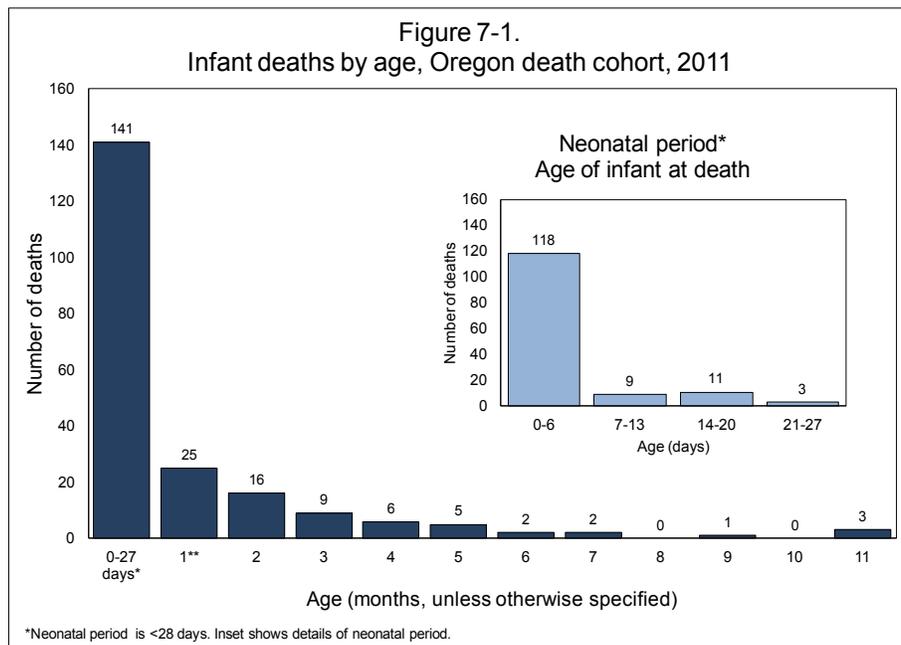


Fetal and infant mortality

Introduction

This report presents fetal and infant mortality data. Infant deaths are deaths occurring within one year of birth. Fetal deaths included in this report are for fetuses weighing at least 350 grams at delivery, or at least 20 weeks gestation if delivery weight is unknown. This definition applies to data after 1998. Although fetal and infant death records are useful for statistically describing deaths within a given time frame, their fundamental purpose is to assist in the discovery and evaluation of 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 (Figure 7-2).

The five categories of fetal and infant death were analyzed using three databases: (1) fetal deaths, (2) infant deaths and (3) births. National publications covering the subject of fetal and infant death may use one or any combination of these databases. As a result, death rates often vary slightly depending on whether birth or death cohorts were used as



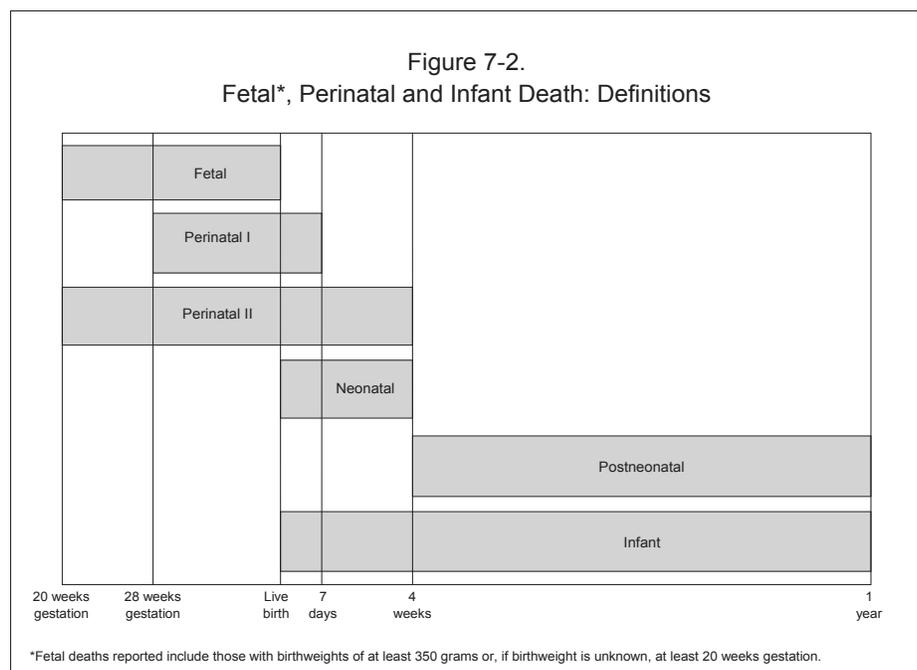
the data source for statistical analysis (for a description of these cohorts, see the next section below).

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; 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.

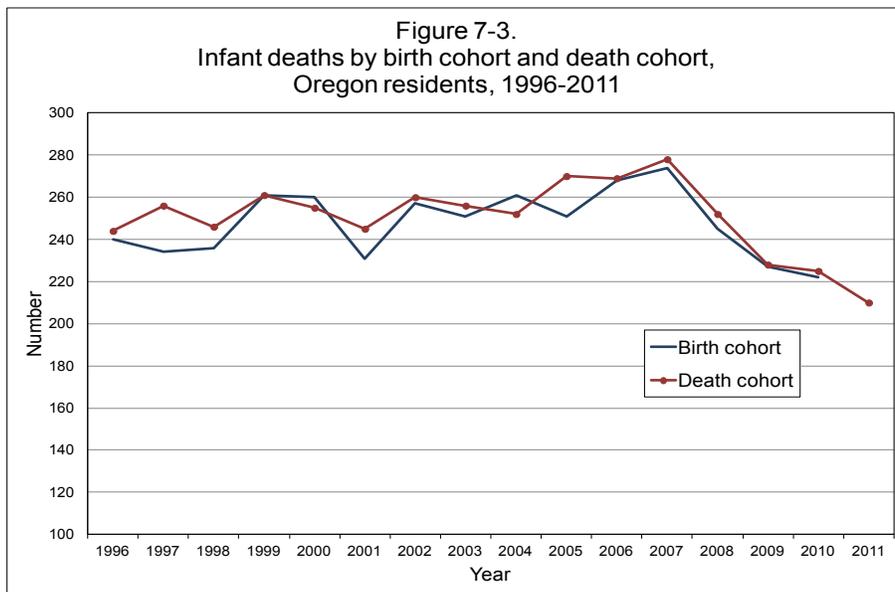
- **Fetal deaths** occur to fetuses weighing at least 350 grams at delivery, or at least 20 weeks gestation if delivery weight is unknown. For an event to be classified as a fetal death, the developing fetus either dies in utero or during delivery. Fetal deaths are classified as “early” (20–27 weeks gestation) or “late” (28 or more weeks gestation). Oregon public health and safety laws require they be reported.¹
- **Infant deaths** 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 seven 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 seven 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**,² includes all infant deaths occurring 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 infants who died in 2011 and could have been born in either 2010 or 2011. Data from the death cohort are usually available sooner than birth cohort data, as described below. The death cohort's focus and analysis are on death certificate information, such as age, 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 infants born in 2010 and died in either 2010 or 2011. Analysis based on a birth cohort is typically not as timely, but allows the analysis of characteristics from the birth

Figure 7-3.
Infant deaths by birth cohort and death cohort,
Oregon residents, 1996-2011



certificate, such as mother's race, age, and factors affecting the birth outcomes (i.e., birth weight, prenatal care, mother's use of tobacco). Rates using the birth or death cohorts may differ slightly, but the difference is usually small. Tables 7-8 through 7-18 are based on an infant birth cohort.

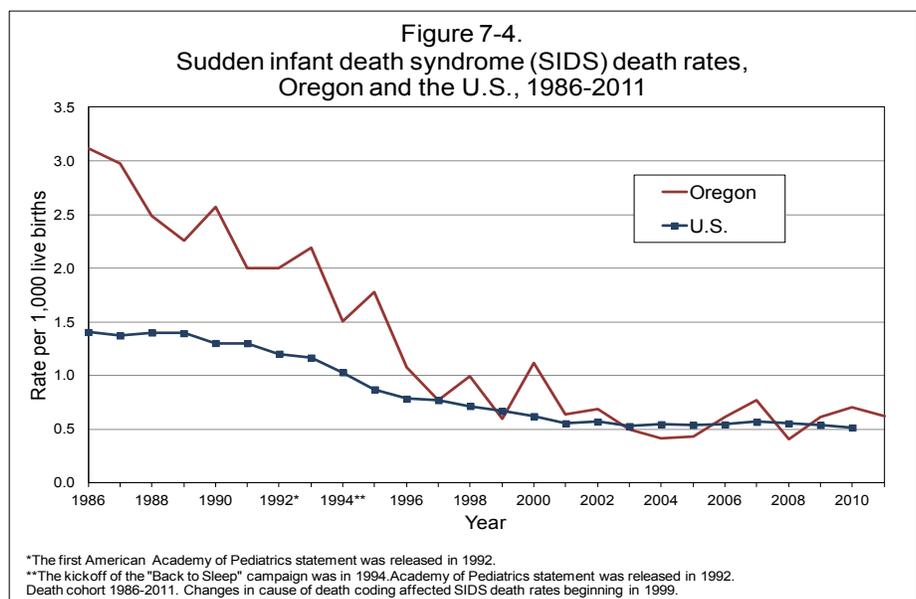
Use of the 2011 death cohort

This chapter uses data from the 2011 death cohort in the first two tables. Much of the discussion is on the cause of death. Infant characteristics at the time of death are derived from death certificates, with the primary focus on age at death, county of residence at death, and underlying cause of death. 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

During 2011, 210 infants under age 1 died who were residents of Oregon, down from 225 in 2010. The infant mortality rate was 4.7 deaths per 1,000 births, and decreased 0.2 percent from the previous year's rate of 4.9. The decrease was not statistically significant. Oregon's infant death rate is 21.7 percent lower than the preliminary 2011 U.S. rate of 6.2 per 1,000 births.³ As in previous years, most infants (67.1 %) who died during 2011 were less than 28 days old. More than half (56.2 %) of infant deaths occur within the first week of life. [Figure 7-1].

During 2011, 210 infants under age 1 died.



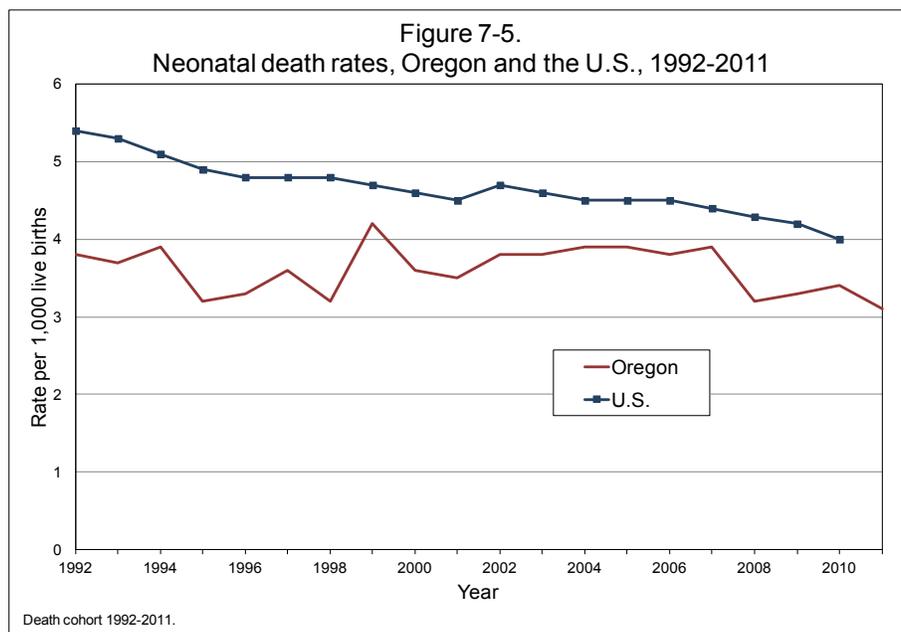
During the five-year period 2007 to 2011, the infant mortality rates for Oregon counties ranged from 2.6 to 11.7 (excluding counties with less than five infant deaths). Three Oregon counties had infant mortality rates statistically significantly higher than the state rate (5.0): Jefferson (11.7), Tillamook (10.1) and Klamath (7.8). No counties had infant mortality rates statistically significantly lower than the state rate.

Sudden Infant Death Syndrome

Sudden Infant Death Syndrome (SIDS) is the sudden and unexpected death of an apparently healthy infant under 1 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 rates and the nation's rates have been very similar. Oregon's rate started dropping quickly after "Back to Sleep," a national educational campaign to encourage non-prone sleeping positions for infants, kicked off in 1994. As the number of SIDS-related events decreases, there will be more variability in Oregon's rate of SIDS deaths due to smaller numerators in rate calculations.

The number of SIDS deaths decreased from 32 deaths in 2010 to 28 in 2011, and the SIDS death rate among infants decreased from .7 SIDS deaths per 1,000 live births to .6. However, the decrease was not statistically significant. In 2011, SIDS accounted for 13.3 percent of the state's total infant deaths and 39.1 percent of all postneonatal deaths. [Table 7-2].

***There was an decrease
in SIDS deaths in 2011.***



| Table A - Neonatal deaths due to Respiratory Distress Syndrome, 1995-2011 | | | |
|---|--------|----------|--------|
| Year | Number | Percent* | Rate** |
| 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 |
| 2008 | 3 | 1.9 | 6.1 |
| 2009 | 2 | 1.3 | 4.2 |
| 2010 | 3 | 2.0 | 6.6 |
| 2011 | 4 | 2.8 | 8.9 |

- Quantity is zero.
 * Percent of neonatal deaths due to RDS.
 **Per 100,000 live births.

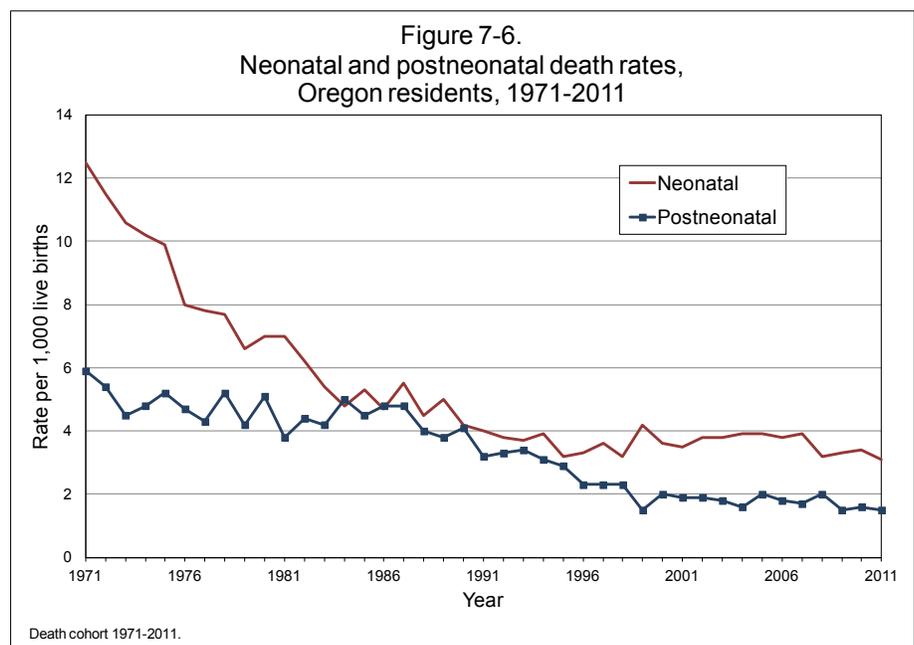
Neonatal death

Neonatal and postneonatal death rates have been declining since 1936, when the neonatal death rate was 29.0 per 1,000 births, and the postneonatal death rate was 15.3 per 1,000 births. In 2011, the neonatal death rate was 3.1 per 1,000 live births (down from 3.4 in 2010), and the postneonatal death rate was 1.5 (down from 1.6 in 2010). [Figure 7-5, Table 7-1].

In 2011, 141 infants died during the neonatal period, a decrease from 153 in 2010. Oregon's neonatal death rate has consistently been below that of the U.S. [Figure 7-6]. The 2011 Oregon rate (3.1) is 22.5 percent lower than the preliminary 2011 national rate of 40.3. Maternal factors were responsible for more neonatal deaths than any other cause (26.2%), followed by congenital anomalies (23.4%), and short gestation and fetal growth (19.9%). [Table 7-2]. There were four neonatal deaths due to Respiratory Distress Syndrome (RDS) in 2011. [Table A]. The numbers of RDS deaths vary considerably from year to year. This is due to physicians citing it less frequently as the cause of death — a change of only a few RDS events incorrectly appears as an alarming increase or decrease, for example there were 10 neonatal RDS events reported in 2005, but only five in 2006.

Postneonatal death

In 2011, 69 infants died during the postneonatal period, representing 32.9 percent of all infant deaths. The postneonatal death rate (1.5 per 1,000 births) is a decrease



from 2010 (1.6 per 1,000); however, the difference is not statistically significant. [Figure 7-5]. Sudden Infant Death Syndrome (SIDS) was the most common cause of death (39.1 %). Congenital anomalies were the second most common cause of death and accounted for 17.4 percent of postneonatal deaths. Unintentional injuries were the third most common cause of postneonatal death (13.0 %). [Table 7-2]. Before 1996, Oregon’s postneonatal death rate was higher than the U.S. rate; since then, the state rate has been lower than the national postneonatal rate (1.5 vs. 2.0 per 1,000 births in 2011).³

Table B - Fetal death ratios per 1,000 live births, by mother's age, 2007-2011

| AGE | YEAR | | | | |
|-------|------|------|------|------|------|
| | 2011 | 2010 | 2009 | 2008 | 2007 |
| Total | 4.1 | 4.0 | 4.6 | 4.3 | 3.7 |
| 15-44 | 4.1 | 4.0 | 4.6 | 4.3 | 3.6 |
| 15-19 | 6.4 | 5.1 | 8.1 | 5.6 | 3.2 |
| 20-24 | 4.6 | 3.5 | 4.4 | 5.0 | 3.9 |
| 25-29 | 2.9 | 3.4 | 3.4 | 3.3 | 2.9 |
| 30-34 | 3.9 | 3.7 | 4.3 | 4.7 | 3.6 |
| 35-39 | 4.6 | 6.3 | 4.8 | 3.9 | 4.5 |
| 40-44 | 8.1 | * | 8.6 | * | 6.3 |

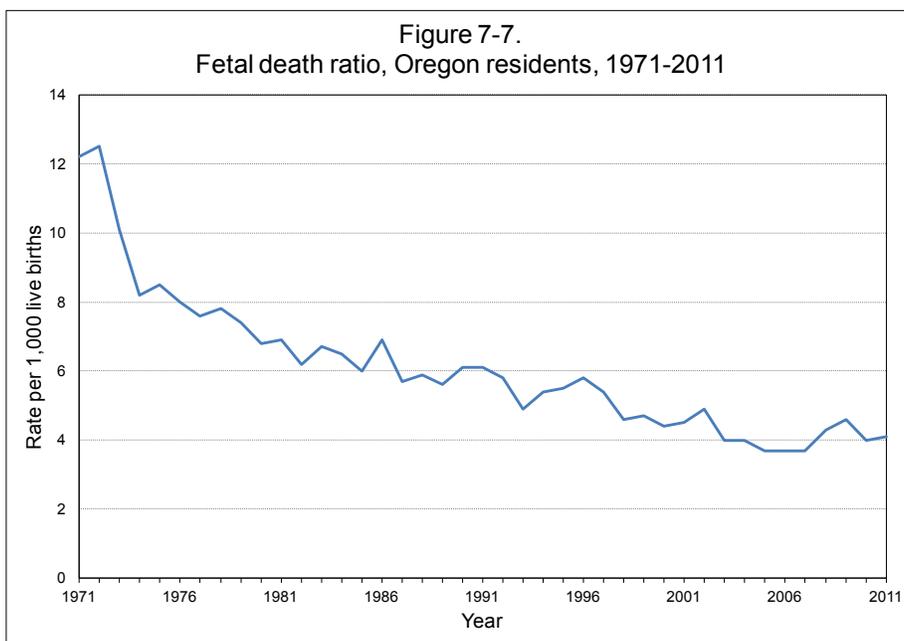
* Ratio was not calculated because there were fewer than five fetal deaths in this category.

Fetal death

Fetal deaths were first reported to the Public Health Division in 1928, when the ratio of fetal deaths to live births was 29.0 for every 1,000 birth. Since then, the ratio has generally decreased, and has remained under 6.0 since 1992. [Figure 7-7, Table 5-2]. In 2011, there were 186 Oregon resident fetal deaths, or 4.1 fetal deaths per 1,000 live births. [Table 7-3]. This is not a statistically significant increase from 2010 when there were 181 fetal deaths reported, and the ratio to births was 4.0.

Fetal cause of death

Causes of Oregon’s 186 fetal deaths in 2011 are shown in Table 7-4. Fetal death of unspecified cause was the most frequently reported cause of fetal death in 2011 (70 deaths).



| Year | weeks of gestation | | |
|------|--------------------|-------|------|
| | <28 | 28-36 | 37+ |
| 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 |
| 2008 | 41.5 | 31.6 | 26.4 |
| 2009 | 33.3 | 40.3 | 26.4 |
| 2010 | 39.2 | 35.4 | 24.9 |
| 2011 | 36.6 | 36.6 | 26.9 |

Complications of the placenta, cord and membranes were the second most common cause of death (55 deaths). Congenital anomalies were third (17 deaths). These three causes of death represented 76.3 percent of all 2011 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 2011, this same cause made up 37.6 percent of fetal deaths, a 104.3 percent increase.

2010 birth cohort for infant deaths

Infant mortality analyses can also be performed using birth cohort data. The numerators for all rates and ratios are based on the number of infants born in a given year who die prior to their first birthday. Perinatal analyses also include all fetal deaths occurring in the same year. Because infants can be born in one year and die the following year, use of the birth cohort requires inclusion of the 2011 death data in the report on the 2010 birth cohort. For illustration, 222 of the infants born in 2010 died within the first year of life; of these 222 deaths, 202 died in calendar year 2010, and 20 died in 2011. Those dying in 2011 are also reported in this year's report as part of the 2011 death cohort.

Small numbers

Because of the small number 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, combines fetal deaths of specific gestation and neonatal deaths. [Figure 7-2]. These tables present a comprehensive picture of late gestation fetal deaths and neonatal deaths. As shown in Figure 7-8, the perinatal death rate (the combined rates of fetal and neonatal death) is now lower than the rates seen in the early 1990s. The neonatal death rate for the 2010 birth cohort (3.4) was one of the lower rates seen in the past decade. Both the fetal and neonatal death rates are erratic year-to-year due to the small number of cases. The fetal death rate hit a low of 3.7 in the 2005 to 2007 period, but has increased slightly since then.

Neonatal deaths: 2008–2010 birth cohorts

Characteristics of the mothers of infants who died during the neonatal period 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].

Birth weight

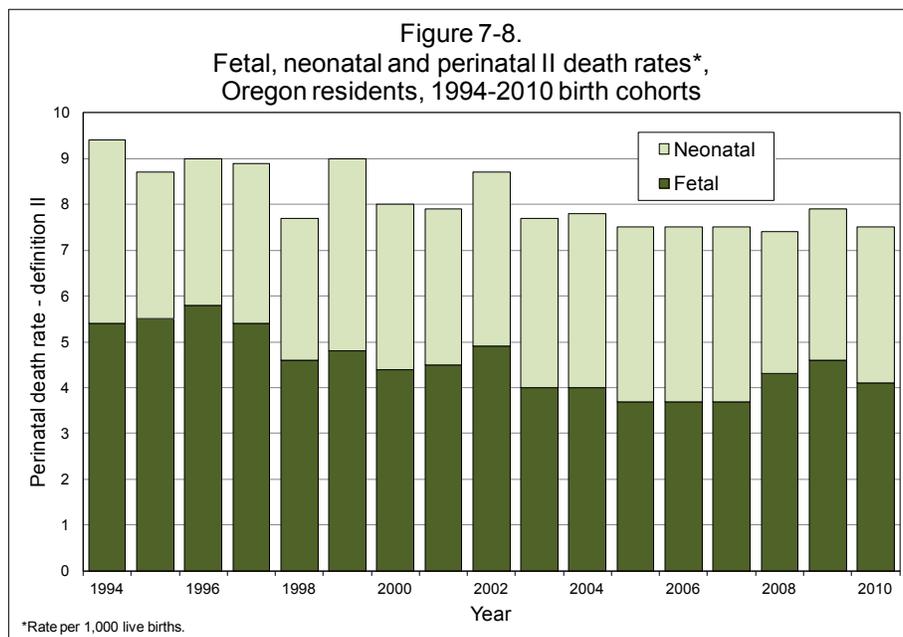
The birth weight of an infant has long been a predictor of subsequent survival. An increase in birth weight is correlated with a decrease in the risk of neonatal death. For the period 2008–2010, the neonatal death rate decreased by about one-half, on average, for each 250 to 500 gram increase in birth weight for infants weighing less than 3,000 grams at birth. [Table 7-12]. The death rate for infants weighing less than 350 grams was 984.1 per 1,000 live births, decreasing to 0.7 per 1,000 live births for infants weighing more than 2,500 grams. [Table 7-12 and Figure 7-9].

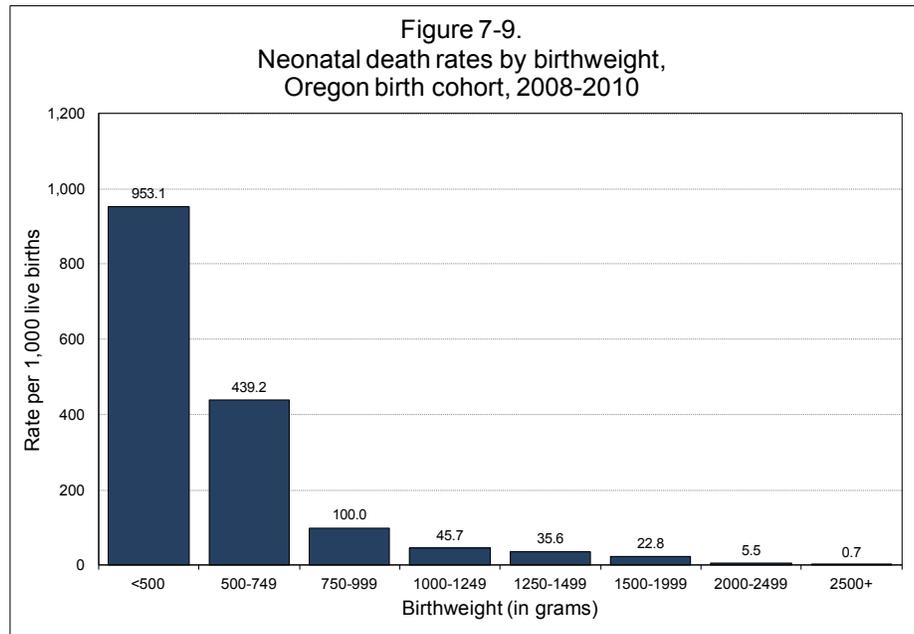
Many behavioral, social and medical conditions are associated with higher rates of infant death. These conditions may also have confounding or mitigating effects on each other. This report does not try to account for or hold all these variables constant in relation to each other. Instead, it presents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

***Birth weight has long
been a predictor of
survival.***

Maternal characteristics

Though a majority of women reported being married at the time of birth, the neonatal death rate was statistically





significantly higher for unmarried women than for married women during the period 2008–2010 (3.9 versus 2.9 per 1,000). Women with at least some college education had a lower neonatal death rate (2.9 per 1,000) than women with fewer years of education, but the differences between these rates were not statistically significant. Non-Hispanic White mothers had a statistically significantly lower rate of neonatal infant death than non-Hispanic Black and non-Hispanic Pacific Islander mothers (3.2 versus 6.8 and 8.3). Hispanic mothers had a significantly lower rate statistically of neonatal infant death than non-Hispanic Black mothers (3.1 versus 6.8). None of the other differences in rates between race and ethnic groups were significant. Mothers that were ages 30–34 had a statistically significantly lower rate of neonatal death than mothers ages 15–19 (2.9 versus 4.6). Mothers of multiple births also had statistically significantly higher rates of neonatal deaths than those with single births (18.1 versus 2.8). [Table 7-18].

Prenatal care

Women who received prenatal care, regardless of when prenatal care began, had statistically significantly lower rates of neonatal deaths than women who received no prenatal care (2.8 versus 29.9 per 1,000 births). [Table 7-18].

Tobacco use

The infants of women who smoked during pregnancy had a statistically significantly higher rate of neonatal deaths

than infants of women who did not use tobacco (4.4 versus 3.0 per 1,000). Tobacco use may be underreported, thereby eliminating some high-risk mothers from the analysis and lowering the neonatal death rates for this category. [Table 7-18].

Postneonatal deaths: 2008–2010 birth cohort

Mothers who were unwed, or had a high school education or less, or used tobacco during pregnancy, or had no prenatal care, or gave birth to multiple infants had statistically significantly higher rates of postneonatal death. The postneonatal mortality rate for non-Hispanic American Indian mothers was statistically significantly higher than the rate for non-Hispanic White, non-Hispanic Asian and Hispanic mothers (5.5 versus 1.6, 1.3, and 1.3, respectively). Infants of younger mothers had higher death rates than infants of older mothers. Infants born to mothers who were ages 35–39 had the lowest postneonatal death rate (1.0). [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.” Currently, hospitals and reporting facilities send all fetal deaths directly to the State of Oregon Center for Health Statistics rather than to county registrars.
2. See definitions under Statistical measure and definitions at the National Association of Health Statistics and Information Systems website:
<http://www.naphsis.org/Pages/StatisticalMeasuresandDefinitions.aspx> or the Volume 61, Number 4, National Vital Statistics Reports at the

National Center for Health Statistics website: *http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_03.pdf*.

3. Preliminary 2011 U.S. data obtained from the Volume 61, Number 6, National Vital Statistics Reports at the National Center for Health Statistics website:

http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_04.pdf