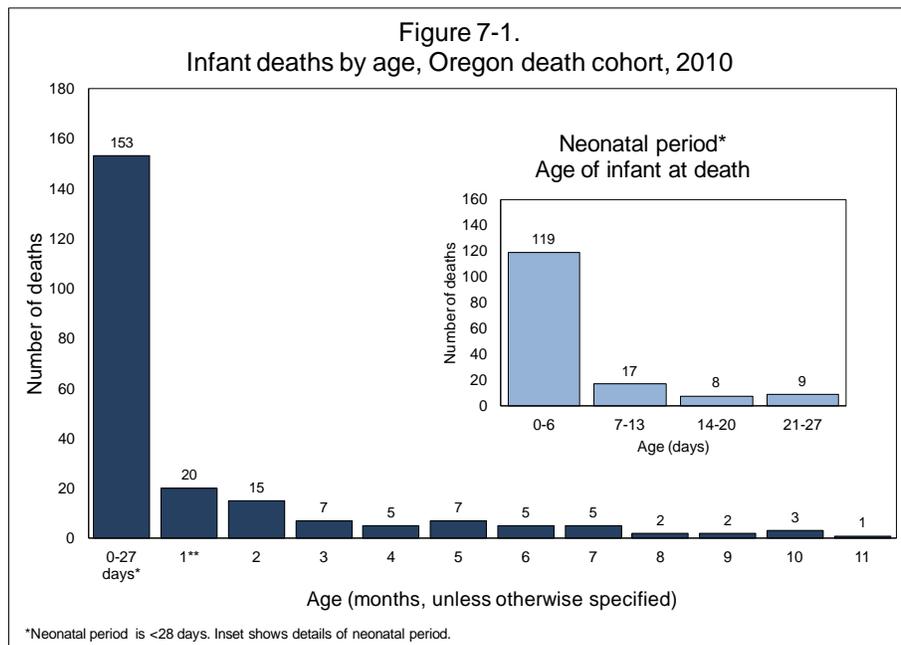


Fetal and infant mortality

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



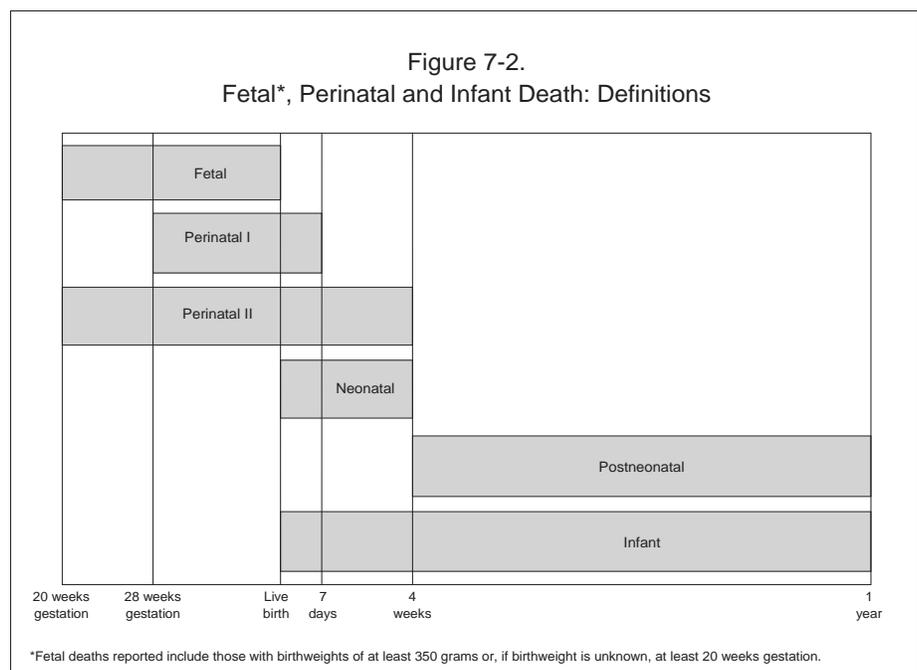
the data source for statistical analysis (for a description of these cohorts, see the next section below).

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; 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.

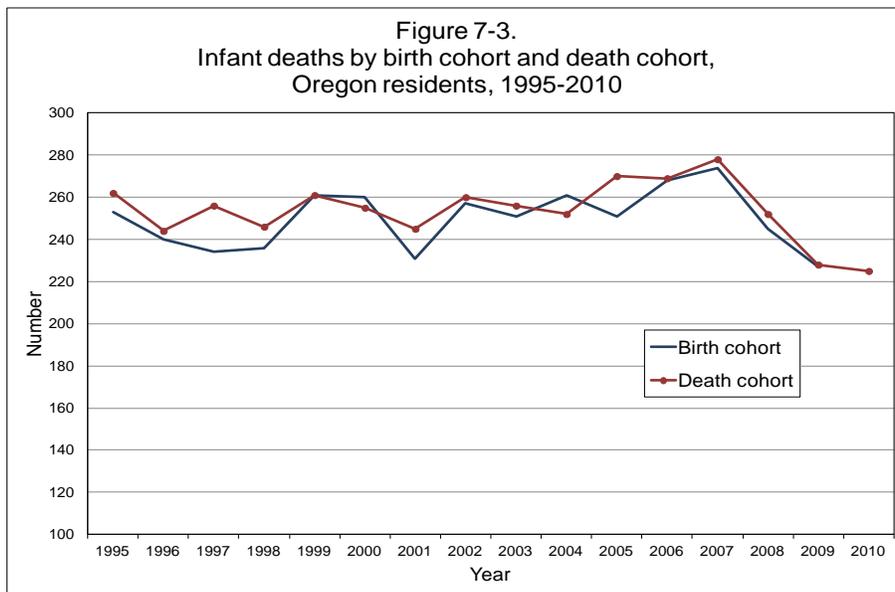
- **Fetal deaths** occur to fetuses weighing at least 350 grams at delivery, or at least 20 weeks gestation if delivery weight is unknown. For an event to be classified as a fetal death the developing fetus either dies in utero or during delivery. Fetal deaths are classified as “early” (20–27 weeks gestation) 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 2009 and could have been born in either 2008 or 2009. 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 birth. In this report, the birth cohort consists of infants born in 2008 and who died in either 2008 or 2009. 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, 1995-2010



certificate, such as mother's race, age, and factors affecting 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.

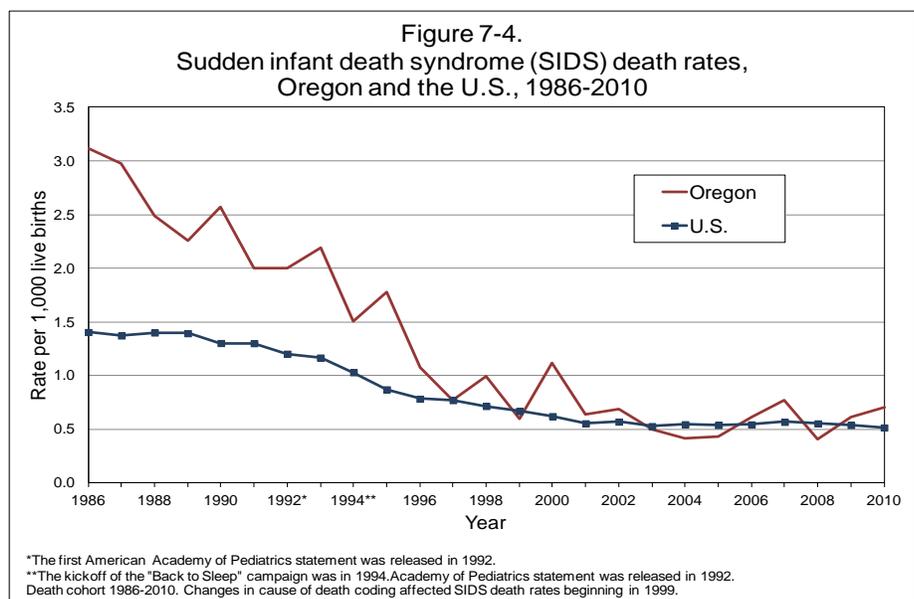
Use of the 2010 death cohort

This chapter uses data from the 2010 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 2010, 225 infants under age 1 died who were residents of Oregon, down from 228 in 2009. The infant mortality rate was 4.9 deaths per 1,000 births, and increased 2.1 percent from the previous year's rate of 4.8. The increase was not statistically significant. Oregon's infant death rate is 19.74 percent lower than the preliminary 2010 U.S. rate of 6.1 per 1,000 births.³ As in previous years, most infants (68.0 %) who died during 2010 were less than 28 days old. Over half (52.9 %) of infant deaths occur within the first week of life. [Figure 7-1].

During 2010, 225 infants under age 1 died.



During the five-year period 2006 to 2010, the infant mortality rates for Oregon counties ranged from 2.1 to 13.9 (excluding counties with fewer than five infant deaths). One Oregon county, Baker, had an infant mortality rate statistically significantly higher than the state rate (13.9 versus 5.2). Two counties had infant mortality rates significantly lower than the state rate: Malheur (2.1) and Benton (2.6).

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 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 decrease, there will be more variability in Oregon's rate of SIDS deaths due to smaller numerators in rate calculations.

The number of SIDS deaths increased from 29 deaths in 2009 to 32 in 2010, and the death rate increased from 0.6 SIDS deaths per 1,000 live births to 0.7. However, the increase was not statistically significant. In 2010, SIDS accounted for 14.2 percent of the state's total infant deaths

There was an increase in SIDS deaths in 2010.

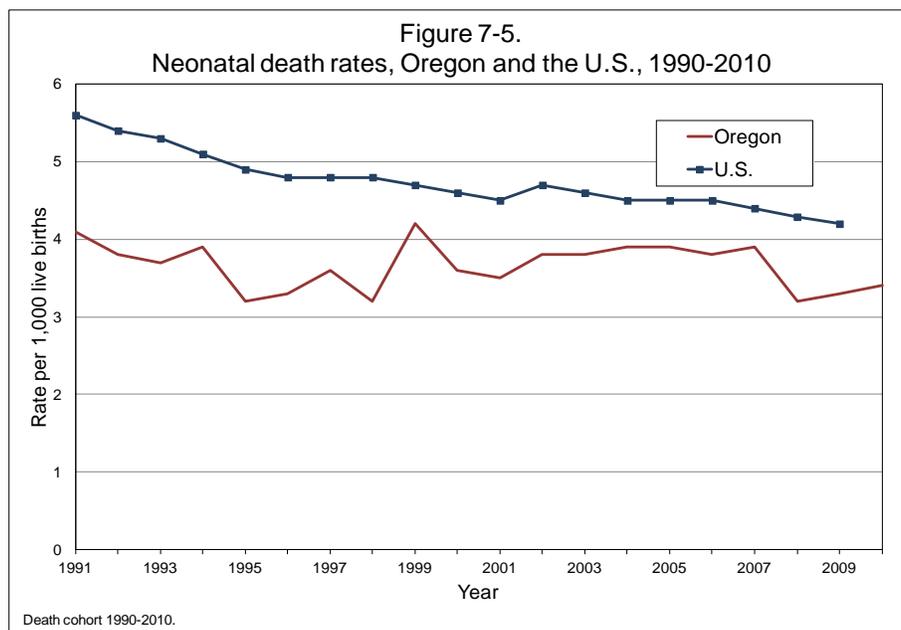


Table A - Neonatal deaths due to Respiratory Distress Syndrome, 1994-2010			
Year	Number	Percent*	Rate**
1994	10	6.1	23.9
1995	4	2.9	9.4
1996	5	3.4	11.5
1997	2	1.3	4.6
1998	8	5.6	17.7
1999	7	3.1	13.3
2000	6	3.6	13.1
2001	5	3.2	11.0
2002	4	2.3	8.9
2003	3	1.7	6.5
2004	6	3.4	13.1
2005	10	5.6	21.8
2006	5	2.7	10.3
2007	9	4.7	18.2
2008	3	1.9	6.1
2009	2	1.3	4.2
2010	3	2.0	6.6

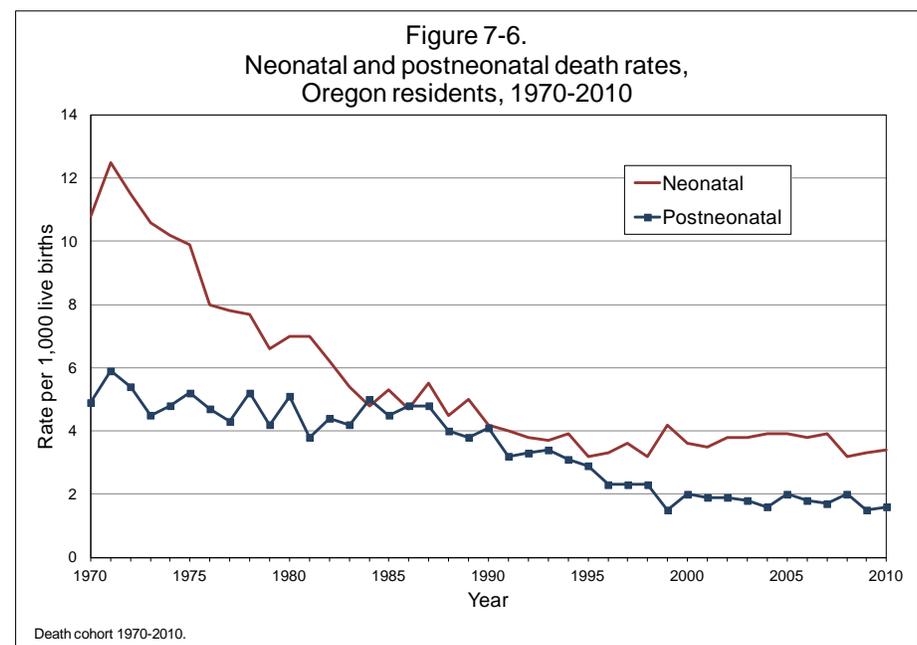
- Quantity is zero.
 * Percent of neonatal deaths due to RDS.
 **Per 100,000 live births.

and 40.3 percent of all postneonatal deaths. [Table 7-2].

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 2010, the neonatal death rate was 3.4 per 1,000 live births (up from 3.3 in 2009), and the postneonatal death rate was 1.6 (up from 1.5 in 2009). [Figure 7-5, Table 7-1].

In 2010, 153 infants died during the neonatal period, a decrease from 157 in 2009. Oregon’s neonatal death rate has consistently been below that of the U.S. [Figure 7-6]. The 2010 Oregon rate (3.4) is 15.0 percent lower than the preliminary 2010 national rate of 4.0. [Tables 5-1 and 5-2]. Congenital anomalies were responsible for more neonatal deaths than any other cause (27.5 %), followed by maternal factors (22.9 %) and short gestation and fetal growth (16.3 %). [Table 7-2]. The number of neonatal deaths due to Respiratory Distress Syndrome (RDS) decreased from 12 in 1990 to three in 2010. [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 small change in the number of 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 2010, 72 infants died during the postneonatal period, representing 32.0 percent of all infant deaths. The postneonatal death rate (1.6 per 1,000 births) is an increase from 2009 (1.5 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 (40.3 %). Congenital anomalies were the second most common cause of death and accounted for 13.9 percent of postneonatal deaths. Unintentional injuries were the third most common cause of postneonatal death (12.5 %). [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 (1.6 vs. 2.1 per 1,000 births in 2010).³

Table B - Fetal death ratios per 1,000 live births, by mother's age, 2006-2010

AGE	YEAR				
	2010	2009	2008	2007	2006
Total	4.0	4.6	4.3	3.7	3.7
15-44	4.0	4.6	4.3	3.6	3.6
15-19	5.1	8.1	5.6	3.2	4.2
20-24	3.5	4.4	5.0	3.9	3.1
25-29	3.4	3.4	3.3	2.9	3.5
30-34	3.7	4.3	4.7	3.6	3.0
35-39	6.3	4.8	3.9	4.5	5.1
40-44	2.5	8.6	*	6.3	8.3

* 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 2010, there were 181 Oregon resident fetal deaths, or 4.0 fetal deaths per 1,000 live births. [Table 7-3]. This is not a statistically significant decrease from 2009 when there were 216 fetal deaths reported, and the ratio to births was 4.6.

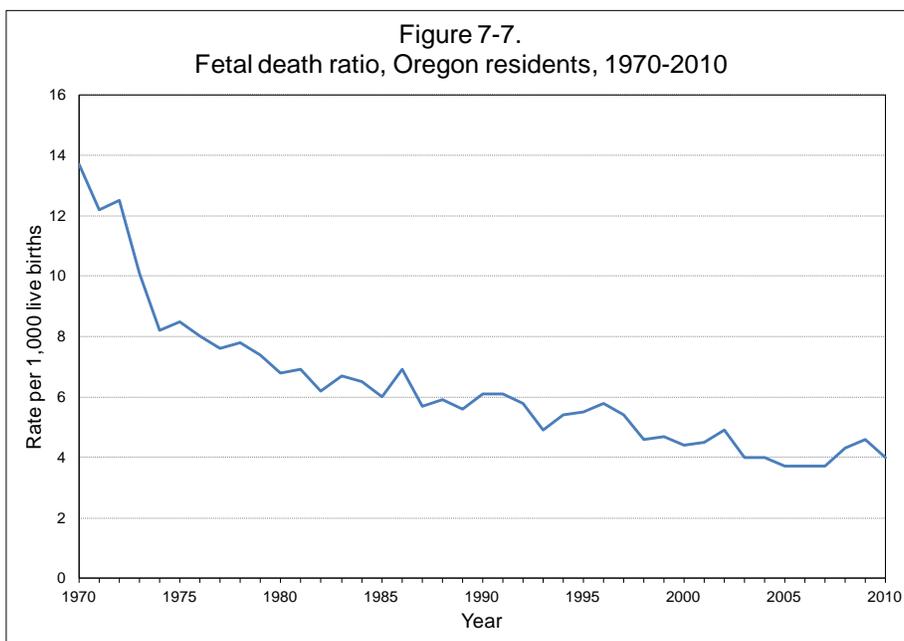


Table C - Percentage of fetal deaths by weeks of gestation, 2001-2010

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

Fetal cause of death

Causes of Oregon's 181 fetal deaths in 2010 are shown in Table 7-4. Fetal death of unspecified cause was the most frequently reported cause of fetal death in 2010 (62 deaths). Complications of the placenta, cord and membranes were the second most common cause of death (53 deaths). Congenital anomalies were third (22 deaths). These three causes of death represented 75.7 percent of all 2010 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 2010, this same cause made up 34.3 percent of fetal deaths, an 86.4 percent increase.

2009 birth cohort for infant deaths

Infant mortality analyses can also be performed using birth cohort data, with numerators for all rates and ratios based on the number of infants born in a given year who die prior to their first birthdays. 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 2010 death data in the report on the 2009 birth cohort. For illustration, 227 of the infants born in 2009 died within the first year of life; of these 227 deaths, 203 died in calendar year 2009, and 24 died in 2010. Those dying in 2010 are also reported in this year's report as part of the 2010 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 also are 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

2009 birth cohort (3.3) 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: 2007–2009 birth cohorts

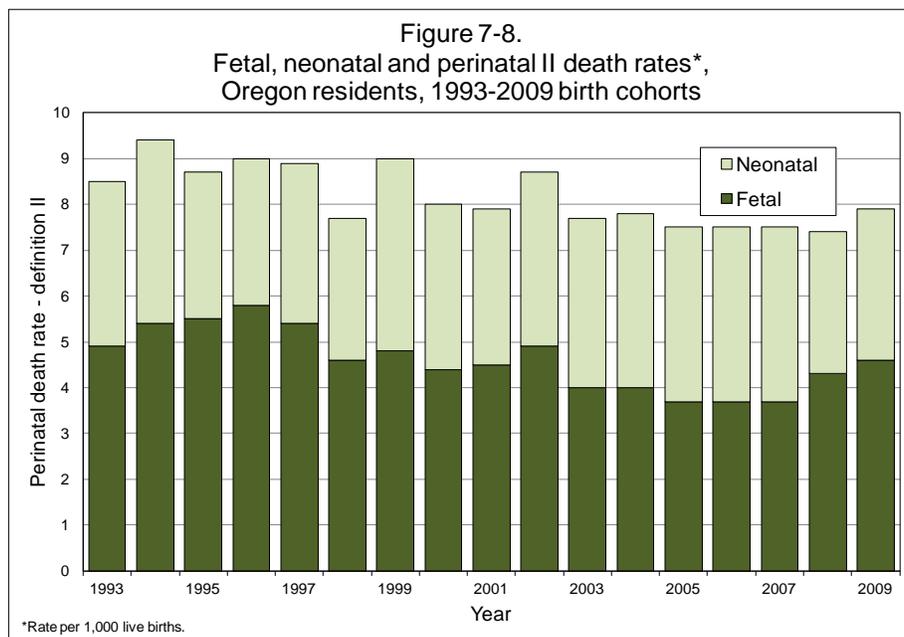
Characteristics of the mothers of infants who died during the neonatal period may have affected the outcome of their pregnancies. These include marital status, age, ethnicity and race, education, prenatal care, and tobacco use. [Table 7-18].

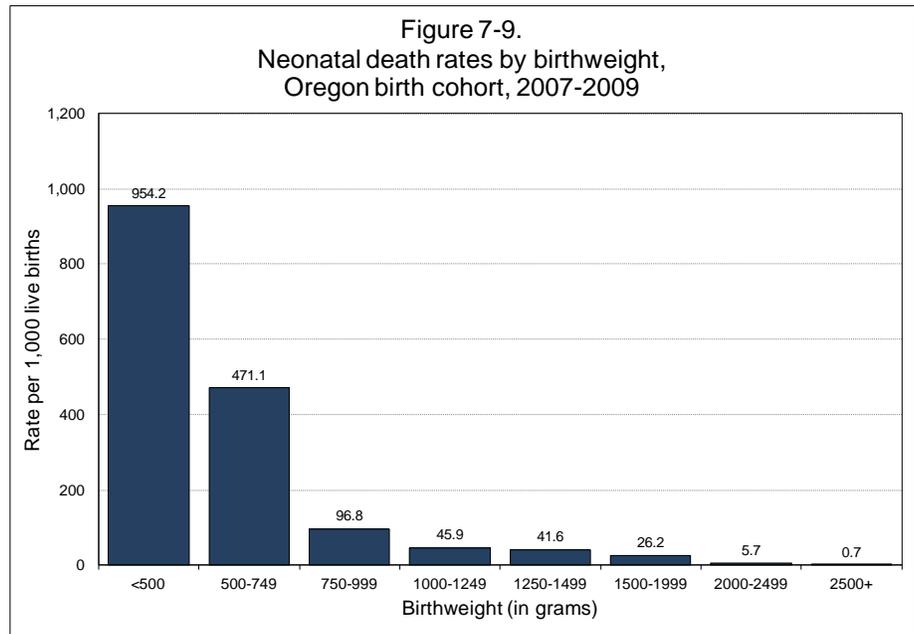
Birth weight

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 2007–2009, 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]. All infants weighing less than 350 grams died (1,000.0 per 1,000 live births). The death rate for infants weighing less than 500 grams was 954.2, 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 also may have confounding or mitigating

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





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 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 2007–2009 (4.0 versus 3.1 per 1,000). Women with some college education or more had a lower neonatal death rate (3.0 per 1,000) than women with a high school diploma or GED (3.6), but the difference was not statistically significant. Asian mothers had a statistically significantly lower rate of neonatal infant death than Black mothers (1.7 versus 5.7), but none of the other differences in rates between race and ethnic groups were significant. Mothers who were ages 40–44 had statistically significantly higher rates of neonatal death than mothers ages 20–34. Mothers of multiple births also had statistically significantly higher neonatal death rates than those with single births (20.9 versus 2.9). [Table 7-18].

Prenatal care

Women who received prenatal care, regardless of when prenatal care began, had statistically significantly lower neonatal death rates than women who received no prenatal care (3.1 versus 24.0 per 1,000 births). [Table 7-18].

Tobacco use

The infants of women who smoked during pregnancy had a statistically significantly higher neonatal death rate than infants of women who did not use tobacco (4.8 versus 3.2 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:
2007–2009 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 postneonatal death rates. The postneonatal mortality rate for non-Hispanic American Indians (6.1) was statistically significantly higher than the rates for non-Hispanic Whites (1.6), non-Hispanic Asians (1.4) and for Hispanics (1.3). Infants of younger mothers had higher death rates than infants of older mothers. Infants born to mothers who were 30 to 34 years old had the lowest postneonatal death rate (1.1). [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 60, Number 3, 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 2010 U.S. data obtained from the Volume 60, Number 4, National Vital Statistics Reports at the National Center for Health Statistics website:

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