

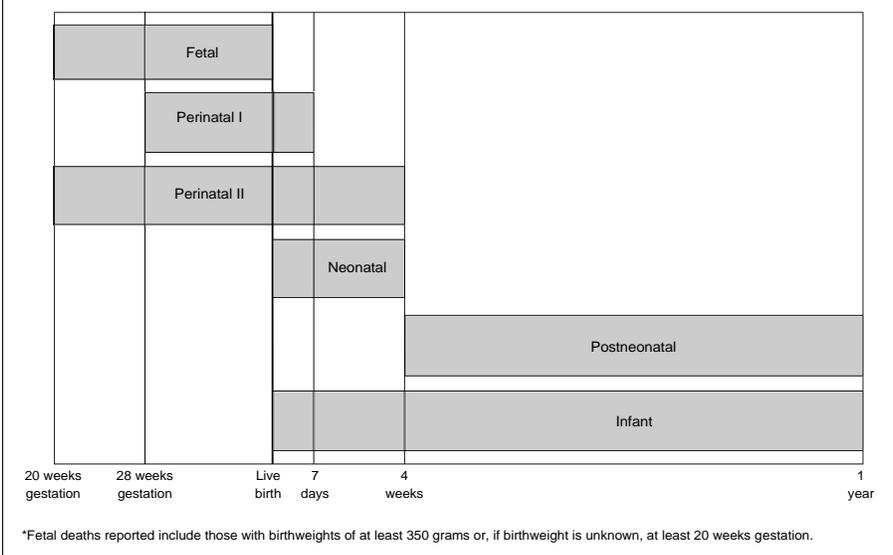
# Fetal and infant mortality

## Introduction

This report presents fetal and infant mortality data. Infant deaths occur 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 statistical descriptions of deaths within a given period, their fundamental purpose is to help discover and evaluate preventive strategies to improve infant health. As an aid to understanding and monitoring health trends, this report divides fetal and infant deaths into five overlapping categories: fetal deaths, perinatal deaths, infant deaths, neonatal deaths and postneonatal deaths. These categories are consistent with the definitions established by the National Center for Health Statistics (see Figure 7-1).

The five categories of fetal and infant death were analyzed using three databases: fetal deaths, infant deaths and 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. The next section discusses the definitions for birth and death cohorts.

Figure 7-1.  
Fetal\*, perinatal and infant death: definitions



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. It is important to avoid inferring causal relationships based solely on the data contained in these tables.

## Definitions and methodology

The following are definitions of fetal and infant death data components.

- **Fetal deaths** occur among fetuses weighing at least 350 grams at delivery, or that have completed at least 20 weeks' gestation if delivery weight is unknown. To classify an event 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 fetal death reporting.\*
- **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” (seven to 27 days).
  - » **Postneonatal deaths** occur from day 28 through day 364 after birth.
- **Perinatal deaths definition I** includes fetal deaths at 28 weeks of gestation or more, and infant deaths at less than seven days.
- **Perinatal deaths definition II** includes fetal deaths at 20 weeks or more of gestation, and infant deaths at less than 28 days.

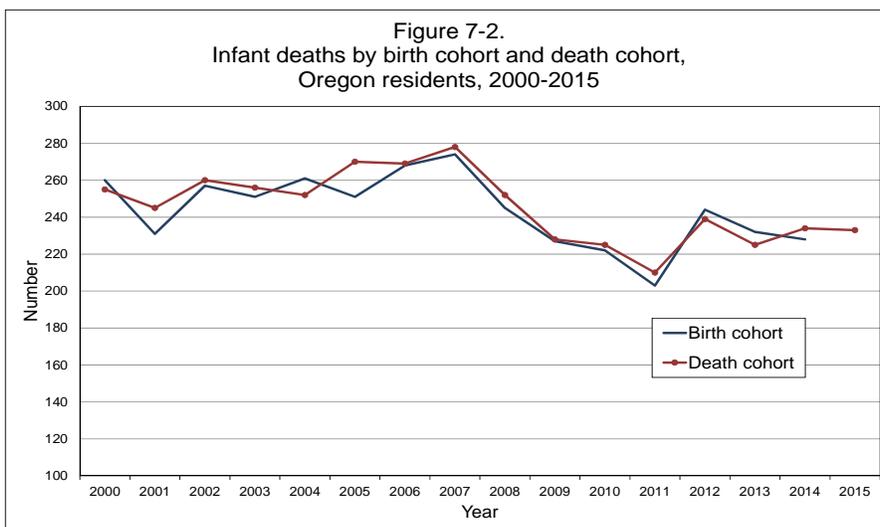
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\* Prior to Nov. 10, 1998, fetal deaths occurring at 20 weeks of gestation or more were reported. Effective that date, the Oregon Legislature amended ORS 432.333 to read: “Each fetal death of 350 grams or more, or, if weight is unknown, of 20 completed 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 five 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 death reports directly to the Oregon Center for Health Statistics rather than to county registrars.

- The **death cohort** for infant death includes all infant deaths occurring in any given calendar year. In this report, the death cohort consists of infants that died in 2015 and could have been born in either 2014 or 2015. Data from the death cohort are usually available sooner than birth cohort data, as described below. The focus and analysis of the death cohort is on death record information, such as age, residence of the infant and cause of death. Table 7-1 and Table 7-2 are based on a death cohort.
- The **birth cohort** for matched infant deaths (each death record matched to its corresponding birth record) is based on analysis of infants born in the same calendar year that die within one year of their birth. In this report, the birth cohort consists of infants born in 2014 that died in either 2014 or 2015. Analysis based on a birth cohort is typically not as timely; however, it allows the analysis of characteristics from the birth record, such as mother's race, age and factors affecting the birth outcomes (i.e., birthweight, 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. See Figure 7-2 for a comparison of deaths by birth cohort and death cohort.

## Use of the 2015 death cohort

This chapter uses data from the 2015 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 records, 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 2015, 233 Oregon resident infants under one year of age died, a slight decrease from 234 in 2014. The infant mortality rate was 5.1 deaths per 1,000 births (see Table 7-1), which was unchanged from the previous year. Oregon’s infant death rate was 12.1% lower than the U.S. rate of 5.8 per 1,000 births during 2014 (the most recent year for which data are available).(1) As in previous years, most infants (64.4%) that died during 2015 were less than 28 days old. More than half (53.6%) of infant deaths occurred within the first week of life (see Figure 7-3).

Between 2011 and 2015, the infant mortality rates for Oregon counties (excluding counties with fewer than five infant deaths) ranged from 3.9 to 12.3. Two Oregon counties had infant mortality rates significantly higher than the state rate (5.0): Tillamook (11.3) and Josephine (8.1). No county had an infant mortality rate significantly lower than the state rate.

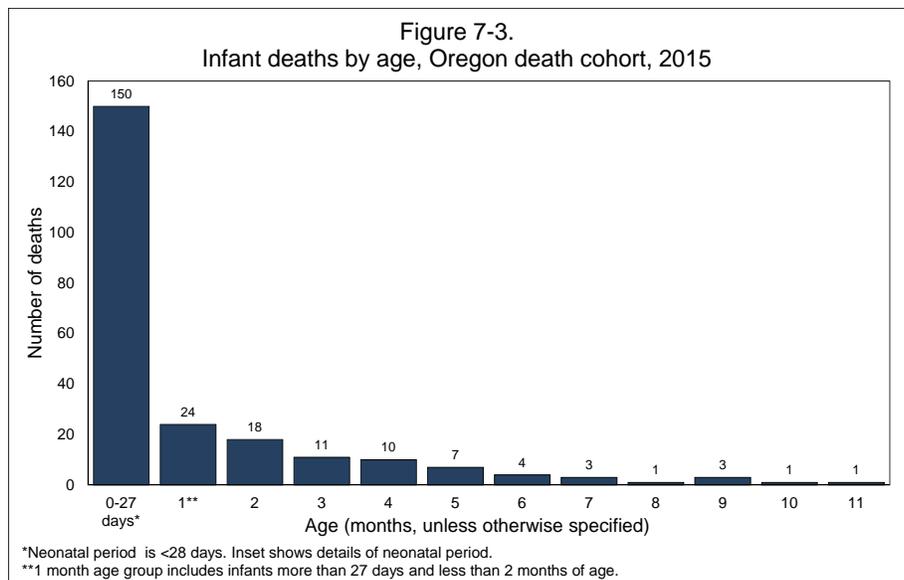
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***During 2015, 233 infants died within the first year of life.***

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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 (see Figure 7-4). However, since 2001, Oregon's and the nation's rates have been similar. Oregon's rate dropped quickly after the implementation of "Back to Sleep," a national educational campaign begun in 1994 to encourage non-prone sleeping positions for infants.

The number of SIDS deaths decreased slightly from 25 in 2014 to 23 in 2015, and the SIDS death rate among infants decreased from 0.6 per 1,000 live births in 2014 to 0.5 per 1,000 live births in 2015. This decrease in the number of SIDS deaths was not statistically significant. In 2015, SIDS accounted for 9.9% of all infant deaths in Oregon and 27.7% of all postneonatal deaths (see Table 7-2).

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***There was a decrease  
in SIDS deaths in 2015.***

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### 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 2015, the neonatal death rate decreased slightly to 3.3 from 3.5 in 2014. The postneonatal death rate was 1.8, a slight increase from 1.7 in 2014 (see Figure 7-5 and Table 7-1).

In 2015, 150 infants died during the neonatal period, a decrease from 158 in 2014. Oregon's neonatal death rate has consistently been below that of the United States (see Figure 7-6). The 2015 Oregon rate (3.3) is 16.2% lower than the 2014 national rate of 3.9.<sup>(1)</sup> Short gestation and fetal growth were

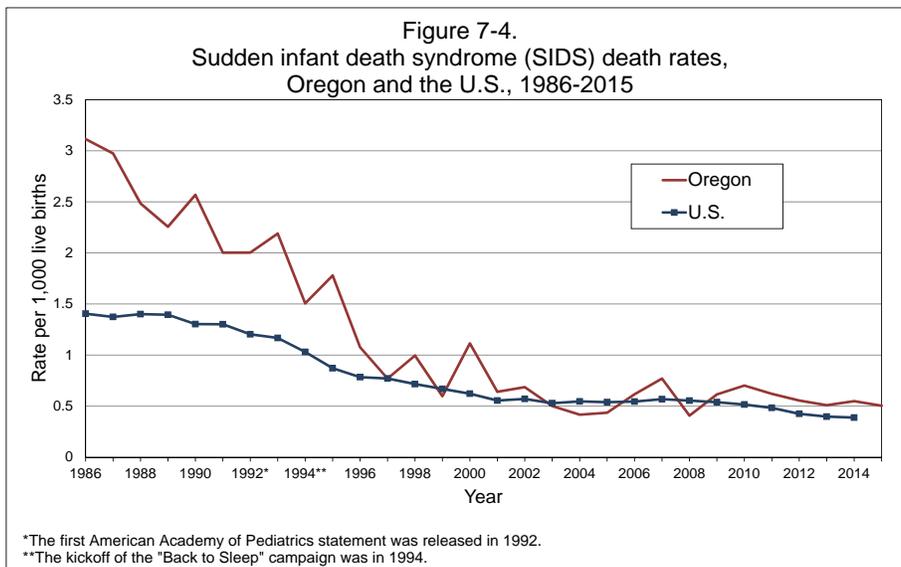


Table A - Neonatal deaths due to Respiratory Distress Syndrome, 1999-2015			
Year	Number	Percent*	Rate**
1999	7	3.1	13.3
2000	6	3.6	13.1
2001	5	3.2	11
2002	4	2.3	8.9
2003	3	1.7	6.5
2004	6	3.4	13.1
2005	10	5.6	21.8
2006	5	2.7	10.3
2007	9	4.7	18.2
2008	3	1.9	6.1
2009	2	1.3	4.2
2010	3	2.0	6.6
2011	4	2.8	8.9
2012	4	2.5	8.9
2013	4	2.6	8.9
2014	2	1.3	4.4
2015	2	1.3	4.4

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

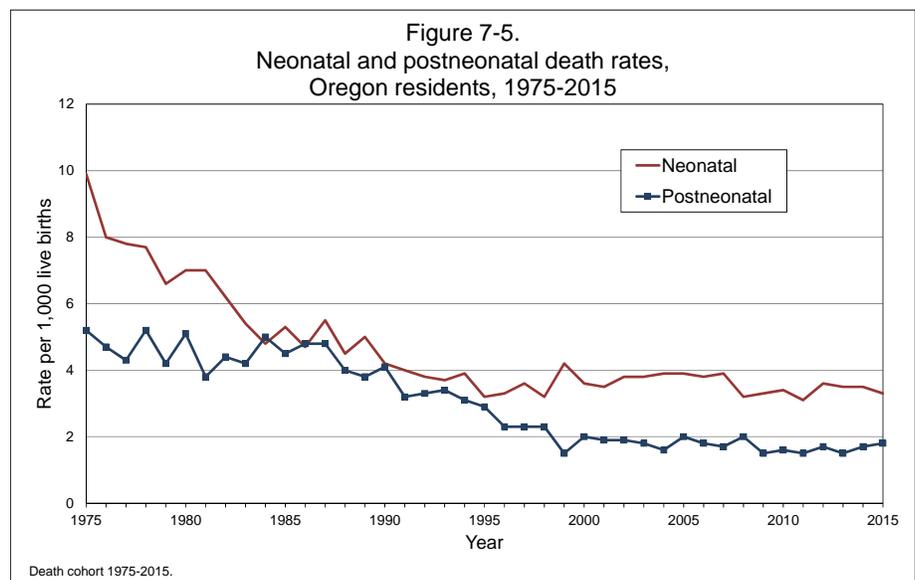
responsible for more neonatal deaths than any other cause (24.7%), followed by maternal factors (21.3%) and congenital anomalies (20.7%) (see Table 7-2). Two neonates died from respiratory distress syndrome (RDS) in 2015 (see Table A). The numbers of RDS deaths vary considerably from year to year. This fluctuation is due to physicians citing it less frequently as the cause of death — a change of only a few RDS events can incorrectly appear as an alarming increase or decrease; e.g., there were eight neonatal RDS events reported in 2013, but only two in 2015.

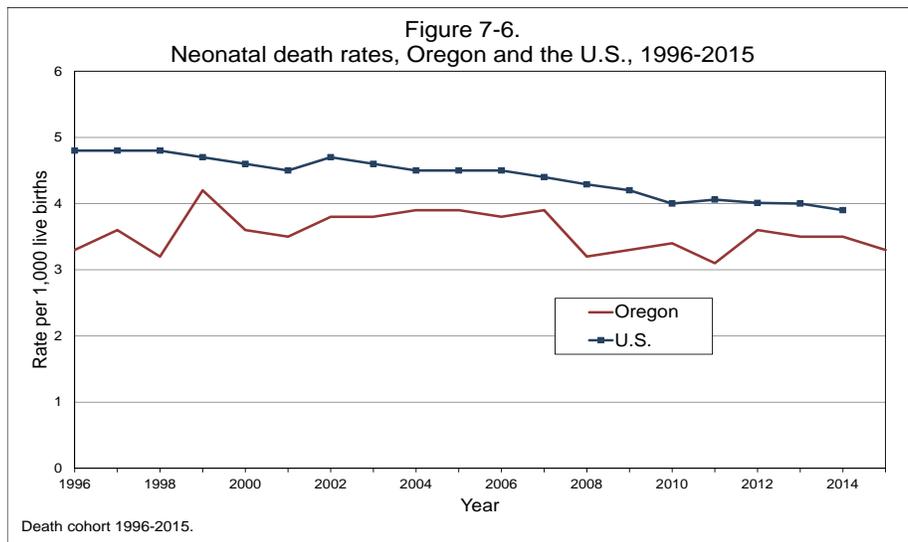
### Postneonatal death

In 2015, 83 infants died during the postneonatal period, representing 35.6% of all infant deaths. The postneonatal death rate of 1.8 per 1,000 births represents a slight increase from 2014 (1.7 per 1,000 births); the difference is not statistically significant (see Figure 7-5). Sudden infant death syndrome (SIDS) was the most common cause of postneonatal death (27.7%). Unintentional injuries were the second most common cause and accounted for 20.5% of postneonatal deaths. Congenital anomalies were the third most common cause of postneonatal death (15.7%) (see 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 rate (1.8 per 1,000 births for Oregon in 2015 vs. 1.9 per 1,000 births for the latest U.S. data available in 2014).(1)

### Fetal death

Fetal deaths were first reported to the Public Health





**Table B - Fetal death ratios per 1,000 live births, by mother's age, 2011-2015**

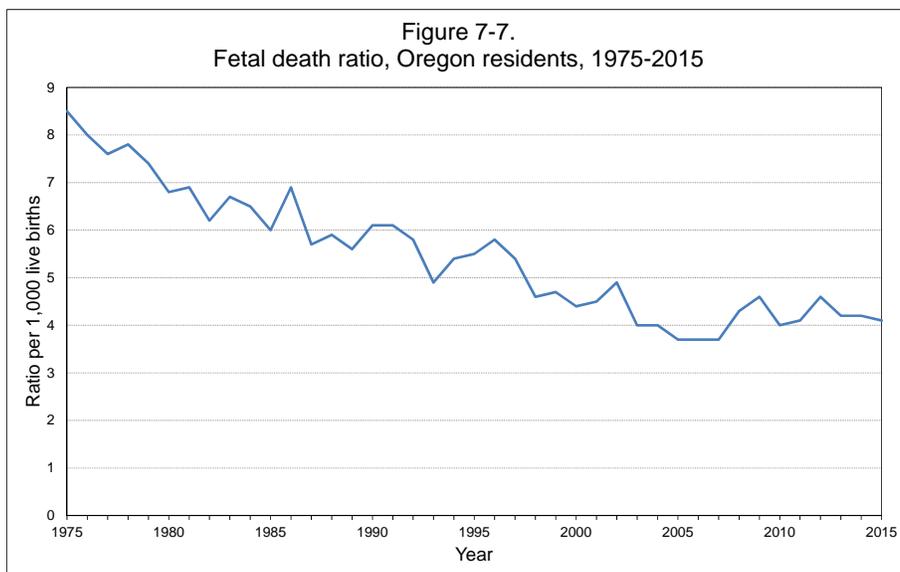
Age	Year				
	2011	2012	2013	2014	2015
Total	4.1	4.6	4.2	4.2	4.1
15-44	4.1	4.6	4.1	4.1	4.0
15-19	6.4	7.4	3.5	5.4	4.8
20-24	4.6	3.9	4.2	3.1	4.6
25-29	2.9	3.4	4.3	4.2	2.9
30-34	3.9	5.0	3.2	3.6	3.9
35-39	4.6	5.2	5.7	4.9	5.0
40-44	8.1	7.8	4.7	7.5	6.7

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

Division in 1928, when the ratio of fetal deaths to live births was 29.0 for every 1,000 births. Since then, this ratio has generally decreased, and has remained under 5.0 since 1998 (see Figure 7-7 and Table 5-2). In 2015, there were 186 Oregon resident fetal deaths, or 4.1 fetal deaths per 1,000 live births (see Table 7-3). This is not a statistically significant decrease from 2014 when 191 fetal deaths were reported, and the ratio was 4.2 fetal deaths per 1,000 live births (see Table B).

**Fetal cause of death**

Table 7-4 shows the causes of Oregon’s 186 fetal deaths in 2015. ”Unspecified” was the most frequently reported cause of fetal death in 2015 (a total of 77 deaths). Complications of the placenta, cord and membranes were the second most common cause of fetal death with 50 deaths. Congenital



<b>Table C - Percentage of fetal deaths by weeks of gestation, 2006-2015</b>			
Year	weeks of gestation		
	<28	28-36	37+
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
2012	36.4	33.5	29.6
2013	39.2	29.1	31.7
2014	34.0	39.3	26.7
2015	40.9	34.9	23.1

anomalies were third most common, with 23 deaths. These three causes of death represented 80.6% of all 2015 Oregon fetal deaths. In 1999, the first year in which Oregon used ICD-10 codes, fetal death of unspecified cause represented 18.4 % of all fetal deaths. In 2015, this same cause made up 41.4% of fetal deaths, a 125.0% increase.

## 2014 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 that 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 that the 2015 death data be included in the report on the 2014 birth cohort. For illustration, 228 of the infants born in 2014 died within the first year of life; of these 228 deaths, 201 died in calendar year 2014, and 27 died in 2015. Those that died in 2015 also appear in this year's report as part of the 2015 death cohort.

The Center for Health Statistics has produced tables containing infant and perinatal death data from the birth, fetal death and matched infant death files. These birth cohort tables display data for infant and perinatal deaths according to several maternal risk factors and low birthweight. Additionally, this report presents neonatal and postneonatal deaths that were matched to their corresponding birth. Thus, a birth occurring at the end of December 2014 may have a matched postneonatal death that occurred up to one year later, at the end of December 2015.

Use of a birth cohort from a matched birth and death file allows analysis of characteristics of an infant's mother during pregnancy and delivery. These are the characteristics of interest: mother's marital status, age, ethnicity, race, education, start of prenatal care and tobacco use. The characteristics of the infant derived from the birth record and fetal death record include birthweight, gestational age and county of residence at time of birth.

### Small numbers

Due to the small number of events in some 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 (see Figure 7-1). 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 generally lower than the rates seen in the 1990s. The 2014 birth cohort's neonatal death rate was 3.4, a decrease from the previous cohort's rate of 3.6. Both the fetal and neonatal death rates fluctuate from year to year due to the small number of cases. The fetal death rate hit a low of 3.7 during 2005 to 2007, but has increased slightly since that time.

### Neonatal deaths: 2012–2014 birth cohorts

Some maternal characteristics may influence pregnancy outcomes of infants that died during the neonatal period. This section discusses marital status, age, ethnicity and race, education, prenatal care and tobacco use (see Table 7-18).

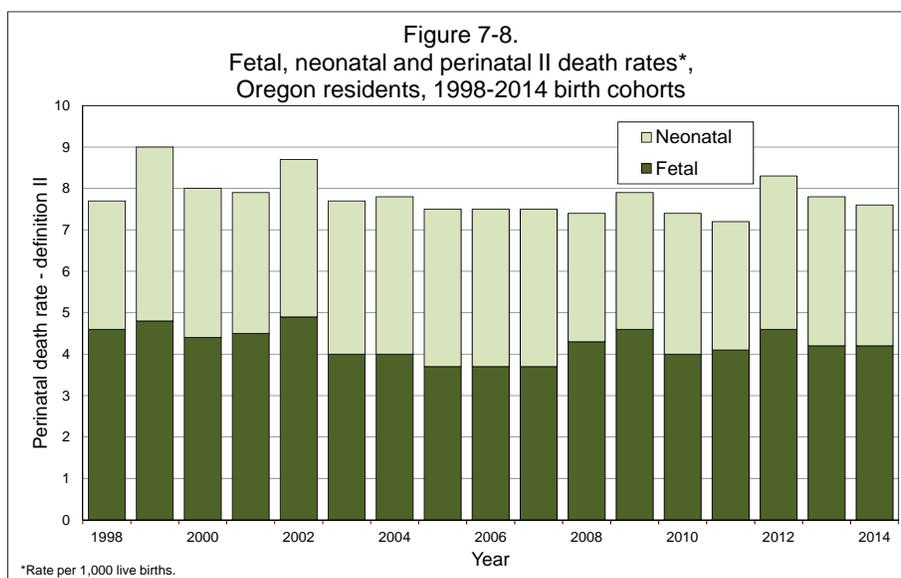
### Birthweight

The birthweight of an infant has long been a predictor of subsequent survival. An increase in birthweight correlates

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

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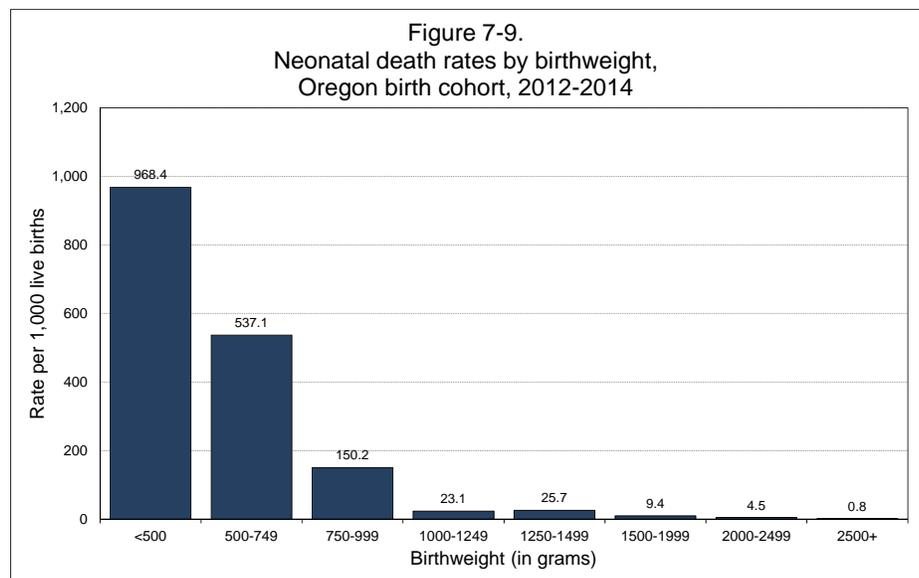


with a decrease in the risk of neonatal death. For 2012–2014, the neonatal death rate decreased, on average, by approximately one-half for each 250- to 500-gram increase in birthweight for infants weighing less than 3,000 grams at birth (see Table 7-12). The death rate for infants weighing less than 350 grams was 1,000.0 per 1,000 live births (i.e., a 100% mortality rate), decreasing to 0.8 per 1,000 live births for infants weighing more than 2,500 grams (see 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.

### Maternal characteristics

The neonatal death rate among women reported being married at the time of birth was lower than for unmarried women during 2012–2014 (3.2 versus 4.1 per 1,000). The difference was significantly different. Women with more than a high school education had a lower neonatal death rate (3.2 per 1,000) than women in other education categories, but the differences between these rates were not statistically significant. Non-Hispanic White mothers had a significantly lower rate of neonatal infant death than non-Hispanic Black mothers (3.4 versus 6.5). Mothers of other and unknown race had a significantly higher rate of neonatal infant death (19.5) than mothers that were



non-Hispanic White (3.4), Asian (2.5), multiple race (3.2) and Hispanic (3.6). None of the other differences in rates between race and ethnic groups was significant. Mothers aged 40–44 years had a significantly higher rate of neonatal infant death than mothers of age groups 20–24, 25–29, 30–34 and 35–39 years (8.7 versus 3.1, 3.0, 3.3 and 3.9). Mothers of multiple births had significantly higher rates of neonatal deaths than those with single births (22.4 versus 2.9, see Table 7-18.)

### **Prenatal care**

Women who received prenatal care, regardless of when it began, had significantly lower rates of neonatal deaths than women who received no prenatal care (3.1 versus 23.7 per 1,000 births) (see Table 7-18).

### **Tobacco use**

The infants of women who did not use tobacco had lower rates of neonatal deaths (3.3 per 1,000) than infants of women who smoked before or during pregnancy (5.4 and 4.8 per 1,000, respectively). The difference was statistically significant between mothers who smoked during pregnancy and those who did not use tobacco. Tobacco use may be underreported, thereby eliminating some high-risk mothers from the analysis and potentially lowering the neonatal death rates for this category (see Table 7-18).

## **Postneonatal deaths:**

### **2012–2014 birth cohort**

Postneonatal death refers to a death to an infant between its 28th and 364th day of life. This section discusses the influences of marital status, age, ethnicity and race, education, prenatal care and tobacco on birth outcomes (see Table 7-18).

### **Maternal characteristics**

Infants born to single mothers had a significantly higher rate of postneonatal death than did infants of married mothers (2.6 versus 1.1). The postneonatal death rate was also significantly higher for infants of mothers who gave birth to multiple infants (3.9 versus 1.5 for singleton births). Infants of women with more than a high school education had a significantly lower postneonatal death rate than infants of

mothers with some high school or high school graduates (1.2 versus 3.1 and 2.0, respectively). The postneonatal mortality rate for non-Hispanic American Indian mothers was significantly higher than the rate for non-Hispanic White mothers (4.6 versus 1.5). Infants of younger mothers had higher death rates than infants of older mothers. Infants born to mothers aged 30–34 had the lowest postneonatal death rate (1.0), followed by mothers aged 35–39 (1.1). Infants in both of these age groups had significantly lower death rates than infants born to mothers aged 15–19 (3.3) and 20–24 years (2.3) (see Table 7-18).

### **Prenatal care**

Infants of women who had received prenatal care during the first trimester of pregnancy (1.2) had lower rates of postneonatal deaths than infants of women who had received prenatal care during the second (2.7) or third trimester (2.9), or who had received no prenatal care (6.5) (see Table 7-18).

### **Tobacco use**

The postneonatal death rate of infants born to mothers who used tobacco during pregnancy was significantly higher than of those born to mothers who did not smoke (4.9 versus 1.2) (see Table 7-18).

## **Fetal and early neonatal deaths: birth attendant and place of delivery**

In 2011, the Oregon Legislature passed House Bill 2380, which required the Oregon Public Health Division to add two questions to the Oregon birth record to determine mothers' planned place of birth and birth attendant. Every mother who delivered in a hospital was asked if she had planned to deliver at a private home or a freestanding birthing center and the planned primary attendant type at the time she went into labor. Overall, one fetal death and one early neonatal death with a gestation of 37 weeks or more were planned out-of-hospital births in 2015.

Three types of midwives practice in Oregon: certified nurse midwives (CNM), licensed direct entry midwives (LDM) and direct entry midwives (DEM). CNMs have completed an accredited, university-affiliated nurse midwifery program and have an active nurse practitioner license. They may

attend deliveries in hospitals, freestanding birth centers and homes. LDMs are direct entry midwives who have volunteered for state licensure through the Oregon Health Licensing Agency. They must meet qualifications and adhere to regulations set by the Oregon Legislature and Board of Direct Entry Midwifery. Lay midwives are unlicensed but are registered with the Center for Health Statistics to certify births.

In 2015, there were 45 full-term (at least 37 weeks' gestation) fetal deaths. The mother in one of these full-term deaths intended an out-of-hospital birth. No deaths occurred after intrapartum transfer to a hospital, and one death occurred in a non-hospital setting (see Table 7-19). The birth attendant for the one full-term fetal death delivered out of hospital was nonmedical personnel.

There were 19 full-term early neonatal deaths in 2015. These are deaths where the infant lived less than seven days after birth, and the gestational period was at least 37 weeks. The mothers in most (18) of these deaths intended to deliver in a hospital. Just one of the full-term early neonatal deaths occurred out of hospital, and the attendant was a naturopathic physician (see Table 7-20).

## Endnote

1. Final 2014 U.S. data obtained from the CDC WONDER detailed mortality table website: <http://wonder.cdc.gov/ucd-icd10.html>. Accessed Nov. 15, 2016.