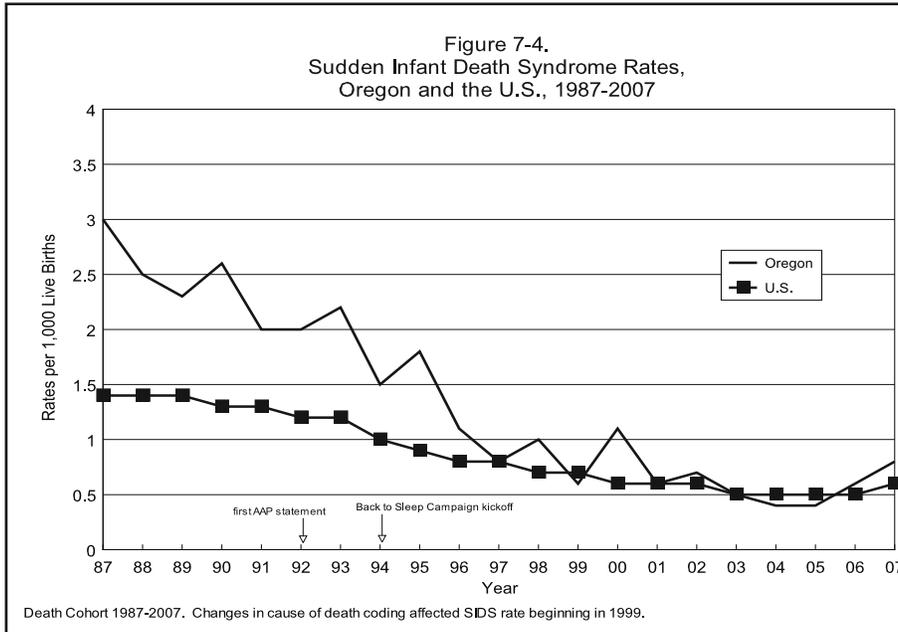
### Sudden Infant Death Syndrome

Sudden Infant Death Syndrome (SIDS) is the sudden and unexpected death of an apparently healthy infant under one year of age, usually during the postneonatal period. Historically, Oregon's SIDS rate has been higher than the national rate and SIDS has been a leading cause of death among Oregon infants. [Figure 7-4]. However, since 2001 Oregon's rate has been very similar to the nation's rate.

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***There was an increase in SIDS deaths in 2007.***

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Oregon's rate started dropping quickly after the "Back to Sleep" campaign was kicked off. There will be more variability in the rate of SIDS deaths in Oregon due to the decreasing numbers.

The number of SIDS deaths increased from 30 deaths in 2006 to 38 in 2007. In 2007, SIDS accounted for 13.7 percent of the state's total infant deaths and 39.5 percent of all postneonatal deaths. [Table 7-2].

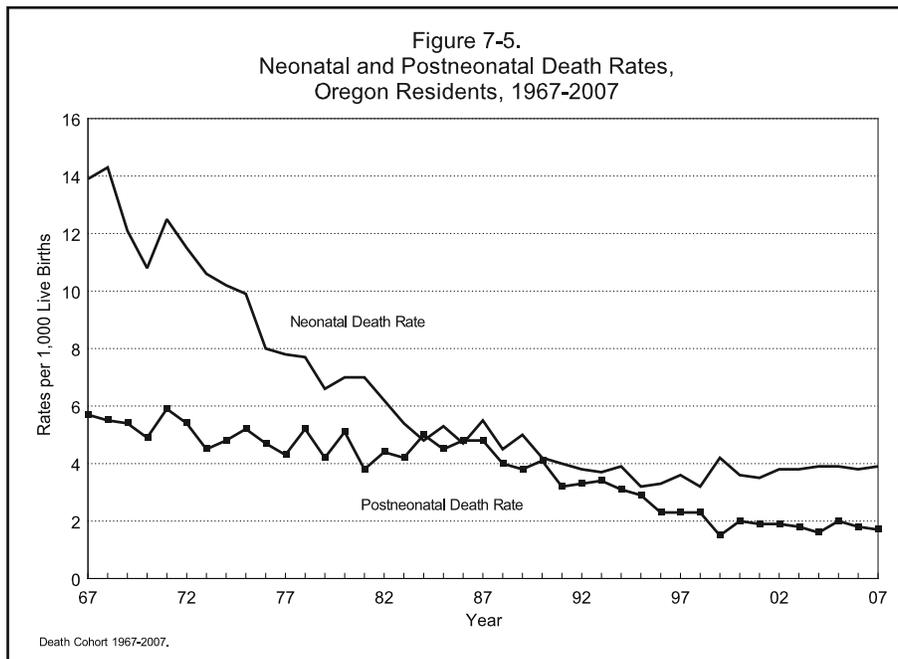
**Neonatal death**

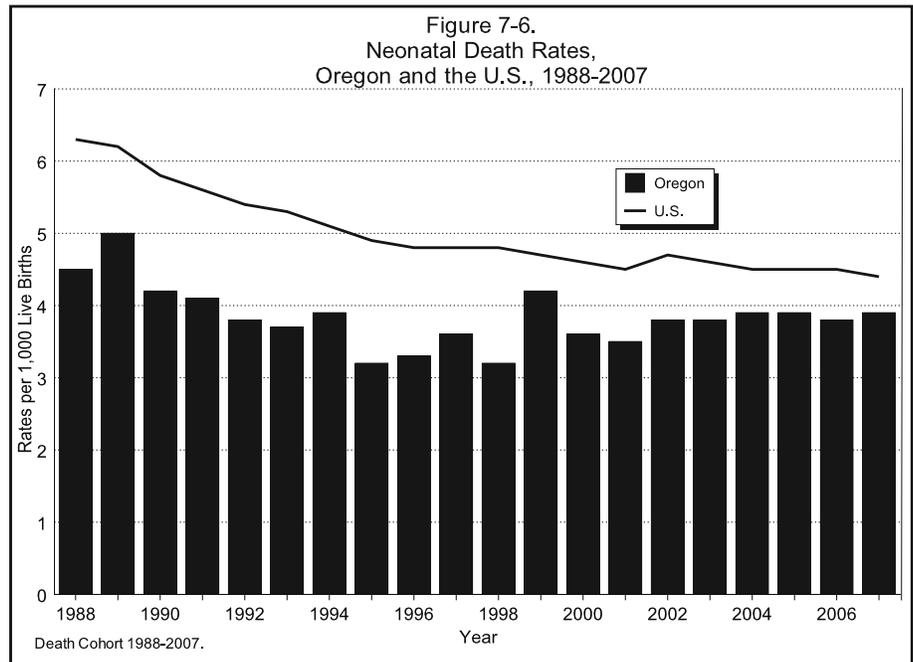
Neonatal and postneonatal death rates have been declining from early reporting since 1936, when the neonatal death

**Table A – Neonatal Deaths  
Due to Respiratory Distress  
Syndrome**

| Year | Number | Percent* | Rate** |
|------|--------|----------|--------|
| 1991 | 9      | 5.2      | 21.2   |
| 1992 | 7      | 4.1      | 21.2   |
| 1993 | 7      | 4.5      | 16.8   |
| 1994 | 10     | 6.1      | 23.9   |
| 1995 | 4      | 2.9      | 9.4    |
| 1996 | 5      | 3.4      | 11.5   |
| 1997 | 2      | 1.3      | 4.6    |
| 1998 | 8      | 5.6      | 17.7   |
| 1999 | 7      | 3.1      | 13.3   |
| 2000 | 6      | 3.6      | 13.1   |
| 2001 | 5      | 3.2      | 11.0   |
| 2002 | 4      | 2.3      | 8.9    |
| 2003 | 3      | 1.7      | 6.5    |
| 2004 | 6      | 3.4      | 13.1   |
| 2005 | 10     | 5.6      | 21.8   |
| 2006 | 5      | 2.7      | 10.3   |
| 2007 | 9      | 4.7      | 18.2   |

- Quality is zero.
- \* Percent of neonatal death due to RDS.
- \*\* Per 100,000 live births.





rate was 29.0 per 1,000 births and the postneonatal death rate was 15.3 per 1,000 births. In 2007, the neonatal death rate was 3.9 and the postneonatal death rate was 1.7 per 1,000 births. [Figure 7-5, Table 7-1].

In 2007, 192 infants died during the neonatal period, a slight increase in number and rate, but not statistically significant. Oregon's neonatal death rate has consistently been below that of the U.S. [Figure 7-6]. The 2007 rate is 11.4 percent lower than the 2007 national rate of 4.4. [Tables 5-1 and 5-2]. Oregon's neonatal death rate has remained virtually unchanged during the last five years, while the U.S. rate dropped slightly. Congenital anomalies were responsible for more neonatal deaths (27.6%) than any other cause, followed closely by maternal factors (24.5%) and short gestation and fetal growth (18.2%). [Table 7-2]. The number of neonatal deaths due to Respiratory Distress Syndrome (RDS) decreased from 12 in 1990 to nine in 2007 (see sidebar Table A). As physicians have noted this cause less frequently on the death certificate, the year-to-year variation can change considerably.

### Postneonatal death

In 2007, 86 infants died during the postneonatal period, representing 30.9 percent of all infant deaths. The postneonatal death rate (1.7 per 1,000 births) is a 5.6 percent decrease from 2006 (1.8 per 1,000); however, the difference is not statistically significant. [Figure 7-5]. SIDS was the most frequent cause of death and accounted for 39.5 percent of

postneonatal deaths. Congenital anomalies were the second most frequent cause of death with nearly 12.8 percent of postneonatal deaths, followed closely by external causes, including unintentional injuries and assaults (11.6%). [Table 7-2]. Before 1996, Oregon’s postneonatal death rate had been higher than the U.S. rate; since then the state rate has been lower than that of the national postneonatal rate (1.7 vs. 2.3 per 1,000 births in 2007).

**Fetal death**

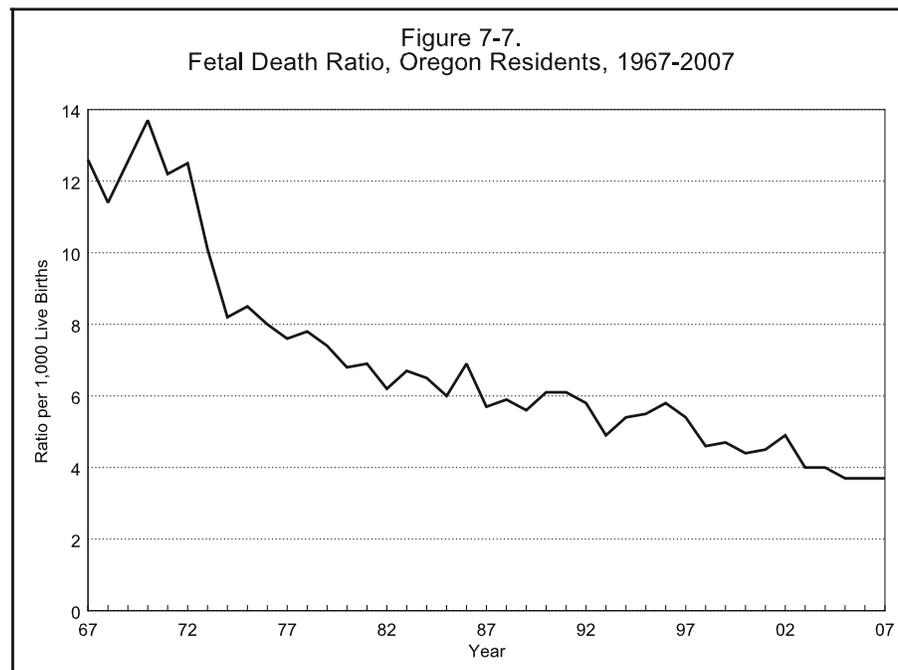
In 2007, there were 181 Oregon resident fetal deaths, or 3.7 fetal deaths per 1,000 live births [Sidebar Table B]. Fetal deaths were first reported to the Public Health Division in 1928, when the ratio was 29.0 for every 1,000 birth. Since then the ratio has followed a general downward trend and has remained under 6.0 since 1992. [Figure 7-7, Table 5-2].

**Fetal cause of death**

Causes of Oregon’s 181 fetal deaths in 2007 are shown in Table 7-4. The most frequently reported cause of fetal death in 2007 (84 deaths) was “Fetal death of unspecified cause.” Complications of the placenta, cord and membranes was the second highest cause of fetal death (35 deaths). Congenital anomalies were the third with 21 deaths. These three causes of death represented over 77.3 percent of all 2007 Oregon fetal deaths. In 1999, the first year Oregon used ICD-10 codes, fetal death of unspecified cause represented 18.4 percent of all fetal deaths. In 2007, this

**Table B – Fetal Death Ratios Per 1,000 Live Births by Mother’s Age**

| AGE   | YEAR |      |      |      |      |
|-------|------|------|------|------|------|
|       | 2007 | 2006 | 2005 | 2004 | 2003 |
| Total | 3.7  | 3.7  | 3.7  | 4.0  | 4.0  |
| 15-44 | 3.6  | 3.6  | 3.6  | 4.0  | 4.0  |
| 15-19 | 3.2  | 4.2  | 6.8  | 4.8  | 4.1  |
| 20-24 | 3.9  | 3.1  | 3.5  | 4.1  | 4.0  |
| 25-29 | 2.9  | 3.5  | 3.3  | 2.9  | 3.8  |
| 30-34 | 3.6  | 3.0  | 3.0  | 4.0  | 3.1  |
| 35-39 | 4.5  | 5.1  | 3.4  | 5.0  | 5.2  |
| 40-44 | 6.3  | 8.3  | 5.7  | 8.2  | 7.5  |



**Table C – Percentage of Fetal Deaths by weeks of gestation**

| YEAR | weeks of gestation |       |      |
|------|--------------------|-------|------|
|      | <28                | 28-36 | 37+  |
| 1998 | 34.6               | 34.1  | 31.3 |
| 1999 | 42.0               | 34.4  | 23.6 |
| 2000 | 36.9               | 34.3  | 28.8 |
| 2001 | 33.7               | 34.6  | 31.2 |
| 2002 | 36.9               | 35.1  | 27.9 |
| 2003 | 29.9               | 37.5  | 31.5 |
| 2004 | 34.2               | 34.2  | 31.5 |
| 2005 | 47.7               | 28.5  | 23.8 |
| 2006 | 42.1               | 36.5  | 21.3 |
| 2007 | 45.3               | 31.5  | 22.7 |

same cause makes up 46.4 percent of fetal deaths, an increase of over 152 percent. Signing medical certifiers appear to be providing less specific cause of death information.

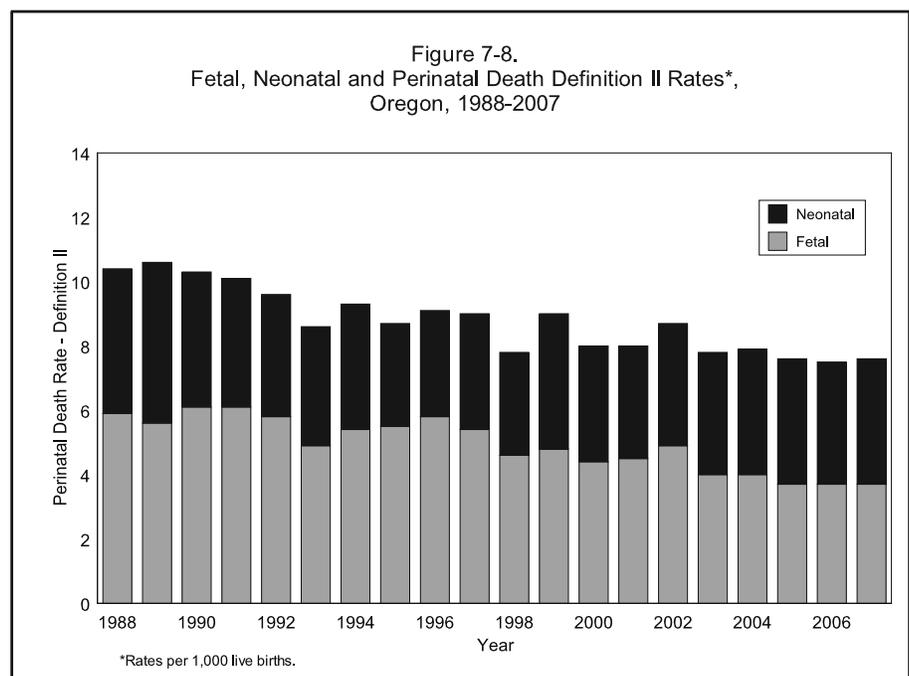
## 2006 birth cohort for infant deaths

### Methodology

Infant and perinatal death statistics can also be determined by use of a birth cohort, with all rates and ratios based on the number of births and fetal deaths that occurred in 2006. Because birth cohorts contain infants who die within their first year of life, some die during the following calendar year, thus requiring the inclusion of 2007 death data in the report on the 2006 birth cohort. For illustration, of the 268 deaths of infants born in 2006: 237 died in calendar year 2006 and 31 died in 2007. Those dying in 2007 would also be reported in this year's report in the 2007 death cohort.

### Small numbers

Because of the small numbers of events in some of the risk factor categories, this report uses three-year groupings of the risk characteristics to improve statistical reliability. Single-year tables displaying risk factors are also included for comparison with statistics of prior years, but the analysis of risk factors and maternal characteristics are done using only the three-year tables.

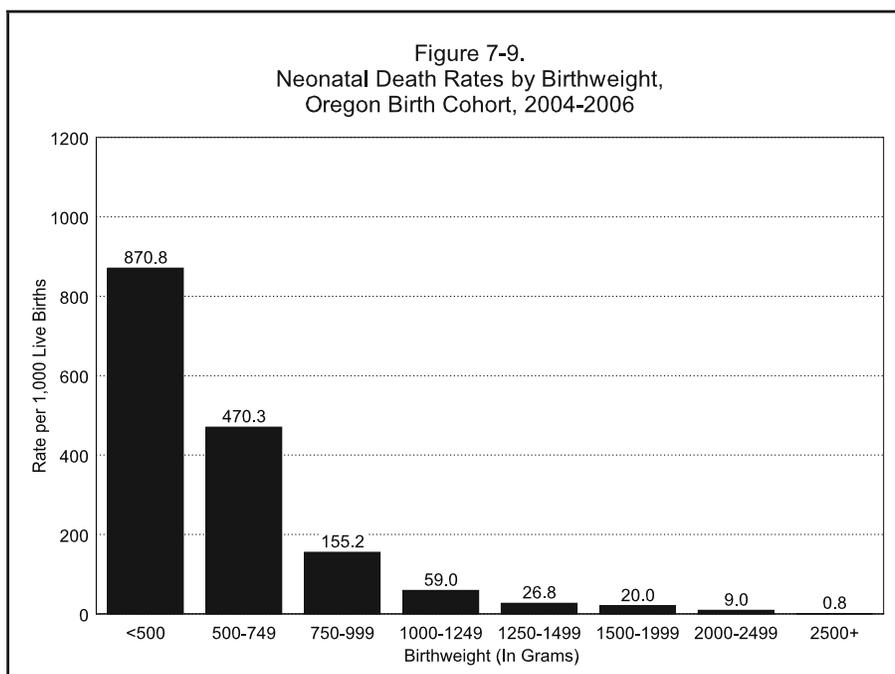


## Perinatal deaths

Perinatal death, reported in Tables 7-13 through 7-16, combine fetal deaths of specific gestation and neonatal deaths (please refer to Figure 7-2 for definitions). These tables present a more comprehensive picture of late gestation fetal deaths and neonatal deaths. As shown in Figure 7-8, the combined rates of fetal and neonatal death have decreased since the late '80s. In the late '80s the two rates were nearly identical, but neonatal deaths declined more rapidly to their lowest level in 1998. The neonatal death rate then spiked and rose back to the point of being slightly higher than the fetal death rate. Fetal death rates during that same period had more erratic year-to-year variation, but have systematically been decreasing. While patterns among groups (race, ethnicity, age, and marital status) are similar to neonatal and postneonatal, researchers and educators may find a time period inclusive of the period shortly before and after birth useful. This information also allows comparisons with national and international data using the standard definitions.

## Neonatal deaths: 2004-2006 birth cohorts

The mothers of infants who died during the neonatal period had various characteristics that may have affected the outcome of their pregnancies. These include marital status, age, ethnicity and race, education, prenatal care, and tobacco use. [Table 7-18].



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***Birthweight has long  
been a predictor  
of survival.***

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### **Birth weight**

The birth weight of an infant has long been a predictor of subsequent survival. An increase in birth weight is correlated with a decrease in the risk of neonatal death. For the period 2004-2006, the neonatal death rate generally decreased by half or more for each subsequent 250 to 500 gram increase in weight for infants weighing less than 3,000 grams at birth. [Table 7-12]. Nearly all infants weighing less than 350 grams died. The death rate for infants weighing less than 500 grams was 870.8 per 1,000 births, decreasing to 0.8 per 1,000 live births for infants weighing more than 2,500 grams. [Figure 7-9].

Many of the same behavioral, social and medical conditions associated with higher rates of infant deaths are also associated with one another and have confounding or mitigating effects on each other. This report does not try to account for or hold all these variables constant in relation to each other. Instead, it presents a simple descriptive analysis.

### **Maternal characteristics**

Though most women reported being married at the time of birth, the neonatal death rate was statistically significantly higher for unmarried women (4.3 versus 3.5 per 1,000). Women with some college education had a statistically significantly lower neonatal death rate (3.1 per 1,000) than women with a high school diploma or GED (4.0) and women with some high school but no degree (5.0). The differences in neonatal death rates for infants of mothers from different race and ethnic categories were not statistically significant. [Table 7-18].

### **Prenatal care**

Women who received any prenatal care had a statistically significantly lower neonatal death rate than women who received no prenatal care (3.6 versus 19.3 per 1,000 births).

### **Tobacco use**

The infants of women who smoked during pregnancy had a higher neonatal death rate than infants of women who did not use tobacco (4.9 versus 3.5 per 1,000), but the difference in the rates was not statistically significant. Tobacco use may be underreported, thereby eliminating some high-risk mothers from the analysis and lowering the neonatal death rates for this category.

## Postneonatal deaths: 2004-2006 birth cohort

Higher, statistically significant postneonatal death rates were found among the infants of mothers who were unwed, had no education beyond high school, or used tobacco during pregnancy. The infants of non-Hispanic African Americans had postneonatal mortality rates that were statistically significantly higher than those of non-Hispanic Whites (4.2 versus 1.7 per 1,000), but there were no statistically significant differences between any of the other race categories. Infants of mothers who received no prenatal care had significantly higher postneonatal death rates when compared with infants of mothers who did receive prenatal care. Infants of younger mothers had higher death rates than infants of older mothers (infants born to mothers who were 30-34 years old had the lowest death rate). [Table 7-18].

## Endnotes

1. Prior to November 10, 1998, fetal deaths occurring at 20 weeks of gestation or more were reported. Effective November 10, 1998, the Oregon Legislature amended ORS 432.333 to read, "Each fetal death of 350 grams or more, or, if weight is unknown, of 20 completed weeks gestation or more, calculated from the date last normal menstrual period began to the date of delivery, that occurs in this state shall be reported within 5 days after delivery to the county registrar of the county in which the fetal death occurred or to the Center for Health Statistics or as otherwise directed by the Center for Health Statistics." Current practice has the hospitals and reporting facilities sending all fetal deaths directly to the state Center for Health Statistics versus the county registrars.
2. See definitions under Statistical measure and definitions at the National Association of Health Statistics and Information Systems website: [www.naphsis.org](http://www.naphsis.org), or page 124 of the Volume 58, Number 19, National Vital Statistics Reports at the National Center for Health Statistics website: [http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58\\_19.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58_19.pdf).