



Oregon Environmental Public Health Tracking Program Reproductive Outcomes Report 2001 – 2010

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Introduction to Oregon Tracking

Environmental Public Health Tracking is the ongoing collection, integration, analysis, interpretation and dissemination of data from environmental hazard monitoring, human exposure and health effects surveillance.

The Centers for Disease Control and Prevention (CDC) funded the Oregon Environmental Public Health Tracking Program (Oregon Tracking) with the following goals:

- Build a sustainable national environmental public health tracking network.
- Enhance environmental public health tracking work force and infrastructure.
- Disseminate information to guide policy and improve public health.
- Foster collaboration among health and environmental programs.

Oregon Tracking is a Web-based network of standardized electronic health and environmental data. Oregon is one of 22 grantees funded by the CDC to participate in a collaborative network development process and implement state/city networks that are components of the National Tracking Network.

Rationale for tracking reproductive outcomes

Reproductive outcomes are an important indicator of the population's health. Our understanding of risk factors for reproductive problems such as infertility, low birth weight, prematurity, fetal and infant death has increased over the past decades but there is still much we do not know. One big question is what role do environmental exposures play in reproductive and infant health problems? Although we have identified many risks related to several substances found in the environment, research in this area has been inconsistent. Some studies have found increased rates of birth problems while other studies have found no effect. Still, there are some environmental factors that may impact a woman's reproductive health:

- Exposure of nonsmoking pregnant women to environmental tobacco smoke (also known as secondhand smoke) may be a risk factor for preterm birth, low birth weight, and possibly fetal death (miscarriage).
- Exposure to some forms of air pollution (carbon monoxide, particulate matter, nitrogen dioxide) have been related to both low birth weight and preterm birth, even at low levels. A pregnant woman's exposure to lead may cause preterm birth, low birth weight, and spontaneous fetal death (miscarriage).
- Exposure to pesticides (herbicides, organochlorides, and organophosphates) has been associated with fetal death (miscarriage) and babies being born too small.

Social conditions such as poverty, crime, poor health before pregnancy, and lack of access to medical care may also cause birth problems. Yet, few studies have looked at how exposure to environmental pollutants and social conditions together can affect birth outcomes. By tracking reproductive outcomes in Oregon, data will be available to answer these questions.

Reproductive outcomes indicators and measures

Oregon Tracking monitors reproductive outcomes throughout Oregon. The following reproductive outcomes indicators and measures are discussed in this report:

<i>Indicator</i>	<i>Measures</i>
A. Fertility	A1. Total fertility rate
B. Mortality	B1. Infant, neonatal, perinatal and postneonatal death rates
C. Prematurity	C1. Percent < 37 weeks gestation; percent < 32 weeks gestation; percent < 2500 grams birthweight; percent < 1500 grams birthweight
D. Sex ratio	D1. Sex ratio

Data come from birth records collected by the Oregon Center for Health Statistics.

A1. Fertility rate

It has been hypothesized that low-level exposures to a number of compounds, such as **phthalates**, **polychlorinated biphenyls (PCBs)**, **dioxin** and **pesticides**, may be affecting human fertility. There is documented evidence that exposure to chemicals such as **DBCP** in the workplace have affected male fertility. However, results from research into the roles of specific environmental hazards have been inconsistent. Some studies have found increased fertility problems while other studies have found no effect.

Fertility trends provide basic descriptive data that may supply clues about changes that could be influenced by environmental risk factors. As more is learned about the link between exposures and fertility, these rates could provide important background information about spatial and temporal variations in fertility and their relation to changes in environmental and health risk factors.

Fertility measures are the total fertility rate statewide and by county. The total fertility rate is the average number of births to a hypothetical **cohort** of 1,000 women of reproductive age (10-49 years) over their lifetime. This means that a total fertility rate of 2000 births for every 1,000 women corresponds to an average of 2 births per woman over her lifetime.

The total fertility rate is influenced by social/demographic factors and choices for reproduction, including contraception use and fertility treatments that lead to multiple births. Because these factors lead to significant variations in overall fertility across populations and geographic areas, social and demographic trends must be understood and accounted for in order to examine any environmental effects on total fertility.

Approximately 10% of problems with fertility have unknown causes. Environmental contaminants including **endocrine disruptors** have been hypothesized as major contributors. Because environmental contamination can have multi-generational effects on reproduction, levels need to be tracked and studied over long periods of time.

This measure is not precise enough to track specific changes related to environmental risk factors. However, it can be used with other measures, including measures of ambient concentrations of pollutants, to look for potential associations with population level changes in fertility and to generate hypotheses for further investigation.

Fertility rates are lowest in higher income countries, reflecting disparities in access to family planning resources and education. In Oregon the fertility rate is lowest in Multnomah, Clackamas, Benton and Lane Counties. In recent years the fertility rate in Oregon has been trending downwards. This may be related to the people delaying having children because of the Great Recession.

Figure 1. Total fertility rate, Oregon 2001-2011

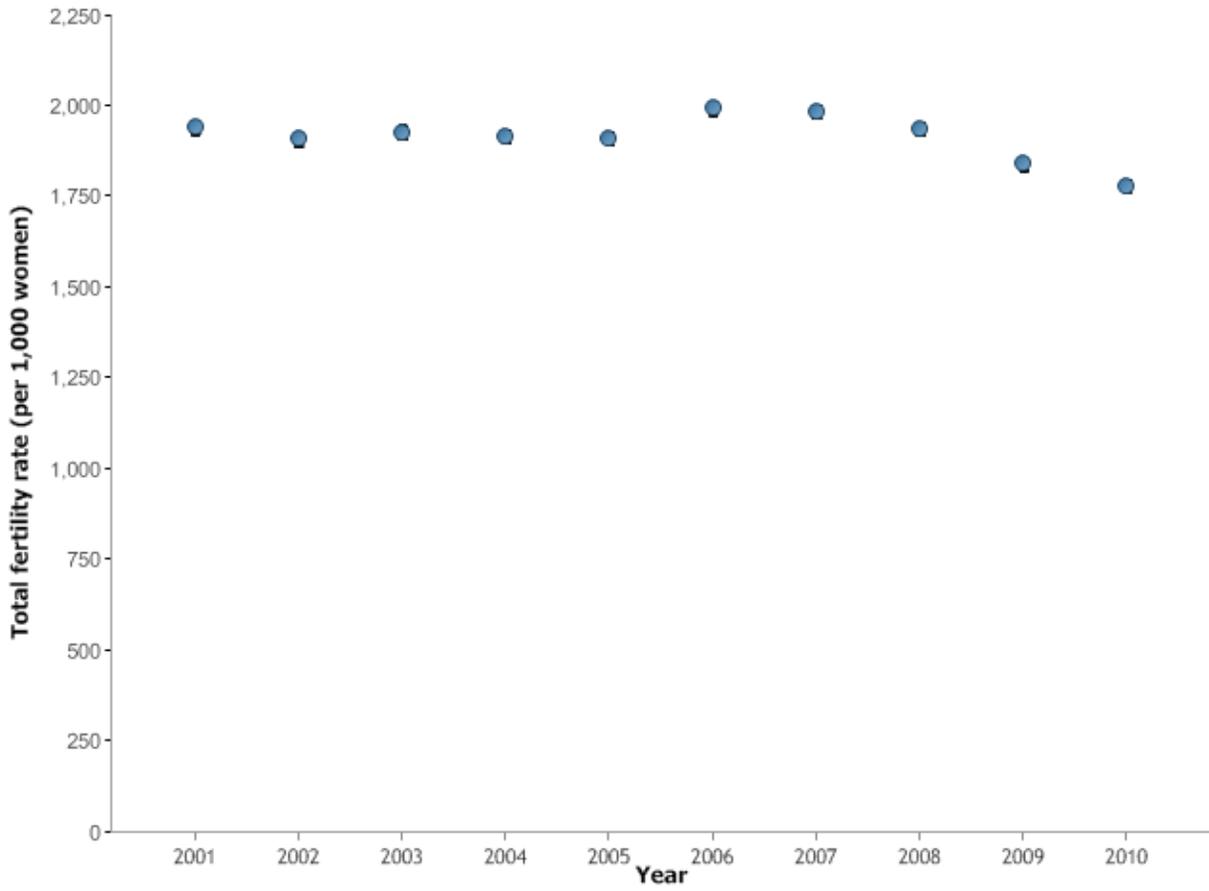
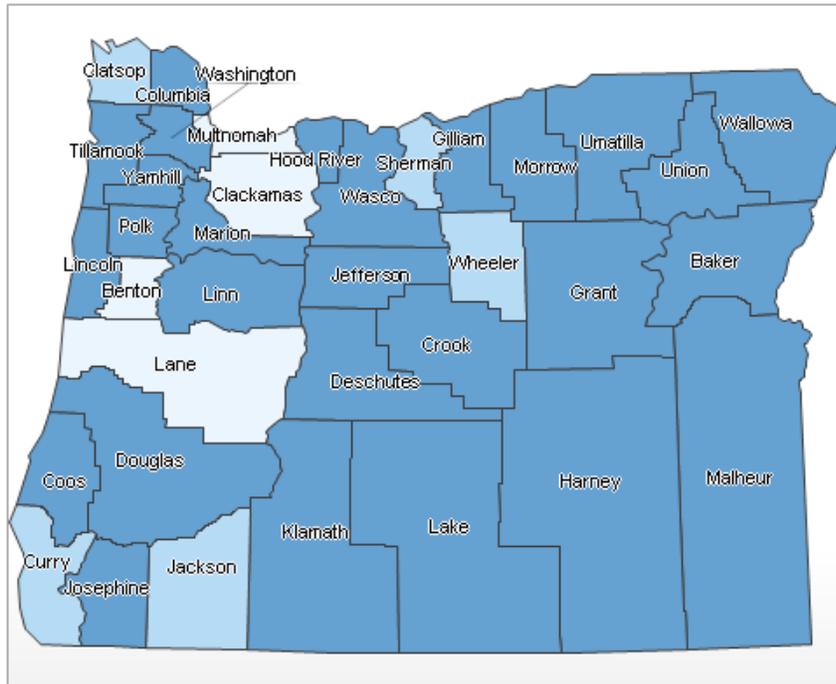


Figure 2. Total fertility rate, Oregon 2001-2011



Statistical comparison based on values for all counties

- Statistically lower than state
- Statistically similar to state
- Statistically higher than state

A2. Mortality rates

Infant mortality refers to deaths that occur before 1 year of age. Deaths are classified as perinatal (occurring before 7 days of age or fetal deaths of ≥ 28 weeks gestation), neonatal (occurring before 28 days of age), postneonatal (occurring after 28 days of age but before 1 year of age), or infant (all deaths occurring before 1 year of age).

Congenital malformations and chromosomal abnormalities are the leading cause of infant deaths (20%). Disorders related to short gestation and low birth weight (less than 5 lbs 8 oz, or 2500 grams) are second, accounting for 17% of deaths.

The leading cause of death varies throughout the first year of life. Disorders related to short gestation and low birth weight are the primary cause of neonatal deaths (24%), while the leading cause of postneonatal deaths is sudden infant death syndrome (22%). Congenital malformations, deformations and chromosomal abnormalities are the second leading cause of neonatal and post-neonatal deaths. Some other factors that contribute to infant mortality are smoking; substance abuse; poor nutrition; lack of prenatal care; access and quality of health care; competency in childcare and injury prevention; genetic and medical problems; and environmental factors such as air pollution and pesticide exposure.

The presence of risk factors does not mean that an infant will die, but the risk of death is higher than for infants with no risk factors. Likewise, the risk of death is not zero even if an infant has no risk factors.

The contribution of environmental exposures to mortality is minor compared to other factors. However, such exposures are important because the fetus and infant are particularly susceptible to the harmful effects of environmental contaminants. Many environmental contaminants have toxic effects in utero by crossing the placenta and making their way into the bloodstream of the developing fetus.

Outdoor air pollution has been identified as an environmental risk factor for infant death. **Particulate matter (PM 2.5)** pollution has been associated with an increase in the rate of post-neonatal deaths, mostly due to respiratory problems and sudden infant death syndrome.

There are no significant linear trends in mortality rates from 2001-2010, though rates are lower in recent years. Continued monitoring will show if this trend continues.

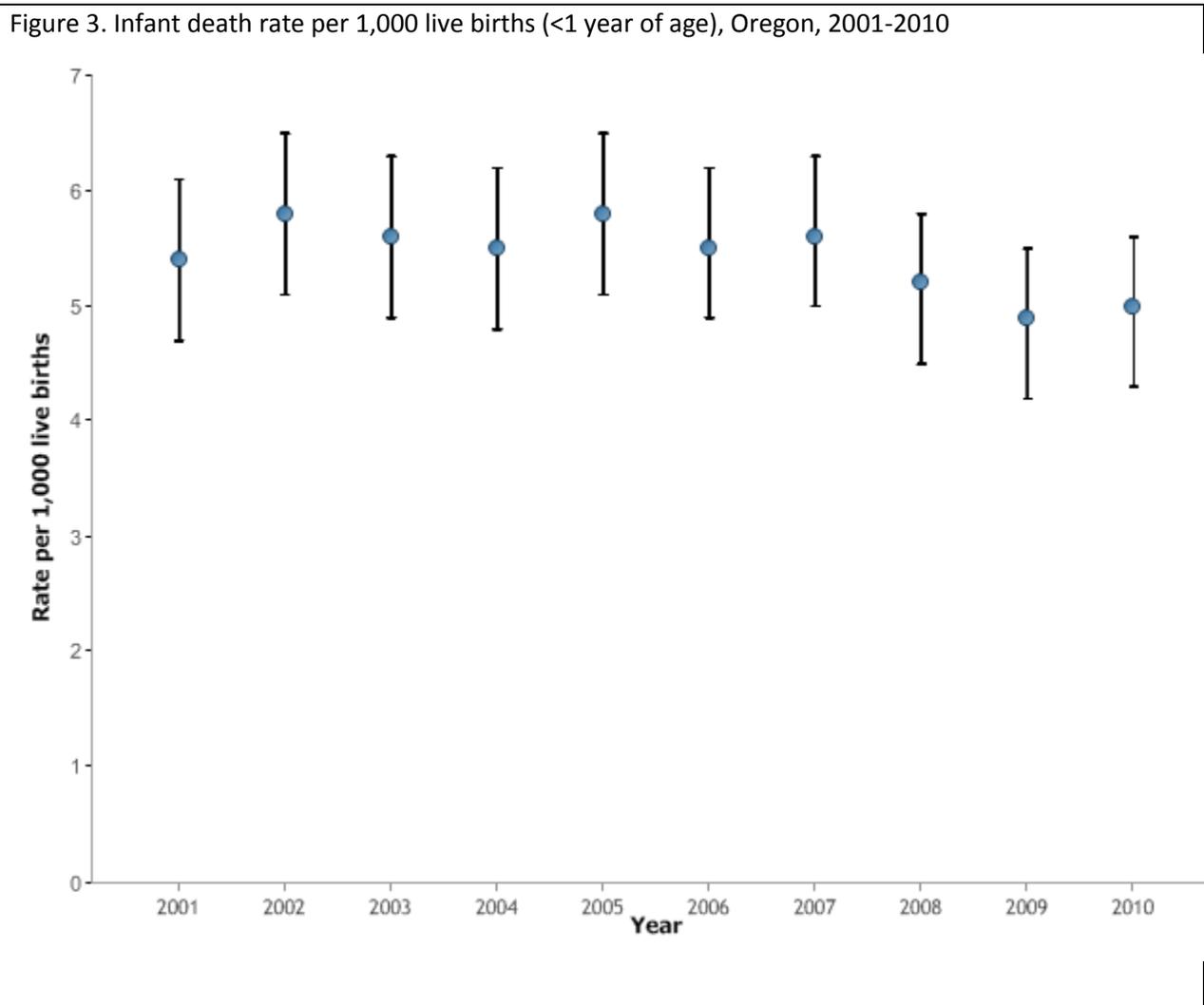


Figure 4. Neonatal death rate per 1,000 live births (<28 days of age), Oregon, 2001-2010

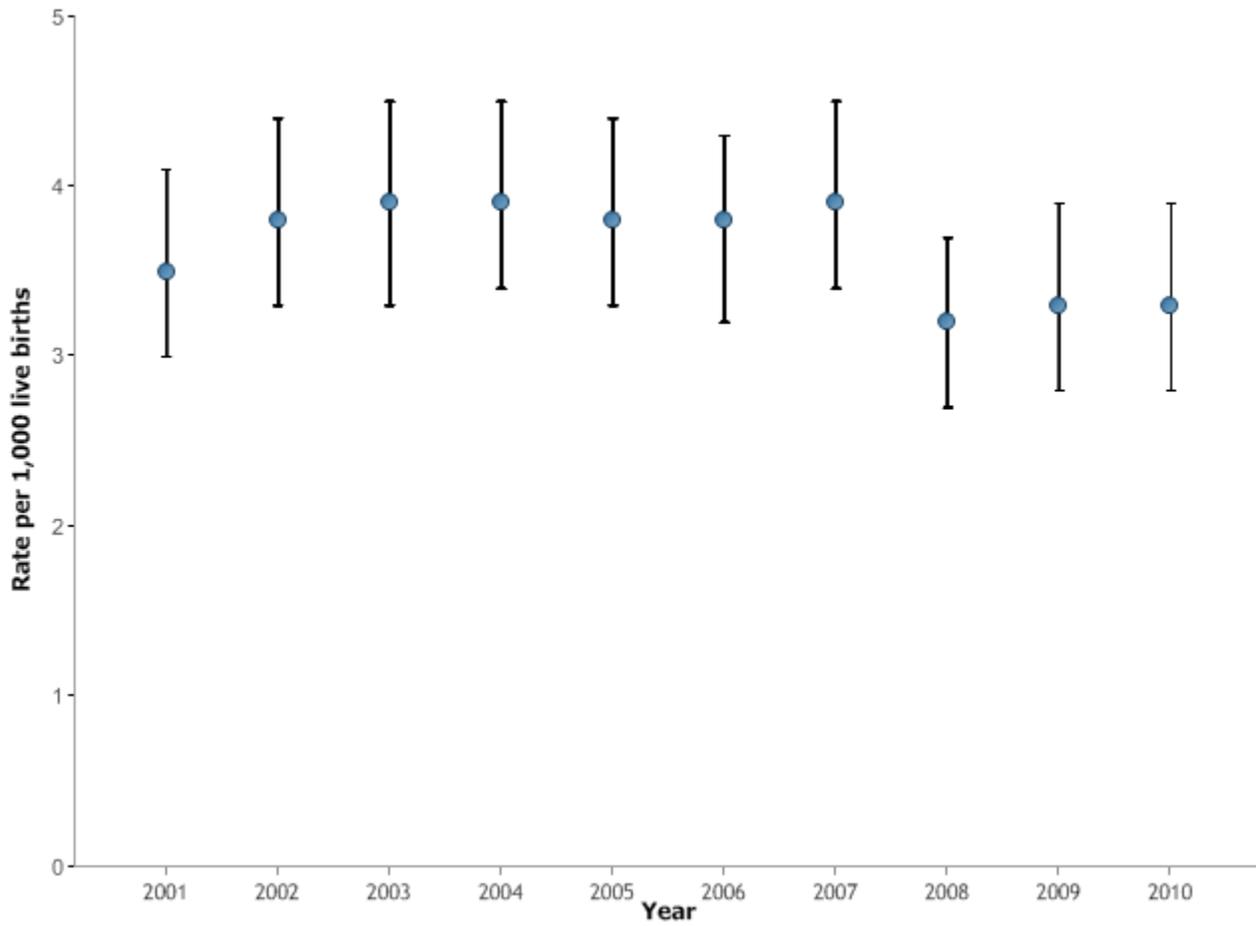


Figure 4. Perinatal death rate per 1,000 live births <7 days old and fetal deaths of ≥ 28 weeks gestation, Oregon, 2001-2010

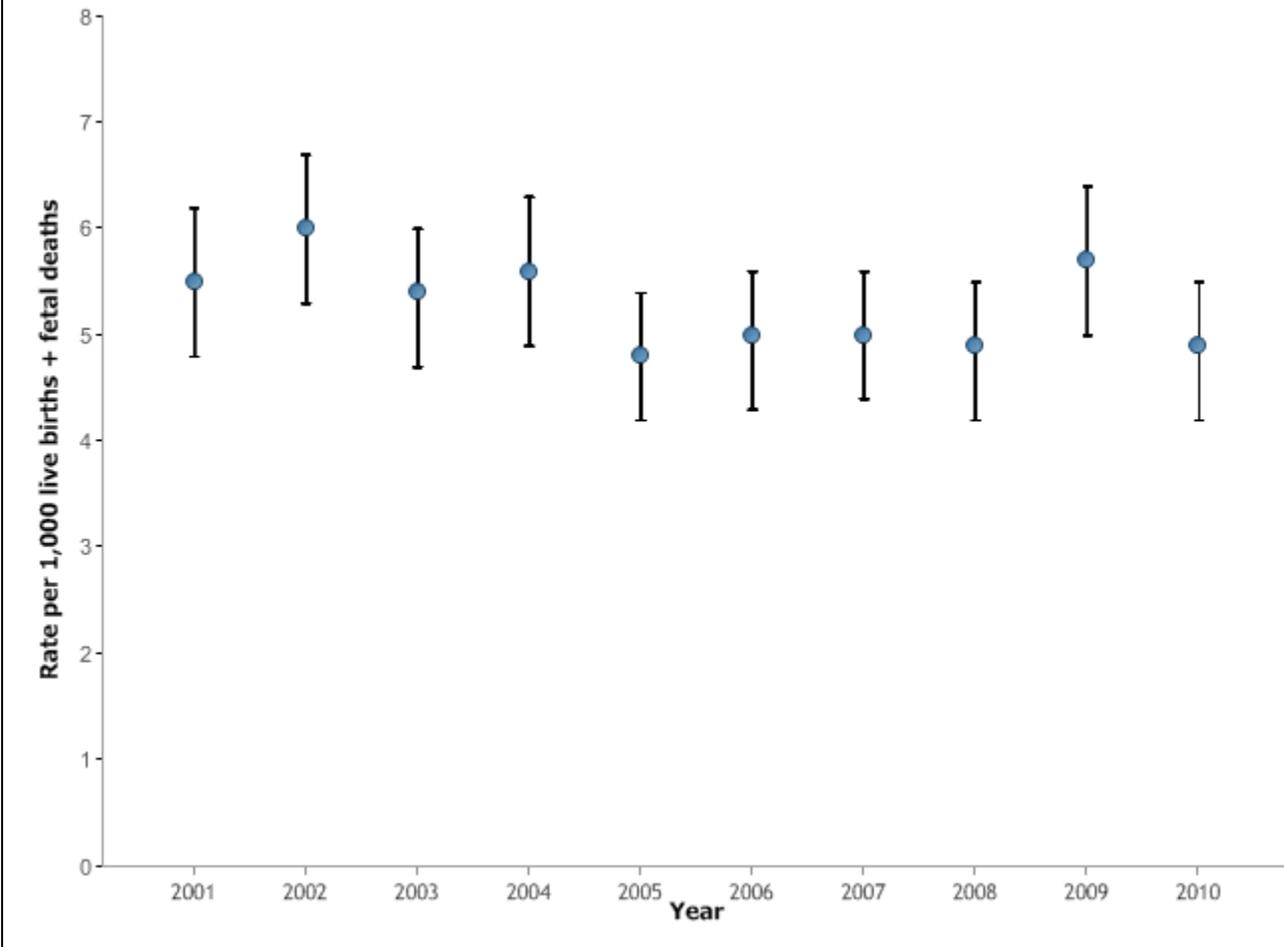
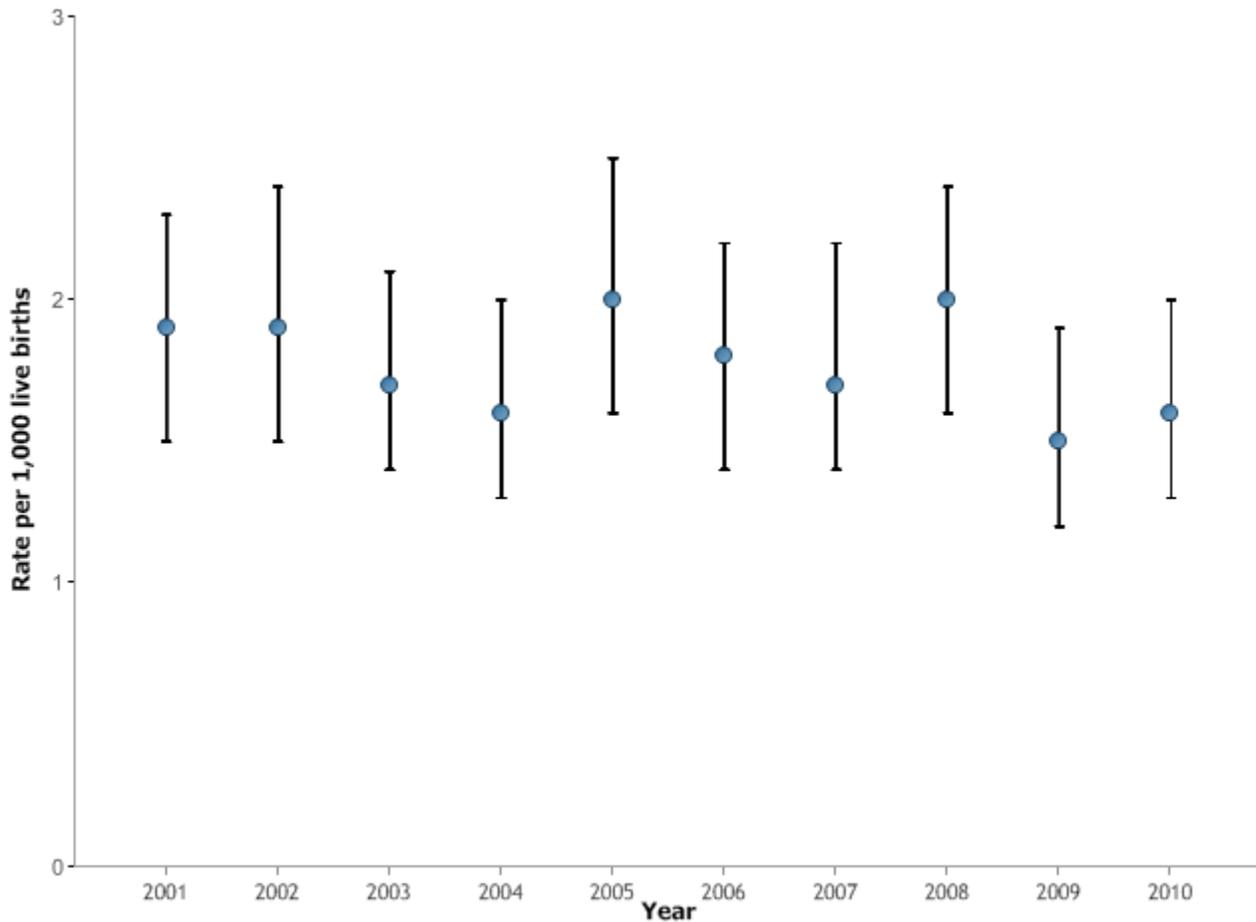


Figure 4. Postneonatal death rate per 1,000 live births (≥ 28 days but less than 1 year of age), Oregon, 2001-2010



A3. Prematurity rates

Premature birth occurs when a baby is born before its organs mature enough to allow normal functioning, growth and development. Premature births are those occurring after less than 37 weeks of pregnancy, while very premature births are less than 32 weeks of pregnancy. A low birthweight baby weighs less than 5 pounds, 8 ounces (2500 g) at birth. A very low birthweight baby is defined as weighing less than 3 pounds, 4 ounces (1500 g) at birth. Birthweight and length of gestation are highly correlated, so premature babies often have a low birthweight.

Nationally, around 11% of singleton births (where only one child is born) are premature and about 1.6% are very premature. About 6% of singleton babies are born with a low birthweight and 1.1% are born very low weight. Oregon tends to have a significantly lower incidence of premature births and low birthweight babies than the national average.

Premature birth is a leading cause of infant mortality, morbidity and long-term disability. All infants born premature are at risk for serious health problems; however, those born earliest are at the greater risk of medical complications, long-term disabilities and death. Studies have shown that children born prematurely, especially those with very low birthweight, have an increased risk of attention deficit hyperactivity disorder (ADHD), cerebral palsy and mental retardation. Premature birth is also associated with congenital gastrointestinal defects, such as gastroschisis. Infants with very low birthweight have about a 25% chance of dying in the first year of life, about 100 times higher than for normal weight infants. Other conditions include visual problems, hearing loss, infections and chronic lung diseases.

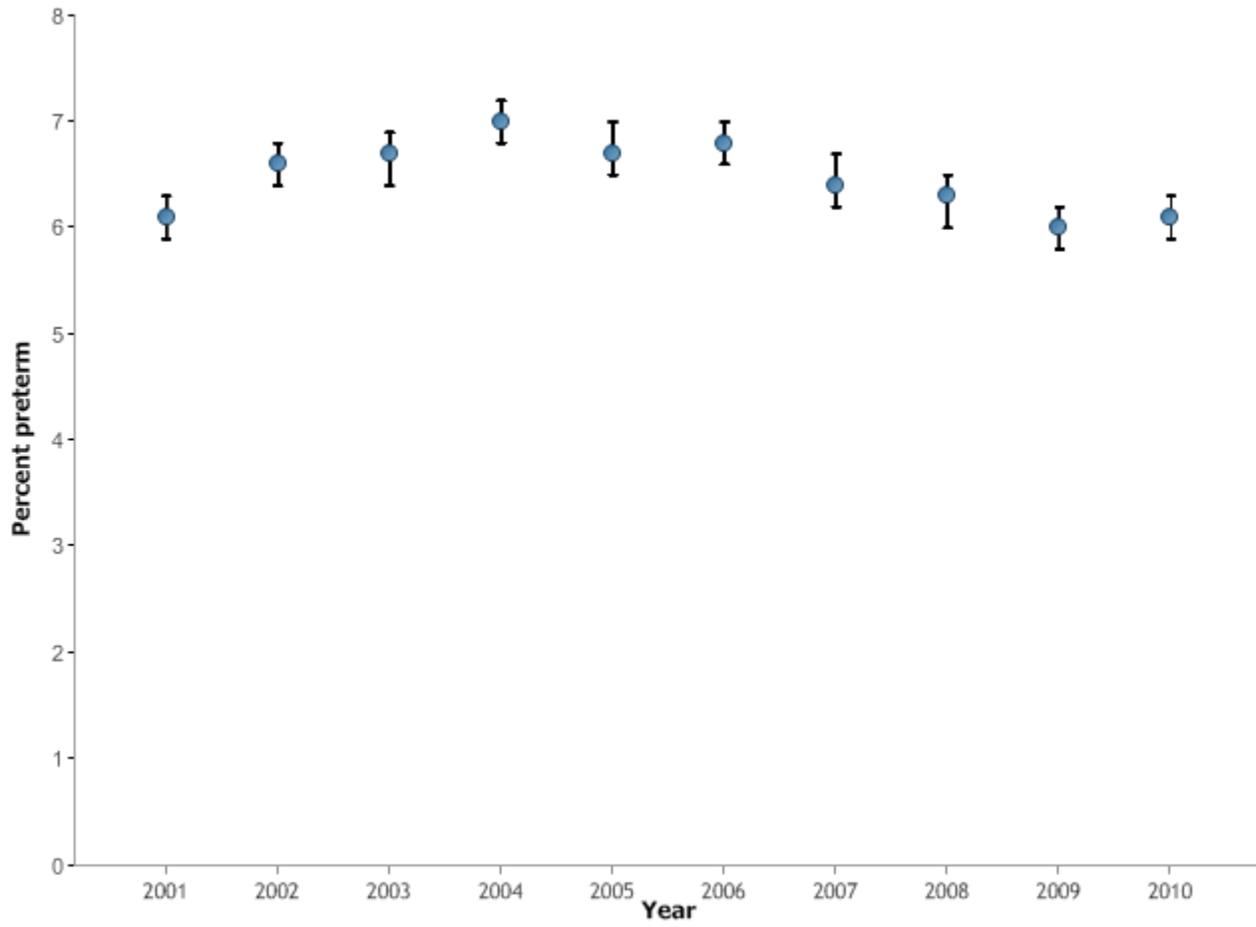
Premature births occur at a significantly higher rate for multiple births and among non-Hispanic African-American mothers. Premature births are associated with a number of maternal genetic, lifestyle and environmental risk factors including previous premature births; uterine or cervical abnormalities; age <18 and >35 years old); low income and education level; lack of prenatal care; smoking, drinking and drug use; domestic violence; stress; body mass; and short time between pregnancies. Environmental factors like air pollution and drinking water contamination may play a small role as well.

The presence of risk factors does not mean that an infant will be born prematurely or low weight, but the risk is higher than pregnancies that have no risk factors. Likewise, the risk of a premature birth is not zero even if a pregnancy has no risk factors.

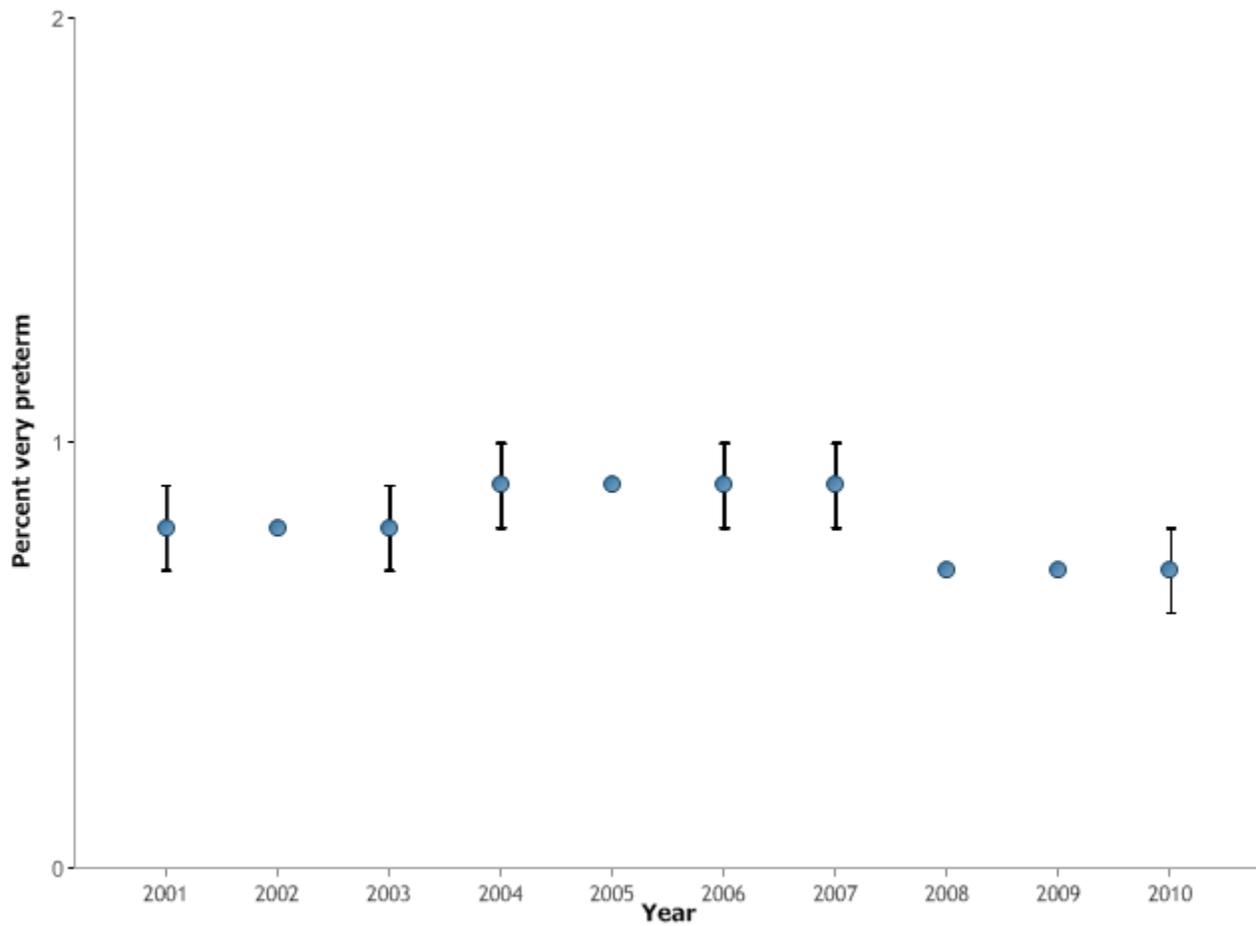
There is some evidence the percent of preterm births is trending down in Oregon, consistent with national trends.¹ This may reflect fewer induced births and cesarean deliveries. The percent of live singleton births with low birthweight (<2500 grams) appears to be increasing, but the percent with very low birthweight (<1500 grams) appears to be decreasing. More years of data are needed to resolve these trends.

¹ NCHS Data Brief No. 39, "Are Preterm Births on the Decline in the United States? Recent Data from the National Vital Statistics System. <http://www.cdc.gov/nchs/data/databriefs/db39.pdf>

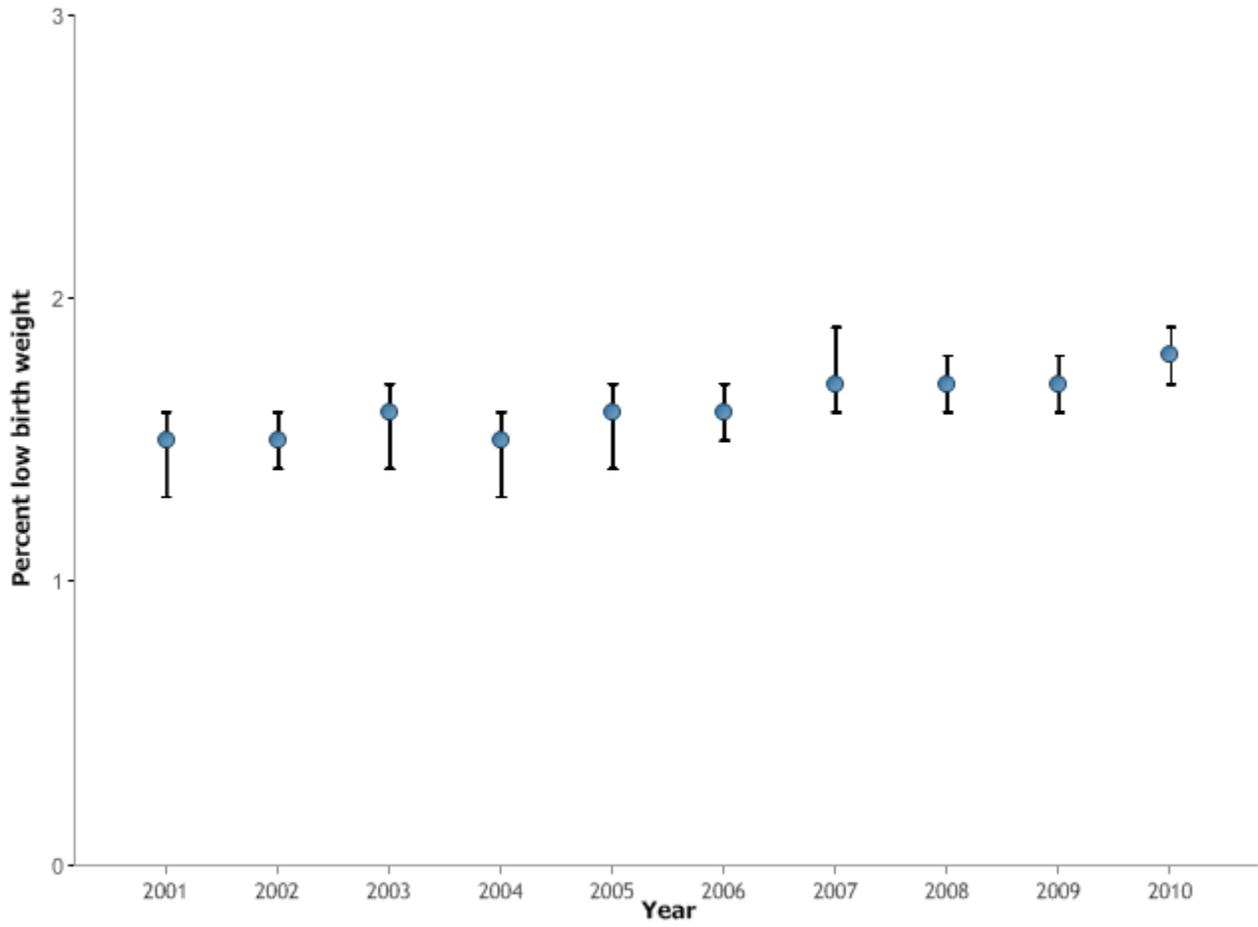
Prematurity: Gestation, percent of preterm (<37 weeks gestation) live singleton births, Oregon, 2001-2010



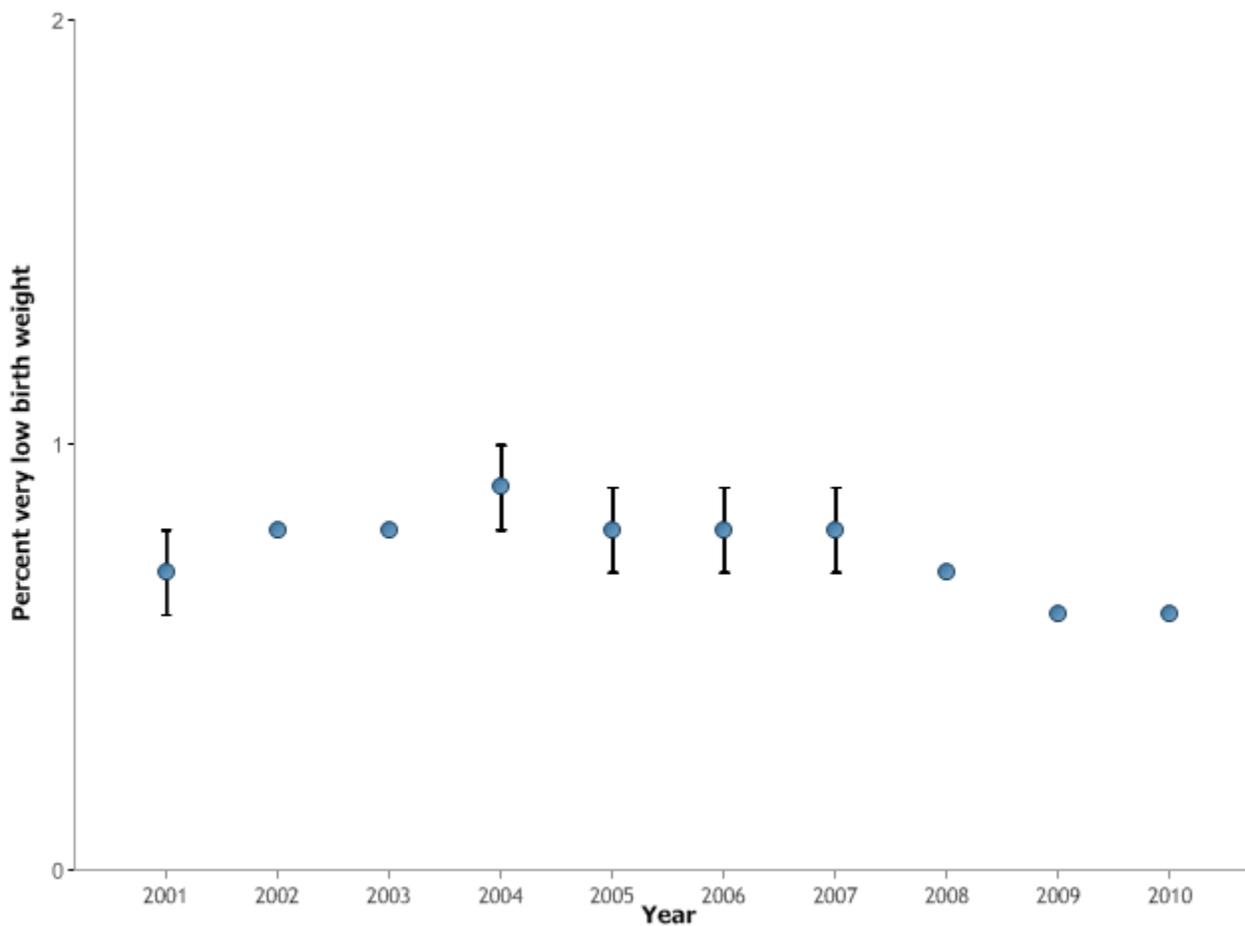
Prematurity: Gestation, percent of preterm (<32 weeks gestation) live singleton births, Oregon, 2001-2010



Prematurity: Weight, percent of low birthweight (<2500 grams) live term singleton births, Oregon, 2001-2010



Prematurity: Weight, percent of very low birthweight (<1500 grams) live singleton births, Oregon, 2001-2010



A4. Sex Ratio

The sex ratio is the ratio of male to female term singleton births. Term births are those for which gestation is equal to or greater than 37 weeks. Singleton births are those for which only one child is born. Term singleton births are selected to help factor out the effect of gestation period on the sex ratio. When the number of male births is equal to the number of female births, the sex ratio is 1.0. The expected sex ratio at birth (male to female) is 1.05 -- approximately 105 males for every 100 females born. If the sex ratio is less than 1.0, it means that fewer males than females were born during that period of time.

Reproductive practices related to sex preference are the usual reason for a shift in the sex ratio (at birth). In some countries, male children are strongly preferred and females are more likely to be

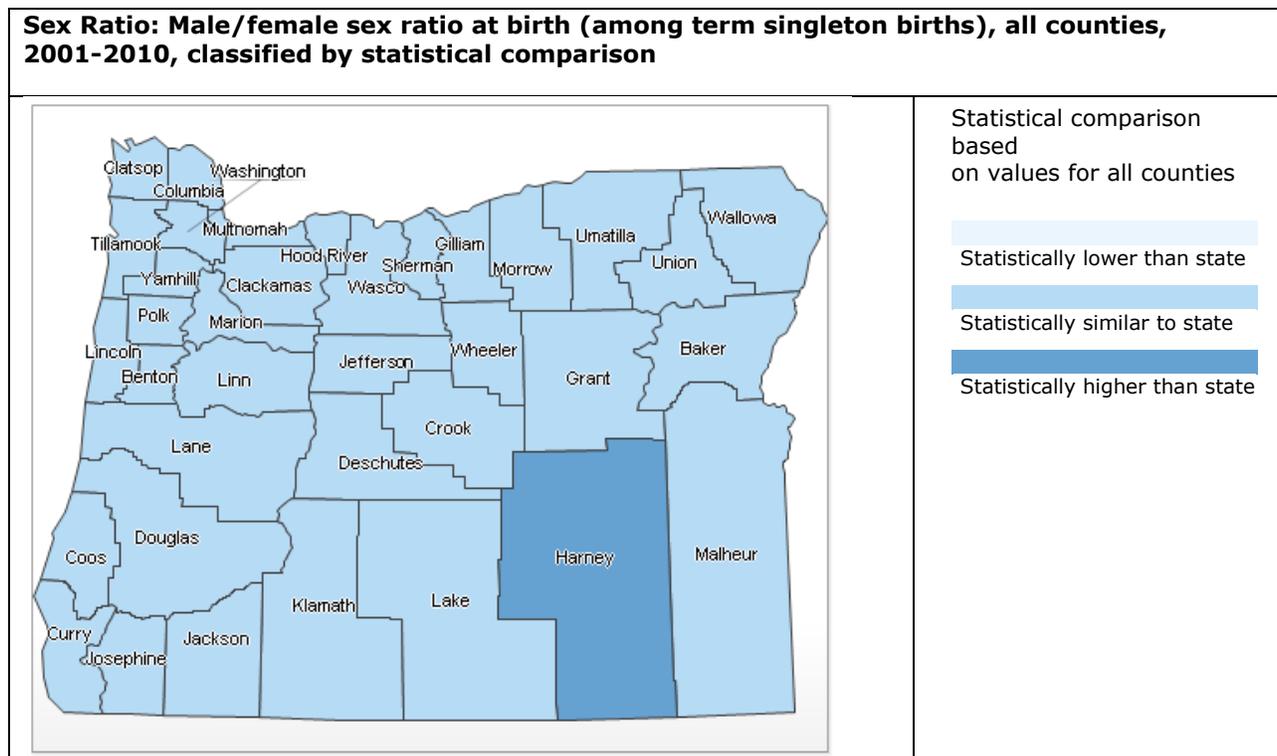
selectively aborted. However, such practices are not common in the United States. A significant shift in the sex ratio, that is not the result of reproductive practices, is rare.

Known risk factors that are associated with a slight decrease in the male/female sex ratio are: older parental age at conception, maternal smoking, longer gestation period and number of births (a woman's likelihood of having a female child increases with each additional child).

Growing evidence suggests that environmental hazards can contribute to a decrease in male births. Exposure to endocrine disruptors (the father prior to conception and the mother during pregnancy) may cause decreased testosterone levels, which can result in fewer male births. Known human endocrine disruptors include dioxin, polychlorinated biphenyls (PCB) and DDT. Suspected human endocrine disruptors, based on limited animal studies, include plasticizers and various pesticides.

Slight differences between counties may be the result of rounding to one decimal place rather than a meaningful difference in the sex ratio at birth. Larger apparent differences between counties are usually the result of temporary aberrations or unstable ratios due to very few births in a county. However, statistically significant differences may occasionally occur due to the factors mentioned above.

Over the period 2001-2010, only Harney County had a sex ratio significantly higher than the rest of the state. Larger apparent differences between counties are usually the result of temporary aberrations or unstable ratios due to very few births in a county. Fewer than 100 babies are born in Harney County each year; between 2010 and 2011, only 0.2% of Oregon births occurred in Harney County. Because of these small numbers, the observed difference is unlikely to persist as more years of data are added.



Major limitations

The address reported by the mother on the date of delivery does not necessarily reflect where the mother lived or worked during her pregnancy. This may have a small influence on county rates but will not affect statewide trends in reproductive outcomes.

The total fertility measure reported here includes births to mothers age 10 to 49, while the measure published by the Oregon Center for Health Statistics excludes births to mothers less than 15 or over 44 years of age. The data presented in this report will therefore differ slightly from similar measures presented elsewhere. The total fertility rate is not a sensitive measure of infertility and these data primarily reflect social and demographic trends in births.

Gestational age is based on an algorithm that uses both the mother's reported last normal menses and the clinician's estimate of gestational age. Advances in medical technology may have improved estimates of gestational age over the time period studied for this report.

Summary

Some reproductive outcomes show signs of improving in Oregon, but more years of data are needed before drawing conclusions. Though low birthweight (< 2500 grams) is trending up, preterm births and very low birthweight appear to be trending down. Collectively this may mean more Oregon children are getting a healthier start to life.

Recommendations

Continued monitoring of reproductive outcomes will help clarify trends.

Reference links

1. [Centers for Disease Control & Prevention – Preterm Birth](#)
2. [March of Dimes – Premature Birth](#)
3. [National Institute of Child Health & Human Development – Preterm Labor & Birth](#)
4. [Oregon Center for Health Statistics](#)
5. [Oregon Reproductive Health Program](#)



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