

Infant Mortality Reduction Report



Contents

Introductory Letter	3	Risk and Protective Factors	23
Acknowledgments	4	Before Pregnancy	23
Executive Summary	5	During Pregnancy	24
Summary of Washington State 2015 Key Findings	5	Labor and Delivery	26
Recommendations	6	Post-Partum	26
Key Findings	7	Disparities in Infant Mortality	27
Leading Causes of Death in 2015	8	Health Disparities	27
Risk Factors	9	Socioeconomics and Smoking	28
Protective Factors	9	Disparities in Age at Death	29
Social Determinants of Health	10	Disparities in Leading Causes of Death	29
Introduction	11	Disparities in Birth Weight and Gestational Age	31
Who Lives in Washington State?	11	Social Determinants of Health	33
Birth and Pregnancy Rates	12	Disparities by Maternal Age	34
Infant Mortality in Washington State	13	Disparities by Marital Status	34
Infant Mortality by Age at Death	13	Disparities by Education Status	35
Infant Mortality by Geography	14	Poverty: Disparities by Income Level	35
Infant Mortality by Maternal Race/Ethnicity	15	Disparities by Smoking Status	37
Infant Mortality by Maternal Country of Birth	16	Substance Use Disorders and Infant Outcomes	38
Infant Mortality by Maternal Age	16	Maternal Substance Use and Infant Outcomes	38
How Does Washington Compare?	17	Policies Impacting Access to Treatment for Opioid Dependence	40
Leading Causes of Infant Death in Washington State	18	Gaps in Our Understanding	40
Congenital Malformations/Birth Defects	19	Recommendations	41
Sudden Unexpected Infant Death (SUID)	20	Limitations	41
Short Gestation and Low Birth Weight	20	Recommendation 1	42
Complications of Placenta, Cord, and Membranes	20	Recommendation 2	43
Maternal Complications of Pregnancy	20	Recommendation 3	44
Cardiovascular Disorders	21	Recommendation 4	45
Unintentional Injury	21	Recommendation 5	46
Infant Mortality by Gestational Age	21	Recommendation 6	47
Infant Mortality by Birth Weight	22	Recommendation 7	48
		Endnotes	50

Tables and Figures

TABLE 1 Total Live Births, Birth Rates, and Pregnancy Rates for Washington Resident and U.S. Women	12	TABLE 19 Infant Mortality Rates (95% CIs) by Maternal Age and Race/Ethnicity	34
TABLE 2 Infant Mortality Rate by Maternal Race/Ethnicity	15	TABLE 20 Infant Mortality Rates (95% CIs) by Maternal Marital Status and Race/Ethnicity	35
TABLE 3 Infant Mortality Rate per 1,000 by Maternal Race/Ethnicity and Maternal Country of Birth	16	TABLE 21 Infant Mortality Rates (95% CIs) by Maternal Education and Race/Ethnicity	35
TABLE 4 Infant Mortality Rate by Maternal Age	16	TABLE 22 Infant Mortality Rates (95% CIs) by Medicaid Status and Maternal Race/Ethnicity	36
TABLE 5 Infant Mortality Rate by Maternal Race/Ethnicity and Select States and Countries	17	TABLE 23 Number/Percent of Total Births by Medicaid Status and Maternal Race/Ethnicity	36
TABLE 6 Overall Leading Causes of Infant Mortality	18	TABLE 24 Infant Mortality Rates by Pre-Pregnancy Maternal Smoking Status and Race/Ethnicity	37
TABLE 7 Leading Causes of Death by Neonatal/Post-Neonatal Period	19	TABLE 25 Number/Percent of Total Births by Pre-Pregnancy Maternal Smoking Status and Race/Ethnicity	37
TABLE 8 Infant Mortality Rates by Gestational Age	21		
TABLE 9 Infant Mortality by Birth Weight	22	FIGURE 1 Infant Mortality Rates for Washington State and the United States	13
TABLE 10 Infant Mortality Rate by Birth Plurality	22	FIGURE 2 Infant Mortality Rates by Infant Age at Death for the Neonatal and Post-Neonatal Periods	13
TABLE 11 Infant Mortality Rate by Maternal Pre-Pregnancy BMI Status	23	FIGURE 3 Infant Mortality Rate by Maternal County of Residence	14
TABLE 12 Infant Mortality Rate by Maternal Pre-Pregnancy Smoking Status	25	FIGURE 4 Infant Mortality Rate by Maternal Race/Ethnicity	15
TABLE 13 Infant Mortality Rates (95% CIs) by Age at Death and Maternal Race/Ethnicity	29	FIGURE 5 Leading Causes of Infant Mortality	18
TABLE 14 Top Five Leading Causes of Infant Mortality by Maternal Race/Ethnicity	30	FIGURE 6 Families with Children <18 Below FPL in Last 12 Months by Maternal Race/Ethnicity and Marital Status	36
TABLE 15 SUID Cases by Diagnosis Code and Maternal Race/Ethnicity	30		
TABLE 16 Infant Mortality Rate by Maternal Race/Ethnicity and Birth Weight/Gestational Age Category	31		
TABLE 17 Number/Percent of Live Births by Maternal Race/Ethnicity and Birth Weight and Gestational Age	32		
TABLE 18 Number/Percent of Infant Deaths by Maternal Race/Ethnicity and Birth Weight and Gestational Age	32		

Introductory Letter

December 6, 2017


Dear Stakeholders:

Our Washington State infant mortality rate is an important indicator of the health of our state. Governor Inslee has highlighted improving the infant mortality rate and the need to address disparities among our youngest residents as a priority in Results Washington. Improving infant mortality represents a fundamental desire that I think is shared by all Washingtonians to live in a state where all babies have the healthiest start to life possible and an equal opportunity to celebrate their first birthday.

Washington's 2015 infant mortality rate was 4.8 infant deaths per 1,000 live births. Our state had the eighth best infant mortality rate in the country. However, African American and American Indian families experience disproportionate rates of preterm birth, low birth weight and infant mortality. This suggests that not all communities in our state have equal access to resources and opportunities that optimize health and allow families, mothers, and infants to thrive and develop to their fullest potential.

This report provides detailed information about infant mortality in Washington State and makes eight recommendations to reduce infant mortality and disparities in birth outcomes so that all children have equal opportunity to achieve their highest health potential. Together, building on our states' successes in improving birth outcomes, we can eliminate disparities in birth outcomes among our most vulnerable young Washington residents.

Sincerely,

A handwritten signature in black ink, appearing to read 'Janna Bardi', with a stylized flourish at the end.

Janna Bardi, MPH

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Acknowledgments

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Executive Summary

An important goal under Governor Inslee's [Results Washington](#) initiative is to decrease the Washington State [infant mortality \(IM\)](#) rate from 5.1 deaths per 1,000 births in 2010 to 4.1 deaths per 1,000 births by 2020. This includes lowering the rate of infants with [Low Birth Weight \(LBW\)](#) among communities of color, decreasing unintended pregnancy rates, and increasing early entry into prenatal care.¹

[Infant mortality](#) is the death of an infant before his or her first birthday. Infant mortality serves as an important measure for the health status of a population because it is associated with access to quality medical care, health status, public health policies and practices, and social, economic, environmental, and political conditions.

Washington State has one of the lowest infant mortality rates in the nation and has done significant work over the past two decades to reduce infant mortality to historically low levels. However, large inequities exist in outcomes for babies, especially Non-Hispanic (NH) Black/African American, NH American Indian/Alaska Native, and NH Native Hawaiian and Other Pacific Islander (NHOPI) as compared to NH Whites, and for families in poverty. These disparities have been relatively constant over time and we need to implement more innovative ways to decrease infant mortality in all racial/ethnic and economic groups.

Infant deaths were identified by linking Washington State Vital Records' birth and infant death files from 2003–2015. Information on the mother was also collected from Washington State Vital Records' birth records from 2003–2015. Tests of statistical significance were performed using Stata (version 9.2) and Joint Point Regression Software (version 4.2). This report details findings from analyses and provides recommendations for possible steps to prevent infant mortality in our state. We strongly suggest consideration of community wisdom and cultural appropriateness when implementing these recommendations.

Summary of Washington State 2015 Key Findings

- In 2015, the infant mortality rate in Washington State was 4.8 per 1,000 live births (431 infant deaths). This number ranks eighth lowest in the nation.
- Despite progress, disparities remain in infant mortality throughout the state.
- Babies who are NH Black/African American, NH American Indian/Alaska Native, or NH Native Hawaiian and Other Pacific Islander are twice as likely to die before their first birthday as NH White and NH Asian babies.
- The leading causes of infant death in 2015 were:
 - » Congenital Malformations: 109 (25.3%)
 - » [Sudden Unexplained Infant Death \(SUID\)](#): 67 (15.5%)
 - » Short [Gestational Period](#) and Low Birth Weight: 54 (12.5%)
- These have been the top three causes of IM in Washington for the past 25 years.



Disparities in birth outcomes by race and ethnicity have continued over time. More work is needed to achieve equity and decrease infant mortality for all babies in our state.

INFANT MORTALITY RATE A ratio of infant deaths per 1,000 live births over a specified period of time. Calculated by dividing the number of infant mortality cases by the number of live births over a period, then multiplying by 1,000.

LOW BIRTH WEIGHT (LBW) Birth weight of less than 2,500 grams at birth. LBW can be divided into multiple lesser categories, with LBW typically referring to birth weight less than 2,500 grams and greater than 1,500 grams.

INFANT MORTALITY (IM)/INFANT DEATH The death of liveborn infant during the first year of life.

SUDDEN UNEXPECTED INFANT DEATH (SUID) A term used to describe and classify deaths that occur suddenly and unexpectedly to infants less than one year old. SUID includes three ICD-10 codes: SIDS (R95), III-Defined and Unknown Causes (R99), and Accidental Suffocation and Strangulation in Bed (W75).

GESTATIONAL PERIOD Pregnancy, or the period of embryonic and fetal intrauterine development.

- Geographically, Pierce, Clallam, and Spokane Counties have higher infant mortality rates than the state as a whole. Meanwhile, King and Snohomish Counties have lower infant mortality rates than Washington State as a whole.
- Over half of babies who died before their first birthday were born before 37 weeks and/or weighed less than 2500 grams (about five and a half pounds).
- Factors that help improve infant mortality rates such as sleep position and breastfeeding have improved over the last decade.
- A baby is more likely to die before his/her first birthday if the mother:
 - » smoked while she was pregnant.
 - » experienced poverty.
 - » had a low level of educational attainment.
 - » was younger than 20 or older than 40 years of age.
 - » was obese prior to pregnancy.
 - » had diabetes.
- In our state, 90% of women who deliver a Very Low Birth Weight (VLBW) baby do so in a hospital with a Level III or IV² Neonatal Intensive Care Unit; this assures that the infant can receive the appropriate specialty care needed.
- Infant mortality rates decreased dramatically between 1980 and 2000. Since 2000, the decrease has slowed and rates have been fairly stable for the last five years.

The following recommendations can be applied at either the state or community level. Due to the complex nature of infant mortality and all of the factors involved, many of these recommendations intersect. These recommendations were developed with input from partners after review of the data, evidence-based and evidence-informed practices, and a literature review.

Recommendations

1. Address social determinants of health, such as poverty and low educational attainment, in order to reduce infant mortality in racial/ethnic groups with disparities.
2. Improve support for vulnerable infants and families in our communities.
3. Reduce the rate of low birth weight and preterm births in Washington.
4. Reduce the rate of SUID, which includes SIDS and sleep-related infant deaths, in Washington.
5. Provide comprehensive, coordinated health care to all women during the preconception, pregnancy, and post-partum periods.
6. Improve the rate of pregnancies that are planned and well-spaced, including reducing the rate of teen pregnancies.
7. Increase cross-agency access to and linkage of datasets for surveillance, assessment, planning, and quality improvement.

See pages 42–49 for details about each recommendation.

A baby is more likely to die before his/her first birthday if the mother smoked while she was pregnant, experienced poverty, had a low level of educational attainment, was younger than 20 or older than 40 years of age, was obese prior to pregnancy, or had diabetes.

VERY LOW BIRTH WEIGHT (VLBW) Birth weight less than 1,500 grams and greater than 1,000 grams.

LEVEL III FACILITY The minimum level of care for neonatal intensive care unit (NICU).

PRETERM BIRTH Birth before 37 completed weeks of pregnancy.

SUDDEN INFANT DEATH SYNDROME (SIDS)
The leading cause of SUID, SIDS refers to the sudden death of an infant under one year of age that remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history.

Key Findings

- In 2015, there were 431 infant deaths and 89,000 live births for an overall infant mortality (IM) rate of 4.8 per 1,000.
- Nationally, the IM rate in 2014 was 5.8 per 1,000 live births and Washington ranked 8th among all 50 states.
- IM rates decreased dramatically between 1980 and 2000 in Washington State. The decrease has slowed since 2000 and rates have been fairly stable for the last five years.
- Decreases in the IM rate have been driven largely by decreases in the death rate of infants after the first month of life ([post-neonatal deaths](#)).
- In 2015, 89.7% of Very Low Birth Weight births were delivered in facilities with Level III or IV neonatal services, a percentage which has increased significantly over the past decade.
- Looking at IM rates by county is difficult because of small numbers; which results in a lot of variability in the rates. When aggregating five years of Washington State data from 2011–2015:
 - » Pierce, Clallam, and Spokane counties have statistically higher rates of IM than Washington State as a whole.
 - » King and Snohomish counties have statistically lower IM rates than Washington State as a whole.



NH Black/African Americans had the highest infant mortality rate from 2011–2015 in our state, at 8.9 per 1,000 births compared to the lowest rate of 3.4 per 1,000 among NH Asians.

Race

- Over the 2011–2015 period, the NH Black/African American population had the highest IM rate at 8.9 per 1,000 live births, followed by NH American Indian/Alaska Natives (8.4 per 1,000), and NH Native Hawaiian and Other Pacific Islanders (7.7 per 1,000).
- The lowest rates of infant mortality occurred among NH Asians (3.4 per 1,000), NH Whites (4.2 per 1,000), and Hispanic/Latino residents (4.4 per 1,000).
- There have been no statistically significant decreases in IM rates by race/ethnicity in the last decade.

Age

- Infants born to women younger than 20 and older than 39 have higher IM rates than infants born to women aged 20–39.
- Younger women (<20 years) are more likely to have infants die in the [post-neonatal period](#) than older women (20+ years).
- NH Black/African Americans have the highest IM rate among infants less than 28 days (neonatal) at 6.0 per 1,000, over twice the rate of NH Whites and NH Asians (2011–2015).
- NH American Indian/Alaska Natives have the highest post-neonatal IM rate (4.1 per 1,000), nearly three times the rate for NH Whites.

PERINATAL PERIOD *The period from birth to six days after birth.*

PERINATAL DEATH *Infant mortality that occurs from birth to six days after birth.*

NEONATAL PERIOD *The first four weeks after birth.*

NEONATAL DEATH *Infant mortality that occurs from seven to 27 days after birth.*

POST-NEONATAL PERIOD *The period from 28 days to one year after birth.*

POST-NEONATAL DEATH *Infant mortality that occurs from 28 days to one year after birth.*

Leading Causes of Death in 2015

The top three causes of IM in Washington for the past 25 years have been:

- Congenital Malformations: 109 (25.3% of IM in 2015)
- SUID: 67 (15.5% of IM)
- Short Gestation and Low Birth Weight: 54 (12.5% of IM)
- The leading cause of death differs by race/ethnicity:
 - » NH Black/African American—short gestation and low birth weight
 - » NH American Indian/Alaska Native—SUID
 - » Other races/ethnicities—congenital malformations

Gestational Age

- 8.1% of births in 2015 were preterm (born before 37 weeks of gestation).
- Between 2011 and 2015, 56% of infant deaths were born before 37 weeks of gestation.
- IM rates decrease dramatically as **gestational age** at birth increases.
- Even among full term infants, NH Black/African Americans, NH American Indian/Alaska Natives, and NH Native Hawaiian and Other Pacific Islander are more likely to die than NH White infants.

Birth Weight

- During 2011–2015, 6.3% of infants were born low birth weight.
- During 2011–2015, 57% of infants who died were born low birth weight.
- NH Blacks/African Americans, NH American Indian/Alaska Native, and NH Native Hawaiian and Other Pacific Islander infants are more likely to be born preterm and/or low birth weight.

Plurality

Infant mortality rates are higher among multiple-gestation pregnancies:

- Twins have an IM rate approximately five times higher than the IM rate among singleton (one baby) births (2011–2015).
- Triplet or higher order multiple gestation births have an IM rate more than 16 times higher than singleton births (2011–2015).



GESTATIONAL AGE *The number of weeks between the first day of the last menstrual period and the date of delivery, irrespective of whether a live birth fetal death.*

Risk Factors

Smoking

Washington women who reported cigarette smoking during the three months before pregnancy had an IM rate approximately two times higher than the rate among women who didn't smoke.

Vaping and Marijuana

Although we do not have Washington State-specific data, nationally there is emerging evidence that maternal cannabis smoking negatively impacts lower birth weight of the infant.^{3,4}

BMI

In 2015, nearly 54% of women in Washington who had a live birth were either overweight or obese before they became pregnant.

Diabetes

- The rate of pregnant women in Washington with pre-existing diabetes and gestational diabetes has increased significantly since 2005.
- The rate of gestational diabetes has increased from 5.1 per 100 births in 2005 to 8.2 per 100 births in 2015.

Protective Factors

Folic Acid/Vitamins

In 2014, approximately 35% of women report taking a multivitamin, a prenatal vitamin or a folic acid vitamin, every day of the week in the month prior to becoming pregnant, and about 46% of women report not taking any multivitamin, a prenatal vitamin or a folic acid vitamin, at all in the month prior to becoming pregnant.⁵

Risk Appropriate Levels of Care

90.5% of VLBW births were delivered at a Level III facility. This rate has been increasing over the past decade, and Washington State is far exceeding the HP2010 Goal of 83.7%.

Sleep Position

Approximately 79% of Washington women in 2014 reported putting their infant to sleep on their back.

Breastfeeding

- Approximately 97% of women in 2014 indicated that they had ever breastfed their infant.
- Breastfeeding rates have significantly increased over the past 10 years.
- Only 25% of women continue to breastfeed after six months according to the 2014 National Immunization Survey.

Social Determinants of Health

Marital Status

- Women who are unmarried have higher IM rates than married women.
- NH American Indian/Alaska Native women have the highest percent of births as unmarried women (70.3%).

Education Status

- In general, infant mortality is higher among mothers who completed fewer years of formal education.
- However, this trend does not hold true among NH Black/African Americans, for whom the rate does not change as educational attainment increases.

Poverty

- Women who received Medicaid assistance coverage of their pregnancy and/or delivery have higher IM rates than women who did not.
- 60% or more of NH Black/African Americans, NH American Indian/Alaska Natives, NH Native Hawaiian and Other Pacific Islanders, and Hispanic/Latino births are to women on Medicaid.



Women who received Medicaid had higher rates of infant mortality than women who did not.

Introduction

Washington State has one of the lowest infant mortality rates in the nation. However, large disparities exist in outcomes for babies, especially NH Black/African Americans and NH American Indian/Alaska Natives as compared to NH Whites, and for families in poverty. These disparities have been relatively constant over time. We need to allocate resources based on need as we create innovative solutions to decrease infant mortality in all racial/ethnic and economic groups. This report identifies the current status of infant mortality, and provides recommendations to further reduce and prevent it.

Who Lives in Washington State?

The state of Washington is home to about seven million residents and is growing quickly. Between the 2010 census and 2016 population estimates, Washington's population increased approximately 7% (from 6.7 to 7.2 million),⁶ well above the national rate of 4.1%.⁷ Washington is geographically divided by the Cascade Mountain Range, and about three-fourths of the population lives in Western Washington. Population growth over the past two decades has primarily occurred in urban areas.⁸



Our vision is to provide the foundation of equal opportunity so that each woman has the information and resources to plan a healthy pregnancy and every baby can grow in a healthy home and community.

Washington is gradually becoming more racially/ethnically diverse. In 2000, 79% of Washington residents reported NH White as their only race; that figure decreased to 71% in 2015. Over that period, the percentage of residents classifying themselves as Hispanic/Latino grew from 7.5% to 12.2%, while the percentage identifying as NH Asian grew from approximately 6% to 8.6%.⁹ According to the 2015 American Community Survey 1-Year Estimates for 2015, approximately 19% of Washington’s children aged 5–17 years speak a language other than English at home and 7.5% speak English less than “very well.” Of [2014 Washington households](#), 19% reported speaking a language other than English at home, with four percent of households living in linguistic isolation. The U.S. Census Bureau defines a linguistically isolated household as one in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English “very well.”¹⁰ In other words, all members 14 years old and over have at least some difficulty with English. In 2015, approximately 3.9% of households identified as NH Black/African American, 0.7% identified as NH Native Hawaiian and Other Pacific Islander, and 1.8% identified as NH American Indian/Alaska Native. Washington is home to 29 federally recognized Tribes.

It is important to note while the race/ethnicity categories used in this report allow us to examine disparities and differences in the factors surrounding infant mortality in Washington, they are not perfect. In this report, race and ethnicity adhere to standardized categories defined by the state of Washington and may not reflect how groups would prefer to be identified. In addition, they cannot quantify or describe subgroups that may exist within race/ethnic groups, and as a result, may mask inequalities or differences that exist within race/ethnic categories.

Birth and Pregnancy Rates

As of April 1, 2015, there were an estimated 1,381,770 women of reproductive age (15–44) in Washington State. After remaining fairly stable through the 1990s, births to Washington women increased from 81,004 live births in 2000 to a high of 90,270 live births in 2008.¹¹ The average number of live births from 2010 to 2015 was 87,500, and in 2015 there were 89,000 live births. In 2015, the state birth rate was 64.4 per 1,000 women aged 15–44, and 4.3% of live births were to mothers under aged 20.¹² The pregnancy rate in 2015 was 77.2 per 1,000 women aged 15–44 (Table 1).¹³

TABLE 1 Total Live Births, Birth Rates, and Pregnancy Rates for Washington Resident and U.S. Women, 2003–2015

Year	Washington ¹⁴			United States ¹⁵	
	Live Births	Birth Rate*	Pregnancy Rate**	Birth Rate*	Pregnancy Rate**
2003	80,482	61.6	81.2	66.1	103.7
2004	81,715	62.2	81.2	66.4	104.1
2005	82,625	62.5	81.2	66.7	103.7
2006	86,845	64.8	83.7	68.6	106.6
2007	88,921	65.8	84.4	69.3	107.0
2008	90,270	66.5	84.8	68.1	105.5
2009	89,242	65.7	82.8	66.2	102.1
2010	86,480	63.8	79.7	64.1	98.7
2011	86,929	64.2	79.4	63.2	—
2012	87,417	64.4	78.3	63.0	—
2013	86,566	63.6	76.8	62.5	—
2014	88,561	64.5	77.7	62.9	—
2015	89,000	64.4	77.2	62.5 ¹⁶	—

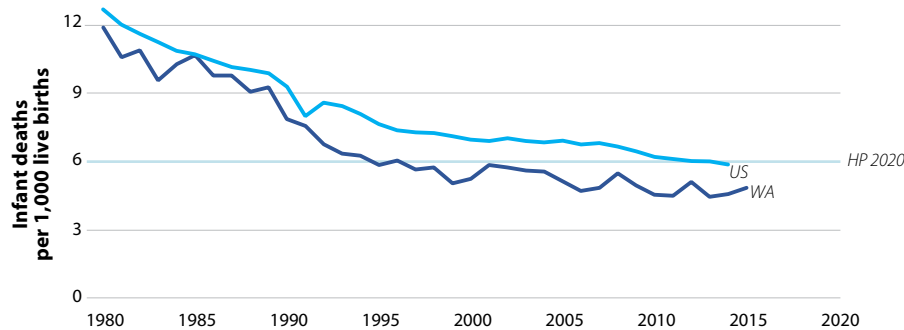
*Births per 1,000 women aged 15–44;

**Total pregnancies (births, fetal deaths, abortions) per 1,000 women aged 15–44

Infant Mortality in Washington State

The Healthy People 2020 objective is to reduce the infant mortality rate to no more than 6.0 deaths per 1,000 live births. Nationally, this goal was met in 2013 with an infant mortality rate of 5.96 per 1,000 live births.¹⁷ Like the nation, Washington has seen dramatic decreases in the infant mortality rate over the past two decades (Figure 1). There were 802 infant deaths in 1980 compared to 431 in 2015. Washington has also consistently been below the Healthy People 2020 goal since 1997. In 2015, the infant mortality rate was 4.8 deaths per 1000 live births. Washington State has one of the lowest rates in the nation and in 2014 had the 8th lowest rate among all 50 states.¹⁸

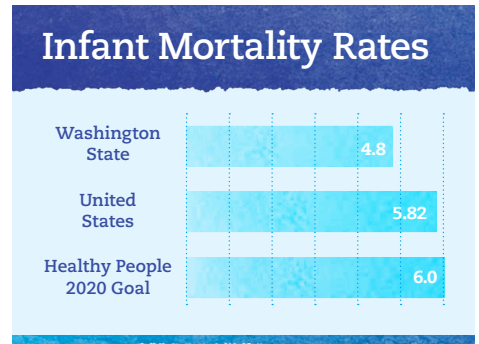
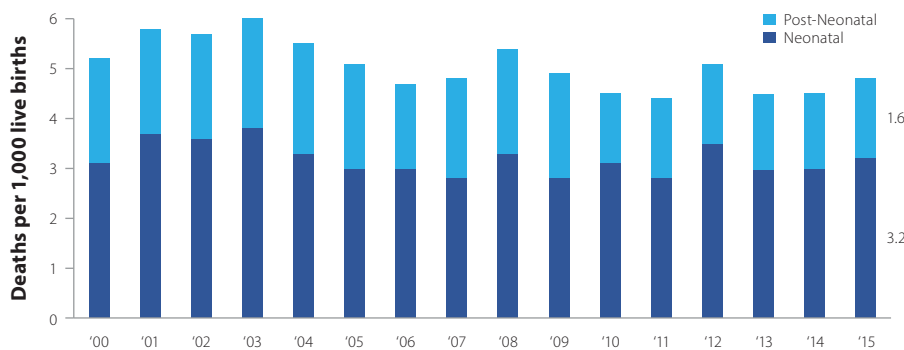
FIGURE 1 Infant Mortality Rates for Washington State and the United States, 1980–2015¹⁹



Infant Mortality by Age at Death

Infant deaths are often divided into two groups: neonatal and post-neonatal. Deaths during the neonatal period are often related to the mother’s health during pregnancy (chronic diseases, diabetes, access to care), or to fetal/neonatal issues such as birth defects or preterm birth. Deaths in the post-neonatal period are often due to environmental and social factors (unsafe sleep practices, injury, and infection). The majority of infant deaths occur within the first four weeks of life. In 2015, 289 infants died in the neonatal period and 142 died in the post-neonatal period. Over the past 16 years we have seen very little overall change in the neonatal infant mortality rate. However, in 2010, we saw a 25% decrease in the post-neonatal infant mortality rate that has remained consistent through 2015 (Figure 2).

FIGURE 2 Infant Mortality Rates by Infant Age at Death for the Neonatal and Post-Neonatal Periods, Washington State, 2000–2015



Infant Mortality by Geography

Infant mortality rates varied significantly across the state during the 2011–2015 period, with rates ranging from 3.2 per 1,000 in Stevens County to 8.1 per 1,000 in Clallam County (Figure 3). While rates varied across counties, only Clallam, Pierce, and Spokane Counties had statistically higher rates than the overall state rate of 4.7 deaths per 1,000 live births (yellow). King and Snohomish Counties had rates that were statistically lower than the state (blue). The small number of births and infant deaths in many counties results in a lot of random fluctuation in the rates and limits our ability to determine whether counties like Pend Oreille or Stevens are actually experiencing higher or lower rates of infant mortality than the state as a whole.

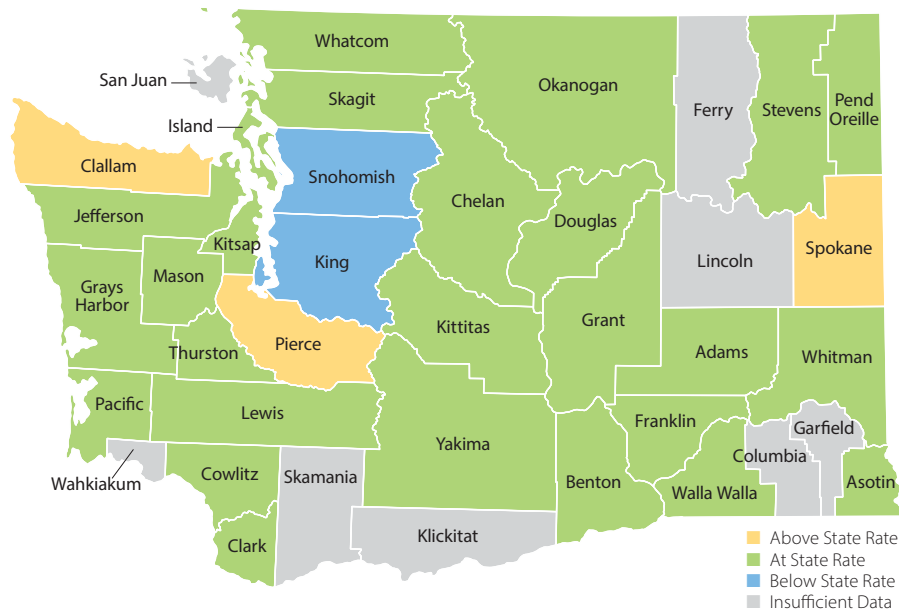
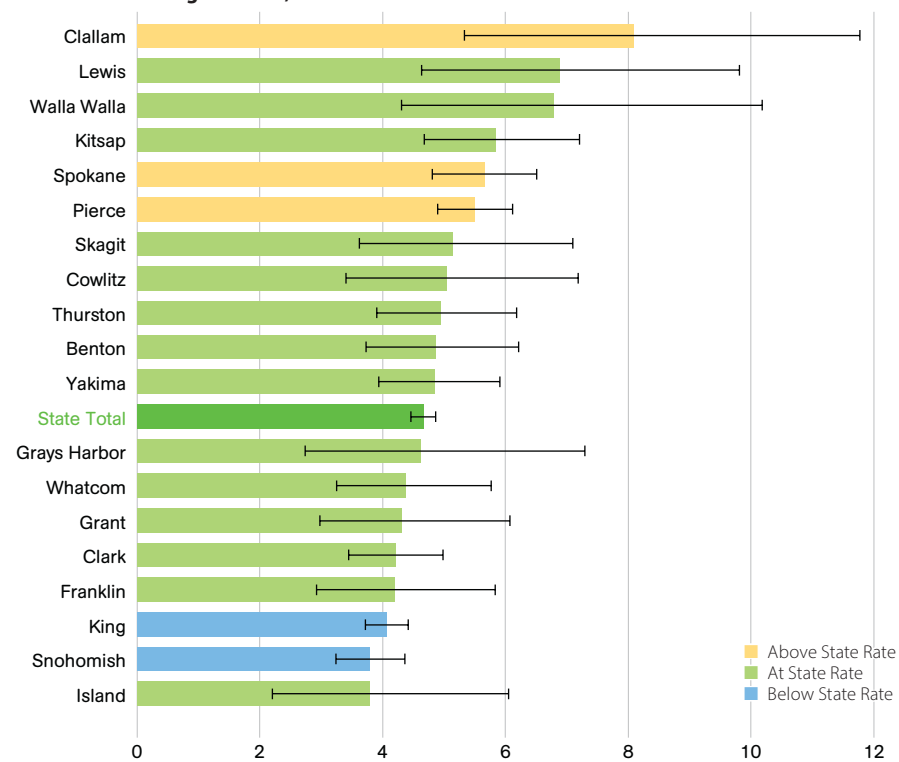


FIGURE 3 Infant Mortality Rate by Maternal County of Residence, Washington State, 2011–2015



Infant Mortality by Maternal Race/Ethnicity²⁰

Infant mortality varies significantly by race/ethnicity. Between 2011 and 2015, babies born to NH Black/African American and NH American Indian/Alaska Native mothers experienced infant mortality rates of 8.9 and 8.4 per 1,000 live births respectively. This was twice the rate of those born to NH White mothers, 4.2 per 1,000 (Table 2).

Between 2011 and 2015, babies born to Black and Native American mothers experienced infant mortality rates that were twice the rate of those born to White mothers.

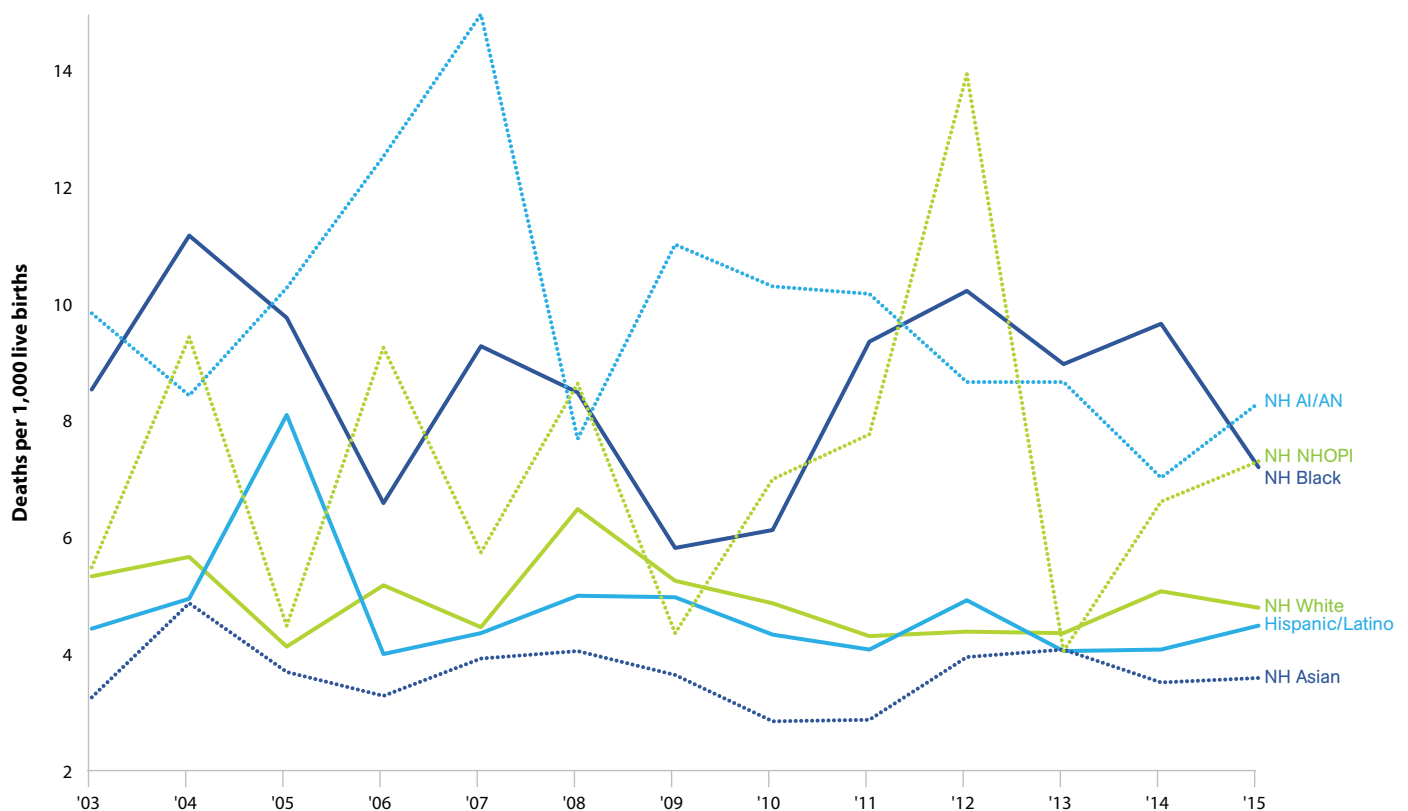
TABLE 2 Infant Mortality Rate by Maternal Race/Ethnicity, Washington State, 2011–2015*

Race/Ethnicity	Deaths	Births	Infant Mortality Rate (95% CI)
NH Black	168	18,813	8.9 (7.6, 10.3)
NH AI/AN	55	6,554	8.4 (6.3, 10.9)
NH NHOPI	40	5,185	7.7 (5.5, 10.5)
NH White	1,127	270,138	4.2 (3.9, 4.4)
NH Asian	136	39,746	3.4 (2.8, 4.0)
Hispanic/Latino	347	79,086	4.4 (3.9, 4.8)
Total	1,873	419,522	4.5 (4.3, 4.7)

*Rate per 1,000 live births

Infant mortality rates by race/ethnicity have shown significant decreases over the past 25 years; however, most progress occurred prior to 2005. The NH Black/African American infant mortality rate has declined substantially since 1990, when the rate was 17.2 per 1,000 live births, but has remained fairly stable over the last 10 years. Similar declines were seen for NH American Indian/Alaska Native infants in the 1990s. The infant mortality rate for NH American Indian/Alaska Natives decreased from 23.7 per 1,000 in 1990 to 9.4 per 1,000 in 2000, and rates have remained fairly stable since then.

FIGURE 4 Infant Mortality Rate by Maternal Race/Ethnicity, Washington State, 2003–2015



Infant Mortality by Maternal Country of Birth

In Washington State from 2010 to 2014, infants of U.S.-born mothers had higher rates of infant mortality, regardless of race category (Table 3). Overall, the infant mortality rate among infants of U.S.-born mothers was 4.8 per 1,000 live births, compared to 3.4 per 1,000 live births among infants of women born internationally. The difference between infant mortality rates by country of birth was particularly pronounced among NH Black/African Americans. Infants of U.S.-born NH Black women had over twice the infant mortality rate of foreign-born NH Black women.

TABLE 3 Infant Mortality Rate per 1,000 by Maternal Race/Ethnicity and Maternal Country of Birth, Washington State, 2011–2015*

Race/Ethnicity	U.S.-Born (95% CI)	Born Outside of the U.S. (95% CI)
NH Black	11.8 (9.7, 13.9)	5.4 (3.8, 6.9)
NH AI/AN	8.4 (6.2, 10.7)	†
NH NHOPI	7.4 (4.4, 10.5)	7.0 (4.3, 12.0)
NH White	4.3 (4.1, 4.6)	2.4 (1.8, 3.1)
NH Asian	4.7 (3.2, 6.3)	3.2 (2.5, 3.7)
Hispanic/Latino	4.5 (4.0, 5.0)	3.1 (1.4, 4.1)
Overall	4.7 (4.5, 4.9)	3.4 (2.9, 3.7)

*Maternal nativity status determined from birth certificate;

†No cases in this race/ethnic group were born outside of the United States

Infant Mortality by Maternal Age

Nationally, babies born to teenage mothers and mothers aged 40 and older have the highest infant mortality rates.^{21,22,23} In Washington, from 2011–2015, babies born to mothers younger than 20 years and mothers 40 or older also had higher infant mortality rates than babies born to mothers aged 20–39 (Table 4).

TABLE 4 Infant Mortality Rate by Maternal Age, Washington State, 2011–2015

Maternal Age	Neonatal Deaths	Post-Neonatal Deaths	Total Deaths	Births	Infant Mortality Rate (95% CI)	Neonatal Mortality Rate [†]	Post-Neonatal Mortality Rate [†]
<15	*	*	*	196	*	*	*
15–19	93	73	166	22,782	7.3 (6.2, 8.4)	4.1	3.2
20–24	264	204	468	87,365	5.4 (4.9, 5.8)	3.0	2.3
25–29	384	186	570	129,202	4.4 (4.0, 4.8)	3.0	1.4
30–34	353	136	489	125,077	3.9 (3.6, 4.3)	2.8	1.1
35–39	195	64	259	59,653	4.3 (3.8, 4.9)	3.3	1.1
40+	68	20	88	141,98	6.2 (5.0, 7.6)	4.8	1.4
Total	1,360	684	2044	438,473	4.7 (4.5, 4.9)	3.1	1.6

*Cell suppressed to protect privacy because of small numbers;

†Mortality rates per 1,000 live births

How Does Washington Compare?

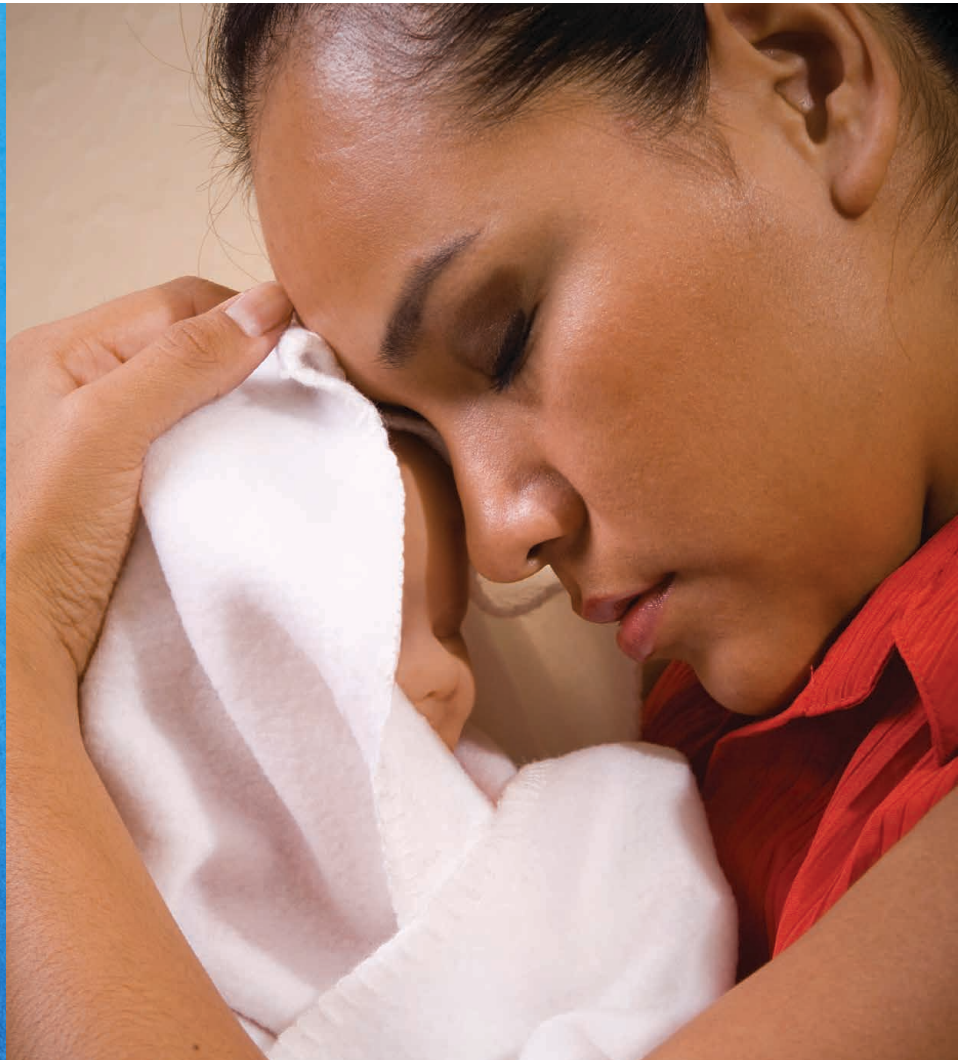
Washington State has one of the lowest infant mortality rates in the nation. When compared to other west-coast and neighboring states, including Oregon, Alaska, Idaho, and California, Washington has one of lowest infant mortality rates overall; slightly lower than Alaska and slightly higher than California (Table 5). Washington has the lowest rate of Hispanic/Latino infant mortality (4.2 per 1,000), but rates for other race/ethnic groups are higher than nearby states. It is also important to consider that the United States has a higher rate of infant mortality when compared to other similarly industrialized nations. While Washington still has low infant mortality overall, it is clear that there is still more that can be done.

TABLE 5 Infant Mortality Rate by Maternal Race/Ethnicity and Select States and Countries, 2011–2013^{† 24,25}

Race/Ethnicity	WA	OR	ID	AK	CA	US	UK	Finland	Japan
NH Black	8.8	8.3	—	—	9.4	11.3	*	—	—
NH AI/AN	8.7	10.2	—	8.1	5.9	8.1	*	—	—
NH Asian/NHOPI	4.4	4.1	—	—	3.8	4.2	*	—	—
NH White	4.4	4.7	5.0	3.6	3.9	5.1	*	—	—
Hispanic/Latino	4.2	4.8	6.7	—	4.6	5.1	*	—	—
Total	4.8	5.0	5.4	4.9	4.7	6.0	4.2	2.3	2.3

[†]Source dataset does not include data for these cells;
[†]Mortality Rates per 1,000 live births.

While Washington still has low infant mortality overall, it is clear that there is still more that can be done.



Leading Causes of Infant Death in Washington State

The leading causes of infant death in Washington for 2015 were congenital malformations (25.3%), SUID (15.5%), short gestation and low birth weight (12.5%), Complications of Placenta, Cord, or Membranes (7.7%) and Maternal Complications of Pregnancy (6.7%) (Figure 5). Together, these account for approximately 68% of infant deaths in Washington State. Although there have been changes in death patterns and causes over time, Congenital Malformations, SUID, and Short Gestation and Low Birth Weight have remained the leading three causes of infant mortality for the past 25 years.

FIGURE 5 Leading Causes of Infant Mortality, Washington State, 2015

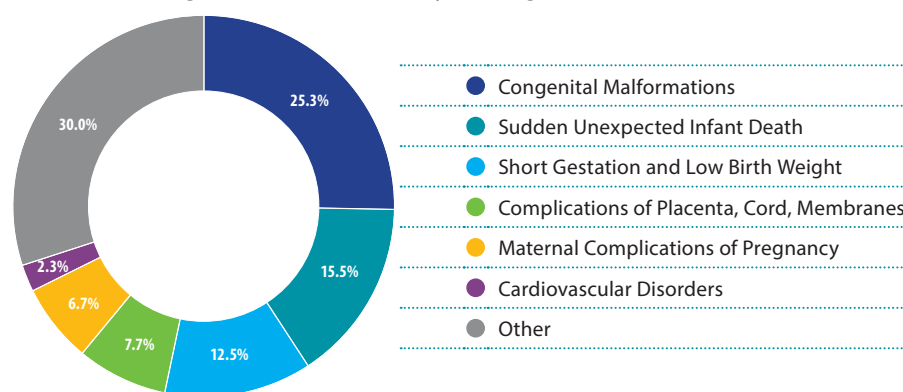


TABLE 6 Overall Leading Causes of Infant Mortality, Washington State, 2015

Rank	Causes of Death	Frequency	Percent
1	Congenital Malformations	109	25.3%
2	Sudden Unexpected Infant Death (SUID)	67	15.5%
	<i>Sudden Infant Death Syndrome (SIDS)</i>	55	82.1%
	<i>Ill-defined and unknown cause</i>	2	3.0% [†]
	<i>Accidental suffocation and strangulation in bed (ASSB)</i>	10	14.9%
3	Short Gestation and Low Birth Weight	54	12.5%
4	Complications of Placenta, Cord, Membranes	33	7.7%
5	Maternal Complications of Pregnancy	29	6.7%
6	Cardiovascular Disorders	10	2.3% [†]
7	Unintentional Injury (Accident)	9	2.1% [†]
8	Respiratory Distress of Newborn	8	1.9% [†]
9	Bacterial Sepsis of Newborn	7	1.6% [†]
10	Necrotizing Enterocolitis of Newborn	7	1.6% [†]
11	Disease of the Circulatory System	7	1.6% [†]
12	Diarrhea and Gastroenteritis	6	1.4% [†]
13	All Other Causes of Death (≤5 Cases)*	85	19.7%
	Total	431	100.0%

*Includes all other causes of infant mortality with counts <5;

[†]Relative Standard Error (RSE) ≥25, indicates unstable estimate due to small numbers

Table 7 shows the distribution of the leading causes of infant mortality over the neonatal and post-neonatal periods. As [Figure 2](#) suggests, most infant deaths occur during the neonatal period, and are from causes of death related to the mother's health during pregnancy or fetal/neonatal health issues. Congenital malformations, short gestation and low birth weight, and issues related to pregnancy complications or under-development of the fetus are dominant in this category. Leading causes of death in the post-neonatal period are typically due to environmental and social factors, and include SUID, diseases of the circulatory system, and unintentional and intentional injury.

TABLE 7 Leading Causes of Death by Neonatal/Post-Neonatal Period, 2011–2015

Rank	Leading Cause of Death	Neonatal		Post-Neonatal		Total Deaths
1	Congenital Malformations	355	72.4%	135	27.6%	490
2	Sudden Unexpected Infant Death	44	13.2%	290	86.8%	334
	<i>Sudden Infant Death Syndrome</i>	26	10.2%*	230	89.8%	256
	<i>Ill-Defined or Unknown Cause</i>	7	30.4%	16	69.6%*	23
	<i>Accidental Suffocation and Strangulation in Bed</i>	11	20%	44	80%*	55
3	Short Gestation and Low Birth Weight	239	98.0%	5	2.0%*	244
4	Maternal Complications of Pregnancy	161	100.0%	0	0.0%	161
5	Complications of Cord, Placenta, Membranes	113	99.1%	1	0.9%*	114
6	Respiratory Distress	48	94.1%	3	5.9%*	51
7	Cardiovascular Disorder originating in the Perinatal Period	45	97.8%	1	2.2%*	46
8	Unintentional Injury (Accident)	3	6.7%*	42	93.3%*	45
9	Necrotizing Enterocolitis of the Newborn	39	95.1%	2	4.9%*	41
10	Intrauterine Hypoxia and Birth Asphyxia	34	91.9%	3	8.1%*	37
11	Bacterial Sepsis of Newborn	33	97.1%	1	2.9%*	34
12	Disease of the Circulatory System	4	11.8%	30	88.2%*	34
13	Atelectasis	27	87.1%	4	12.9%	31
14	Assault (Homicide)	3	13.6%	19	86.4%*	22
15	All Other Causes of Death	212	58.9%	148	41.1%	360
	Total	1,360	66.5%	684	33.5%	2,044

*Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

Congenital Malformations/Birth Defects

Congenital malformations are the leading cause of infant mortality both in Washington State (25.3% of deaths in 2015) and nationally. Approximately one in 33 babies in the U.S. are born with a major birth defect.²⁶ Birth defects are structural conditions that result from incorrect organ and structural development during pregnancy. Major birth defects include: spina bifida, anencephaly, limb reduction defects, cleft lip and/or palate, hypospadias, gastroschisis, heart defects, Down Syndrome, and Trisomy 18. Congenital malformations have been the leading cause of infant mortality since 1994. Overall infant mortality rates in Washington State due to birth defects have dropped by about half since the early 1980s, from a rate of 2.2 per 1,000 to 1.1 per 1,000 in 2011–2015. This is likely explained by a combination of factors, including improved prenatal diagnosis and pregnancy management, as well as improvements in neonatal technology and surgical repair of congenital malformations. Additionally, increased use of folic acid, taken prior to pregnancy, has been found to prevent neural tube defects (such as spina bifida)—conditions with very high mortality rates.

Overall, infant deaths due to birth defects have dropped by about half since the early 1980s.

Sudden Unexpected Infant Death (SUID)

Approximately 3,500 infants die annually in the United States from sleep-related infant deaths, including SIDS (ICD-10 R95), ill-defined deaths (ICD-10 R99), and accidental suffocation and strangulation in bed (ICD-10 W75). After an initial decrease in the 1990s, the overall death rate attributable to sleep-related infant deaths has not declined in more recent years.²⁷ SUID accounted for 15.5% of infant deaths in 2015. The American Academy of Pediatrics recommends a safe sleep environment that can reduce the risk of all sleep-related infant deaths. Recommendations for a safe sleep environment include positioning infants to sleep on their back, the use of a firm sleep surface, room-sharing without bed-sharing, and the avoidance of soft bedding and overheating. Additional protective factors for SIDS reduction include the avoidance of exposure to smoke, alcohol, and illicit drugs; breastfeeding; use of a pacifier; and routine immunization. Additional risk factors include sleeping on couches/armchairs and in sitting devices.²⁸ The recommendations and strength of evidence for each recommendation are included in this policy statement. The rationale for these recommendations is [discussed in detail here](#).

Short Gestation and Low Birth Weight

The percent of infants born low birth weight steadily increased from 5.3% in 1990 to 6.5% in 2006, and has remained stable since; however, the percent of infant deaths attributed to short gestation and low birth weight has increased from 5.0% in 1990 to 12.5% percent in 2015. Since 1990, the number of preterm births in Washington has decreased significantly to a low of 8.1% in 2014; however, even as the preterm birth rate has diminished, the proportion of preterm births that are **very preterm** has significantly increased to a rate of 19.7% in 2015. Babies born preterm or low birth weight are at significantly increased risk for life-threatening complications in the newborn period, as well as long-term developmental and health complications. The risk of infant mortality increases significantly for babies born very preterm or very low birth weight. Short gestation (preterm birth) and low birth weight may also result in prolonged postnatal hospital care and poor weight gain and growth. The trend to intervene and resuscitate infants 23–28 weeks of gestation has steadily increased due to medical advances since the 1990s and may continue to impact the mortality rates for preterm birth babies.²⁹

VERY PRETERM Birth before less than 32 weeks of gestation.

Complications of Placenta, Cord, and Membranes

Complications of placenta, cord, and membranes contributed to 7.7% of infant mortality cases from 2015. The placenta, umbilical cord, and fetal membranes are vital to the health and growth of the unborn infant. For example, some unborn infants have only one umbilical artery instead of two. Additionally, about 20% of these infants have some sort of **congenital anomaly** that places them at increased risk for death.³⁰ Infection of the fetal membranes or amniotic fluid that may be associated with infection in the mother or unborn infant, too much or too little amniotic fluid in the uterus, and placenta abnormalities can result in distress of the unborn infant.

CONGENITAL ANOMALY Physical and/or neurological defect that is present at delivery.

Maternal Complications of Pregnancy

Pregnancy complications include health problems before pregnancy, pregnancy-related problems, and infections during pregnancy, and attributed to 6.7% of infant deaths in 2015. The most commonly reported complications during pregnancy include uncontrolled maternal bleeding, high blood pressure, gestational diabetes, maternal infections, and obstructed

Pregnancy complications include health problems before pregnancy, pregnancy-related problems, and infections during pregnancy.

labor. Women with high blood pressure have increased risk for preeclampsia and placental abruption. This can lead to a higher likelihood of preterm birth and low birth weight.

PREECLAMPSIA High blood pressure and problems with kidney and other organs after the twentieth week of pregnancy.

PLACENTAL ABRUPTION Condition where the placenta separates from the wall of the uterus.

Cardiovascular Disorders

Cardiovascular disorders originating in the perinatal period account for 2.3% of infant deaths in 2015. These categories include cases of infant mortality resulting from neonatal cardiac failure, dysrhythmia, hypertension, persistent fetal circulation issues, and transient myocardial ischemia in addition to other rare congenital cardiovascular conditions. Fatal cardiovascular disorders in the perinatal period occur more commonly among preterm births.

Unintentional Injury

Unintentional injury was a cause of death for 2.1% of infant deaths in 2015. It is mostly related to post-neonatal mortality, including motor vehicle accidents, falls, drowning, poisoning, and obstructive suffocation.

Infant Mortality by Gestational Age

In 2015, 8.1% of live births in Washington were preterm. Washington’s singleton preterm birth rate ranked sixth lowest among states, and is well below the HP 2020 objective of 11.4%.³¹ Preterm infants are at risk for numerous medical problems that require extended care in the hospital, and the risk increases with decreasing gestational age. Infants with short gestation make a disproportionately large contribution to infant mortality. Although just 5.3% of live births from 2011 to 2015 were born preterm, 56.1% of infant mortality cases during the same period were born earlier than 37 weeks of gestation. The rate of infant mortality increases dramatically as gestational age at birth decreases (Table 8). Most newborns born at less than 22 weeks of gestation will die in the neonatal period or have significant long-term neurodevelopmental morbidity; however, outcomes in individual cases are difficult to predict. At this time, 22 weeks of gestation is considered the lower limit of viability.³² Infants born during weeks 21–22 of pregnancy have nearly eight times the rate of infant mortality as infants born during weeks 25–28 of pregnancy, and are approximately 490 times more likely to die than infants who reach 37 weeks of gestation or more before birth. Table 8 also demonstrates the difference that a few weeks of gestation can make; the percentage of infants who survive their first year increases from just 6.8% among infants born at 21–22 weeks of gestation to 88.3% among infants born at 25–28 weeks of gestation.

A few weeks of gestation can make a big difference in infant survival rate: 88.3% of babies born at 25–28 weeks of gestation survived, compared to just 6.8% born from 21–22 weeks.

TABLE 8 Infant Mortality Rates by Gestational Age, 2011–2015**

Weeks of Gestation	Deaths	Births	Percent of Total Births	Infant Mortality Rate	Percent Survival at One Year
17–20	149	161	0.04%	925.5	7.5%
21–22	179	192	0.05%	932.3	6.8%
23–24	179	381	0.09%	469.8	53.0%
25–28	156	1,330	0.31%	117.3	88.3%
29–32	105	3,163	0.75%	33.2	96.7%
33–36	214	22,556	5.31%	9.5	99.1%
37+	770	396,680	93.45%	1.9	99.8%

*Restricted to Singleton births;
 **Mortality Rates per 1,000 live births.

Infant Mortality by Birth Weight

Infant birth weight follows a similar trend as gestational age at birth—the IM rate increases as birth weight decreases (Table 9). Infants born **Low Birth Weight (LBW)** make a disproportionately large contribution to infant mortality. Although just 6.3% of live births from 2011 to 2015 were born LBW, 57% of infant mortality cases during the same period were born LBW. Infants born **Extremely Low Birth Weight (ELBW)** had an IM rate approximately eight times higher than infants born **Very Low Birth Weight (VLBW)**. Infants born VLBW had an IM rate 3.2 times higher than infants born LBW, and 23 times higher than infant born at a **normal birth weight**. Infant deaths were made up disproportionately of ELBW and VLBW (37% of deaths) whereas only 0.8% of liveborn infants were ELBW and VLBW. More infant deaths compared to liveborn infants were LBW (15.7% vs 4.2%, respectively).

TABLE 9 Infant Mortality by Birth Weight, 2011–2015*

Birth Weight Category	Deaths	Births	Percent of Total Births	Infant Mortality Rate [†]	Percent Survival at One Year
Extremely Low Birth Weight (<1000g)	569	1,594	0.4%	357.0	64.3%
Very Low Birth Weight (>1000g and <1500g)	76	1,723	0.4%	44.1	95.6%
Low Birth Weight (>1500g and <2500g)	271	17,136	4.0%	15.8	98.4%
Normal Birth Weight (>2500)	806	404,013	95.2%	2.0	99.8%

*Restricted to Singleton births;

[†]Mortality Rates per 1,000 live births

Multiple-Gestation Birth

The infant mortality rate increases as birth plurality increases because prematurity and other comorbid conditions are more likely to occur with multiple gestations (Table 10). Out of 89,000 resident live births in 2015, 2,885 (3%) were multiple gestation births (2,824 twin and 61 triplet births). The infant mortality rate among triplet births was more than 14 times higher than the rate among singleton births (67.8 vs 4.1 per 1,000 live births, respectively).

TABLE 10 Infant Mortality Rate by Birth Plurality, 2011–2015**

Birth Plurality	Deaths	Births	Percent of Total Births	Infant Mortality Rate [‡]	Percent Survival at One Year
Singleton	1,758	424,502	96.8%	4.1	99.6%
Twin	256	13,570	3.1%	18.9	98.1%
Triplet or Greater	27	398	0.1%	67.8	93.2%

**3 infant death certificates excluded because of missing birth plurality;

[‡]3 birth certificates excluded because of missing birth plurality;

*Mortality Rates per 1,000 live births

Risk and Protective Factors

Before Pregnancy

Pre-Pregnancy BMI

The percentage of Washington women who are overweight or obese is steadily increasing. Obesity during pregnancy increases maternal risk of gestational diabetes, preeclampsia (which may lead to eclampsia or stroke), and sleep apnea which may result in hypertension and cardiovascular disorders. Additional risks of obesity include preterm birth, birth defects (such as cardiac defects and neural tube defects), and macrosomia (birth weight more than 4,000 grams), which can result in birth injury.³³ In 2015, nearly 54% of women in Washington who had a live birth were either overweight or obese before they became pregnant. In 2015, only 29.2% of women gained the amount of weight during pregnancy recommended American College of Obstetricians and Gynecologists; 50.5% of women gained more weight than recommended, and 20.3% gained less than recommended. Table 11 demonstrates that infant mortality rates increase as pre-pregnancy maternal BMI increases, and in general, women who had a lower BMI before pregnancy had a lower rate of infant mortality.

TABLE 11 Infant Mortality Rate by Maternal Pre-Pregnancy BMI Status, 2011–2015

BMI Category	Deaths	Births	Infant Mortality Rate* (95% CI)
Underweight (BMI <18.5)	40	11,481	3.5 (2.5, 4.7)
Normal Weight (BMI 18.5–24.9)	698	189,648	3.7 (3.4, 4.0)
Overweight (BMI 25.0–29.9)	476	109,075	4.4 (4.0, 4.8)
Obese (BMI 30+)	830	128,269	6.5 (6.0, 6.9)
Total	2,044	438,473	4.7 (4.5, 4.9)

*Mortality Rates per 1,000 live births

Diabetes

The risks of diabetes during pregnancy include large-for-gestational-age (LGA) birth weight/macrosomia, shoulder dystocia, stillbirth, and neonatal morbidities such as hypoglycemia, respiratory distress, and neonatal intensive care admission, and malformations, especially when the diabetes is poorly controlled prior to and during pregnancy.³⁴ The rate of pregnant women with pre-existing diabetes increased significantly between 2005 and 2015 (0.7 to 0.9 per 100 live births), and the rate of gestational diabetes increased 55% over the same period (5.1 to 8.2 per 100 live births).³⁵

Hypertension and Preeclampsia

Preeclampsia is a leading cause of maternal and neonatal illness and death. Potential adverse outcomes include preterm delivery, severe hypertension, stroke, and seizures.³⁶ The rate of women with pre-existing hypertension increased 23% from 2005 to 2015 (1.3 to 1.6 per 100 live births), while the rate of gestational hypertension increased from 17% (5.4 to 6.3 per 100 live births).³⁷

Previous Preterm Birth

Women who have experienced a previous preterm birth are at greater risk for a repeat preterm birth. In 2015, 3.4% of birth certificates reported a previous preterm birth, and approximately 27% of those women experienced a repeat preterm birth with their most recent pregnancy. This is compared to a prematurity rate of just 7.9 per 100 births among women who had given birth to at least one child, but who had not experienced a preterm birth.

Folic Acid or Vitamins Prior to Pregnancy

Folic acid supplementation prior to pregnancy helps reduce the incidence of neural tube defects (such as spina bifida and anencephaly), and other birth defects. Several of these birth defects have increased the risk of infant mortality. In 2014, approximately 35% of women who completed the Washington Pregnancy Risk Assessment Monitoring System (PRAMS) survey reported taking a multivitamin, a prenatal vitamin or a folic acid vitamin every day of the week in the month prior to becoming pregnant, and 46% of women reported not taking a multivitamin, a prenatal vitamin or a folic acid vitamin at all in the month prior to pregnancy.³⁸ Over the past 15 years, rates of daily vitamin use have slowly been increasing from a low of 27% in 2000.³⁹

During Pregnancy

Unintended Pregnancy

Approximately half of the 6.6 million pregnancies in the United States each year are unintended, and it is estimated that 36% of Washington live births were unintended in 2013.⁴⁰ Women whose pregnancy is unintended are less likely to seek prenatal care and if they do, more likely to initiate prenatal care later in pregnancy and to receive less adequate care than women who have intended the pregnancy. Women with unintended pregnancies are also more likely to experience substance use, depression, and negative socioeconomic factors such as lower income status and educational attainment. As a result, a child who is the result of unintended pregnancy is at a greater risk of being born at LBW and of dying during the first year of life.⁴¹



Early Entry and Access to Prenatal Care

Pregnant women who do not receive adequate prenatal care run the risk that complications will go undetected or may not be managed in a timely manner, which increases the possibility of adverse outcomes for the mother and baby.⁴² Early and regular prenatal care is an accepted strategy to improve health outcomes of pregnancy for mothers and infants.⁴³ Two of the most significant benefits of early and ongoing prenatal care are improved birth weight and decreased risk of preterm.⁴⁴ After a low of 68% in 2007, the percent of Washington women initiating prenatal care in the **first trimester** increased to 74% by 2015. Among Medicaid eligible women, the percent was 65% in 2015, compared to non-Medicaid eligible women at 82%. Among pregnant women, 26% of women do not enter prenatal care in their first trimester, mostly due to difficulty of access.

FIRST TRIMESTER Time period extending from the first day of the last menstrual period through 12 weeks of gestation.

Smoking

According to birth certificate data, 9.6% of the mothers of liveborn infants reported smoking in the last three months before pregnancy. Smoking during pregnancy increases the risks for intrauterine growth restriction, placenta previa, abruptio placentae, decreased maternal thyroid function, preterm premature rupture of membranes, low birth weight, and perinatal mortality. An estimated 5–8% of preterm deliveries, 13–19% of term deliveries of infants with low birth weight, 23–34% cases of SIDS, and 5–7% of preterm-related infant deaths can be attributed to prenatal maternal smoking.⁴⁵ In Washington State from 2011–2015, mothers who reported any cigarette smoking behavior in the last three months before their most recent pregnancy experienced approximately twice the infant mortality rate (8.3 per 1,000 live births) of women who did not report smoking before pregnancy (4.2 per 1,000 live births) (Table 12).

TABLE 12 Infant Mortality Rate by Maternal Pre-Pregnancy Smoking Status, 2011–2015

Smoked 3 Months Before Pregnancy	Deaths	Births	Infant Mortality Rate* (95% CI)
Yes	300	46,795	8.3 (7.5, 9.2)
No	1,744	391,678	4.2 (4.0, 4.4)
Total	2,044	438,473	4.7 (4.5, 4.9)

*Mortality Rates per 1,000 live births

Exposure to Environmental Chemicals

Cigarette smoking is the best studied and most definitive environmental chemical risk factor for infant mortality and morbidity. Other environmental exposures through inhalation, ingestion of food and water, and skin contact with chemicals have been studied less but their contribution to LBW and infant mortality is unclear.

According to the American College of Obstetricians and Gynecologists and reproductive health researchers, prenatal exposure to certain toxic environmental chemicals is linked to poor birth outcomes including preterm birth, low birth weight, pregnancy loss, and impaired neurodevelopment.⁴⁶ Families with adequate income, health care, and social resources may be less likely to suffer exposure to these chemicals, or to have their exposure identified early. Reduction of harmful prenatal exposures is accomplished by a combination of policy efforts that target key sources of women’s exposure and education to help women identify and avoid harmful exposures at workplace and at home.⁴⁷

Social Support

The adverse impact of stress on almost every system in the human body is well documented. Social support has been shown to exert a protective effect on stress.⁴⁸ Social support during pregnancy has been studied in the [Centering Pregnancy Model](#). In those studies, women who participated in the group care model of pregnancy care were shown to have lower preterm birth rates.⁴⁹ Social support intrinsic to the group care model is thought to contribute to the improved outcomes.⁵⁰

Labor and Delivery

Risk Appropriate Perinatal Levels of Care

U.S. preterm birth rates have increased 13% overall from 1990 to 2010 (10.6%–12.0%) as a result of a variety of factors, including increases in multiple births, advanced maternal age, use of antenatal steroids, resuscitation of extremely preterm infants, and complications of pregnancy. The majority of the increase in the preterm birth rate (>70%) is attributable to late preterm births, that is births between 34 and 36 weeks.⁵¹ Infants born late preterm can experience significant morbidity that may result in the need for specialized care and specialized hospital treatment. Because preterm birth is a frequent cause of infant death in the U.S., and infants born with extreme prematurity often have a poor survival rate, Washington and other states have developed a regionalized system of care. A Regionalized Perinatal System of Care assures that preterm and other critically ill infants receive care in the highest level of neonatal care facility necessary for their care. In the late 1980s, DOH developed the [Washington State Perinatal and Neonatal Level of Care Guidelines](#), and continues to revise them according to the American Academy of Pediatrics recommendations. In 2015, 89.7% of Very Low Birth Weight births were delivered at facilities with Level III or IV neonatal services. This percent has increased significantly over the past decade.

Induction of Labor

Induction of labor is carried out in over 20% of pregnancies in developed countries. It is indicated when interrupting the pregnancy is thought to be advantageous for the mother or baby and is often carried out for postdate pregnancies (>41 weeks of gestation), where it has been shown to decrease perinatal mortality. As perinatal mortality and fetal compromise increase progressively with gestation beyond 39 weeks, induction of labor between 39 and 41 weeks has the potential to improve neonatal outcomes.

Cesarean Birth

The impact of cesarean birth on infant mortality is unclear but Washington State has chosen to monitor rates of cesarean births. In 2015, the rate of cesarean birth among the [Nulliparous, Term, Singleton, Vertex \(NTSV\)](#) population was 23 per 100 births, NTSV births are considered to be the lowest risk births, with the lowest likelihood of having a medically-indicated need for cesarean section.

Post-Partum

Infant Sleep

Providing a safe sleep environment for infants, including placing the infant on her/his back to sleep reduces the risk of SUID. In 2014, 79% of women reported most often laying their baby down to sleep on her/his back. Women with Medicaid-paid deliveries were less likely to report putting their infant on her/his back to sleep.⁵² NH Black/African American and NH Pacific Islander women are less likely to place their infants on their backs to sleep than were mothers of other races and ethnicities.

Breastfeeding

Studies have shown a relationship between breastfeeding and a decreased risk of SUID/SIDS.^{53, 54, 55} In Washington State, 97% of women in 2014 report ever having breastfed their infants. This includes women who breastfed for any length of time. However, the rate of exclusive breastfeeding drops significantly thereafter, down to 25% after six months, according to the National Immunization Survey. The decrease in breastfeeding is particularly steep among women whose delivery was paid for by Medicaid. NH Asian women were more likely to be breastfeeding at two months postpartum than women of other races/ethnicities. WIC provides breast pumps when needed and additional food to exclusively breastfeeding moms and babies. Among WIC moms in 2014, 88% initiated breastfeeding and 47% were still breastfeeding at six months.

Because preterm birth is the most frequent cause of infant death in the U.S., Washington has established a regionalized system of care.

NULLIPAROUS, TERM, SINGLETON, VERTEX (NTSV)

A first-time mother, with one baby (not twins or multiples), full term and baby is head down.

Providing a safe environment for babies, including putting a baby to sleep on his or her back, reduces the risk of SUID.

Disparities in Infant Mortality

Washington has one of the lowest rates of infant mortality in the U.S., and was ranked 8th lowest in 2014. Despite low overall infant mortality rates and continuing efforts to reduce infant mortality, large differences in rates persist in some racial/ethnic groups (Table 3). NH Black/African American, NH American Indian/Alaska Native, and NH Native Hawaiian and Other Pacific Islander infants are two times more likely to die in their first year of life when compared with NH White infants. Such observed differences in health outcome are known as health disparities.

Health Disparities

A health disparity is a type of difference in health that is closely linked with social or economic disadvantage. Health disparities negatively affect groups of people who have systematically experienced greater social or economic obstacles to health. These obstacles stem from characteristics historically linked to discrimination or exclusion such as race/ethnicity, religion, socioeconomic status, gender, mental health, sexual orientation, or geographic location. Other characteristics include cognitive, sensory, or physical disability.⁵⁶

Health Equity

Health equity exists when all people have the opportunity to achieve their full health potential, regardless of the color of their skin; where they were born; their level of education; their gender identity; their sexual orientation; their religious beliefs; the job they have; the language they speak; the neighborhood they live in and the resources to which they have access. Not everyone in Washington State has equal opportunity. Many communities experience health inequities because of their race, culture, identity, or where they live.

Stress and Poor Health Outcomes

Exposure to racism and stress increase the potential for poor health outcomes.⁵⁷ An analysis of 2004 Behavioral Risk Factor Surveillance System (BRFSS) data showed that racial discrimination was associated with greater stress among people of color. NH Black/African American respondents reported more emotional stress (18.2%) and physical stress (9.8%) compared to 3.5 and 1.6 percent respectively among NH Whites. Scientists hypothesize that this stress was associated with poorer mental and physical health. Stress was also associated with smoking and alcohol use.⁵⁸

Additionally, racism works in a cycle to damage health. People at a social disadvantage are more likely to experience stress from racism and they are less likely to have the resources to extinguish this stress. The fear of racism alone switches on the body's stress-response systems. The conditions of social injustice prompt poor health outcomes and that risk gets passed down generations.⁵⁹ As an example, the Black-White disparity in birth weight increases with maternal age; it has been hypothesized that this is due to the ongoing discrimination faced by NH Black/African American women, causing increasing levels of stress.⁶⁰

Stress can also compound socio-economic issues that lead to poor health outcomes. Stress related to living in a society with a legacy of racial discrimination may be a major factor in explaining poor health outcomes among minority racial/ethnic groups. Even for individuals who have not personally experienced overt bias, the constant awareness that they (or a loved one) could be unfairly perceived or treated can be a source of chronic stress. Physiological markers of stress found that at every age and income level, NH Black/African Americans had higher



Many communities experience health inequities because of their race, culture, identity, or where they live.



The stress of living in a society with a history of racial discrimination can help explain poor health outcomes among racial/ethnic minority groups.

levels of allostatic load (evidence of bodily wear-and-tear associated with chronic stress) than NH Whites. Racial discrimination has been linked to high blood pressure, infant mortality and coronary artery disease.⁶¹

Further, when children experience poverty, trauma, violence, maltreatment, and other adverse childhood experiences (ACEs), their brain development, learning ability, lifelong health and well-being can be negatively impacted. The short- and long-term outcomes of ACEs include health problems such as alcohol and other substance misuse and dependency; chronic obstructive pulmonary disease (COPD); depression; fetal death; decreased health-related quality of life; heart and liver disease; increased risk for HIV and other sexually transmitted infections (STIs); suicide; and unintended pregnancy.⁶²

Socioeconomics and Smoking

In working on prevention efforts for pregnant women, it is important to be mindful of the association between cigarette smoking and socioeconomic status. While adult smoking prevalence is declining in the U.S., smoking is becoming increasingly concentrated among individuals of low socioeconomic status (SES), as measured by educational level, occupational class, and poverty.⁶³ Social determinants such as poverty, housing, social support, discrimination, quality of schools, and transportation all contribute to tobacco-related disparities.

In addition, the tobacco industry has historically targeted communities of lower SES and racial/ethnic minorities. Access to health care and health education also influence smoking. Health care is expensive and people with lower SES are less likely to receive health care,⁶⁴ and thus, less information about the possible harm of smoking as well as less help quitting if they do become addicted. In fact, people of low SES are just as likely to make quit attempts but are less likely to quit smoking cigarettes than those who are of a higher economic status.⁶⁵ A longitudinal study in Canada found that individuals whose income increased to above the poverty threshold were less likely to continue smoking than individuals who remained in poverty.⁶⁶

Disparities in Age at Death

Deaths occurring in the first month of life (neonatal period) account for almost 67% of infant deaths in Washington, while the remaining deaths occur beyond the first month of life to the end of the first year of life (post-neonatal period). This finding is similar to that of the United States as a whole.

Neonatal death rates for NH Black/African American, NH White, NH Asian, and Hispanic/Latino infants are between two to four times higher than post-neonatal death rates (Table 13). For deaths in the neonatal period, the rate among all racial/ethnic groups is highest among NH Black/African American infants and twice that of NH Whites. This may be because the proportion of underlying causes of death attributed to factors that affect survival in the neonatal period—short gestation and low birth weight, maternal complications of pregnancy, and complications of the placenta, cord, and membranes—are higher for NH Black/African Americans than others (Table 14). NH American Indian/Alaska Native infants have the highest mortality rate during the post-neonatal period, with nearly three times rate seen among NH Whites. This may be attributable to the high burden of SUID in this population, but it is difficult to say without additional information (Table 14). SUID was the only cause of death category for NH American Indian/Alaska Natives that was not suppressed due to low numbers.

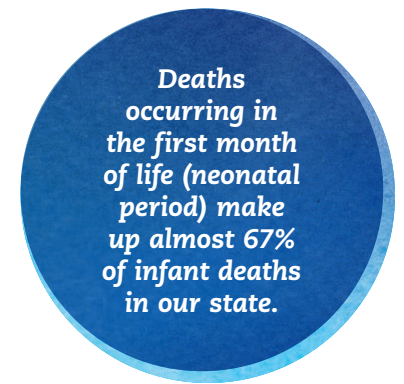


TABLE 13 Infant Mortality Rates (95% CIs) by Age at Death and Maternal Race/Ethnicity, Washington State, 2011–2015*

Maternal Race/ Ethnicity	Neonatal Death (<28 days)	Post-Neonatal Death (28–364 days)	Total
NH Black	6.0 (4.9, 7.1)	2.9 (2.2, 3.8)	8.9 (7.6, 10.3)
NH AI/AN	4.3 (2.8, 6.2)	4.1 (2.7, 6.0)	8.4 (6.3, 10.9)
NH NHOPI	4.4 (2.8, 6.7)	3.3 (1.9, 5.4)	7.8 (5.6, 10.7)
NH White	2.7 (2.5, 2.9)	1.4 (1.3, 1.6)	4.2 (3.9, 4.4)
NH Asian	2.7 (2.2, 3.2)	0.7 (0.5, 1.0)	3.4 (2.8, 4.0)
Hispanic/Latino	2.9 (2.6, 3.3)	1.4 (1.2, 1.7)	4.4 (3.9, 4.8)

*Mortality Rates per 1,000 live births

Disparities in Leading Causes of Death

Overall, the leading cause of infant mortality in Washington from 2011–2015 was congenital malformation, followed by SUID, short gestation and low birth weight, maternal complications of pregnancy, and complications of placenta, cord, and membranes. When broken out by race/ethnicity category, congenital malformations remained the leading cause for all groups except NH American Indian/Alaska Natives, NH Black/African Americans, and NH Native Hawaiian/Pacific Islanders. The leading cause of death for NH American Indian/Alaska Natives was SUID, short gestation and low birth weight for NH Black/African Americans. The number of NH Native Hawaiian/Pacific Islander deaths was too few and leading cause of death statistics were suppressed to protect privacy.

Table 14 describes the leading causes of death by race/ethnicity in Washington from 2011–2015. For several groups, SUID is one of the leading causes. Table 15 shows the distribution of SUID cases by the specific SUID-related ICD-10 diagnosis code used to assign an underlying cause of death.



TABLE 14 Top Five Leading Causes of Infant Mortality by Maternal Race/Ethnicity, Washington State, 2011–2015

Rank	NH Black	NH AI/AN	NH Asian	Hispanic/Latino	NH NHOPI	NH White
1	Short Gestation and LBW 36 (21%)	SUID [†] 14 (25%)	Congenital Malformations 29 (21%)	Congenital Malformations 105 (30%)	*	Congenital Malformations 273 (24%)
2	Congenital Malformations 30 (18%)	*	Short Gestation and LBW 20 (15%)	Short Gestation and LBW 49 (14%)	*	SUID 200 (18%)
3	SUID 23 (14%)	*	Maternal Complications of Pregnancy [†] 14 (10%)	SUID 48 (14%)	*	Short Gestation and LBW 107 (9%)
4	Maternal Complications of Pregnancy 20 (12%)	*	Complications of Cord, Placenta, Membranes [†] 14 (10%)	Maternal Complications of Pregnancy 26 (7%)	*	Maternal Complications of Pregnancy 82 (7%)
5	Complications of Cord, Placenta, Membranes [†] 13 (8%)	*	*	Complications of Cord, Placenta, Membranes 17 (5%)	*	Complications of Cord, Placenta, Membranes 57 (5%)

*Cell suppressed due to small numbers to protect privacy;

[†]Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

TABLE 15 SUID Cases by Diagnosis Code and Maternal Race/Ethnicity, Washington State, 2011–2015

Diagnosis (Ascertainment ICD-10 Code)	NH Black	NH AI/AN	Hispanic/Latino	NH White
SIDS (R95)	17 (74%)	11 (79%)	37 (77%)	152 (76%)
Unknown Cause (R99)	2 (9%) [†]	0 (0%)	3 (6%) [†]	13 (7%) [†]
ASSB (W75) [†]	4 (17.%) [†]	3 (21%) [†]	8 (17%) [†]	35 (18%)
Total	23 (100%)	14 (100%)	48 (100%)	200 (100%)

*Excludes NH Asian and NH NHOPI rates suppressed due to small numbers to protect privacy;

[†]ASSB (W75) = Accidental Suffocation and Strangulation in bed;

[†]Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

Disparities in Birth Weight and Gestational Age

There are significant disparities in infant mortality by race/ethnicity, independent of known risk factors such as birth weight or gestational age. Low birth weight and preterm infants are at increased risk of infant mortality; however, even among normal birth weight infants, there are disparities in infant mortality (Table 16). NH Native Hawaiian/Other Pacific Islanders and NH American Indian/Alaska Natives experienced the highest rate of infant mortality among infants born normal birth weight (4.1 and 4.0 per 1,000 live births, respectively), which was statistically significantly greater than NH Whites (2.0 per 1,000 live births). Additionally, NH Native Hawaiian/Other Pacific Islanders and NH American Indian/Alaska Natives have the highest IM rate among term pregnancies (4.2 and 4.1 per 1,000 live births, respectively), which was also statistically significantly higher than NH Whites (1.9 per 1,000 live births). NH Black/African American women also have a high IM rate among infants delivered preterm (63.9 per 1,000 live births).

TABLE 16 Infant Mortality Rate by Maternal Race/Ethnicity and Birth Weight/Gestational Age Category, Washington State, 2011–2015^{†*}

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Birth Weight							
Normal Birth Weight	3.2	4.0	4.1	2.0	1.0	1.7	1.9
Low Birth Weight	12.5	*	*	13.3	6.7	15.6	13.1
Very Low Birth Weight	217.7	250.0	169.5	179.9	182.0	180.5	185.3
Gestational Age							
37 or more weeks	2.8	4.2	4.1	1.9	1.0	1.6	1.9
Less than 37 weeks	63.9	36.1	40.4	31.2	28.6	35.3	33.8

*Cells suppressed due to small numbers to protect privacy;

[†]Restricted to Singleton Births;

^{*}Mortality Rates per 1,000 live births

Tables 17 and 18 show the birth weight and gestational age distribution of live births and infant deaths by maternal race/ethnicity from 2011 to 2015. Across race/ethnicity categories, more than 90% of all live births are born normal birth weight, and approximately 90% of live births in each category are born term (≥ 37 weeks). The distribution of birth weight and gestational age is very different among infant deaths in Table 19. Among infant deaths, the majority of infants (59.1%) were born very low birth weight or low birth weight. Fifty-six percent of infant deaths occurred among infants who were born preterm (32–36 weeks or < 32 weeks). Overall, the majority of infant deaths across race/ethnicity groups were born very low birth weight and less than 32 weeks of gestation. Only the NH White race/ethnicity category had the majority of their infant deaths occur among normal birth weight and term (≥ 37 weeks) infants.



TABLE 17 Number/Percent of Live Births by Maternal Race/Ethnicity and Birth Weight and Gestational Age, 2011–2015*

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Birth Weight							
Normal Birth Weight	16,947 (90.1%)	6,020 (91.9%)	4,840 (93.4%)	254,645 (94.3%)	36,619 (92.1%)	74,200 (93.8%)	393,271 (93.8%)
Low Birth Weight	1,443 (7.7%)	441 (6.7%)	283 (5.5%)	13,050 (4.8%)	2,699 (6.8%)	4,036 (5.1%)	21,952 (5.2%)
Very Low Birth Weight	418 (2.2%)	92 (1.4%)	59 (1.1%)	2,423 (0.9%)	423 (1.1%)	842 (1.1%)	4,257 (1.0%)
Total	18,808 (100%)	6,553 (100%)	5,182 (100%)	270,118 (100%)	39,741 (100%)	79,078 (100%)	419,480 (100%)
Gestational Age							
37 or more weeks	16,644 (91.9%)	5,616 (88.1%)	4,625 (90.8%)	245,149 (94.1%)	35,896 (93.0%)	71,846 (93.0%)	379,776 (93.5%)
32–36 weeks	1,125 (6.2%)	654 (10.3%)	403 (7.9%)	13,494 (5.2%)	2,335 (6.0%)	4,583 (5.9%)	22,594 (5.6%)
<32 weeks	346 (1.9%)	102 (1.6%)	64 (1.3%)	1,997 (0.8%)	377 (1.0%)	833 (1.1%)	3,719 (0.9%)
Total	18,115 (100%)	6,372 (100%)	5,092 (100%)	260,640 (100%)	38,608 (100%)	77,262 (100%)	406,089 (100%)

*Restricted to Singleton Births

TABLE 18 Number/Percent of Infant Deaths by Maternal Race/Ethnicity and Birth Weight and Gestational Age, 2011–2015†

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total**
Birth Weight							
Normal Birth Weight	55 (33.5%)	*	*	498 (44.9%)	36 (27.5%)	124 (36.6%)	713 (40.9%)
Low Birth Weight	18 (11.0%)	*	*	174 (15.7%)	18 (13.7%)	63 (18.6%)	273 (15.7%)
Very Low Birth Weight	91 (55.5%)	*	*	436 (39.4%)	152 (58.8%)	152 (44.8%)	756 (43.4%)
Total	164 (100%)	*	*	1108 (100%)	131 (100%)	339 (100%)	1742 (100%)
Gestational Age							
37 or more weeks	47 (34.3%)	*	*	468 (48.5%)	35 (35.4%)	116 (37.1%)	666 (44.0%)
32–36 weeks	11 (8.0%) [‡]	*	*	143 (14.8%)	11 (11.1%) [‡]	49 (15.7%)	214 (14.1%)
<32 weeks	79 (57.7%)	*	*	354 (36.7%)	53 (53.5%)	148 (47.3%)	634 (41.9%)
Total	137 (100%)	*	*	965 (100%)	99 (100%)	313 (100%)	1514 (100%)

*Cell suppressed due to small numbers to protect privacy;

**Totals do not include counts from NH AI/AN and NH NHOPI;

†Restricted to Singleton Births;

‡Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

Social Determinants of Health

Multiple environmental and demographic factors (social determinants) may contribute to infant mortality. It is often difficult to determine the degree of influence each factor has on mortality. Not only is there a complex interaction between factors, but the effects of the factors will vary by the health of mother and infant. This presents challenges in identifying successful approaches to reducing disparities in infant mortality. A crucial aspect of reaching our most vulnerable communities is consideration of additional but necessary steps to build trusting relationships in delivery of services, considering cultural wisdom, ethical practices, and historical distrust concerns.

The next section describes the relationship between selected social determinants and infant death. The data allow the comparison of contributing factors to infant mortality for each racial/ethnic group. Maternal characteristics and health-seeking behaviors including age, marital status, education, and initiation of prenatal care, contribute to pregnancy health and birth outcomes. Social and environmental factors such as social support, income level, housing status and access to health care are related to health outcomes. Only limited data are available that allows an examination of the relationship between infant mortality and social and environmental factors at the state level. The Washington birth certificate collects information on payer of delivery (Medicaid, private, or other sources). This payer information serves as a proxy for income status. However, other social and environmental factors are not captured on the birth nor death certificate of the infant. Therefore, it is not possible to examine the influences of a more complete set of social and environmental factors on infant mortality.

The highest infant mortality rates are seen among NH Black/African American mothers aged less than 20 and 35 and older as compared to other racial/ethnic groups of similar ages.



Disparities by Maternal Age

Infants of teen and older mothers (35 years and older) have a higher risk of mortality in the first year of life than infants born to mothers in other age groups due to a mixture of biological and social reasons. Racial/ethnic disparities are seen across all ages similar to the overall race and ethnic disparities in infant mortality (Table 19). Of note, the distribution of births by age of mother does vary somewhat across race and ethnic groups with the highest proportions of teen births among NH American Indian/Alaska Native (11%) and Hispanic/Latino women (11%). The highest proportion of older mothers is among NH Asian women (26%). The highest infant mortality rates are observed for NH Black/African American mothers aged 15–19 and 35–39 as compared to other racial/ethnic groups of similar age groups (Table 19). For NH Black/African American and NH American Indian/Alaska Native mothers between 25–30, and 30–34 years, the infant mortality rates were approximately twice that of NH White mothers in the same age groups. Infants born to NH Black/African American mothers aged 20–24 have the highest mortality rate (8.3) compared to infants born to mothers of other race/ethnicity groups of similar ages.

TABLE 19 Infant Mortality Rates (95% CIs) by Maternal Age and Race/Ethnicity, Washington State, 2011–2015[†]

Age of Mother	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino
15–19	16.8 (9.6, 27.2) [†]	*	*	7.3 (5.7, 9.1)	*	5.0 (3.6, 6.8)
20–24	8.3 (5.8, 11.5)	7.1 (3.9, 11.9) [†]	9.6 (5.2, 16.1) [†]	4.9 (4.3, 5.5)	6.7 (4.0, 10.5)	4.3 (3.9, 5.3)
25–29	8.9 (6.6, 11.8)	8.9 (5.2, 14.3)	6.1 (2.9, 11.2) [†]	4.0 (3.5, 4.4)	2.4 (1.5, 3.5)	4.5 (3.6, 5.4)
30–34	8.0 (5.7, 11.0)	8.0 (3.8, 14.7) [†]	*	3.6 (3.2, 4.0)	3.5 (2.6, 4.5)	3.3 (2.5, 4.3)
35–39	9.7 (6.2, 14.4)	*	*	3.7 (3.1, 4.3)	3.0 (1.9, 4.4)	5.7 (4.2, 7.5)
40+	*	*	*	5.7 (4.2, 7.5)	4.9 (2.3, 9.0) [†]	4.6 (2.2, 8.5) [†]
Total	8.9 (7.6, 10.3)	8.4 (6.3, 10.9)	7.7 (5.5, 10.5)	4.2 (3.9, 4.4)	3.4 (2.8, 4.0)	4.4 (3.9, 4.9)

*Cell suppressed due to small numbers to protect privacy;

[†]Mortality Rates per 1,000 live births

Disparities by Marital Status

Marital status of the mother is linked to birth outcome. Unmarried mothers are at greater risk for inadequate prenatal care and other factors that might contribute to increased risk for poor birth outcomes due to lack of resources and support. Marriage has been shown to be a protective factor against infant mortality.^{67,68} Marriage appears to provide benefits for both women and their children because pregnancies are more likely to be planned, there is a higher level of social and financial support for married mothers and there are less barriers to care such as lack of time or financial concerns.⁶⁹ Although unmarried mothers in all racial/ethnic groups appear to have increased risk for infant mortality compared to married mothers, the differences are not significantly different for any group except NH White mothers (Table 20). Infants born to NH White unmarried mothers are nearly two times more likely to die in the first year compared with infants of NH White married mothers. NH American Indian/Alaska Native unmarried mothers have the highest infant mortality rate (10.5) among unmarried mothers of other racial/ethnic groups (Table 20). Similar to overall infant mortality rate differences, rates for infants of NH Black/African American and NH Other Pacific Islander married mothers are 2.5 and 2.2 times higher than the rate among infants of NH White married mothers.

TABLE 20 Infant Mortality Rates (95% CIs) by Maternal Marital Status and Race/Ethnicity, Washington State, 2011–2015†

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino
Married	8.4 (6.7, 10.4)	*	7.4 (4.4, 11.5)	3.4 (3.2, 3.7)	3.2 (2.6, 3.8)	3.8 (3.2, 4.4)
Unmarried	9.5 (7.5, 11.8)	10.5 (7.7, 13.9)	8.1 (5.0, 12.3)	6.1 (5.5, 6.7)	5.0 (3.3, 7.3)	4.8 (4.1, 5.5)
Total	8.9 (7.6, 10.3)	8.3 (6.2, 10.8)	7.7 (5.5, 10.5)	4.2 (3.9, 4.4)	3.4 (2.9, 4.0)	4.3 (3.8, 4.8)

†Cases with unknown Marital Status were excluded from analysis (n=991);

*Cell suppressed due to small numbers to protect privacy

Disparities by Education Status

Lower levels of educational attainment are commonly associated with poor health, including higher rates of infant and maternal mortality.⁷⁰ The gap in infant mortality based on mothers' years of education has widened significantly since 1985 in the U.S. Increasing maternal education appears to be an important predictor of infant survival.⁷¹ Table 21 provides information on infant mortality rates by education level across race/ethnic groups. The infant mortality rate, in general, is higher among mothers who completed fewer years of formal education; however, this trend does not hold true among NH Black/African Americans, for whom the rate does not change as education increases. The infant mortality rate in this group for women who have completed a college or advanced degree is 8.5 (95% CI: 5.3, 12.7) per 1,000 live births; no different than the rate among women who have less than a high school education, 8.7 (95% CI: 5.8, 12.5) per 1,000 live births.

TABLE 21 Infant Mortality Rates (95% CIs) by Maternal Education and Race/Ethnicity, 2011–2015†*

Maternal Education	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino
Less than High School	8.7 (5.8, 12.5)	12.6 (7.9, 19.1)	*	7.4 (6.1, 8.6)	7.6 (4.5, 12.0)	5.3 (4.4, 6.1)
High School or GED	8.7 (6.4, 11.5)	8.2 (4.9, 12.8)	8.8 (5.3, 13.7)	5.3 (4.7, 5.9)	2.5 (1.3, 4.4)‡	3.8 (3.1, 4.7)
Associates or Some College	8.8 (6.8, 11.3)	6.0 (3.1, 10.5)‡	7.5 (3.9, 13.1)‡	3.9 (3.5, 4.3)	4.3 (3.0, 6.0)	3.8 (2.9, 4.8)
College Graduate	8.5 (5.3, 12.7)	*	*	3.0 (2.7, 3.4)	2.7 (2.0, 3.4)	3.2 (2.0, 4.7)

*Cells suppressed due to small numbers to protect privacy;

†Excludes records for which educational attainment was unknown (n=37);

‡Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

MATERNAL MORTALITY Death of a woman (ages 10–49) during pregnancy or up to one year after delivery.

MATERNAL MORTALITY RATE Number of maternal deaths per 100,000 births from any cause that is pregnancy associated.



Poverty: Disparities by Income Level

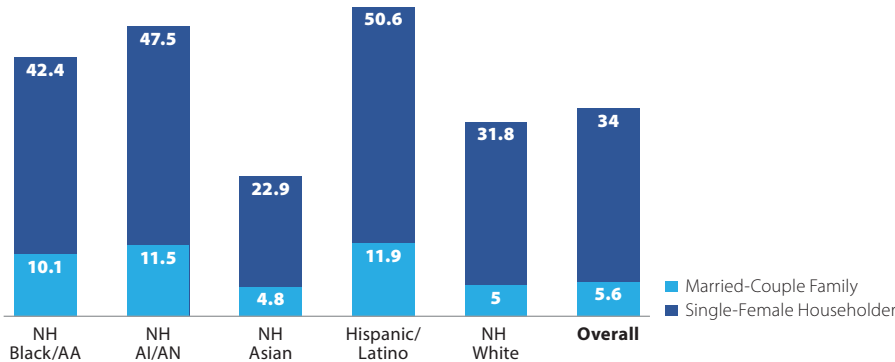
Poverty can limit a family's ability to purchase nutritious food, access health care, secure safe housing, and more. Large and persistent disparities in the level of poverty exist between race/ethnic groups in the United States.

In 2015, the Federal Poverty Level guideline for a family of four was \$24,250, meaning that a family of four that earned \$24,250 in one calendar year was at 100% of the FPL.⁷² Figure 6 shows the percentage of Washington families with children under age 18 in poverty by two categories: Married-Couple Family and Single-Female Householder. This table uses data from the American Community Survey (ACS).⁷³ When poverty estimates are stratified by parental marriage status and race/ethnicity, married NH Asian families in Washington have the smallest percentage of their population below the FPL (4.8%), and married

Poverty can limit a family's ability to purchase nutritious food, access health care, secure safe housing, and more.

Hispanic/Latino families have the highest percentage of their population below the FPL (11.9%). The rate of poverty is much higher among single-female householder families with children under 18 years of age across race/ethnic groups, likely because the householder lacks a spouse's additional income and parental support. The highest percentage of the single-female householders in poverty is seen among the Hispanic/Latino population in Washington, with more than half (50.6%) of these households living in poverty. The lowest percentage is seen in the NH Asian population (22.9%), a difference of 27.7%.

FIGURE 6 Families with Children <18 Below FPL in Last 12 Months by Maternal Race/Ethnicity and Marital Status, Washington State, 2015



Participation in publicly-funded healthcare programs, such as Medicaid, is often used as a proxy measure of income for mothers and children. Across racial/ethnic groups, infants of mothers on Medicaid had higher mortality rates than infants of women not on Medicaid, except for infants born to NH Black/African American mothers (Table 22). In general, the racial/ethnic disparities in infant mortality among women on Medicaid were lower than the race and ethnic disparities among women not on Medicaid.

TABLE 22 Infant Mortality Rates (95% CIs) by Medicaid Status and Maternal Race/Ethnicity, 2011–2015[†]

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Medicaid	8.8 (7.1, 10.7)	8.3 (5.8, 11.5)	8.2 (5.4, 11.9)	5.9 (5.4, 6.5)	4.5 (3.2, 6.2)	4.6 (4.1, 5.2)	5.7 (5.4, 6.1)
Non-Medicaid	8.9 (6.9, 11.4)	7.2 (4.0, 11.9) [‡]	6.7 (3.4, 11.6) [‡]	3.4 (3.1, 3.6)	3.0 (2.4, 3.7)	3.7 (2.9, 4.6)	3.6 (3.3, 3.8)
Total	8.8 (7.5, 10.2)	7.9 (5.9, 10.5)	7.6 (5.4, 10.5)	4.2 (3.9, 4.4)	3.3 (2.8, 3.9)	4.4 (3.9, 4.8)	4.4 (4.2, 4.6)

*Mortality Rate per 1,000 live births;
[†]Excludes infant deaths and births with unknown Medicaid status (n=6,220);
[‡]Relative Standard Error (RSE) >25, indicates unstable estimate due to small numbers

There are large differences in the distribution of Medicaid participation by race and ethnicity among live births as well. The highest proportion of births reimbursed by Medicaid from 2011 to 2015 occurred among the Hispanic/Latino race/ethnic group (71.3%), and the lowest occurred among NH Asians (21.5%). To compare, the overall proportion of births reported as reimbursed by Medicaid on the birth certificate was 39.6%.

TABLE 23 Number/Percent of Total Births by Medicaid Status and Maternal Race/Ethnicity, 2011–2015

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Medicaid	11,168 (60.5%)	4,329 (67.5%)	3,297 (64.6%)	80,890 (30.4%)	8,420 (21.5%)	55,701 (71.3%)	163,805 (39.6%)
Non-Medicaid	7,292 (39.5%)	2,087 (32.5%)	1,804 (35.4%)	185,153 (69.6%)	30,774 (78.5%)	22,429 (28.7%)	249,539 (60.4%)
Total	18,460 (100%)	6,416 (100%)	5,101 (100%)	266,043 (100%)	39,194 (100%)	78,130 (100%)	413,344 (100%)

Disparities by Smoking Status

As mentioned previously in this report, maternal cigarette smoking is a significant risk factor for infant mortality and morbidity, and outcomes are expected to be worse for infants of mothers who smoke compared to their non-cigarette smoke exposed peers. Using maternally-reported cigarette smoking in the three months before pregnancy, infant mortality is worse among NH Black/African American, NH White, and Hispanic/Latino mothers who reported smoking three months before pregnancy. There does not appear to be an increased risk associated with smoking among NH American Indian/Alaska Natives or NH Native Hawaiian and Other Pacific Islander mothers (Table 24).

The infant mortality rate among NH Black mothers who smoke is almost three times greater than the rate among NH White mothers.

TABLE 24 Infant Mortality Rates by Pre-Pregnancy Maternal Smoking Status and Race/Ethnicity, 2011–2015[†]

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Smoked 3 Months Before Pregnancy	19.8 (13.5, 28.1)	9.6 (5.5, 15.6)	8.3 (2.7, 19.3)	7.0 (6.1, 8.7)	5.5 (1.8, 12.9)	9.6 (6.6, 13.4)	7.7 (6.9, 8.5)
Did not Smoke	7.9 (6.6, 9.3)	8.0 (5.7, 10.9)	7.6 (5.3, 10.6)	3.8 (3.5, 4.0)	3.4 (2.8, 4.0)	4.1 (3.7, 4.6)	4.1 (3.9, 4.3)
Total	8.9 (7.6, 10.3)	8.4 (6.3, 11.1)	7.7 (5.5, 10.5)	4.2 (3.9, 4.4)	3.4 (2.8, 4.0)	4.4 (3.9, 4.8)	4.5 (4.3, 4.7)

*Cell suppressed due to small numbers to protect privacy;
[†]Rate per 1,000 live births

National prevalence estimates of smoking among women of reproductive age range from 17–30%, and varying by demographic characteristics and profession.^{74,75,76} Among all live births in Washington State from 2011–2015, the percentage of women who reported cigarette smoking before pregnancy was 10.3% (Table 25). Reported smoking varied by race/ethnicity category, from a high of 25.5% among NH American Indian/Alaska Native women to a low of 2.3% among NH Asian women. It is important to note that these estimates come from the 2003 U.S. standard revision of the birth certificate, and underreporting of smoking status is an identified issue. One study estimated that 22.9% (95% CI: 11.8, 34.6) of pregnant women who currently smoked did not report smoking, and 9.2% (95% CI: 7.1, 11.2) of women of reproductive age who currently smoked but were not pregnant did not report their smoking.⁷⁷

TABLE 25 Number/Percent of Total Births by Pre-Pregnancy Maternal Smoking Status and Race/Ethnicity, 2011–2015

	NH Black	NH AI/AN	NH NHOPI	NH White	NH Asian	Hispanic/Latino	Total
Smoked 3 Months Before Pregnancy	1,564 (8.3%)	1,669 (25.5%)	606 (11.7%)	35,089 (13.0%)	904 (2.3%)	3,553 (4.5%)	43,385 (10.3%)
Did not Smoke	17,249 (91.7%)	4,885 (74.5%)	4,579 (88.3%)	235,049 (87.0%)	38,842 (97.7%)	75,533 (95.5%)	376,137 (89.7%)
Total	18,813 (100%)	6,554 (100%)	5,185 (100%)	270,138 (100%)	39,746 (100%)	79,086 (100%)	419,522 (100%)

Substance Use Disorders and Infant Outcomes

Maternal Substance Use and Infant Outcomes

Substance use contributes to obstetric and pediatric complications, including Fetal Alcohol Spectrum Disorders, prematurity, abruptio placenta, stillbirth, newborn withdrawal, adverse childhood experiences, neglect, and low birth weight.⁷⁸ The association between substance use and infant mortality needs further research and data analysis that has not yet been completed.

Alcohol

According to the Washington State Pregnancy Risk Assessment Monitoring System (PRAMS), approximately 68% of women in 2014 reported drinking alcohol in the three months prior to pregnancy, and 20% of women reported binge drinking in the three months prior to pregnancy. Additionally, 15% of women reported drinking during the last three months of pregnancy. The exact impact of alcohol use during pregnancy on infant mortality needs further review.

E-Cigarettes and Vapor Products

Although the aerosol of e-cigarettes generally has fewer harmful substances than cigarette smoke, e-cigarettes and other products containing nicotine are not safe to use during pregnancy. Nicotine is a health danger for pregnant women and developing babies and can damage a developing baby's brain and lungs. Also, some of the flavorings used in e-cigarettes may be harmful to a developing baby. Liquid nicotine is toxic and just a few drops on the skin or taken by mouth may be fatal to children.⁷⁹



Marijuana (Medical and Recreational)

The amount of tetrahydrocannabinol (THC) in marijuana (i.e., marijuana potency) has increased over the past few decades. The higher the THC content, the stronger the effects on the brain. In addition, newly popular methods of using marijuana (e.g., dabbing, edibles) may deliver very high levels of THC to the user. Developing brains, like those in babies and children, are especially susceptible to the adverse effects of marijuana. Although scientists are still learning about the effects of marijuana there is substantial evidence of association between maternal cannabis smoking and lower birth weight of the infant.^{80,81}

The Washington State Department of Health (DOH) provides educational resources to women about the potential risks associated with using tobacco or marijuana during pregnancy and while breastfeeding. As an agency, DOH supports access to cessation services and treatment through the SmartQuit App, Tobacco Quitline, and Recovery Helpline.

The Tobacco and Vapor Product Prevention and Control Program coordinates the implementation of a statewide five-year strategic plan that is the result of a collaborative process with partners and stakeholders around the state. Several state policy priorities have been identified, and are being executed, including an initiative to raise the legal age of the purchase of tobacco and vapor products from 18 to 21 years statewide, and addressing health insurance regulations so all licensed health care providers can be reimbursed for tobacco cessation services. The program is also working with state and local partners on the implementation of a new state law regulating vapor products and reducing exposure to secondhand vape emissions.

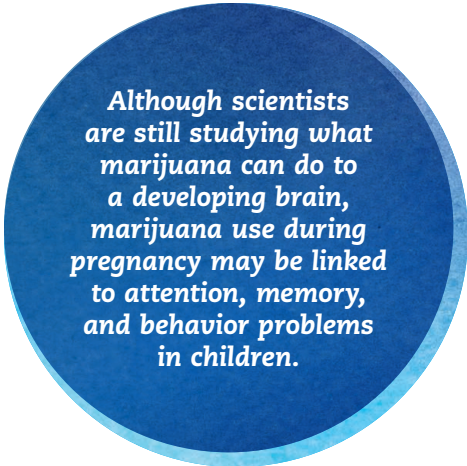
Amphetamines

Between 2009 and 2014, Washington has also seen a surge in maternal hospitalizations with an amphetamine-related diagnosis. Rates have more than doubled over the past six years (4.2 per 1,000 maternal hospitalizations to 9.5 per 1,000 maternal hospitalizations). The long-term effects of amphetamines on the child are still being analyzed by longitudinal studies that look at long term physical and behavior health. The exact impact on in-utero exposure on infant mortality is unclear.

Opioids and Neonatal Abstinence Syndrome

Washington State, like the rest of the nation is in the midst of an unprecedented opioid epidemic, including prescription opioid pain relievers and heroin. Prescription opioid use is common in the United States,^{82,83} and has increased dramatically over the past decade. With the increasing overall population use, we have seen corresponding increases in use among pregnant women.⁸⁴

Neonatal abstinence syndrome (NAS) is a postnatal withdrawal syndrome that can occur after exposure to opioids during pregnancy. Opioid abuse/misuse during pregnancy can also increase the risk of obstetrical complications such as stillbirth, low birth weight, preterm birth, infection (most often Hepatitis C), sexually transmitted infections, and SIDS.⁸⁵ Between 2000 and 2012, the number of infants diagnosed with NAS increased nearly five-fold.^{86,87} According to a CDC examination of state trends in NAS using all-payer, hospital inpatient delivery discharges between 1999 and 2013, NAS incidence rates per 1,000 hospital births in the state of Washington jumped from 1.5 per 1,000 in 1999 to 7.9 per 1,000 in 2013, an increase of 426% (higher than the national increase in this report of 300%)⁸⁸ Between 2004 and 2013, the proportion of NICU days nation-wide attributable to NAS increased six-fold from 0.6% to 4.0%, with 10% NICUs reporting over 10% of total NICU days were attributable to NAS.⁸⁹ It has been estimated that NAS accounts for an estimated \$1.5 billion in hospital costs each year in the U.S.⁹⁰ Several national and state organizations have been working to set standards for prescribing opioids; the CDC published its guidelines for treating chronic pain in 2016.⁹¹ While NAS cannot be directly tied to infant mortality, it does contribute to infant morbidity in our state.



Although scientists are still studying what marijuana can do to a developing brain, marijuana use during pregnancy may be linked to attention, memory, and behavior problems in children.

Policies Impacting Access to Treatment for Opioid Dependence

Federal guidelines for opioid treatment programs were revised in 2015.⁹² On July 6, 2016, the Department of Health and Human Services (HHS) released a [final rule](#) to increase access to medication-assisted treatment with buprenorphine products in the office setting by allowing eligible practitioners to request approval to treat up to 275 patients. The final rule includes requirements to ensure that patients treated by these practitioners receive high-quality care, and to minimize the risk of diversion. In October of 2015, the Washington Health Care Authority (HCA) allowed coverage of medication assisted therapy outside of traditional substance use treatment programs to allow greater access points for treatment and to provide patients with additional flexibility.⁹³ Section 303 of the Comprehensive Addiction and Recovery Act (CARA), signed into law by President Obama on July 22, 2016, made several changes to the law regarding office-based opioid addiction treatment with buprenorphine. Among the changes is an expansion of prescribing privileges to nurse practitioners (NPs) and physician assistants (PAs) for five years (until October 1, 2021).⁹⁴

Gaps in Our Understanding

At the present time, we have no data to determine the extent to which substance dependency contributes to infant mortality. Data may exist in state databases; however, lack of connectivity hinders exploration. Additionally, multiple factors such as late entry into care, resistance to medication assisted treatment, and the complexity of substance dependency in itself impact our ability to treat substance use disorders during pregnancy.

Recommendations

Infant mortality is a marker of a society's overall health, serving as an indicator of underlying issues like poor access to and quality of healthcare services and health inequity. As such, it is an important indicator in [Results Washington](#) and decreasing disparities in low birth weight is one specific objective. The recommendations described in this section serve as an initial framework for developing more specific strategies to address infant mortality.

- Address the social determinants of health in order to reduce racial/ethnic disparities in infant mortality.
- Improve support for vulnerable infants and families in our communities.
- Reduce the rate of low birth weight and preterm births in Washington.
- Reduce the rate of SUID, which includes SIDS and sleep-related infant deaths, in Washington.
- Provide comprehensive, coordinated health care to all women during the preconception, pregnancy, and post-partum periods.
- Improve the rate of pregnancies that are planned and well-spaced, including reducing the rate of teen pregnancies.
- Increase cross-agency access to and linkage of datasets for surveillance, assessment, planning, and quality improvement.

Limitations

This report is the result of collaboration between many professionals and community members, and provides information on infant mortality through synthesis of data, literature review, and subject matter expertise. However, there are still limitations to the methods of this report:

- Race/ethnicity categories are defined according to state standards, with Hispanic/Latino as a stand-alone ethnic group. These categorizations are broad, and may hide intra-group disparities or differences.
- By convention, infant race is categorized according to maternal race and ethnicity only.
- Infants with multiple reported races or with unknown race/ethnicity were excluded from race/ethnicity-specific analyses.
- Fields from the birth certificate have variable validity and reliability. Some variables may be prone to over- or under-reporting.
- Comparisons to state or national estimates are approximations. Although comparisons were carefully considered, variable definitions may differ across locales.
- The analyses presented in this report are restricted to Washington State residents, and findings might not be generalized to other populations.
- Independent contributions of risk factors cannot be determined, as multivariable analyses of the data were not performed.

Recommendation 1

Address social determinants of health, such as poverty and low educational attainment, in order to reduce infant mortality in racial/ethnic groups with disparities.

Rationale

Both the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) report that the social determinants of health have a far greater impact on health than access to healthcare services. Therefore, addressing these determinants should be a priority in preventing infant mortality. In general, disparities persist even after controlling for factors such as income, education, and socio-economic status. While the infant mortality rate has been declining in Washington during the last decade, the rate among NH American Indians/Alaska Natives has been increasing.⁹⁵

Disparities in low birth weight and very low birth weight rates exist for all racial/ethnic groups, with rates being twice as high for NH Black/African Americans as for NH Whites.⁹⁶ Disparities in receiving first trimester prenatal care exist for NH American Indian/Alaska Native, NH Black/African American, NH Native Hawaiian and Other Pacific Islander, and Hispanic/Latino women.^{97,98}

What can we do to make this recommendation happen?

- Support programs and policies that address social determinants of health and social inequities, such as increasing income security, housing stability and rent control; improving educational attainment and success; and expanding healthcare coverage and access.
- Fund infant death review for populations with the highest rates of infant mortality to identify cause of death, contributing factors to the death and prioritize funding accordingly.
- Target funding to communities with the highest infant mortality rate.
- Fund Community Health Representative (CHR) programs in tribal communities to mentor and guide mothers through pregnancy and the first years of parenting. Research has shown that programs such as “[Family Spirit](#)” increase parenting knowledge and involvement; decrease maternal depression; increase home safety; decrease emotional and behavioral problems of mothers; and decrease emotional and behavioral problems of children.⁹⁹
- Fund programs that decrease infant mortality and improve other maternal and child health outcomes,¹⁰⁰ for example, programs that utilize Community Health Workers (CHWs).
- Increase funding to existing programs such as Maternity Support Services (MSS), Infant Case Management (ICM) and Nurse Family Partnership (NFP).
- Fully implement the recommendation from the [Governor’s Interagency Council on Health Disparities](#) to support the [American Indian Health Commission’s Maternal-Infant Health Strategic Plan](#).¹⁰¹ The goal of this plan is to address specific issues facing tribal communities through policy, environment and systems change, in part using the [Pulling Together for Wellness](#) framework.

Recommendation 2

Improve support for vulnerable infants and families in our communities.

Rationale

The birth of a baby brings joy to families, neighborhoods, and communities.¹⁰² Unfortunately, some infants are particularly vulnerable. Vulnerability can be attributed to physical, psychological, and social risk factors. These often intersect, creating more vulnerability. Physical vulnerability includes infants born preterm, infants with special health care needs such as cystic fibrosis, heart conditions, and birth defects. Vulnerability in the psychological area is usually attributable to parental mental health conditions, both chronic and acute, such as postpartum depression. This area also includes substance use disorder in parents or other caregivers. There is ample literature about the significant impact on infants from an environment in which the caregiver has mental illness or substance use disorder.^{103,104,105}

Another risk for infants is the social environment of the family, and often extended to the neighborhood and community. Examples of social risk for infants are low socio-economic status, violence, including family violence and neighborhood/community violence, neglect, homelessness, lack of adequate access to health care, and poor nutrition.^{106,107}

What can we do to make this recommendation happen?

- Require insurers to pay for at least one home visit post-partum to assess caregivers' and newborns' medical, mental health, and socio-economic needs and risk factors, child injury concerns, breastfeeding, car seats, safe sleep environment, newborn's medical needs, birth control, community resources, and other factors as appropriate. In that visit, identify need and facilitate additional home visiting and resources for each family's specific needs.
- Implement quality improvement around screening and referral of caregivers for depression and substance use by pediatric providers.
- Institute quality improvement measures to ensure that every child receives well child visits, according to the [American Academy of Pediatrics Bright Futures](#) initiative.
- Explore and identify strategies to ensure that all school districts provide sexual health education per the requirements outlined in the [Healthy Youth Act of Washington](#), ensuring every public school in our state provides sexual health education which is medically and scientifically accurate and age-appropriate, regardless of gender, race, disability status, or sexual orientation, and includes information about methods of preventing unintended pregnancy as well as sexually transmitted infections.
- Promote the [Safe Haven law \(RCW 13.34.360\)](#) and encourage potential drop off locations to promote use through signage and policies as well as educate future parents about the law.

Recommendation 3

Reduce the rate of low birth weight and preterm births in Washington.

Rationale

Low birth weight is when a baby is born weighing less than 5 pounds, 8 ounces. About one in every 12 babies in the United States is born low birth weight. Some low birth weight babies are healthy, even though they are small. However, being low birth weight can cause serious health problems for some babies.

There are two main reasons why a baby may be born low birth weight:

- **Preterm birth.** This is birth before 37 weeks of pregnancy. About seven of 10 low-birth weight babies are preterm. The earlier a baby is born, the lower their birth weight may be. About one in 10 babies in the United States is born preterm. Health care providers can work with clients to help reduce the chances of having a preterm baby.
- **Fetal growth restriction** (also called growth-restricted, small for gestational age, and small for date). This means a baby does not gain the weight they should before birth. Growth-restricted babies may have low birth weight simply because their parents are small. Others may have low birth weight because something slowed or stopped their growth in the womb. About one in 10 babies (10 percent) are growth-restricted.

Although babies born low birth weight and/or preterm are a small percentage of all births, these infants account for a large proportion of infant deaths.¹⁰⁸ Low birth weight and preterm birth are leading causes of infant mortality and morbidity in our state for all races. NH Black/African Americans, NH Native American/Alaska Native, and NH Native Hawaiian and Other Pacific Islander infants are more likely to be born preterm and/or low birth weight¹⁰⁹ and the leading cause of death for NH Black/African Americans is short gestation and low birth weight.

What can we do to make this recommendation happen?

- Fund smoking cessation from tobacco, vaping, and marijuana for pregnant women and mothers of infants, as well as those living with them, to reduce low birth weight and SIDS.
- Ensure that all preterm birth education materials meet Culturally and Linguistically Appropriate Services (CLAS) standards.
- Fund enhanced reimbursement for evidence-based and/or evidence-informed group prenatal care in order to reduce low birth weight.
- Analyze further if the price and/or prior authorization for [17 alpha-hydroxyprogesterone caproate](#) is delaying or preventing treatment for women who need this medication to prevent a preterm birth.
- Continue to track [early elective deliveries](#) to sustain recent hospital gains in reducing the rate of elective delivery before 39 weeks.
- Ensure appropriate management of maternal chronic medical disorders before, during and after pregnancy in order to decrease risk of prematurity.
- Understand if and how multiple births through assisted reproductive therapy (ART) impact infant mortality in our state.

EARLY ELECTIVE DELIVERIES Neonates delivered before 39 weeks of pregnancy that were non-medically indicated. Elective deliveries may occur either by induction or cesarean section (C-section).

Recommendation 4

Reduce the rate of SUID, which includes SIDS and sleep-related infant deaths, in Washington.

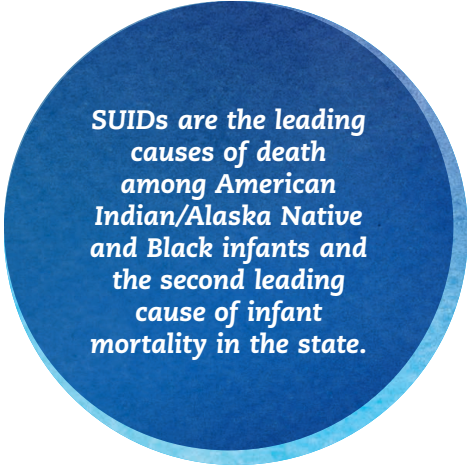
Rationale

SUIDs, which include SIDS and sleep-related deaths, are the leading causes of deaths among NH American Indian/Alaska Native infants, the leading cause of death in the NH Black/African American population, and the second leading cause of infant deaths in the state overall ([Table 6](#)). As with infant mortality rates overall, racial/ethnic differences in SUID rates exist. The majority of these deaths are attributed to SIDS and Accidental Suffocation and Strangulation in Bed, potentially preventable causes of infant mortality.

Teen maternal age, plurality, low socioeconomic or educational status, maternal smoking, not breastfeeding or decreased breastfeeding duration, cultural practices, lack of prenatal care, and unmarried status are other factors that may influence the observed SUID patterns. Further exploration is needed to explain the racial/ethnic disparities in SIDS and other sleep-related infant deaths.¹¹⁰

What can we do to make this recommendation happen?

- Use the American Academy of Pediatrics [recommendations](#) as the guideline for all infant safe sleep promotion in Washington.
- Fund implementation of a statewide infant death review that builds from current local [Child Death Review](#) efforts to identify causes of death and prioritize funding accordingly.
- Fund smoking cessation from tobacco, vaping, and marijuana for pregnant women and mothers of infants, as well as those living with them, to reduce low birth weight and SIDS.
- Fund implementation of evidence-informed and culturally appropriate interventions for safe sleep practices.
- Promote reimbursement for community lactation support to increase exclusive breastfeeding for at least six months for all babies. Beyond the health benefits of breastfeeding, emerging research shows that breastfeeding is a protective factor for Sudden Infant Death Syndrome (SIDS).¹¹¹
- Fund Community Health Representative (CHR) programs in tribal communities to mentor and guide mothers through pregnancy and the first years of parenting. Tribal communities are disproportionately affected by SIDS and research has shown that these programs can increase home safety.¹¹²



SUIDs are the leading causes of death among American Indian/Alaska Native and Black infants and the second leading cause of infant mortality in the state.

Recommendation 5


Provide comprehensive, coordinated health care to all women during the preconception, pregnancy, and post-partum periods.

Rationale

The health status and health experiences of women before and between pregnancies are critical to healthy birth outcomes.¹¹³ In addition to intentionally planning a pregnancy, women are encouraged to address chronic health conditions, take vitamins including folic acid, and reduce risky behaviors before conception. Increasing these practices within Washington could lead to improved birth outcomes, including a reduction in infant mortality for all populations.¹¹⁴ An optimal pregnancy outcome depends on good health across the parent's entire life span prior to the pregnancy.¹¹⁵ Comprehensive medical services and community-based interventions,¹¹⁶ provided in a manner sensitive to the cultural needs of families, along with optimized individual-level health, would also lead to improved outcomes. It is important to take a holistic approach when assessing a woman's preconception wellness, in addition to assessing the nine clinical measures including: 1) pregnancy intention, 2) access to care, 3) preconception multivitamin with folic acid use, 4) tobacco avoidance, 5) absence of uncontrolled depression, 6) healthy weight, 7) absence of sexually transmitted infections, 8) optimal glycemic control in women with pregestational diabetes, and 9) teratogenic medication avoidance. It is critical to also consider management of risk factors such as genetic and family history, maternal age and prior pregnancy outcomes while enhancing protective factors such as nutrition, family planning and providing screening and referral for interpersonal violence and sexual abuse concerns.¹¹⁷

What can we do to make this recommendation happen?

- Establish outpatient pediatric and family practice providers to implement patient care protocols that screen the mother at well-baby checks during the first year of the baby's life for smoking status, depression, contraception use, and folic acid consumption.
- Promote/provide preconception and interconception care for women of childbearing age with an emphasis on controlling chronic disease, folic acid, birth control, and other prevention management for those contemplating pregnancy.
- Promote evidence-informed group prenatal care, and increase reimbursement for this type of prenatal care.
- Promote the use of and educate women of reproductive age about the benefits to taking folic acid and its impact on preventing congenital anomalies, the leading cause of infant death.
- Continue to promote the use of doulas due to the strong evidence that doula care improves labor outcomes by reducing cesarean deliveries, length of labor, and pain medication use as well as rates of breastfeeding.¹¹⁸
- Require insurers to pay for at least one home visit post-partum to assess caregivers' and newborns' medical, mental health, and socio-economic needs and risk factors, child injury concerns, breastfeeding, car seats, safe sleep environment, newborn's medical needs, birth control, community resources, and other factors as appropriate. In that visit, identify need and facilitate additional home visiting and resources for each family's specific needs.
- Promote the use of the national [Text4Baby campaign](#) as an educational tool for parents and caregivers in Washington State.



Because pregnancy outcomes depend on good health throughout the lifespan, medical services and culturally appropriate interventions can lead to improved birth outcomes.

Recommendation 6

Improve the rate of pregnancies that are planned and well-spaced, including reducing the rate of teen pregnancies.

Rationale

Unintended, unwanted, and mistimed pregnancies are associated with a significant increased risk of preterm birth and low birth weight. The infant mortality rate of babies born to teens is higher than the rate of infant death for older mothers across most races and ethnicities. Teens from populations of color and American Indian teens in Washington have higher birth rates than White teens.¹¹⁹ One of the most effective strategies in reducing unintended pregnancies is Long-Acting Reversible Contraception (LARC). LARC methods are more than 99% effective at preventing pregnancy, are safe for most women and teens, and are underutilized in our state.

What can we do to make this recommendation happen?

- Increase the number of birthing hospitals which have implemented programs for tubal ligation and LARC insertion during the postpartum inpatient period.
- Hospitals, clinics, and primary care providers should be trained and have policies that allow contraception services including LARC insertion.
- Expand teen pregnancy prevention programs to include free access to LARC, access to the birth control of their choice without parental consent, support and educate teens who are parenting, and assistance for teen parents to delay repeat pregnancies.
- Clinics providing contraception services must disseminate culturally appropriate education materials related to contraception options with particular sensitivity to ensuring each woman's choice of contraception is the right one for her.
- Increase state funding of family planning clinics, through the DOH family planning program, and Medicaid's 1115 Family Planning Only Waiver so that contraception care can be expanded to more women.
- Explore and identify strategies to ensure all school districts provide sexual health education per the requirements outlined in the [Healthy Youth Act of Washington](#), ensuring every public school in our state provides sexual health education which is medically and scientifically accurate and age-appropriate, regardless of gender, race, disability status, or sexual orientation, and includes information about methods of preventing unintended pregnancy as well as sexually transmitted infections.

Recommendation 7

Increase cross-agency access to and linkage of datasets for surveillance, assessment, planning, and quality improvement.

Rationale

Systematic collection of information about infant and maternal health is conducted by many state agencies in a variety of ways. Each data system and resulting database helps to identify and characterize populations and various unique population needs, which provides vital information for decision-making at each agency. Databases are linked and shared within and across state agencies to help better understand population-level risk factors, outcomes, and services. Linking databases, however, is very time-consuming and resource-intensive. DOH collects data from [Vital Statistics](#) that includes birth certificates and death certificates, and is able to link these two files to better understand infant mortality. The linked file provides information about risk factors at birth, the age of the infant at death, and the leading causes of death. While this file provides information about infant mortality, we are unable to assess many other factors that influence birth outcomes such as poverty, health care, and social service utilization. DOH and other state agencies collect additional data, through PRAMS and other health surveys, about the health of infants and mothers, but these data sources are not linked to infant death records. Improved linkage of databases will help better identify and characterize necessary public health actions and strategies to prevent infant mortality.

Data sources collected by DOH include:

- [Comprehensive Hospital Abstract Reporting System \(CHARS\)](#)
Hospital discharge data provides information on services, diagnoses, procedures, and outcomes associated with labor and delivery.
- [Birth Defects Surveillance System \(BDSS\)](#)
Infants born with congenital anomalies or birth defects are reported to the BDSS; linkage could assess short and long-term outcomes for these infants.
- [Syndromic Surveillance and Notifiable Conditions Data](#)
Monitoring of communicable disease and disease outbreaks and the impact on infant outcomes.
- [Trauma Registry](#)
Assessment of the impact of serious injury on infant morbidity and mortality.
- [Women, Infants, and Children's \(WIC\) Program](#)
WIC data provides risk information associated with nutrition and breastfeeding.
- [Prescription Monitoring Program](#)
PMP data monitors all Schedule II, III, IV, and V drugs, including opioids, to help prevent overdose and misuse; data can potentially help understand the impact of prescription drug use on infant outcomes.
- [Pregnancy Risk Assessment Monitoring System \(PRAMS\)](#)
PRAMS gather information from mothers two to six months postpartum about their experiences before, during, and after their most recent pregnancy.

Health care utilization and social service data are also collected by other state agencies. These sources are essential for understanding risk factors for infant mortality, quality, and equity in service utilization, and costs associated with adverse infant outcomes. [Health Care Authority \(HCA\)](#) has information about Medicaid eligibility, as well as services to both mother and infant. The [Department of Social and Health Services \(DSHS\)](#) has data on service utilization, including substance dependency disorder treatment programs, child welfare services, and mental health treatment. [Department of Early Learning \(DEL\)](#) has

information about Early Learning programs and home visiting services. Together, all of these data sources provide essential information for improving the health of infants in our state.

Partially funded by a federal grant and led by the Health Care Authority, [Healthier Washington](#) is an initiative sponsored by Governor Inslee. Healthier Washington's primary focus is to transform Washington State's healthcare system so our residents can experience better health during their lives, receive better care when they need it, and ensure care is both accessible and affordable. As part of Healthier Washington, DOH is actively engaged with the Health Care Authority and Department of Social and Health Services in a strategy called "[Analytics, Interoperability, and Measurement](#)" (AIM). AIM strategies include working collaboratively across state agencies and public- and private-sector partners to break down data-related silos; addressing long-term needs for health data management solutions, services and tools; and serving as a key lever to implement population health improvement strategies across Washington State.

The Washington State legislature also supports data sharing across state agencies to improve the health of infants and children. Recently passed legislation to create the Department of Children, Youth, and Families includes stipulations that would help the state create a data-focused environment in which there are aligned outcomes and shared accountability for achieving those outcomes across state government agencies, with shared, real-time data that is accessible to staff interacting with families and infants to identify what is needed, and which services would be most effective. There are a number of current efforts to increase data sharing across state agencies. These efforts are vital to increasing state agency capacity to address infant mortality.

What can we do to make this recommendation happen?

- Capitalize on existing opportunities, such as Healthier Washington, to link relevant databases.
- Continue existing efforts and expand resources to link databases both within state agencies and between agencies to provide evidence for program planning and policy development.

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Infant Mortality Reduction Report

DOH 140-157 December 2017

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