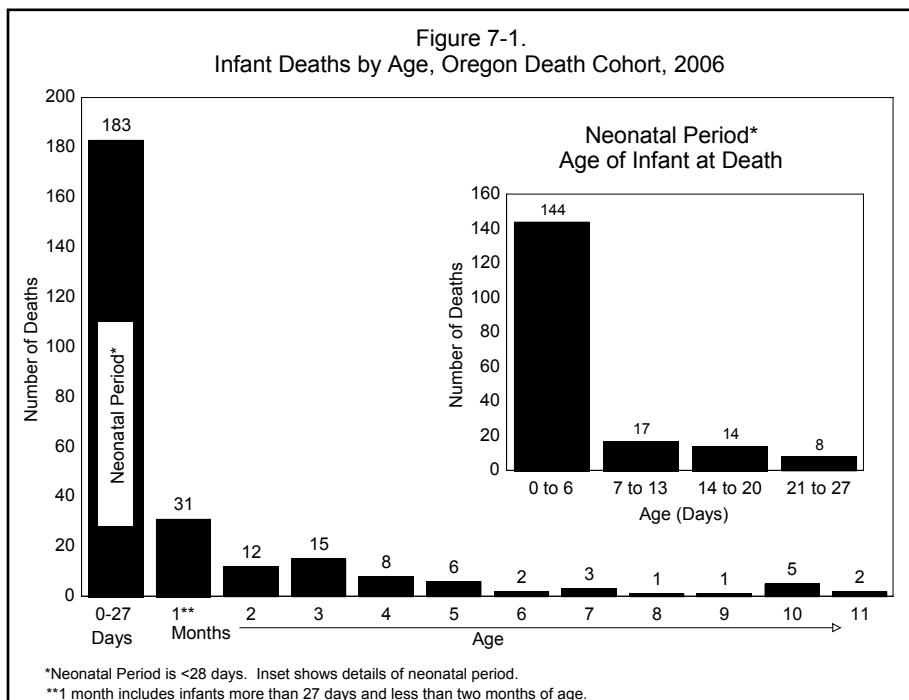
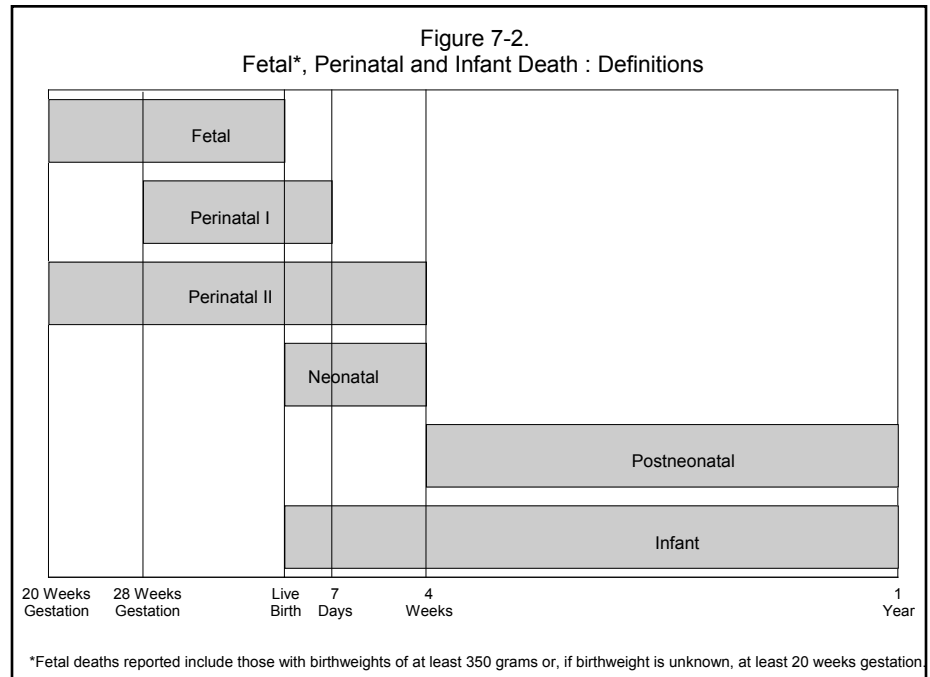

Fetal and infant mortality

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.¹
- **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 **Infant Mortality Rate**² 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 2006 and could have been born in either 2005 or 2006. This measure is usually available sooner than the birth cohort as described below. Its focus and analysis is 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 their 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 2005 and died in either 2005 or 2006. 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 2006 death cohort

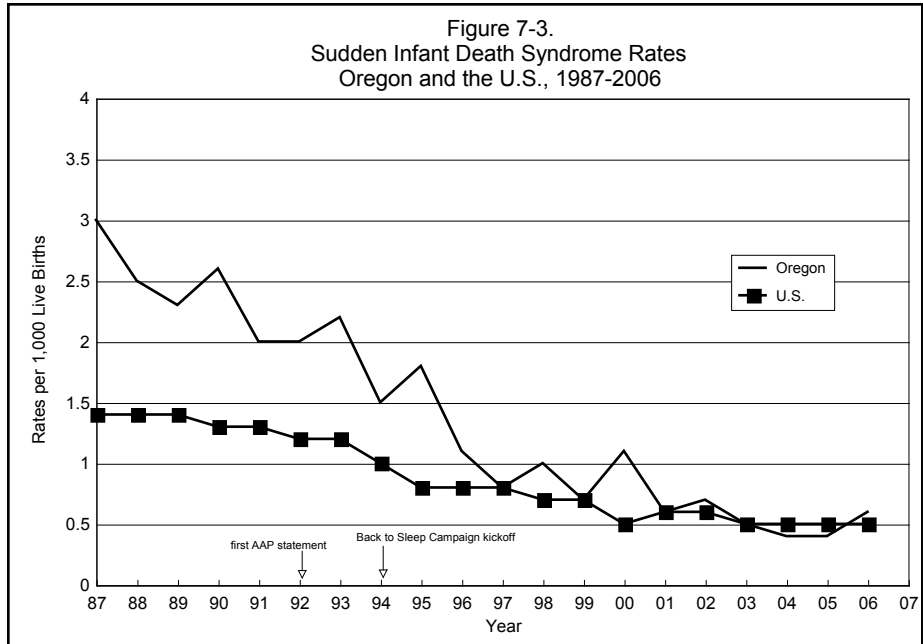
This report uses data from the 2006 birth cohort in the first two tables and much of the discussion on cause of death. Infant characteristics at the time of death are derived from death certificates. The characteristics of most interest are age at death, county of residence at death and underlying cause. 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.

During 2006, 260 infants under age one died.

Demographics

In 2006, 269 infants under age one died who were residents of Oregon. The infant mortality rate was 5.5 deaths per 1,000 births, and decreased 6.8 percent from the previous year. The decrease was not statistically significant. Oregon's infant death rate is 18.0 percent lower than the U.S. rate of 6.7 per 1,000 births. [Table 5-1]. As in previous years, most infants who died during 2006 were less than 28 days old. [Figure 7-1]. More than two-thirds of infant deaths (68%) occurred within the first month of life. Fifty-three percent of infant deaths occur in the first week of life. Among counties the infant death rate ranged from zero in smaller counties to 17.6. However there was no statistically significant variation in the infant death rate among counties. When the events for 2002-

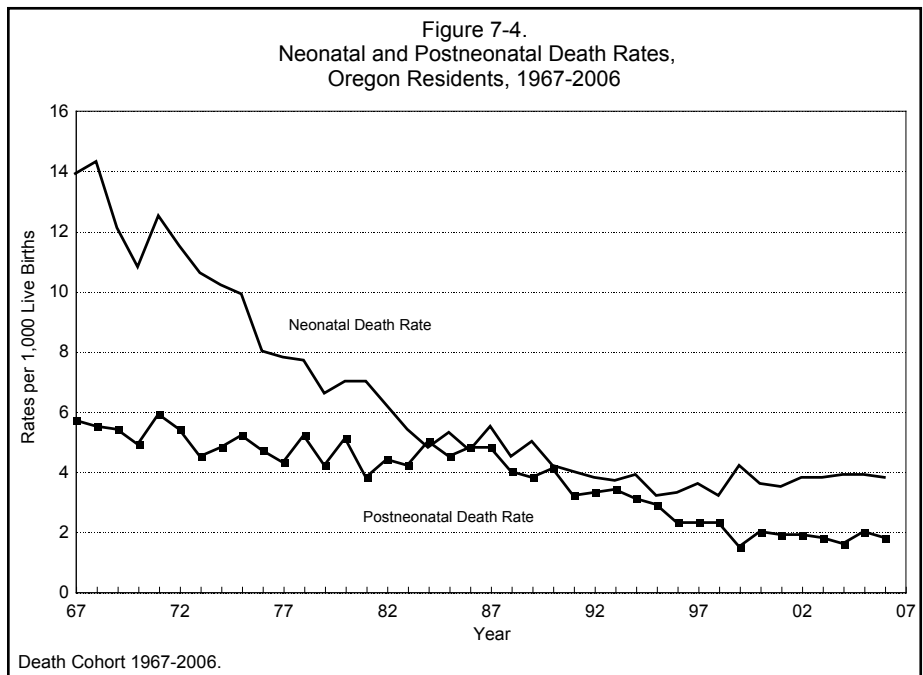
There was an increase in SIDS deaths in 2006.



2006 are combined in a five-year average, Baker, Lake and Jefferson counties exhibit statistically significant higher rates of infant mortality. Benton and Clackamas have infant death rates 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 post-neonatal 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 7-3]. However, since 2001 Oregon’s rate has been very similar to the nation’s rate. 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 death increased from 20 deaths in 2005 to 30 in 2006. In 2006, SIDS accounted for 11 percent of the state’s total infant deaths and 31.3 percent of all post-neonatal deaths. [Table 7-2].

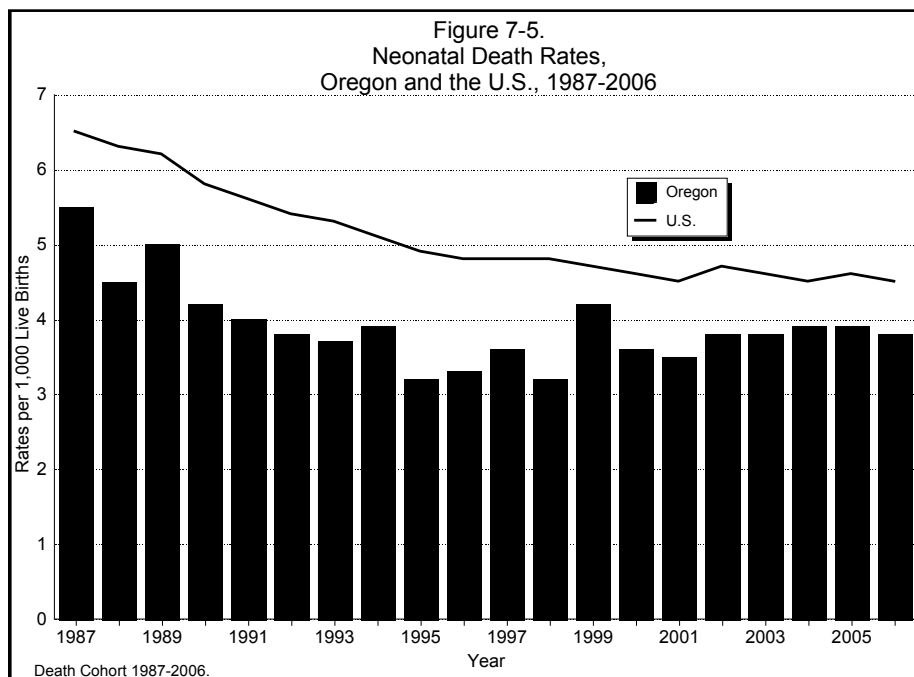
Neonatal death

Neonatal and postneonatal death rates have been declining from early reporting 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 2006, the neonatal death rate was 3.8 and the postneonatal death rate was 1.8 per 1,000 births. [Figure 7-4, Table 7-1].

In 2006, 183 infants died during the neonatal period, a slight increase in number but a decrease in the rate. Oregon’s neonatal death rate has consistently been below that of the U.S. [Figure 7-5]. The 2006 state rate is 15.5 percent lower than the 2006 national rate of 4.5. [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 (29.0%) than any other cause, followed closely by short gestation and fetal growth (28.4%), and maternal factors (13.7%). [Table 7-2]. Since 1990, the number of neonatal deaths due to Respiratory Distress Syndrome (RDS) decreased from 12 to five in 2006 (see sidebar Table A). As physicians have noted this cause less frequently on the death certificate, the year-to-year variation can change considerably.

Table A – Neonatal Deaths Due to Respiratory Distress Syndrome			
Year	Number	Percent*	Rate**
1990	12	6.7	28.0
1991	9	5.2	21.2
1992	7	4.1	16.7
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

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



Postneonatal death

In 2006, 86 infants died during the postneonatal period, representing 32.0 percent of all infant deaths. The postneonatal death rate (1.8 per 1,000 births) is a 10 percent increase from 2005 (2.0 per 1,000). [Figure 7-4]. SIDS was the most frequent cause of death and accounted for 31.4 percent of postneonatal deaths. External causes, including unintentional injuries and assaults, were the second most frequent cause of death with nearly 20.9 percent of postneonatal deaths. [Tables 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 (1.8. vs. 2.2 per 1,000 births).

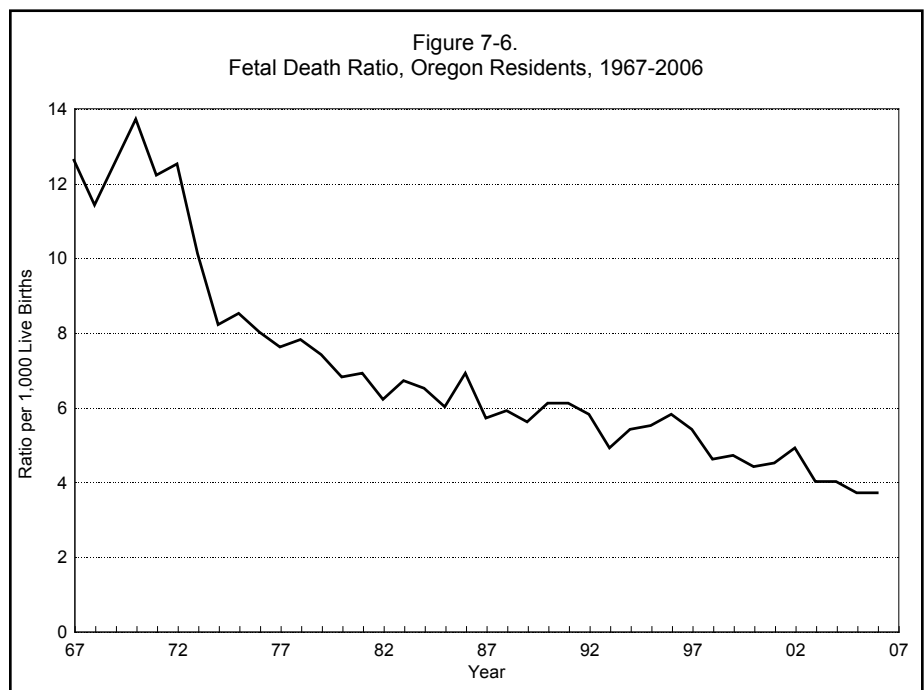
Fetal death

In 2006, there were 177 Oregon resident fetal deaths, exhibiting no change in the fetal death ratio from the preceding year (3.7 in 2006). [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 7-6].

Fetal cause of death

Causes of Oregon's 177 fetal deaths in 2006 are shown in Table 7-4. The most frequently reported cause of fetal death in 2006 (62 deaths) was "Fetal death of unspecified cause." Complications of the placenta, cord and membranes was the second highest cause of fetal death (44 deaths). Congenital anomalies were the third with 17 deaths. These three causes of death represented over 69.4 percent of all 2006 Oregon fetal deaths. Fetal death of unspecified cause has increased

AGE	YEAR				
	2006	2005	2004	2003	2002
Total	3.7	3.7	4.0	4.0	4.9
15-44	3.6	3.6	4.0	4.0	4.9
15-19	4.2	6.8	4.8	4.1	4.5
20-24	3.1	3.5	4.1	4.0	5.3
25-29	3.5	3.3	2.9	3.8	3.2
30-34	3.0	3.0	4.0	3.1	5.5
35-39	5.1	3.4	5.0	5.2	6.4
40-44	8.3	5.7	8.2	7.5	7.7



18.4 percent in 1999, the first year Oregon used ICD-10 codes, to 35.0 percent in 2006. Frequencies of other causes were not too dissimilar from previous years. Signing medical certifiers appear to be providing less specific information.

2005 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 2005. 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 2006 death data in the report on the 2005 birth cohort. For illustration for the 251 deaths of infants born in 2005: 225 died in calendar year 2005 and 26 died in 2006. Those dying in 2006 would also be reported in this year's report in the 2006 death cohort.

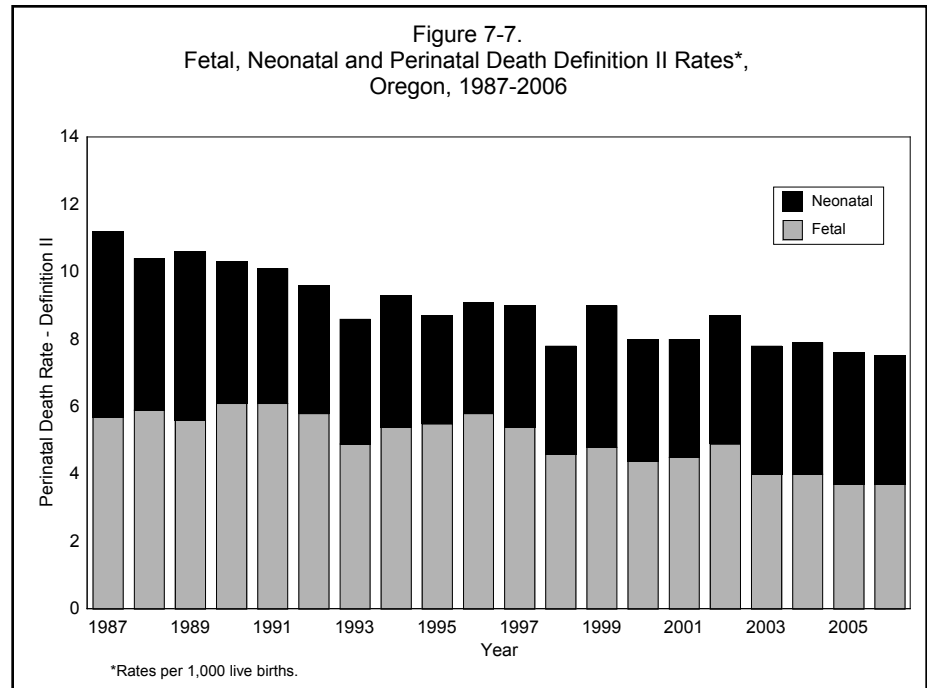
Small numbers

Because of the small numbers of events in some of the risk factor categories, this report uses three-year grouping 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 7-7, 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. It 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.

YEAR	weeks of gestation		
	<28	28-36	37+
1997	29.9	37.0	32.7
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



Neonatal deaths: 2003-2005 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 7-16].

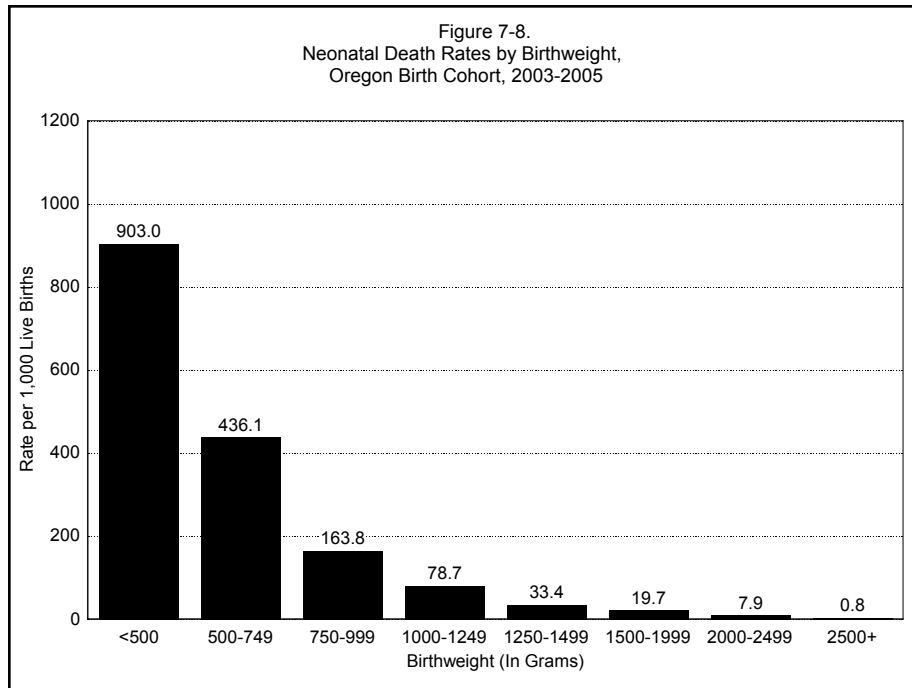
Birth weight

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 2003-2005 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 400 grams died. The death rate for infants weighing less than 500 grams was 903 per 1,000 births, decreasing to .08 per 1,000 live births for infants weighing more than 2,500 grams. [Figure 7-8].

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 (7.1 versus 2.2 per 1,000). [Table



7-18]. Both women with a high school diploma or GED (4.1 per 1,000) and women without a high school diploma or GED (5.1) had a statistically significantly higher neonatal death rate than women with some college (2.7). [Table 7-18]. The neonatal death rate for infants of African American mothers (5.4 per 1,000 births) and American Indian mothers (5.5) were higher than the neonatal death rate for infants of White Non-Hispanic mothers (3.7) and this difference was 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 (3.5 versus 25.8 per 1,000 births).

Tobacco use

The infants of women who smoked during pregnancy had a higher neonatal death rate compared to those women who did not use tobacco (5.6 versus 3.3 per 1,000). There may be under-reporting of tobacco use, thereby lowering the neonatal death rates for this category by eliminating high-risk mothers from the analysis.

Postneonatal deaths: 2003-2005 birth cohort

Higher postneonatal death rates were found among the children of mothers who were younger, unwed, without a high school diploma or GED, or used tobacco during pregnancy. These rates were statistically significant. The children of non-Hispanic American Indians and

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

non-Hispanic African Americans had higher rates of postneonatal mortality, and both rates were statistically significant. [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 432,222 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: www.naphsis.org/ website or page 124 of the Volume 57, Number 14, National Vital Statistics Reports at the National Center for Health Statistics website: www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf.