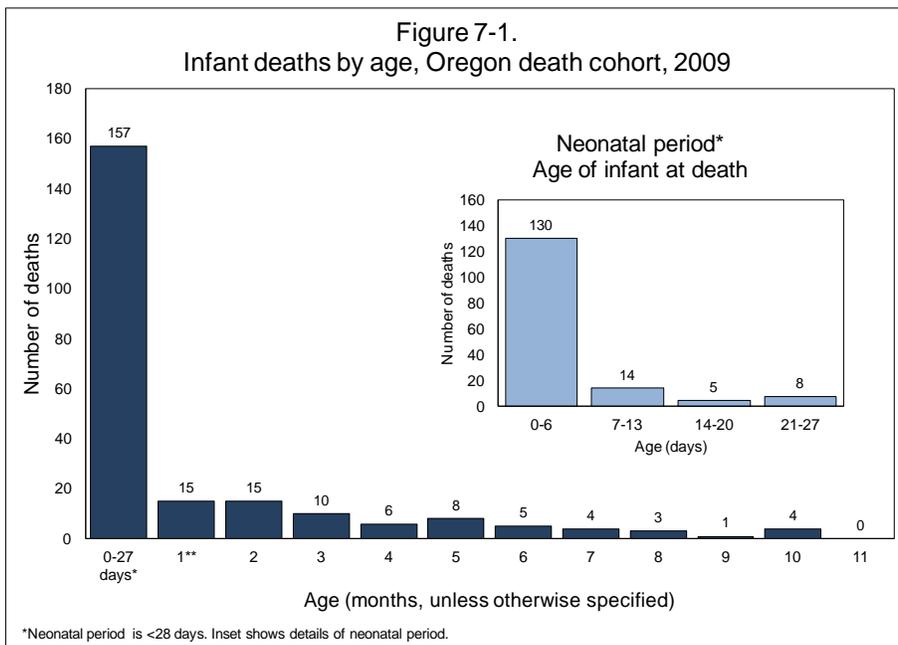

Fetal and infant mortality

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



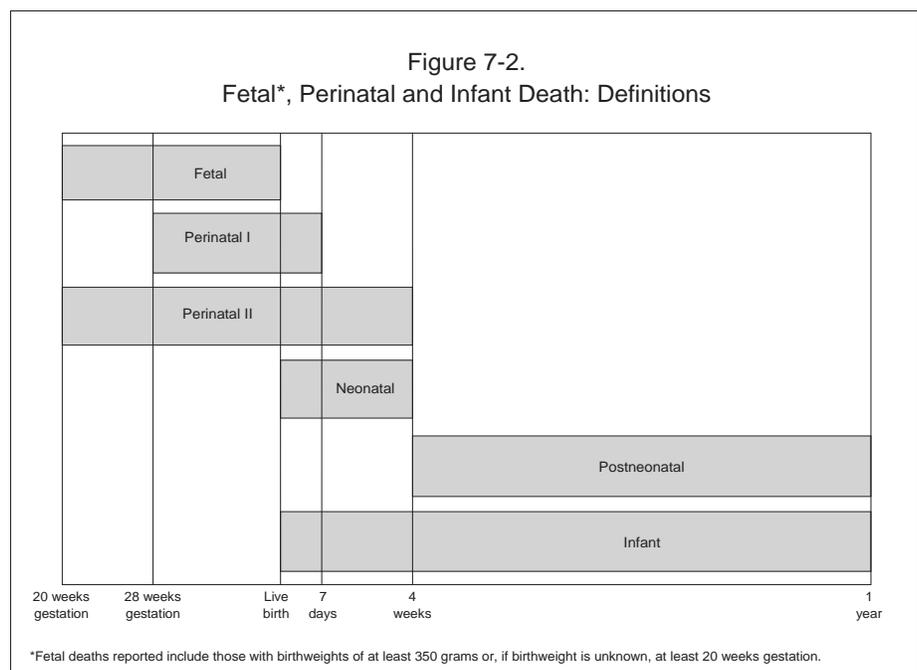
the data source for statistical analysis (for a description of these cohorts, see the next section below).

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

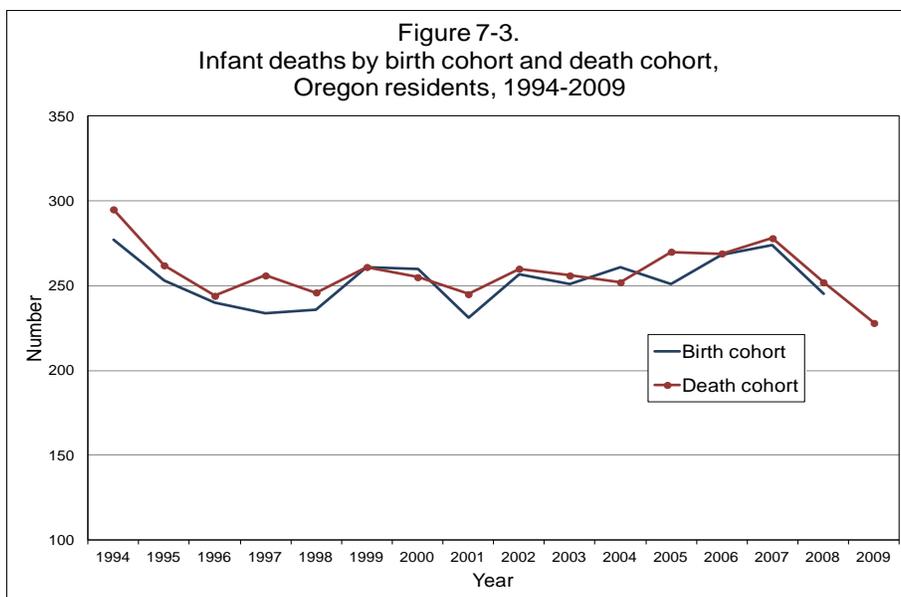
Before analyzing fetal and infant death data, it is necessary to define their different components.

- **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 dies either 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 Rate²** 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 their birth. In this report, the birth cohort consists of infants born in 2008 and 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 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 2009 death cohort

This chapter uses data from the 2009 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 2009, 228 infants under age one died who were residents of Oregon, down from 252 in 2008. The infant mortality rate was 4.8 deaths per 1,000 births, and decreased 5.9 percent from the previous year's rate of 5.1. The decrease was not statistically significant. Oregon's infant death rate is 25.0 percent lower than the preliminary 2009 U.S. rate of 6.4 per 1,000 births. [Table 5-1]. As in previous years, most infants (68.9%) who died during 2009 were less than 28 days old. Fifty-seven percent of infant deaths occur within the first week of life. [Figure 7-1].

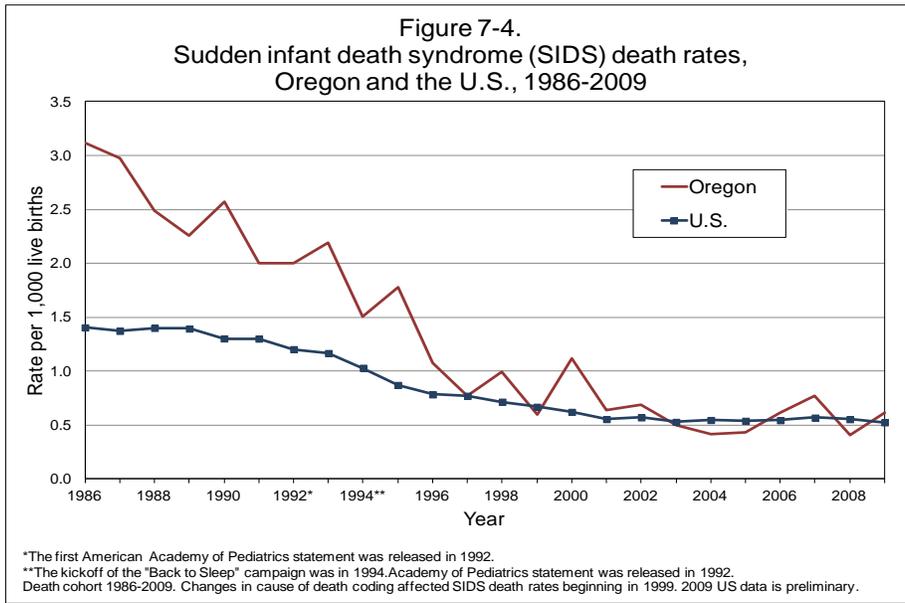
During the five year period 2005 to 2009, the infant mortality rates for Oregon counties ranged from 3.1 to 17.3 (excluding counties with less than five infant deaths). Four Oregon counties had infant mortality rates statistically significantly higher than the state rate of 5.4: Baker (17.3), Jefferson (10.6), Klamath (8.7), and Josephine (8.3). Only Washington County (4.2) had an infant mortality rate 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 one year of age, usually during the postneonatal period. Historically, Oregon's SIDS rate has been higher than

During 2009, 228 infants under age one died.

There was a increase in SIDS deaths in 2009.



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 20 deaths in 2008 to 29 in 2009, and the death rate increased from 0.4 SIDS deaths per 1,000 live births to 0.6. However, the increase was not statistically significant. In 2009, SIDS accounted for 12.7 percent of the state’s total infant deaths and 36.6 percent of all postneonatal deaths. [Table 7-2].

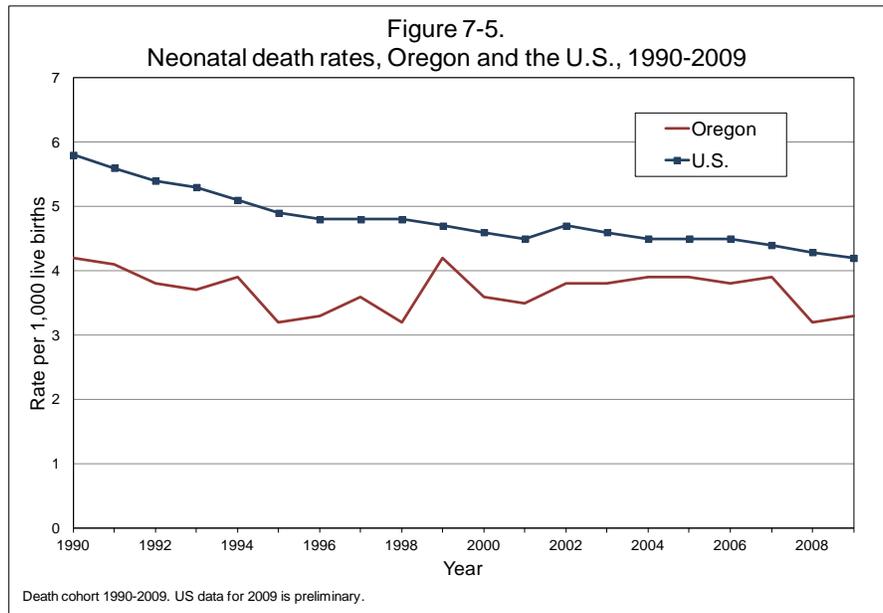
Neonatal death

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 2009, the neonatal death rate was 3.3 per 1,000 live births (up from 3.2 in 2008), and the postneonatal death rate was 1.5 (down from 2.0 in 2008). [Figure 7-5, Table 7-1].

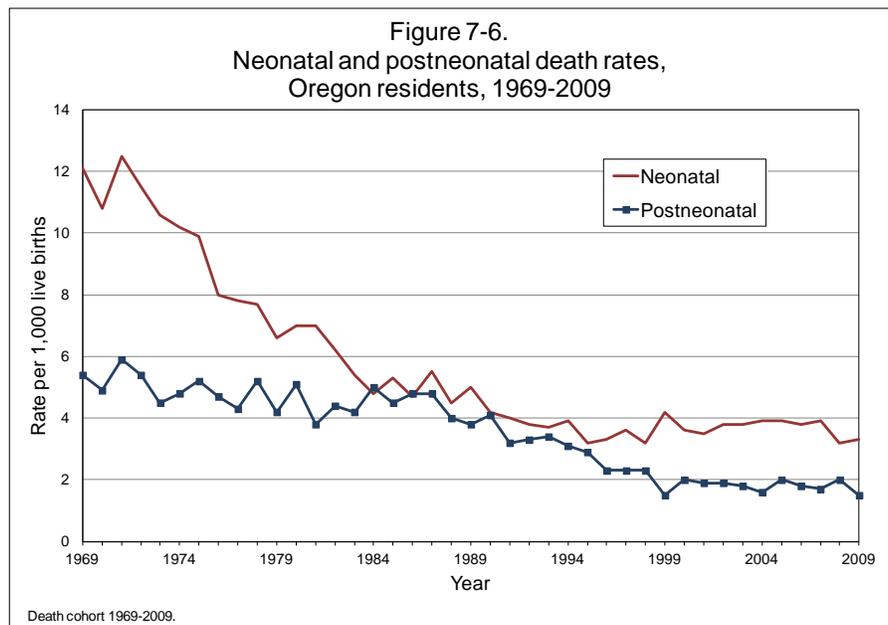
In 2009, 157 infants died during the neonatal period, an increase in number and rate, but not statistically significant. Oregon’s neonatal death rate has consistently been below that of the U.S. [Figure 7-6]. The 2009 Oregon rate (3.3) is 21.4 percent lower than the preliminary 2009 national rate

Year	Number	Percent*	Rate**
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
2008	3	1.9	6.1
2009	2	1.3	4.2

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



of 4.2. [Tables 5-1 and 5-2]. Congenital anomalies were responsible for more neonatal deaths than any other cause (21.7%), followed by short gestation and fetal growth (20.4%), and maternal factors (17.2%). [Table 7-2]. The number of neonatal deaths due to Respiratory Distress Syndrome (RDS) decreased from 12 in 1990 to two in 2009. [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 ten neonatal RDS events reported in 2005, but only five in 2006.



Postneonatal death

In 2009, 71 infants died during the postneonatal period, representing 31.1 percent of all infant deaths. The postneonatal death rate (1.5 per 1,000 births) is a decrease from 2008 (2.0 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 (36.6%). Unintentional injuries were the second most common cause of death and accounted for 15.5 percent of postneonatal deaths. Congenital anomalies were the third most common cause of postneonatal death (8.5%). [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 (1.5 vs. 2.2 per 1,000 births in 2009).

Table B - Fetal death ratios per 1,000 live births, by mother's age, 2005-2009

AGE	YEAR				
	2009	2008	2007	2006	2005
Total	4.6	4.3	3.7	3.7	3.7
15-44	4.6	4.3	3.6	3.6	3.6
15-19	8.1	5.6	3.2	4.2	6.8
20-24	4.4	5.0	3.9	3.1	3.5
25-29	3.4	3.3	2.9	3.5	3.3
30-34	4.3	4.7	3.6	3.0	3.0
35-39	4.8	3.9	4.5	5.1	3.4
40-44	8.6	*	6.3	8.3	5.7

* 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 2009, there were 216 Oregon resident fetal deaths, or 4.6 fetal deaths per 1,000 live births. [Table 7-3]. This is not a statistically significant increase from 2008 when there were 212 fetal deaths reported, and the ratio to births was 4.3.

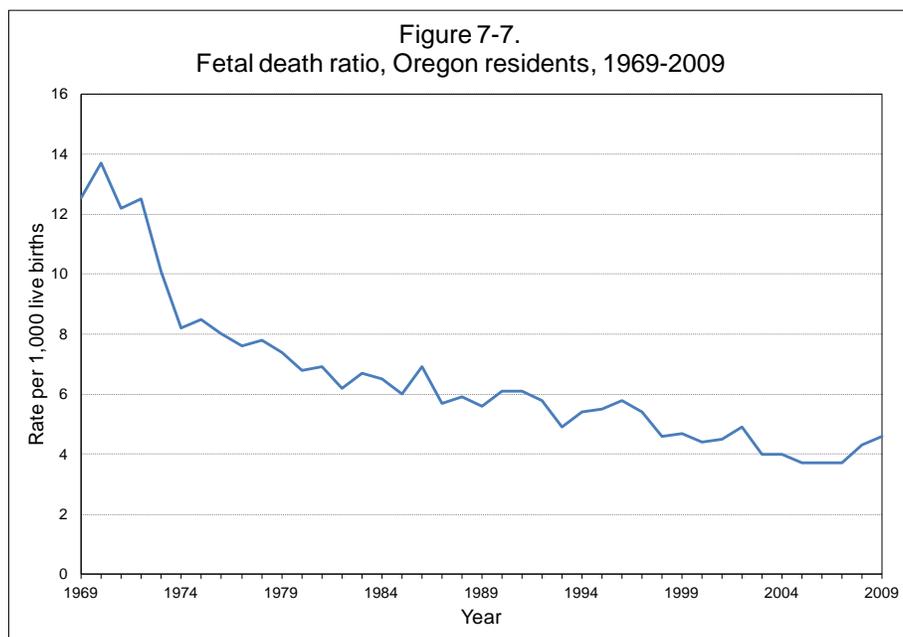


Table C - Percentage of fetal deaths by weeks of gestation, 2000-2009

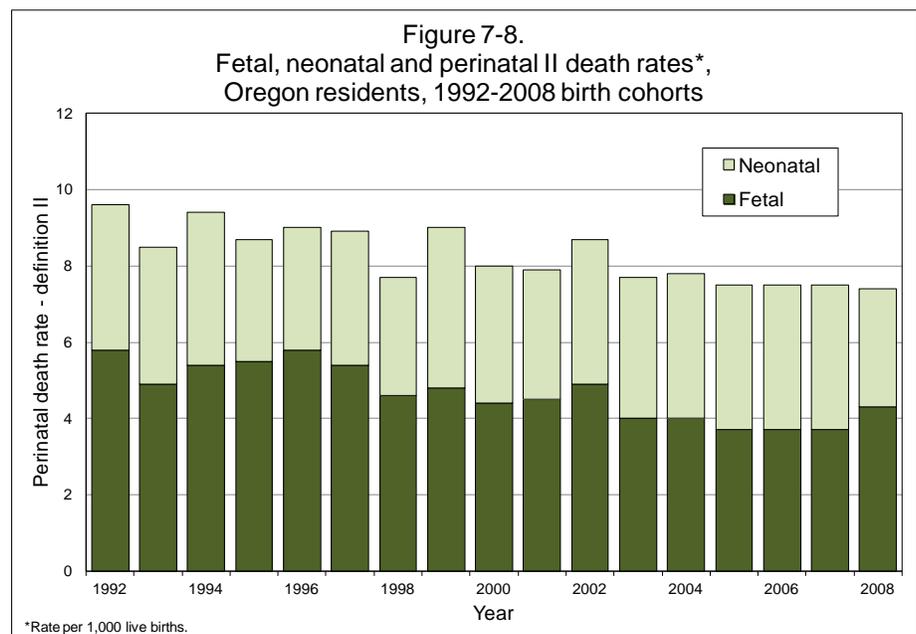
Year	weeks of gestation		
	<28	28-36	37+
2000	36.9	34.3	28.8
2001	33.7	34.6	31.2
2002	36.9	35.1	27.9
2003	29.9	37.5	31.5
2004	34.2	34.2	31.5
2005	47.7	28.5	23.8
2006	42.1	36.5	21.3
2007	45.3	31.5	22.7
2008	41.5	31.6	26.4
2009	33.3	40.3	26.4

Fetal cause of death

Causes of Oregon's 216 fetal deaths in 2009 are shown in Table 7-4. Complications of the placenta, cord, and membranes were the most frequently reported cause of fetal death in 2009 (70 deaths). Fetal death of unspecified cause was the second most common cause of death (63 deaths). Congenital anomalies were third (28 deaths). These three causes of death represented 74.5 percent of all 2009 Oregon fetal deaths. In 1999, the first year Oregon used ICD-10 codes, fetal death of unspecified cause represented 18.4 % of all fetal deaths. In 2009, this same cause made up 29.2 % of fetal deaths, a 58.7 percent increase.

2008 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 that die prior to their first birthday. Perinatal analyses would 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 2009 death data in the report on the 2008 birth cohort. For illustration, 245 of the infants born in 2008 died within the first year of life; of these 245 deaths, 218 died in calendar year 2008, and 27 died in 2009. Those dying in 2009 would also be reported in this year's report as part of the 2009 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 2008 birth cohort (3.1) 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 increased in 2008 (4.3) and 2009 (4.6).

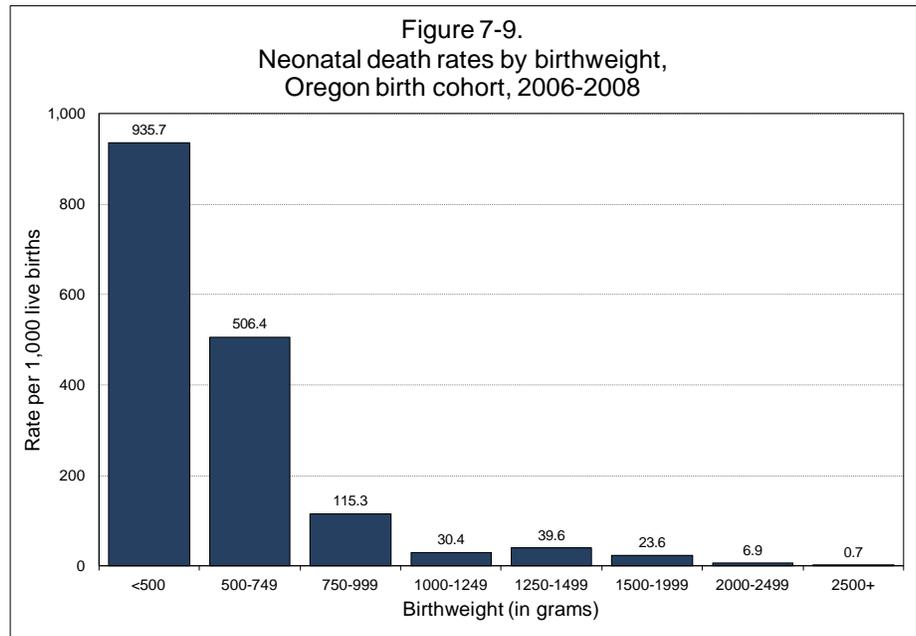
Neonatal deaths: 2006-2008 birth cohorts

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 2006-2008, 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]. Nearly all infants weighing less than 350 grams died (987.2 per 1,000 live births). The death rate for infants weighing less than 500 grams was 935.7, decreasing to 0.7 per 1,000 live births for infants weighing more than 2,500 grams. [Table 7-12 and Figure 7-9].

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



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.

Maternal characteristics

Though most 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 2006-2008 (4.2 versus 3.2 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 (3.8). 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 prenatal care, regardless of when prenatal care began, had statistically significantly lower neonatal death rates than women who received no prenatal care (3.3 versus 19.7 per 1,000 births). [Table 7-18]].

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 (4.4 versus 3.4 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. [Table 7-18].

Postneonatal deaths: 2006-2008 birth cohort

Mothers who were unwed, or had no education beyond high school, or used tobacco during pregnancy, or had no prenatal care had statistically significantly higher postneonatal death rates. The postneonatal mortality rates for non-Hispanic African Americans (4.0) and non-Hispanic American Indian (5.5) were statistically significantly higher than the rates for non-Hispanic Whites (1.7) and for Hispanics (1.4). Infants of younger mothers had higher death rates than infants of older mothers. Infants born to mothers who were 25 to 34 years old had the lowest death rate (1.3). [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/index.asp?bid=1205>, or page 139 of the Volume 59, Number 10, National Vital Statistics Reports at the National Center for Health Statistics website: http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_10.pdf.