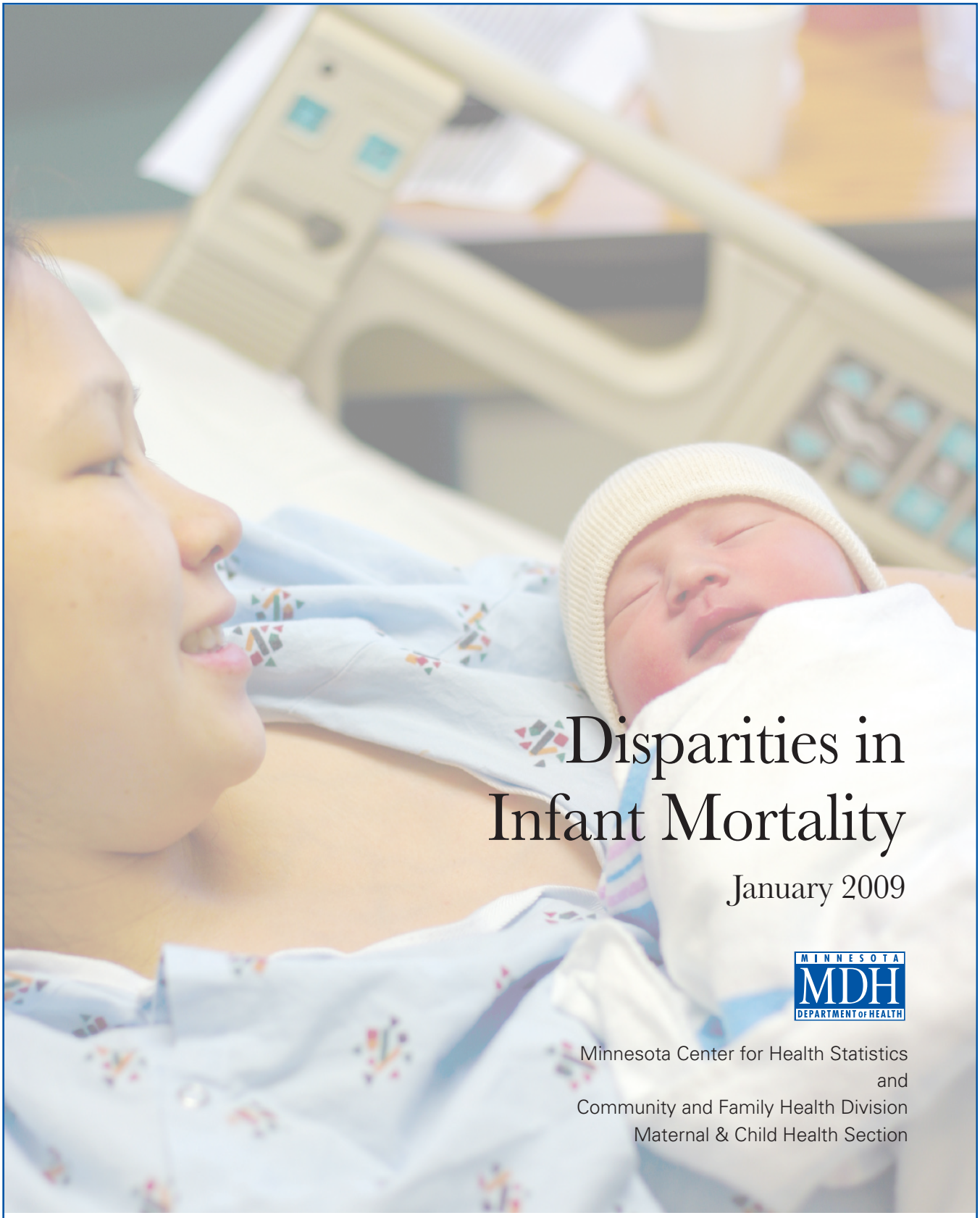


Disparities in Infant Mortality

January 2009

Minnesota Center for Health Statistics
and
Community and Family Health Division
Maternal & Child Health Section

Disparities in Infant Mortality

January 2009

Minnesota Center for Health Statistics
and
Community and Family Health Division
Maternal & Child Health Section

PO Box 64882
St. Paul, MN 55164-0882
Phone: (651) 201-3550
Fax: (651) 201-5179
TDD: (651) 201-5797

TABLE OF CONTENTS

Executive Summary 3

I. Introduction 6

II. Infant Mortality Overview 10

III. Measuring Infant Mortality Disparities 12

Infant Age at Death and Causes of Infant Death 13

Leading Causes of Death. 14

Contributing Factors 16

Individual Factors 18

Infant Characteristics. 23

Environment and Community 26

Systems Factors. 32

Summary 33

IV. Efforts to Reduce Infant Mortality in Minnesota 34

Best and Promising Practices and Strategies to Address Infant Mortality 34

Data Collection and Surveillance 39

Community Input to MDH. 39

Links to Services 40

V. Targeted Efforts to Reduce Infant Mortality Disparities by Race/Ethnicity 41

VI. Recommendations 44

VII. Conclusion 45

VIII. Sources 46

IX. Glossary 47

X. Appendix A – Infant Mortality Rates 48

XI. Appendix B – Causes of Death 51

XII. Appendix C – MCH Advisory Task Force Recommendations 52

EXECUTIVE SUMMARY

Minnesota is widely recognized as one of the healthiest states in the nation. In rankings of insurance rates, access to healthcare, premature death, cardiovascular disease deaths, and smoking rates, Minnesota is at or near the top among all states. In terms of infant mortality, defined as the death of an infant before its first birthday, Minnesota has one of the lowest rates of any state, and Minnesota's overall infant mortality rate is consistently lower than the U.S. rate. Strong maternal and child health programs, higher rates of insurance coverage, poverty rates that are lower than the national average and overall healthier lifestyles may be among the factors that contribute to Minnesota's lower overall infant mortality rate.

Minnesota's overall infant mortality rate is consistently lower than the U.S. rate, but the overall rate masks significant disparities by race and ethnicity

However, looking at Minnesota's infant mortality rate through a larger lens, we see that our low overall rate of infant deaths masks significant disparities by race and ethnicity. While the five-year average mortality rate for White infants in Minnesota during 2001-2005 was 4.4 per 1,000 infants, the rate for African American infants was more than twice as high at 9.2. For American Indians, the rate was even higher at 10.3 per 1,000 infants.

The twin goals of reducing overall rates of infant mortality and eliminating disparities in infant death rates among racial and ethnic groups are high priority public health goals. Additionally, reducing disparities in infant mortality is one of eight target areas for the Eliminating Health Disparities Initiative (EHDI). The EHDI, established by the MN Legislature in 2001, has a goal of reducing the magnitude of disparities in infant mortality between Whites and Populations of Color/American Indians by 50 percent by 2010. Data for the 2001-2005 period show that disparities have been substantially reduced for all racial/ethnic groups, and that the 2010 target has already been met for Asians and Hispanics.

During a period when little progress has been made on the national level to reduce disparities in infant mortality by race, the disparity with Whites has been decreased for Asian and Hispanic infants in Minnesota by 75.0 percent and 66.7 percent, respectively. However, efforts need to continue in order to maintain the gains made with Asians and Hispanics and to reach the target for American Indian and African American infants, where the disparity has been decreased by 26.3 percent and 37.7 percent, respectively. The data also show:

- The overall infant mortality rate in Minnesota is the lowest in the nation, and infant mortality rates for African American, Asian, and Hispanic infants are significantly lower than the national average. The American Indian rate is nearly the same as the national average (2003-2005).
- Relatively small numbers of annual births and infant deaths in some Populations of Color including American Indians mean that the prevention of even one infant death can significantly impact rates. Looked at within this context, the EHDI target could have been reached in the 2001-2005 reporting period if there had been five fewer infant deaths for African Americans per year and three fewer deaths for American Indians.

- The causes of infant mortality are complex and often intertwined, making it challenging to develop public health approaches that will successfully reduce infant deaths.
- Factors that generally decrease the likelihood of an infant death among White mothers (e.g., being married, having a college education, and being tobacco free) do not equally protect infants of African American and American Indian mothers from death.
- While prenatal care is crucial for early risk assessment, intervention, and monitoring among those at risk for adverse birth outcomes, African Americans and American Indians have higher rates of infant mortality regardless of timing of initiation of prenatal care.
- While prematurity and low birth weight contribute to many infant deaths, even full-term and normal birth weight infants of African American and American Indian mothers are two to three times more likely to die in Minnesota than full-term and normal birth weight White infants.
- The causes of death vary among Populations of Color and American Indians, suggesting clear avenues for potential impact. Addressing the higher prevalence of SIDS and other sleep-related infant deaths among American Indian infants could reduce the disparity between American Indian and White infant mortality rates by 41.8 percent. For African Americans, reducing the higher rate of deaths due to SIDS and other sleep-related infant deaths could reduce their disparity by 21.0 percent.

The Minnesota Department of Health, along with its community partners, has a long history of working to reduce both overall infant mortality rates and disparities in rates among racial/ethnic groups, through programs that focus on unintended pregnancy reduction, teen pregnancy prevention, educating communities about risk factors for infant mortality, increasing access to prenatal care, and reducing risk factors such as smoking and alcohol consumption. The results of these programs offer policymakers, the public health community, health care providers, educators and communities a roadmap for continuing progress towards the elimination of health disparities in infant mortality. The specific recommendations include:

1. Assure continuous access to health care for all women of childbearing age. Encourage a health care home.
2. Promote/provide preconception and interconception care to all women of childbearing age.
3. Promote/provide culturally appropriate family planning/child spacing services to all women of childbearing age.
4. Implement Culturally and Linguistically Appropriate Services (CLAS), as developed by the federal Office of Minority Health, throughout health care and the public health system.
5. Screen and refer to programs as appropriate to reduce substance use/abuse for women of childbearing age. For pregnant and parenting women, screen and refer at every visit. This includes alcohol, tobacco, and other drugs.
6. Screen and refer to programs as appropriate to address stress, social support, intimate partner violence, and depression for women of childbearing age. During pregnancy and postpartum, screen and refer at every visit.

7. Educate new parents and their families about reducing the risk of Sudden Infant Death Syndrome (SIDS) and other sleep-related infant deaths.
8. Monitor healthy weight, nutrition status, and adequacy of food supply for women of childbearing age. Educate and refer to nutrition programs as needed. Promote and support breastfeeding.
9. Expand effective teen pregnancy prevention programs, support and educate teens who are parenting, and assist teen parents to delay repeat pregnancies.
10. Assure that all pregnant women have access to prenatal care in the first trimester and receive the appropriate level of care throughout pregnancy and birth based on their level of risk.
11. Periodically review fetal and infant deaths to detect emerging trends, increase community awareness, and engage communities in activities and partnerships to improve birth and infant outcomes.
12. Collaborate with partners to enhance and coordinate activities targeted at assuring healthy women, infants and families.

I. INTRODUCTION

Currently about 70,000 babies are born in Minnesota every year, and about 380 babies die.

The total number of births in Minnesota has increased gradually in the past 10 years. Currently about 70,000 babies are born in Minnesota and about 380 babies die each year. Infant mortality, the death of an infant in the first year of life, has a profound impact on families, extended families, and communities and serves as an important indicator of the health and well-being of a population.

The great strides made to promote maternal and child health in Minnesota and in the U.S. over the last century represent one of the greatest public health success stories in this country. At the beginning of the 20th century, nearly 100 out of every 1,000 babies died before their first birthday[1]; that rate now hovers below 7 per 1,000. Despite that dramatic progress, the U.S. lags behind most countries in reducing infant mortality. Since the 1920s, the U.S. infant mortality rate has been one of the worst among industrialized nations.

Minnesota, on the other hand, has the lowest overall infant mortality rate in the country, and since 1995, infant mortality in Minnesota has steadily declined. The overall infant mortality rate in Minnesota (4.8 per 1,000 births) is significantly lower than the national rate (6.8), and rates for most racial/ethnic groups in Minnesota (White, African American, Asian and Hispanic) are also among the lowest in the country (Table 1). The rate for Minnesota American Indians is very near the national average, and ranks at about the midrange among states reporting rates for this population.

TABLE 1:

Infant Mortality Rates by Race / Ethnicity: Minnesota and United States, 2003-2005

	Overall	White	African American	American Indian	Asian	Hispanic
Minnesota	4.8	4.3	8.7	8.6	3.8	4.3
United States	6.8	5.7	13.3	8.4	4.8	5.6
States Reporting	50	50	39	13	26	40
Minnesota Ranking*	1	2	3	6	2	1

Source: National Center for Health Statistics

* Ranking is from lowest (1) to highest rates (50)

Note: States were excluded from this report if there were fewer than 20 infant deaths.

Three-year reporting period published by National Center for Health Statistics

Yet Minnesota's overall infant mortality rate masks significant disparities in rates, where some populations experience much higher rates of infant deaths than others. In fact, African American and American Indian infants are two times more likely to die than White infants, despite dramatic progress in reducing rates in these populations.

Goals to reduce overall infant mortality and eliminate disparities in infant mortality are the focus of several statewide efforts. Minnesota Milestones, a 30-year plan initiated in 1991, identified infant mortality as a widely accepted and understood measure of community health and included reducing the overall infant mortality rate and reducing disparities in infant mortality among the 70 progress indicators. Reducing infant mortality for all racial/ethnic populations is also an important component of the Minnesota Governor's Performance Accountability Agenda to ensure that all children get a healthy start in life.

In further recognition of the importance of health disparities as an indicator of public health, the Minnesota legislature passed the Eliminating Health Disparities Initiative (EHDI) in 2001. This 10-year initiative has the goal of strengthening and improving the health status of Populations of Color and American Indians in eight targeted health areas, including infant mortality. The EHDI promotes full community involvement and builds on the strengths of communities to implement local grant programs. The Minnesota Legislature set a goal for the state to decrease the disparities in infant mortality rates between Populations of Color and American Indians and Whites by 50 percent by 2010.

The baseline against which reduction in infant mortality rate disparities are measured is the five-year period of 1995-1999, just prior to the establishment of the EHDI (Table 2). The data for the most recent reporting period, 2001-2005, indicate that although this goal has not yet been met for all populations, substantial progress has been made in reducing infant mortality rates, both overall and among Populations of Color and American Indians.

As Table 2 shows, all populations have seen large declines in infant mortality rates ranging from 20.0 percent for Whites to 32.4 percent for Asians. In terms of reducing disparities among the populations, even more substantial progress has been made; the size of the gaps between White infant mortality rates and those for Populations of Color/American Indians have been reduced across the board, with the shrinking of the gap ranging from 26.3 percent for American Indians to 75.0 percent for Asians. These reductions are likely due to a combination of factors: EHDI efforts targeting Populations of Color and American Indians, MDH and community programs focused on the health of mothers and children directed to all populations, and advances in health care focused on premature and low birthweight infants.

Another perspective on the progress made toward reducing infant mortality disparities comes from considering the additional reduction in infant deaths required to achieve the 50 percent disparity reduction goal. For some populations, such as American Indians, relatively small numbers of annual births and infant deaths mean that the prevention of even one infant death can significantly impact rates. Within this context, the 50 percent disparity reduction goal could have been reached in the 2001-2005 reporting period if there had been five fewer infant deaths for African Americans per year and three fewer deaths for American Indians.

The 50 percent disparity reduction goal could have been reached in the 2001-2005 reporting period if there had been five fewer infant deaths for African Americans per year and three fewer deaths for American Indians.

TABLE 2:
EHDI Infant Mortality Rates and Disparities

	African American	American Indian	Asian	Hispanic	White
Baseline (1995-1999)	13.2	13.5	7.1	7.0	5.5
Current (2001-2005)	9.2	10.3	4.8	4.9	4.4
Percentage Mortality Reduction	30.3%	23.7%	32.4%	30.0%	20.0%
Baseline Disparity with Whites	7.7	8.0	1.6	1.5	na
Current Disparity with Whites	4.8	5.9	0.4	0.5	na
Percentage Disparity Reduction with Whites	37.7%	26.3%	75.0%	66.7%	na
EHDI Disparity Goal Met*	no	no	yes	yes	

Source: Minnesota Department of Health, Vital Statistics
Baseline Disparity with Whites = Baseline Population of Color Rate – Baseline White Rate
Current Disparity with Whites = Current Population of Color Rate – Current White Rate
*EHDI Disparity Reduction Goal - 50 %

Infant mortality rates for Populations of Color and American Indians have decreased dramatically, during a time when little or no improvement has been seen for these populations at the national level. At the same time, the size of the disparity for all populations when compared to Whites has decreased substantially. Despite these improvements, though, disparities remain unacceptably high, particularly for African Americans and American Indians. Among these populations, rates remain more than twice as high as the rate for White infants.

Even more troubling is that differences in mortality rates are evident even when infants are born healthy. For example, when African American and American Indian infants are born at normal weight (2500 grams and above) or at normal gestational age (37 weeks gestation and above), they are still at significantly greater risk for death prior to their first birthday than White infants (Table 15).

This report describes the current status of infant mortality by race and ethnicity of mother in Minnesota looking at age at death, cause of death and the characteristics of mothers and infants that raise or lower the risk of infant mortality. Infant mortality rates are explored using a variety of maternal and infant characteristics, as well as environmental, community, and systems factors that influence birth outcomes, such as poverty, education, stress and discrimination.

This report also provides a summary of past and current efforts to address infant mortality including a public health approach to reduce infant mortality overall, and programs and activities that specifically target disparities in infant mortality in Minnesota.

Data Sources

The National and Minnesota vital statistics – linked birth/death dataset, the Minnesota Pregnancy Risk Assessment Monitory System (PRAMS), and Minnesota Health Access Surveys were used as the major sources of data for this report.

The linked birth/death dataset links information from the birth certificate and death certificate such as characteristics of the mother (age, race, education), infant characteristics (birthweight, gestational age), and prenatal care. The linked set also includes information from the death certificate such as age at death and underlying cause of death.

The Minnesota Pregnancy Risk Assessment Monitory System (PRAMS) is a yearly survey of a random sample of mothers who have recently had a baby. It includes questions about attitudes and feelings related to pregnancy, prenatal care, and experiences before, during and after pregnancy. Minnesota PRAMS has oversampled for African American and American Indian mothers in nearly every year since its inception.

Minnesota Health Access Survey, conducted in 2001, 2004 and 2007, is a statewide population survey which studies trends in health insurance coverage in Minnesota.

Data Definitions

An infant death is defined as the death of a live-born infant occurring within the first year of life. The infant mortality rate is the number of infant deaths divided by the number of live births for that year. The infant mortality rate or infant death rate is most often expressed as a rate of death per 1,000 live births. For comparison, consistency, and small numbers for some groups, data are presented as a 5-year aggregate. In a few cases, however, data are presented as a 3-year aggregate for comparison to national results.

The majority of data in this report are presented by race or ethnicity of mother as indicated on the birth certificate. On the birth certificate, race and Hispanic ethnicity are obtained separately and are analyzed separately in this report. Hispanic ethnicity includes anyone indicating Hispanic/Latino descent irrespective of race. The combining of race-specific and Hispanic infant deaths does not match total infant deaths because Hispanics, who can be any race, are counted in the race categories and because the "other" race category is excluded from this analysis.

The infant death data in this report are presented by the year of the infant's birth, not death. For example, in Table 2 the 2001-2005 African American infant mortality rate of 9.2 was calculated using the number of deaths to infants born in 2001-2005 (birth cohort) divided by the number of live births in 2001-2005.

II. INFANT MORTALITY OVERVIEW

INFANT MORTALITY RATE: the total number of deaths divided by the total number of live births within a given time period

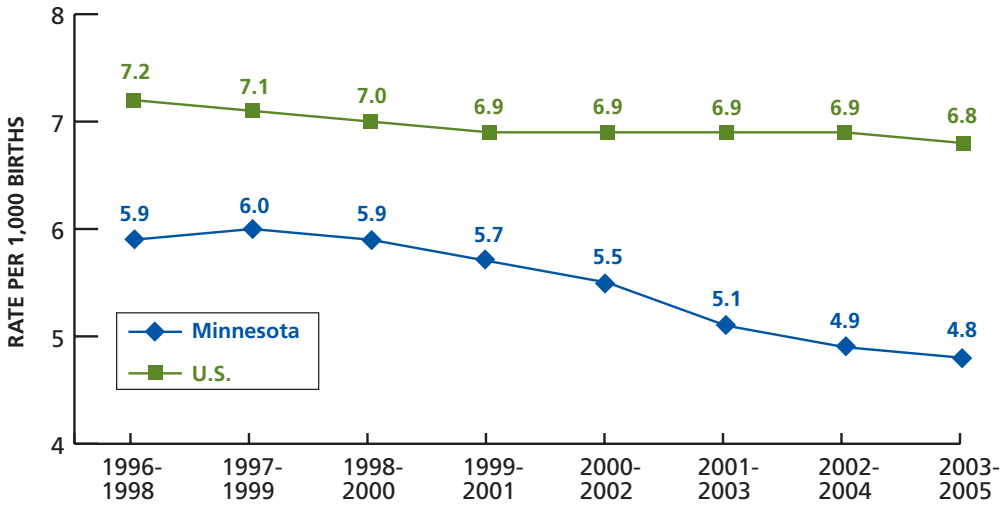
The cost of infant mortality can be measured not only in the cost of the lives of infants, but also in the impact on parents, families and communities. The monetary cost of infant mortality is difficult to measure because it involves the loss of an infant life, and would involve placing a price tag on the health of an individual, family, or community, or the loss to society of a productive human being. From this perspective, the cost of infant mortality far outweighs the expense of preventive programs and health care expenses to prevent infant mortality and other at-risk births.

Research indicates that programs aimed at preventing infant mortality, prematurity, and low birthweight such as early initiation of prenatal care, nutrition education, and preconception care are cost effective approaches as they reduce the likelihood that an infant will be born needing costly and intensive medical treatment. Preventive measures such as preconception and primary health care for women are a more cost effective means of reducing infant mortality and at risk births than other programs targeted at treating the effects of prematurity or other poor birth outcomes, such as neonatal intensive care[2].

Infant Mortality Trends

National and state trends indicate a general decline in infant mortality in recent decades, continuing a trend that began in earnest around the turn of the 20th century. While rates have improved both nationally and in Minnesota, Minnesota's progress has been more rapid than average. From 1996 to 2005 (three year average rates), the infant mortality rate in Minnesota declined by 19 percent, from 5.9 to 4.8 per 1,000 live births, while the U.S. rate declined by 5 percent from 7.2 to 6.8 per 1,000 live births (Figure 1).

FIGURE 1: Infant Mortality Rates, Minnesota and U.S., 3-year Averages



Source: National Center for Health Statistics

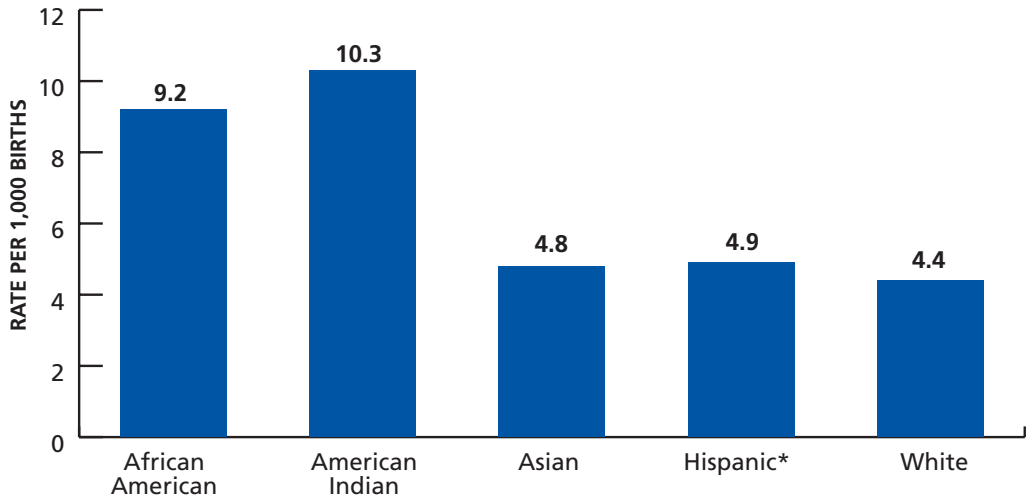
In 2003-2005, the U.S. infant mortality rate (6.8) was 1.3 times higher than the Minnesota rate of 4.8. Compared to other states, the Minnesota infant mortality rate during this time period was the lowest in the country, followed by Utah and Massachusetts, while the District of Columbia and Mississippi had the highest rates at 12.2 and 10.7. Strong maternal and child health programs, higher rates of insurance coverage, poverty rates that are lower than the national average and overall healthier lifestyles may be among the factors that contribute to the low overall infant mortality rate in Minnesota.

Infant Mortality by Race and Ethnicity

A view of infant mortality by race/ethnicity in Minnesota demonstrates that rates of infant death differ substantially between African Americans and Whites and between American Indians and Whites in Minnesota. During 2001-2005, infant mortality rates for American Indians (10.3) and African Americans (9.2) were more than twice as high as the rate for Whites (4.4). Rates for Asians and Hispanics, on the other hand, were close to the White rate (Figure 2).

As will be shown in the next section, the trends in rates for Populations of Color and American Indians mirror the overall Minnesota trend with significant declines among Populations of Color (African American, Asian, Hispanic) and American Indians over the last decade. Despite these declines, significant disparities in rates remain for some racial/ethnic groups as compared to the White rate. Oftentimes, these disparities are masked by the overall decline in Minnesota rates and low rate of infant mortality overall as compared to other states. Given that the rate of infant deaths in a community serves as a strong measure of a population's health, the persistence of disparities in infant mortality rates among racial and ethnic populations is a cause of serious concern.

FIGURE 2: Infant Mortality Rates by Race/Ethnicity, Minnesota 2001-2005



Source: Minnesota Department of Health, Vital Statistics

*Can be any race

III. MEASURING INFANT MORTALITY DISPARITIES

Given the disparities in rates of infant mortality between Populations of Color, American Indians and Whites, it is important to discuss methods of measuring progress towards eliminating these disparities. There are several approaches for identifying and monitoring disparities in infant mortality, including the use of ratios and the raw difference between rates for two groups. A ratio expresses the number of times greater a rate is in proportion to a base rate. For example, Table 3 indicates that in 2001-2005 the infant mortality rate for American Indians was 2.3 times the rate of Whites. The rate difference is the simply the arithmetic difference between two rates, one of which serves as a baseline rate. For example, the rate difference for American Indians compared to Whites in 2001-2005 is 5.9 (American Indian rate – White rate or 10.3 – 4.4 = 5.9). Regardless of which approach is used, the progress made towards reducing health disparities in infant mortality is clear.

Tables 3 and 4 compare rates from 1995-1999 and 2001-2005 by race/ethnicity. A comparison of rates from one time period to the next indicates that infant mortality declined for all race groups, and that the reduction in the difference ranged from 26.3 percent for American Indians to 75.0 percent for Asians. However, a comparison of ratios shows that infant mortality rates for some groups remain nearly as high as a proportion of the White rate as they did in the earlier time period, due to the reduction in the rate for Whites.

For example, between the two time periods, the African American infant mortality rate of 13.2 per 1,000 live births decreased to a rate of 9.2. However, the disparity ratio for the African American rate is still 2.1 times the White rate. For the same time period, the disparity ratio for American Indians went from 2.5 to 2.3 times the rate of Whites, even though the difference in the rates decreased from 8.0 to 5.9. The ratios between Asian and the White and Hispanic and the White infant mortality rates were similar for both time periods, with both ratios just over 1.

TABLE 3:

Infant Mortality Rates and Disparities, Minnesota 1995-1999 and 2001-2005

	1995-1999			2001-2005		
Race/Ethnicity	Infant Mortality Rate	Ratio	Disparity Difference	Infant Mortality Rate	Ratio	Disparity Difference
African American	13.2	2.4	7.7	9.2	2.1	4.9
American Indian	13.5	2.5	8.0	10.3	2.3	5.9
Asian	7.1	1.3	1.6	4.8	1.1	0.4
Hispanic	7.0	1.3	1.5	4.9	1.1	0.5
White	5.5			4.4		

Source: Minnesota Department of Health, Vital Statistics
Infant Mortality Rate: Infant deaths per 1,000 births
Disparity Ratio: Population of Color Rate/White Rate
Disparity Difference: Population of Color Rate –White Rate

The Eliminating Health Disparities Initiative, discussed in greater detail in Section IV, uses the Disparity Differences in Table 3 to calculate percent change to monitor the change in disparities by racial ethnic group (Table 4).

TABLE 4:

Infant Mortality Disparity Difference and Percent Change in Disparity, Minnesota Selected Years

	Disparity Difference		Percent Change in Disparity
	1995-1999	2001-2005	
African American	7.7	4.9	36.4
American Indian	8.0	5.9	26.3
Asian	1.6	0.4	75.0*
Hispanic	1.5	0.5	66.7*

Source: Minnesota Department of Health, Vital Statistics

*Meets the 50 percent reduction in infant mortality as defined by the EHDI legislation

There have been substantial reductions in disparities for all racial/ethnic groups, but significant disparities remain.

Table 4 indicates that there has been a reduction in disparities between racial/ethnic infant mortality rates and the White rate for all racial/ethnic groups. The percent of reduction for Asian and Hispanic groups has been the largest, with both groups already meeting the 2010 goal of a 50 percent reduction in the disparity with Whites. While there have been substantial reductions in disparities for African Americans and American Indians compared to Whites between the two time periods, these data also indicate that there are still significant disparities in rates for these two groups compared to Whites, and that additional progress needs to be made to meet the EHDI target.

Infant Age at Death and Causes of Infant Death

Age at Death

In Minnesota, as in the U.S., approximately 67 percent of infant deaths occur in the neonatal period (the first month of life), with the remaining deaths occurring during the postneonatal period, from one month to the end of the first year of life. In 2001-2005, Minnesota's neonatal infant mortality rate of 3.3/1,000 live births was nearly twice the postneonatal rate of 1.7.

Deaths occurring in the neonatal period are due mostly to problems with the pregnancy or health of the infant, such as preterm delivery, birth defects or low birthweight. Infant deaths occurring in the postneonatal period are more likely to be the result of social and environmental factors such as sudden infant death syndrome (SIDS), exposure to cigarette smoke, or problems with access to health care.

Neonatal and postneonatal death rates by race/ethnicity in Minnesota are similar to the trend in the overall rate of infant mortality, where neonatal death rates are higher than postneonatal death rates (Table 5). Similar to the overall Minnesota rate, for Asians, Hispanics and Whites

the rates of death of an infant within the first month of birth are at least two times higher than corresponding postneonatal rates for Asians, Hispanics and Whites. However, the infant mortality rate for American Indians is actually higher in the postneonatal period, almost six times higher than the White postneonatal rate.

TABLE 5:

Infant Mortality Rates per 1,000 Births by Time of Death and Race/Ethnicity, Minnesota 2001-2005

	African American	American Indian	Asian	Hispanic	White
Age at Death					
Neonatal (<28 days)	5.4	4.3	3.2	3.5	3.1
Postneonatal (28 to 364 days)	3.9	6.0	1.6	1.4	1.3

Source: Minnesota Department of Health, Vital Statistics

Birth defects are the most common cause of infant death

Comparing death rates for racial/ethnic groups in both the neonatal and postneonatal periods, African Americans and American Indians have the highest rates of infant death (Table 5) in both periods. Compared to all racial/ethnic groups in the neonatal and postneonatal periods, the highest mortality rate (6.0) is for American Indians in the postneonatal period, while the second highest rate (5.4) is the neonatal death rate for African Americans. As the next section will show, higher rates of SIDS among American Indians may account for some of this difference.

Leading Causes of Death

In Minnesota and the U.S., congenital anomalies, more commonly known as birth defects, are the most common cause of infant death. Congenital anomalies (e.g. neural tube defects and birth defects of the brain and spinal cord) are conditions that are present in the baby at the time of birth and can be severe enough to result in the death of an infant. In 2001-2005, congenital anomalies accounted for 471 or 27.6 percent of the infant deaths in Minnesota (Table 6).

Complications from prematurity were the second leading cause of death in Minnesota, resulting in 299 deaths (17.5 percent). Sudden Infant Death Syndrome (SIDS) and other sleep-related infant deaths were the third leading cause of infant death in Minnesota, accounting for 13 percent of all infant deaths, followed by obstetric conditions (e.g. multiple gestations, premature rupture of membranes, incompetent cervix) at 11.4 percent. These four leading causes of death accounted for 69.4 percent of all infant deaths in 2001-2005.

TABLE 6:

Leading Causes of Infant Death, Minnesota 2001-2005

Rank	Cause of Death	Number	Percent	Cumulative Percent
1	Congenital Anomalies	471	27.6	27.6
2	Prematurity	299	17.5	45.1
3	SIDS*	220	12.9	58.0
4	Obstetric Conditions	195	11.4	69.4
5	Birth Asphyxia	42	2.5	71.8
6	All Injury	38	2.2	74.1
	All Other	443	25.9	100
Total		**1,708**	**100.0**	

*The SIDS category includes Sudden Infant Death Syndrome and other sleep-related infant deaths.
See appendix for ICD codes and definitions

Causes of infant death varied by race/ethnicity. Congenital anomalies were the leading cause of death for White, African American, and Hispanic infants in 2001-2005, while prematurity was the leading cause for Asians, and SIDS and other sleep-related infant deaths were the leading cause for American Indians (Table 7).

TABLE 7:

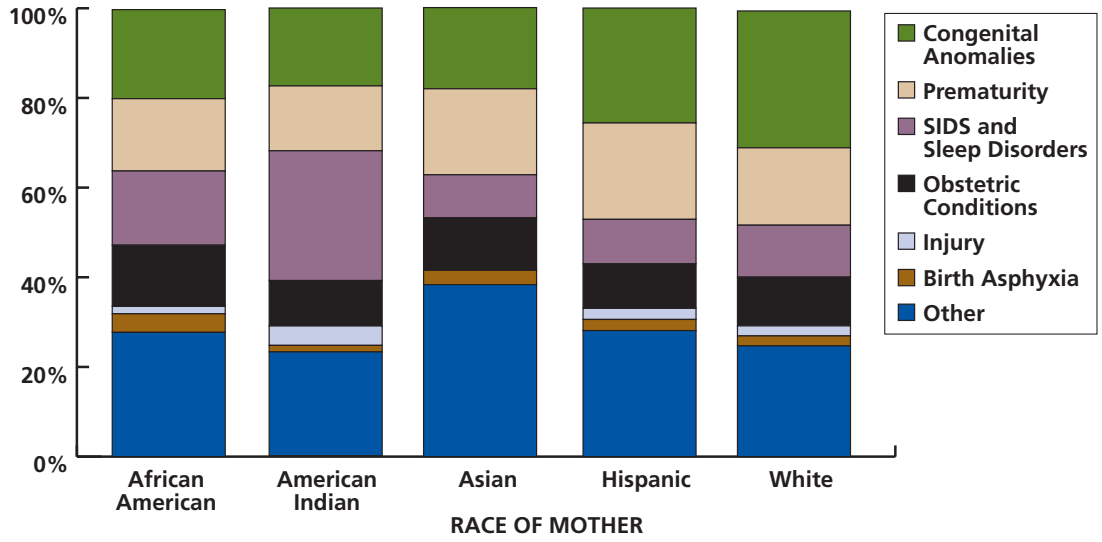
Leading Causes of Infant Death by Cause and Race/Ethnicity of Mother Minnesota 2001-2005

Rank	White	African American	American Indian	Asian	Hispanic
1	Congenital Anomalies	Congenital Anomalies	SIDS *	Prematurity	Congenital Anomalies
2	Prematurity	SIDS *	Congenital Anomalies	Congenital Anomalies	Prematurity
3	SIDS *	Prematurity	Prematurity	Obstetric Conditions	Obstetric Conditions /SIDS*
4	Obstetric Conditions	Obstetric Conditions	Obstetric Conditions	SIDS *	
5	Birth Asphyxia/Injury	Birth Asphyxia	Injury	Birth Asphyxia	Birth Asphyxia/Injury

Source: Minnesota Department of Health, Vital Statistics
*The SIDS category includes Sudden Infant Death Syndrome and other sleep-related infant deaths.

Congenital anomalies, prematurity, SIDS and other sleep-related infant deaths, and obstetric conditions accounted for the majority of deaths for each racial/ethnic group. The greatest variation is for SIDS and other sleep-related deaths, which accounted for 29.0 percent of American Indian infant deaths, 16.6 percent of African American infant deaths, and around 10.0 percent of White, Asian and Hispanic infant deaths (Figure 3).

FIGURE 3: Leading Causes of Infant Death by Cause and Race/Ethnicity of Mother, Minnesota 2001-2005



Source: Minnesota Department of Health, Vital Statistics

In Minnesota in 2001-2005:

- **42% of the excess infant deaths for American Indians, beyond the rate for Whites, are from SIDS and sleep-related disorders**
- **21% of the excess infant deaths for African Americans, beyond the rate for Whites, are from SIDS and sleep-related disorders**

Since most SIDS and other sleep-related infant deaths occur after the first month of birth and before the first birthday of the infant (postneonatal period), the high SIDS and other sleep-related death rate for infants of American Indian mothers accounts for the high postneonatal mortality rate for this group relative to other Populations of Color and Whites. In fact, 41.8 percent of the elevated infant mortality rate for American Indians, when compared with Whites, can be accounted for by their higher rate for SIDS deaths, and 12.0 percent can be accounted for by the differences in prematurity-related deaths. In other words, if the American Indian infant mortality rates from these two causes could be reduced to the levels for White infants, the difference in infant mortality rates between American Indians and Whites would be reduced 31.1 percent.

While 19.9 percent of African American infant deaths were from congenital anomalies, this cause accounted for only 9.2 percent of the 'excess' infant deaths for African Americans beyond the rate for Whites. However, 21.0 percent of the excess African American infant deaths were from SIDS and 14.6 percent were from prematurity-related causes of death. In other words, if the rates of infant deaths from SIDS and prematurity were brought down to the White rate, the African American rate would be reduced by 18.9 percent.

Contributing Factors

Most often, there is no single factor that causes the death of an infant less than one year of age. The death of an infant is most often the result of a number of contributing factors with varying levels of influence on a birth outcome. The complex interactions between these factors, and the varying effects they have on the health of the mother and infant, present challenges in identifying successful approaches to reducing infant mortality.

The situation is even more complex for Populations of Color and American Indians, because the relationships among contributing factors that often hold true overall and for White infants, do

not necessarily follow the same patterns for Populations of Color and American Indians, leading to sometimes contradictory findings and recommendations. Without a better understanding of the complexity of underlying causes of an infant death among these groups, eliminating these racial/ethnic disparities will remain an elusive goal.

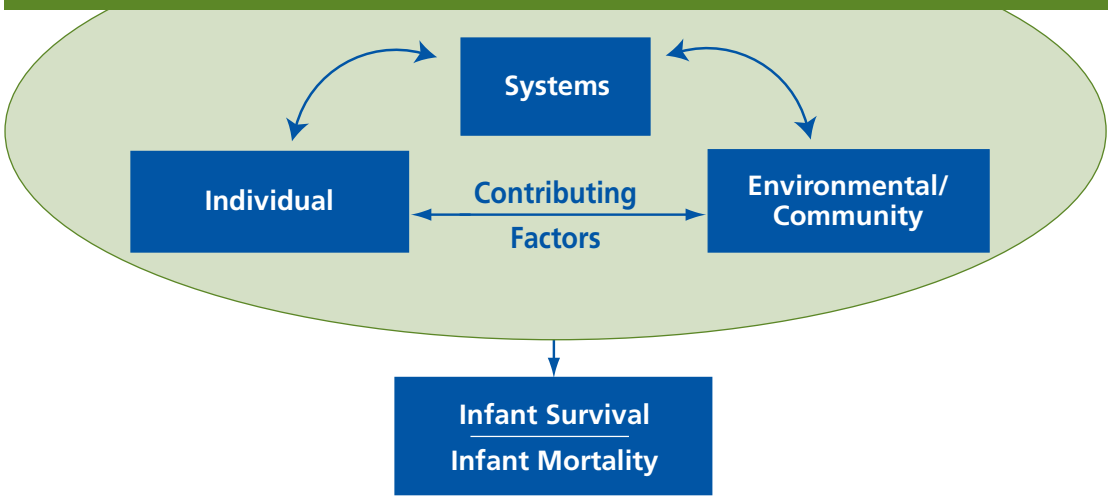
This section organizes contributing factors into three distinct groups: individual (e.g. maternal behaviors), environmental/community (e.g. housing and income) and systems factors (e.g. health care infrastructure and policies), and provides data that illustrate factors that place infants at a greater risk for infant mortality (Figure 4). While multiple factors are often present in the event of an infant death, this section describes the fundamental relationship between a risk factor and an infant death in order to understand how even one risk factor can contribute to infant death (Table 8). In addition to presenting this information for the overall population, this section also compares contributing factors for Populations of Color and American Indians and Whites where there are differences in the findings.

Individual factors are the characteristics or behaviors that have an impact on the health of the mother or the infant. Individual factors that impact birth outcomes include maternal characteristics such as age, maternal behaviors including tobacco use, and infant characteristics such as birth weight.

Environmental and community factors include factors relating to the physical environment (e.g. living and working conditions), the social environment (e.g. cultural and social cohesion), and the economic environment (e.g. income, insurance and affordable health care).

Systems factors related to infant mortality include the health care delivery system, and the state and local public health system.

FIGURE 4:
Contributing Factors for Infant Mortality



Individual Factors

In Minnesota in 2001-2005:

- **Infants born to African American mothers under 20 years old had lower infant mortality rates than infants born to older African American mothers.**
- **For infants born to American Indian mothers, age did not affect the risk of infant mortality.**

Maternal characteristics

Maternal age, marital status, nativity (birthplace of mother), education, and mother's health prior to and during pregnancy all contribute to pregnancy health and birth outcomes.

TABLE 8:

Individual Factors that Affect Birth Outcomes

Maternal Characteristics	Maternal Behaviors	Infant Characteristics
Maternal Age	Tobacco Use	Birthweight
Chronic Illness	Substance Use	Gestational Age
Marital Status	Nutrition	Plurality (Multiple/ Singleton)
Nativity (Birthplace of Mother)	Pregnancy Intention	
	Prenatal Care	Birth Defects

Maternal age can pose an increased risk for an unhealthy pregnancy, birth, and infant. Infants of teen mothers and older mothers, for both biological and social reasons, have a higher risk of infant mortality than infants of mothers in other age groups. In Minnesota, the infant mortality rate for teens was 1.5 times higher than the rate for older mothers in both the 20 to 34 years and 35 years and older age groups in 2001-2005 (Table 9).

Table 9 shows that the increased risk of infant mortality for teen mothers overall is not always the case with some Populations of Color. Asian and Hispanic infants whose mothers were under 20 years of age and age 35 and over in Minnesota were at increased risk of infant mortality (Table 9). But this was not the case for infants born to African American and American Indian mothers. For African Americans, the infant mortality rates increased with age, with infants born to mothers under 20 years of age having the lowest rate (6.5). For American Indians, the rates for infants born to mothers under 20 years and age 20 to 34 years were nearly identical (10.5 and 10.6).

TABLE 9:

Infant Mortality Rates per 1,000 Births by Age of Mother, Minnesota 2001-2005

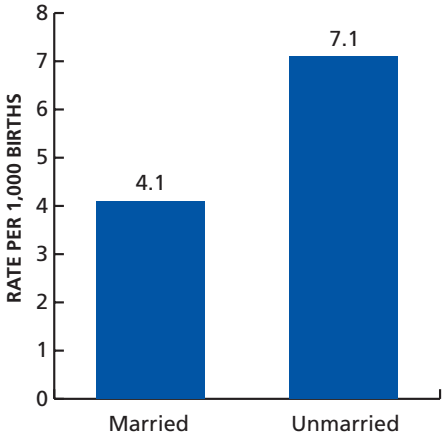
Age of Mother	African American	American Indian	Asian	Hispanic	White
Under 20 years	6.5	10.5	5.8	6.9	7.0
20 to 34 years	9.5	10.6	4.4	4.5	4.3
35 years and older	11.2	#	6.2	5.5	4.3

Source: Minnesota Department of Health Center for Health Statistics

- Fewer than 10 infant deaths

Marital status of the mother has also been linked with pregnancy outcomes, where unmarried mothers are more at risk for poor pregnancy and birth outcomes than married mothers. Single mothers are at a greater risk for inadequate prenatal care and smoking, as well as for other lifestyle risks that might further contribute to increased risk for poor birth outcomes in this population. In Minnesota, the mortality rate for infants born to unmarried mothers was 7.1, 1.7 times higher than the rate for infants born to married mothers (2001-2005, Figure 5).

FIGURE 5: Infant Mortality Rate by Marital Status of Mother, Minnesota 2001-2005



Source: Minnesota Department of Health Center for Health Statistics

There are differences in infant mortality rates by race/ethnicity and marital status, as well. For African Americans, Asians, Hispanics and Whites, infants born to unmarried mothers are more likely to die (Table 10) than those of married mothers. However, the opposite is true for infants born to American Indian mothers; the infant mortality rate is 11.3 for married compared to 9.9 for unmarried women Table 10.

TABLE 10:

Infant Mortality Rates by Marital Status of Mother, Minnesota 2001-2005

Marital Status	African American	American Indian	Asian	Hispanic	White
Married	8.8	11.3	4.4	4.4	3.8
Unmarried	9.3	9.9	5.7	5.3	6.6

Source: Minnesota Department of Health Center for Health Statistics

Nativity (birthplace of mother) illustrates some additional differences in infant mortality rates. Infants born to U.S. born mothers tend to have higher infant mortality rates than infants born to foreign-born mothers. However, in Minnesota the infant mortality rates by nativity of mother were nearly identical. In 2001-2005, the Minnesota mortality rate for infants born to U.S. mothers was 4.8, compared to 5.0 for foreign born mothers.

When comparing infant mortality rates of U.S.-born and foreign-born groups by race/ethnicity, however, there are striking differences. The risk of an infant death is lower among African Americans, Asians, and Hispanics when the mother is born outside of the U.S. (Table 11) than when the mother is U.S.-born. In fact, the infant mortality rate for Asians is more than twice as high for births to U.S.-born mothers as compared to births foreign-born mothers. Also, the rate for U.S. born Asians is closer to the rates of U.S. born African Americans and American Indians. A variety of different hypotheses have been advanced to account for the lower infant mortality

In Minnesota in 2001-2005:

- **Infants born to unmarried American Indian mothers had a lower infant mortality rate than married American Indian mothers.**
- **Infants born to married American Indian women are three times more likely to die than infants born to married White women.**
- **Infants born to married American Indian women are twice as likely to die as infants born to married White women.**

rates among infants of foreign born mothers, including possible differences in migration selectivity, social support, and risk behaviors[3]. Discrimination and stress have been associated with poor health and may explain some of the differences in birth outcomes. African Americans, Asians and Hispanics have generally faced long-term exposure to socioeconomic and structural discrimination and stress, which may also contribute to their relatively higher rates compared to their foreign-born counterparts[4].

TABLE 11:

Infant Mortality Rates per 1,000 Births by Maternal Nativity (Birthplace), Minnesota 2001-2005

Maternal Birthplace	African American	American Indian	Asian	Hispanic	White
U.S. Born	10.0	10.1	9.0	6.0	4.4
Foreign Born	7.3	na	3.9	4.4	4.9

Source: Minnesota Department of Health Center for Health Statistics

na – not applicable

Maternal health also has an impact on birth outcomes. Mothers with preexisting health conditions are at risk for adverse pregnancy outcomes and/or maternal complications. These conditions include maternal hypertension, cardiovascular diseases, gestational diabetes, asthma, and chronic lung conditions. For example, diabetes complicated 1 in every 22 live births to Minnesota residents in 2005, an increase from 1 in every 34 live births in 1993[5].

Maternal Behaviors

Maternal behaviors include the health-related behaviors of mothers prior to and during pregnancy. There are multiple maternal behaviors that contribute to healthy pregnancies and births and a number of factors that place women and infants at risk. One of the ways to prevent poor birth outcomes, including infant mortality, is to promote healthy behaviors of mothers before and during pregnancy.

Smoking during pregnancy places infants at greater risk for poor birth outcomes including infant mortality. Maternal smoking during pregnancy has long been linked with increased SIDS risk, with the increased risk correlated with how much the mother smokes. Several studies have demonstrated that passive tobacco smoke after birth also significantly increases the risk for SIDS. The risk for SIDS is increased in normal birth weight infants about two-fold with passive smoke exposure and about three-fold when the mother smokes during the pregnancy and the baby continues to be exposed to tobacco smoke after he/she is born[6].

Comparing smoking rates by race/ethnicity reveals striking differences in the percent of mothers who reported smoking during pregnancy and differences in infant mortality rates among those who reported smoking and not smoking (2001-2005).

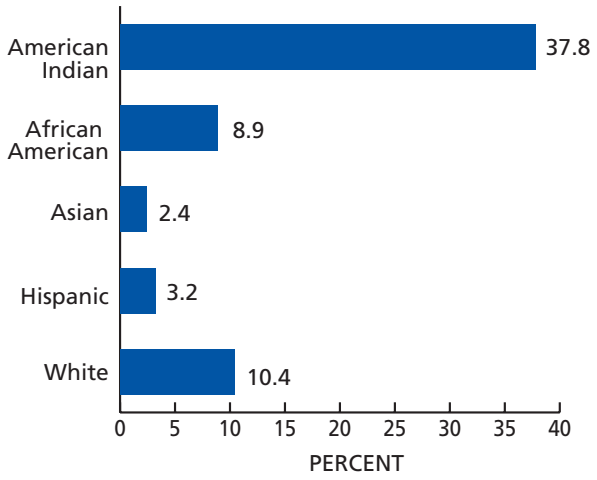
The percent of women who smoked during pregnancy was markedly different among racial/ethnic groups (Figure 6). Asian and Hispanic women reported the lowest rates of smoking during pregnancy (2.4 and 3.2 percent, respectively) and while the African American rate was two to three times higher, this rate was lower than both American Indians and Whites. The data also indicate that over one-third of American Indian mothers reported smoking during pregnancy.

Tobacco use during pregnancy increases the risk of infant mortality.

However, the infant mortality rates for infants born to African American and American Indian mothers who did not smoke are higher than the rate for infants of White mothers who smoked (Minnesota, 2001-2005).

In Minnesota (2001-2005) the mortality rate for infants whose mothers reported smoking during pregnancy was 7.5, 1.7 times higher than the rate for infants of mothers who did not report smoking. By race, the mortality rates for infants whose mothers smoked were higher than for mothers who did not smoke (Table 12). When comparing the rates by race, African American and American Indian infant mortality rates were nearly twice as high as the White rates regardless of smoking status during pregnancy. In addition, the mortality rates for infants of African American and American Indian women who did not smoke were higher than the rate for infants of White women who smoked.

FIGURE 6: Percent of Women Who Reported Smoking During Pregnancy, Minnesota 2001-2005



Source: Minnesota Department of Health Center for Health Statistics

TABLE 12:

Infant Mortality Rates per 1,000 Births by Smoking Status during Pregnancy, Minnesota 2001-2005

Smoking Status during Pregnancy	African American	American Indian	Asian	Hispanic	White
Smoked	13.1	12.4	#	#	6.7
Did Not Smoke	8.4	8.0	4.4	4.6	3.9

Source: Minnesota Department of Health Center for Health Statistics

- Fewer than 10 infant deaths

Alcohol use during pregnancy can also result in poor birth outcomes including physical and mental birth defects. The March of Dimes reports that alcohol use during pregnancy has also been associated with miscarriage, low birthweight and stillbirth, and that each year, up to 40,000 babies are born with some degree of alcohol-related damage[7]. In Minnesota, our understanding of this connection is limited because of a lack of available data. While alcohol use of the mother is included on the birth certificate of the infant, the self-report of the mother is not always considered reliable; in addition missing incomplete information prevents the reporting of these data.

Prenatal care is another common indicator of maternal behaviors during pregnancy as well as an indicator of access and adequacy of health care specific to mothers and infants. Women who initiate prenatal care late or not at all are at a greater risk for poor birth outcomes and infant mortality compared with women who receive prenatal care in their first trimester.

Women who initiate prenatal care late or not at all are at a greater risk for poor birth outcomes and infant mortality

For the years 2001-2005, Minnesota women who had inadequate or no prenatal care had approximately 2.5 times the risk of infant death compared to women who received adequate or intensive prenatal care (Table 13). Similarly, infants whose mothers began prenatal care in the first trimester had a much lower infant mortality rate (4.5) than infants whose mothers did not have prenatal care or began it in the third trimester (9.1).

TABLE 13:

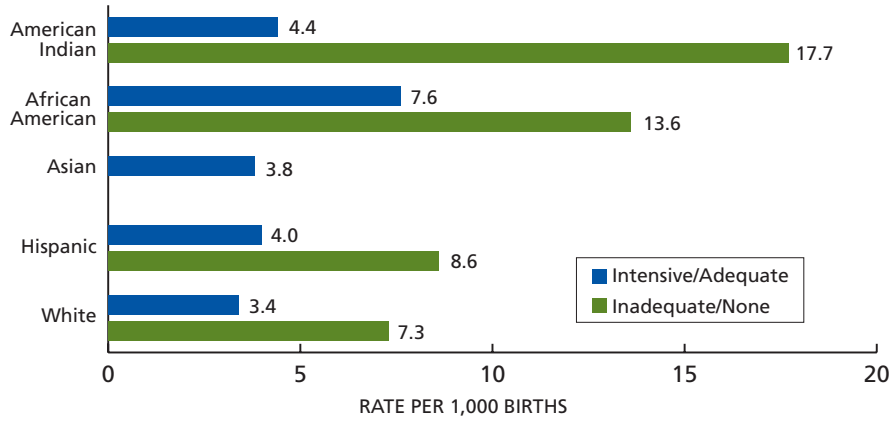
Infant Mortality Rates by Prenatal Care Received, Minnesota 2001-2005

Adequacy of Prenatal Care*	Rate	Trimester Prenatal Care Initiated	Rate
Intensive/adequate	3.7	1st Trimester	4.5
Inadequate/none	9.3	3rd Trimester or none	9.1

Source: Minnesota Department of Health Center for Health Statistics
*GINDEX, an index that defines adequate as care starting in the 1st trimester and having at least nine prenatal care visits.

Figure 7 compares infant mortality rates by race/ethnicity by adequacy of prenatal care. As with the overall population, infants of mothers who received inadequate or no prenatal care were at greater risk of dying. The infant mortality rates for infants whose mothers received intensive or adequate as care were similar across all populations, except for the African American rate whose rate was higher. In fact, the intensive/adequate infant mortality rate (7.6) for African Americans was nearly equal to the White rate (7.3) for inadequate or no prenatal care. The American Indian infant death rates by adequacy of prenatal care were the most disparate (17.7 for inadequate/none and 4.4 for intensive/adequate).

FIGURE 7: Infant Mortality Rate by Adequacy of Prenatal Care*. Minnesota 2001-2005



Source: Minnesota Department of Health Center for Health Statistics
Asian Inadequate/none – Fewer than 10 infant deaths
*GINDEX, an index that defines adequate as care starting in the 1st trimester and having at least nine prenatal care visits.

When infant mortality is viewed by trimester of initiation of prenatal care, African Americans and American Indians had higher rates of infant mortality than other groups, regardless of the timing of prenatal care, (Table 14). They also had lower rates of utilization of prenatal care by trimester. In 2001-2005, American Indians and African Americans had the highest proportions of women who received late or no prenatal care in 2001-2005 (9.5 percent and 5.7 percent).

TABLE 14:

Infant Mortality Rates per 1,000 Births by Prenatal Care Initiation, Minnesota 2001-2005

Prenatal Care	African American	American Indian	Asian	Hispanic	White
1st Trimester	9.8	8.4	4.4	5.0	4.1
3rd Trimester or none	13.0	21.9	#	7.8	6.6

Source: Minnesota Department of Health Center for Health Statistics
- Fewer than 10 infant deaths

This suggests that differences in prenatal care only partially explain differences infant mortality. Several other factors may contribute to higher risk for some populations include maternal or infant characteristics or other behaviors such as pregnancy intention and nutrition. Each of these factors has been attributed to healthy pregnancy or associated with poor birth outcomes. Regardless of the causal link, prenatal care offers an opportunity for early risk assessment, intervention, and monitoring among those at risk for adverse birth outcomes.

Unintended pregnancies include pregnancies that are either mistimed or unwanted. On average, mothers who are not intending to become pregnant do not realize they are pregnant in the early weeks of their pregnancy, so they might not adopt healthy behaviors such as quitting smoking, avoiding alcohol, and beginning prenatal care as early as possible to ensure the best outcome for their child. Thus, unintended pregnancy can lead to adverse birth outcomes. According to 2005 Minnesota PRAMS data, 33.8 percent of all births in Minnesota were unintended including 52.1 percent for African Americans, 61.8 percent for American Indians and 31.1 percent for Whites (there were insufficient data to report for Asians and Hispanics).

Infant Characteristics

Birth weight and gestational age are highly correlated with infant mortality. Not surprisingly, infants born at low birth weight (less than 2,500 grams) and those born prematurely (less than 37 weeks gestation) are at greater risk of death than those who are of normal birth weight and full term.

In Minnesota during 2001-2005, the infant mortality rate for an infant born at less than 2,500 grams was 46.3 compared to 2.1 for an infant born at 2,500 grams or more (Table 15). For the same time period, the infant mortality rate for infants born at less than 37 weeks gestation was 26.5 compared to 2.0 for full term infants.

Infant mortality rates for African American and American infants born at normal birth weight are two to three times higher than normal weight infants born to White mothers.

African American and American Indian infants born at normal gestation (37 weeks or more) are over twice as likely to die as White infants born at normal gestation.

For Populations of Color and American Indians it is also true that low birth weight and prematurity place infants at greater risk for death. Table 16 indicates that American Indian infants born at low birth weight had a noticeably higher infant mortality rate (71.4) than all other racial/ethnic groups, which clustered between 42.9 and 50.2.

TABLE 15:

Infant Mortality Rate by Characteristic of Infant, Minnesota 2001-2005

Characteristic of Infant	Deaths	Rate*
Birth Weight		
Less than 2,500 grams (5.5 lbs)	1,028	46.3
2,500 grams or more	665	2.1
Gestational Age		
Less than 37 weeks gestation	813	26.5
37 weeks gestation or more	568	2.0

Source: Minnesota Department of Health Center for Health Statistics
*per 1,000 births

Comparing infant mortality rates by gestational age and race also demonstrates differences among populations. African American infants born prematurely had the highest infant mortality rate compared to all other racial/ethnic groups (42.9). Infant mortality for premature infants was also notably high for American Indians (38.2). Asians, Hispanics and Whites had similar rates.

Most striking, however, is when infants of healthy birth weight and normal gestation are compared by race/ethnicity (Table 16). These data indicate severe disparities exist in infant mortality rates for infants born at normal weight or normal gestation. For infants born at 2,500 grams or more (normal birth weight), the infant mortality rate for African Americans and American Indians was two to three times the infant mortality rate of normal birthweight infants of White mothers. This pattern is also evident, though not as severe, for infants born at normal gestation (37 weeks or more) where the mortality rates for full term infants born to African American and American Indian women were more than twice as high as the infant mortality rate for normal gestation infants born to White mothers. These findings indicate that racial/ethnic differences in birth weight and gestational age alone do not explain disparities in infant mortality rates across populations; while efforts to decrease the rate of low birthweight and premature infants in Populations of Color and American Indians are vital, these efforts alone will not fully resolve lingering disparities.

TABLE 16:

Infant Mortality Rates per 1,000 Births by Birth Weight and Gestation Minnesota 2001-2005

	African American	American Indian	Asian	Hispanic	White
Birthweight					
Less than 2,500 grams (5.5 lbs)	49.6	71.4	42.9	50.2	45.2
2,500 grams or more	4.4	5.5	1.6	1.9	1.8
Gestational Age					
Less than 37 weeks	42.9	38.2	26.8	28.1	24.5
37 weeks or more	4.3	4.4	1.7	2.0	1.8

Source: Minnesota Department of Health, Center for Health Statistics

Plurality, the total number of births resulting from a single pregnancy, affects the risk of death for an infant. Multiple births, two or more infants in a single pregnancy, are at higher risk of infant mortality than singletons.

FIGURE 8: Infant Mortality Rate by Plurality. Minnesota 2001-2005

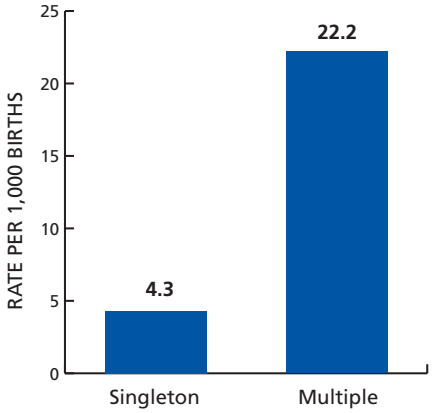


Figure 8 indicates that the infant mortality rate for multiple births was 5 times greater than the singleton rate. In fact, data indicate that as the number of births in a single pregnancy increases, the rate of infant death also increases. The most common reason for the higher rate of infant mortality is that multiples are at greater risk of being born premature or at low birth weight. In 2001-2005 in Minnesota, 52.0 percent of multiples were low birth weight compared to 4.7 percent of singletons. For the same time period, 39.9 percent of multiples and 8.1 percent of singletons were premature.

TABLE 17:

Infant Mortality Rates per 1,000 Births by Plurality, Minnesota 2001-2005

Plurality	African American	American Indian	Asian	Hispanic	White
Single	8.2	10.1	4.0	4.5	3.8
Multiple	35.8	#	44.5	24.8	20.4

Source: Minnesota Department of Health, Center for Health Statistics
- Fewer than 10 infant deaths

A similar pattern exists when comparing infant mortality rates by race/ethnicity and plurality. Table 17 indicates that multiple births place infants at greater risk for death for all racial/ethnic groups. When an Asian mother has a multiple birth pregnancy, the risk for infant mortality is 11 times the risk of infant mortality for a singleton birth. African American, Hispanic, and White multiple birth infants have an approximately 4 to 5 times greater risk of death than singletons.

Birth defects (congenital anomalies) are included in infant characteristics at birth and are the leading cause of infant death in the U.S. In Minnesota, about 2,500 babies are born with birth defects each year, including neural tube defects (NTD), which are birth defects of the brain and spinal cord. The consumption of folic acid, a B vitamin, before conception and during the first trimester can reduce the occurrence of NTDs by up to 70 percent (Centers for Disease Control, 2005). Results from the Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), indicate that 36.9 percent of women reported taking a multivitamin four or more times per week in the month prior to pregnancy, compared to 34.3 percent for the 19 participating PRAMS states nationwide (PRAMS, 2002).

The multitude of maternal characteristics, maternal behaviors, and infant characteristics that contribute to an infant death, along with the findings of differing contributors to infant mortal-

ity among racial/ethnic groups in Minnesota, continue to demand an intensified call to action around women's health, racial/ethnic disparities, preconception care, pregnancy, birth, and infant health care. Yet, there are also larger societal factors that contribute to birth outcomes, including the environment, community and health care system factors.

Environment and Community

Factors such as housing, racism, stress, income and education have all been associated with a higher risk of infant mortality

Our understanding of the connections between the environment and community and health status has improved in recent years. In 2001, MDH conducted a study to the deepen understanding of the factors that impact health including social, economic, physical, and environmental factors - all of which contribute to increased risk for illness, early death, disease, and the health of mothers and infants. Factors such as housing, racism, stress, income and education have all been associated with a higher risk of infant mortality. Table 18 identifies several environmental and community factors where disparities exist placing an unfair burden on some segments of the population.

Connecting environmental and community factors to infant mortality is difficult because of the number of contributing factors that may influence health over a mother's and an infant's lifetime, and the interaction of many contributing factors. For example, there may be additional health issues of the mother, biological factors, maternal behaviors, or infant characteristics at birth that interact with environmental factors to increase the risk of infant death. It is difficult to quantify how each of these factors adds to that risk. There are also limited data on birth or death certificates to document many of the environmental factors that have been associated with poor birth outcomes. In this section, proxy data are used to document that some populations are at greater risk for poor health and poor birth outcomes because of factors that are present in the environment.

This section documents disparities in some environmental/community factors overall and how these factors have a greater impact on some populations. It is interesting to note that populations that experience greater disparities in these areas are also those that experience higher rates of infant mortality.

Physical Environment

Physical environment includes housing, neighborhood, hazards and safety. A healthy physical environment for mothers and infants includes affordable, stable and adequate housing; supportive neighborhoods, and lack of exposure to environmental hazards. Housing that contributes to good health is affordable (e.g. housing costs less than 30 percent of household income), safe (e.g. free from

TABLE 18:

Environmental and Community Factors that Affect Birth Outcomes

Physical	Social	Economic
Housing	Racism	Income
Neighborhood	Stress	Employment/ Occupation
Environmental Hazards	Social Cohesion	Affordable Health Care
Safety	Culture	Education

exposure to lead paint and other environmental hazards), and located in an area with adequate parks, recreation, business, transportation, and other neighborhood assets. The health impact of poor quality housing is often combined with neighborhood issues to have a detrimental impact on the health of families.

For Populations of Color and American Indians in Minnesota, factors relating to the physical environment are even more pronounced. African American, American Indian, and Hispanic people make about 57 percent of the adult homeless population but only 6 percent of the total adult population. While there is no way to approximate the number of homes that contain lead by race/ethnicity, a recent study conducted on Medicaid families indicated higher blood levels for racial/ethnic groups[8].

Studies indicate that in Minnesota:

- Approximately 1.2 million homes throughout the state contain at least some lead paint. Children under 6 years old and pregnant women are the most vulnerable to lead poisoning.
- 300,000 low income households are paying more than 30 percent of their income for housing.
- On any given night more than 20,000 people in Minnesota are homeless or precariously housed.
- 17.9% of American Indian women reported being homeless in the 12 months before their new baby was born compared to 4.4% for African American women and 1.6% for White women (Minnesota PRAMS, 2005)

Sources: 2004 Family Housing Fund, the Greater Minnesota Housing Fund Working Doesn't Always Pay for a Home fact sheet, Kids Count Data Book 2008 Homeless in Minnesota, Wilder Research 2003

Social Environment

Social environment includes social cohesion, culture, racism and stress, all of which can have a strong influence on the health of a mother and her infant. Studies have indicated that women who feel part of a community, and who have strong family, community and cultural ties, experience better health than women who are socially isolated[9].

While identification with community and culture protect the mother and infant from poor health, exposure to racism and stress increase the potential for poor health outcomes. In recent years researchers have proposed scientifically-based models that postulate how the experience of racism could have negative effects on health in general, as well as on pregnancy outcomes in particular[10]. Stresses of the mother also have been associated with poor health, including poor birth outcomes. There is a growing body of literature that links preterm delivery and other adverse birth outcomes with maternal stress[11]. Stress may have both direct and indirect effects on birth outcomes through biological and behavioral pathways[12].

- In Minnesota in 2005, White women who gave birth in Minnesota reported experiencing an average of 1.5 stressful events (e.g. moving, homelessness, death of someone close, losing a job) in the 12 months before the new baby was born compared to 2.4 stressful events for African American women and 3.6 stressful events for American Indian women (PRAMS, 2005)
- According to 2005 Minnesota PRAMS data, only one percent of White women who recently gave birth reported not having anyone to help them if they had a problem, while 2.7 and 3.6 percent of recent African American and American Indian mothers reported this.

Studies indicate that People of Color in Minnesota and elsewhere do not receive the same access to health care as Whites, and are less likely to have health insurance, less likely to have childhood vaccinations and less likely to receive early prenatal care than Whites[13]. These differences are not only attributable to lower income and high risk behaviors, but also to other factors like debilitating stereotypes, racism, and discrimination.

Domestic violence has also been associated with poor birth outcomes. Physical abuse during pregnancy has been associated with many risk factors for infant mortality, such as inadequate prenatal care, smoking, substance abuse, mental health-related illness, and short interpregnancy interval.[15] Research conducted in the United States reveals that up to 20 percent of women experience domestic violence during pregnancy placing women at risk for poor birth outcomes[14]. In Minnesota, African American women (5.8%) and American Indian women (9.5%) were more likely to experience physical abuse during their pregnancy by a husband or partner compared to their White counterparts (3.0%) (PRAMS 2005).

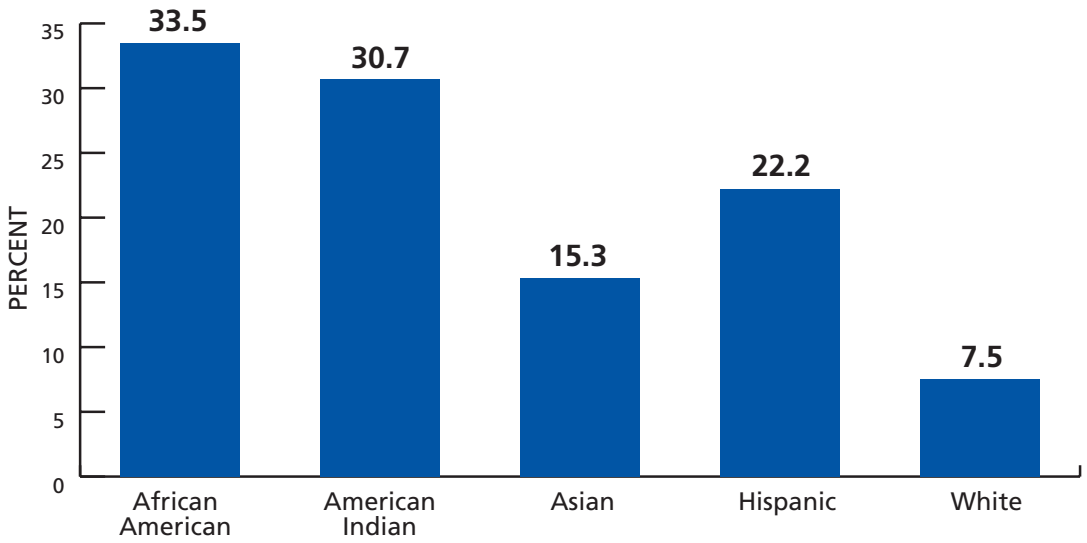
Economic Environment

The ***economic environment*** includes income, employment, occupation, education and access to affordable and appropriate health care.

Income is the single most important modifiable determinant of health and is strongly related to health and well-being. Adequate income is a prerequisite for many other determinants of health, for example, adequate housing, a nutritious diet, transportation, and educational opportunities[16]. Those who live in poverty are often unable to attain the basic necessities of everyday life such as food, shelter and warmth. Poverty also affects individual lifestyle choices (e.g. diet) and causes stress, all of which can have a debilitating effect on the health of a mother and infant.

Poverty rates differ by race/ethnicity. Figure 9 indicates that in 2007, Whites had the lowest rate of poverty compared to all other racial/ethnic groups. The poverty rates for African Americans and American Indians were over four times the rate of Whites. Additionally, the Hispanic rate was three times the rate of Whites and the Asian rate was twice as high. Comparing infant mortality rates to poverty rates provides an interesting perspective. For African Americans and American Indians, high rates of poverty coincide with high rates of infant mortality; low rates of poverty and low infant mortality rates coincide for Whites. While the rates of poverty for Hispanics and Asians are higher than the White rate, the infant mortality rates for these groups are often near the low rate for Whites.

FIGURE 9: Poverty Rates by Race/Ethnicity, Minnesota 2007

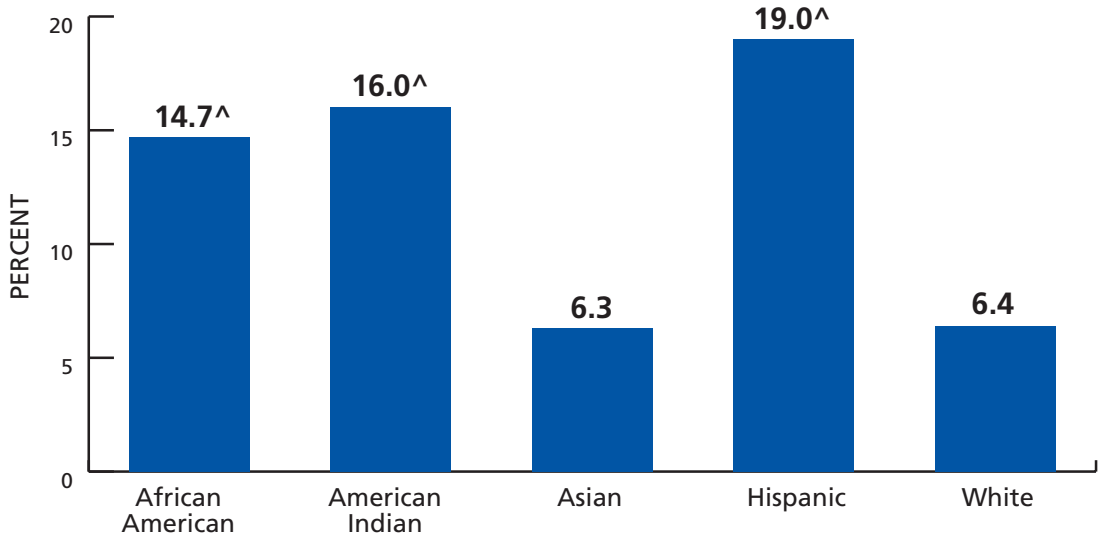


Source: U.S. Census, American Community Survey

Finally, discrimination and stress, which have been associated with poor health, may explain some of the differences in birth outcomes. African Americans and American Indians have faced long-term exposure to socioeconomic and structural discrimination. Recent arrivals to the United States, on the other hand, may not have had similar exposure to discrimination. Along with discrimination comes stress. It is possible that lifelong exposure to racism for African Americans and American Indians is far more stressful than the stress of immigration for Asians and Hispanics. This exposure may play a key role in explaining the higher rates of infant mortality among African Americans and American Indians.

Employment and occupation also influence health. It is widely accepted that unemployment could be detrimental to an individual's physical and mental health. However, having a job does not always guarantee an improvement in health; an unsatisfactory job may not always be better than no job at all, as it is also important to one's health to have a safe, secure, satisfying and adequate paying job.[17]

FIGURE 10: Percent of Uninsurance by Race (All Ages), Minnesota 2007



Source: MDH Health Economics Program and University of Minnesota School of Public Health, Minnesota Health Access Surveys
^ Indicates statistically significant difference from White at the 95% level.

The ***uninsurance*** rate is also a commonly used measure for access to the health care system. In Minnesota, the rate of uninsurance is one of the lowest in the country. According to the 2007 Minnesota Health Access Survey, 7.2 percent of Minnesotans were uninsured, 62.5 percent were insured through an employer/group, 25.2 percent through public insurance (e.g. Medicare and Medicaid) and 5.1 percent through individual insurance. Figure 10 provides the percent of uninsured by race/ethnicity for all Minnesotans. This figure indicates that Hispanics (19.0) have the highest uninsurance rate, followed by American Indians (16.0) and African Americans (14.7). Interestingly, Hispanics actually have one of the lowest infant mortality rates compared to other racial/ethnic groups, perhaps supporting the supposition that the Hispanic experience differs from that of other racial/ethnic groups.

In Minnesota,

- **50 percent of jobs pay less than $31,000, $7,000 less than the minimum earnings needed to rent a two-bedroom apartment.**
- **8% of households are "food insecure," lacking access to enough nutritious food for an active, healthy life for all household members.**

Source: "Working Doesn't Always Pay for a Home" Family Housing Fund October 2004

Infant Mortality Rates and Social Environmental Factors

Only limited data exists on infant mortality and social/environmental factors together. The Minnesota birth certificate collects information on two factors related to the social environment: Medicaid status (a proxy for income) and educational status of mother. Unfortunately, other factors such as occupation, stress, health access and housing status are not captured on the birth certificate or on the death certificate of the infant. It is not possible, therefore, to get a complete picture of the direct influences of these factors on infant mortality.

Participation in ***publicly-funded*** healthcare programs is often used as a proxy measure for income for mothers and their children. In a 2001-2005 study in Minnesota, 31.6 percent of mothers of infants born during those years were enrolled in either Medical Assistance or MinnesotaCare at the time of birth (hereafter referred to in this report as Medicaid).[18] The infant mortality rate for the infants of these women was 6.4, which was slightly higher than the non-Medicaid infant death rate of 4.5. The non-Medicaid population includes uninsured mothers as well as those who were covered by private health insurance. Higher rates for uninsured mothers may counteract lower rates for insured mothers, making the non-Medicaid rate more difficult to interpret.

Comparisons by race/ethnicity again follow a familiar pattern (Table 19). Consistent with patterns of infant mortality, poverty and uninsured status, only Whites and Asians on Medicaid experience higher rates of infant mortality compared to their non-Medicaid counterparts. Again, the composition of the non-Medicaid population likely explains this finding. Both Asians and Whites have low uninsurance rates relative to other populations. This means that the "non-Medicaid" group includes a high number of insured mothers and a small number of uninsured mothers.

Infant mortality rates for African Americans, American Indians, and Hispanics were actually lower in the Medicaid group than the non-Medicaid group. As reported earlier, uninsurance rates for these populations are higher than Whites; this means that the non-Medicaid group for all of these populations includes a relatively higher proportion of uninsured mothers.

TABLE 19:

Infant Mortality Rates per 1,000 Births by Medicaid Status, Minnesota 2001-2005

Medicaid Status	African American	American Indian	Asian	Hispanic	White
Non Medicaid*	11.3	17.0	4.7	6.8	4.1
Medicaid	8.6	8.9	5.4	4.2	5.9

Source: Minnesota Department of Health, Center for Health Statistics

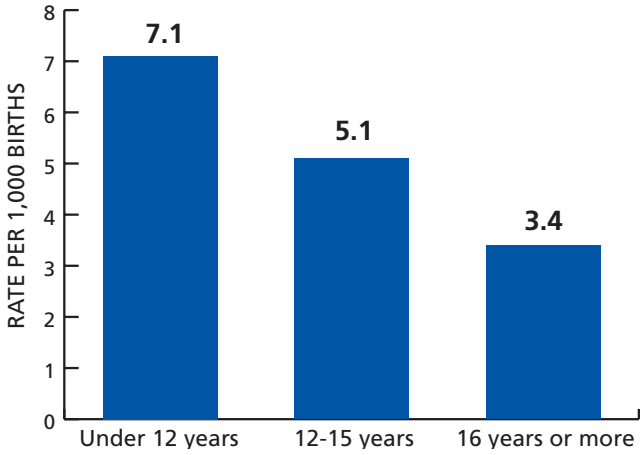
*Non-Medicaid includes those covered by private health insurance, self-insured, and uninsured.

It is also worth noting that the infant mortality rate for White Medicaid recipients is lower than both the American Indian and African American rates. In other words, even among the Medicaid population, where coverage should be similar, these groups experience higher infant mortality rates than Whites. This suggests that Medicaid-enrollees from these populations face barriers beyond insurance status, increasing their risk for infant mortality.

Education, along with income and employment status, is critical in determining people's social and economic position and thus their health. A low level of education is associated with poor health status. In Minnesota, lower educational status is also linked to poor pregnancy outcomes. Figure 11 shows that overall infant mortality rates decrease as education levels of mothers increase. The mortality rate of infants whose mothers completed at least 16 years of education was 1.5 to 2 times lower for infants whose mothers had fewer years of education. One reason for the higher rate of mortality among infants whose mothers have not completed high school is that this group includes teenage mothers, whose infants are already at greater risk of dying before their first year of birth.

When looking at infant mortality rates by educational status and race, these rates are higher for Asian and White infants whose mothers are less educated (Table 20). However, there is no difference for African American mothers by educational status. In fact, the mortality rate for infants of college educated African American mothers is *higher* than the rate for infants of White mothers who completed less than high school.

FIGURE 11: Infant Mortality Rate by Educational Status of Mother, Minnesota 2001-2005



Source: Minnesota Department of Health, Center for Health Statistics

African Americans, American Indians, and Hispanics on Medicaid have lower infant mortality rates than their counterparts who are not on Medicaid.

Whites who are not on Medicaid had the lowest infant mortality rate compared to all other racial/ethnic groups including both Medicaid and non-Medicaid groups.

TABLE 20:

Infant Mortality Rates per 1,000 Births by Maternal Education, Minnesota 2001-2005

Maternal Education	African American	American Indian	Asian	Hispanic	White
Less than High School	8.1	11.6	5.8	5.5	7.1
College Graduate	8.0	#	3.5	#	3.4

Source: Minnesota Department of Health, Center for Health Statistics

- Fewer than 10 infant deaths

Systems Factors

Systems related to infant mortality include the health care delivery system and the state and local public health system. Each system has established an infrastructure, developed external and internal policies, and cultivated relationships with other sectors and communities to improve the health and well-being of their communities. These infrastructures, policies and relationships can have a great influence on health of mothers and their infants.

For the infant mortality rate to change, larger systems of care and governance must be engaged

For example, something as simple as office hours (internal policy) can affect health. If health care office hours are restrictive (e.g. only open during traditional work hours), some women may not be able to receive prenatal care, increasing the risk of a poor birth outcome. According to 2002-03 PRAMS data, in Minnesota, 28 percent of women who did not receive prenatal care in their first trimester indicated it was because they could not get an appointment earlier in their pregnancy, 23 percent reported that the doctor or health plan would not start care earlier, 4.3 percent had no way to get to the clinic or doctor's office and 1.4 percent had no one to take care of their children.

Undertaking systems change recognizes that for the infant mortality rate to change, larger systems of care and governance must be engaged. This means having competent health care for mothers and infants, looking into policies that improve birth outcomes, and reorienting health systems so that responsibility for health is shared among individuals, communities, health professionals, health systems, and others.

Several graphs in this section show low rates of infant mortality for Hispanic and Asian infants – including those where rates for these groups are lower than the rate for infants born to White mothers. Interestingly, these groups often include a high percentage of recent arrivals to the U.S.. Several studies theorize that a "healthy immigrant effect" – where immigrants are healthier than those born in the U.S. – could explain some of these differences. Health screenings conducted at the point of immigration, healthier behaviors and self-selection where those with greater resources choose to immigrate (money, education) are examples of why these groups might appear healthier than their native born counterparts. Lower infant mortality rates for these groups may be the result self selection where women who immigrate tend to have fewer reproductive issues than U.S. born women or that women who recently came to the U.S. from other countries might be more likely to retain and practice the cultural traditions and values of their homeland which may be more supportive of healthy pregnancy behaviors. Immigrant groups might also possess stronger and more extensive networks of social of support than U.S. born African Americans and American Indians.

Source: Steven Kennedy & James Ted McDonald & Nicholas Biddle, 2006.
"The Healthy Immigrant Effect and Immigrant Selection: Evidence from Four Countries," Social and Economic Dimensions of an Aging Population Research Papers 164, McMaster University.

Summary

Most often, infants are at risk of infant mortality as a result of a number of contributing factors operating simultaneously. Separating the influence of these multiple contributing factors can be challenging, especially given that their impact on infant mortality risk differs across Populations of Color and American Indians. These intertwining, and sometimes conflicting, risk factors can also make it difficult to design programs that work to reduce infant mortality rates and infant mortality disparities across populations; what works for one population may or may not address a risk factor for another population. In addition, a lack of data sometimes limits our ability to know the extent to which populations are impacted by these risk factors. In light of these conflicting risk factors and other limitations, it is important to reiterate that the disparities in infant mortality among Populations of Color and American Indians as compared to Whites have been reduced substantially during the most recent time frame since EHDI was implemented.

The next section will discuss the history of efforts to decrease overall infant mortality rates in Minnesota, and to decrease the magnitude of disparities in rates among Populations of Color and American Indians.

IV. EFFORTS TO REDUCE INFANT MORTALITY IN MINNESOTA

Reducing infant mortality is a high priority for the Minnesota Department of Health (MDH). The Maternal and Child Health Section (MCH) at MDH provides statewide leadership and public health information essential to the health and well-being of women, children and families. Reducing infant mortality is one of the primary goals of MCH, working collaboratively with other Sections and programs within MDH and at the local and statewide level to reduce infant mortality.

Since 1989 state funding, known as the Infant Mortality Reduction Initiative (IMRI), has supported an MDH Infant Mortality Consultant who provides leadership and technical assistance on best practices to local public health, tribal health, and many community and other state partners engaged in a variety of activities to prevent infant death, improve birth outcomes, and reduce racial and ethnic disparities. The Infant Mortality Consultant coordinates MDH efforts around infant mortality reduction activities.

Throughout the 1990s, the IMRI funded Fetal and Infant Mortality Review projects in the Twin Cities area, in southern St. Louis County, and in eleven southeast Minnesota counties. Over the years, efforts to reduce Minnesota's infant mortality rate have focused on family planning and adolescent pregnancy prevention; improving the quality, comprehensiveness and accessibility of prenatal care; interventions targeting specific risk factors or causes of infant deaths; and interventions that target particular populations in the state.

Best and Promising Practices and Strategies to Address Infant Mortality

Efforts to address issues and factors related to infant mortality have evolved as recent research and practices influence programs. The current MDH effort to reduce infant mortality is focused in the following areas, with examples of programs, partners and activities in the tables following.

- Infant Injury Prevention
- Reduce Unintended Pregnancy
- Teen Pregnancy Prevention
- Early and Adequate Prenatal Care
- Preconception and Interconception Health
- Smoking Cessation for Women of Childbearing Age
- Prematurity Prevention
- Data Collection and Surveillance
- Community Input to MDH
- Links to Services

Infant Injury Prevention

Preventing and reducing the risk of injuries to infants, both intentional and unintentional, is a high priority of MDH staff and the Infant Mortality Reduction program. Coalitions of agencies follow the advice of the American Academy of Pediatrics (AAP) on a variety of topics and support public and professional education campaigns to promote infant safety and prevention messages.

Programs/Partners	Activities
MN Sudden Infant Death Center Infant Mortality Reduction Initiative Child Mortality Review Panel-DHS MN Coroners & Medical Examiners Association Family Home Visiting	*Back To Sleep Campaign* *Safe & Asleep in a Crib of Their Own Campaign* *Safe Sleep Top 10*
Midwest Children's Resource Center Child Mortality Review Panel-DHS MN Hospital Association Prevent Child Abuse—Minnesota Infant Mortality Reduction Initiative Family Home Visiting	Public and professional education interventions to prevent Shaken Baby Syndrome (SBS) also known as Inflicted Abusive Head Trauma

Reduce Unintended Pregnancy

The Institute of Medicine has identified three components that best protect women from low birth weight or other poor pregnancy outcomes:

1. active planning for pregnancy
2. entering pregnancy in good health
3. being fully informed about her reproductive and general health before conception

Nationally about 49 percent of pregnancies overall are unintended and, for women in poverty, about 61 percent are unintended. Unintended pregnancy is a risk factor for late/inadequate prenatal care, exposure of the fetus to alcohol, tobacco, and other toxins, maternal depression, low birth weight, and infant death. Minnesota uses state and federal funds to improve access to family planning services throughout the state.

Programs	Activities
Family Planning Special Projects	Provides family planning services to low income high risk women of reproductive age
Family Home Visiting	Educates about health benefits of child spacing; refers for family planning services
MN Family Planning Program-DHS (Medicaid)	Expands eligibility for low income women to family planning services

Teen Pregnancy Prevention

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 of Populations of Color and American Indian teens in Minnesota have higher birth rates than White teens. Some of Minnesota's infant mortality disparity can be attributed to infants born to teen mothers living in disadvantaged social environments. Repeat births to teens (about 17 percent of teen births in Minnesota) also contribute to this disparity.

Programs/Partners	Activities
School-based Clinics	Provides health services & education on contraception
MN Organization on Adolescent Pregnancy Prevention & Parenting (MOAPPP)	Coordinates statewide effort to reduce teen pregnancy and strengthen youth development activities
Family Home Visiting	Supports & educates teen parents to improve parenting and to delay repeat pregnancies
Eliminate Health Disparities Initiative Teen Pregnancy Prevention	Provides community grants to prevent teen pregnancy

Early and Adequate Prenatal Care

Assuring that Minnesota's pregnant women have access to prenatal care in their first trimester and receive the appropriate number of visits with an appropriate provider is a Minnesota state MCH priority. Adequate prenatal care reduces infant mortality by monitoring the growth and development of the fetus, treating the health conditions of the pregnant woman, educating the pregnant woman about preventive versus risky behaviors, screening and testing for infections, promoting healthy weight gain and good nutrition, screening for and treating depression or other mental health disorders, preparing her for childbirth, and promoting breastfeeding.

Programs	Activities
Positive Alternatives grantees	Educate & refer women facing an unintended pregnancy for early prenatal care
Women, Infants, Children Program (WIC)	Provides nutrition counseling, nutritious foods, & refers low income women for early prenatal care
Family Home Visiting	Refers for & supports early prenatal care
Infant Mortality Reduction Initiative	Monitors rates of adequate prenatal care & provides leadership, technical assistance and consultation to support early & adequate care for all MN women
Medicaid expansion-DHS	Assures more low income women are eligible for health insurance when pregnant

Preconception and Interconception Health

The health and healthy behaviors of women before and between pregnancies are critical to healthy birth outcomes. 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. As these practices are institutionalized within Minnesota, it is anticipated that improved birth outcomes, including a reduction in infant mortality, for all populations will be the result.

Programs/Partners	Activities
Preconception Conferences 2007-2008	Educates professionals to encourage women's health care before and between conceptions
Family Home Visiting	Promotes preconception & interconception care
Infant Mortality Reduction Initiative	Provides leadership, technical assistance and consultation to programs promoting preconception & interconception care for women
Folic Acid Council	Promotes folic acid intake before conception & during pregnancy to prevent neural tube birth defects through a statewide partnership
Family Planning Special Projects	Provides family planning services to low income high risk women of reproductive age helping to assure both intentional and healthy pregnancies

Smoking Cessation for Women of Childbearing Age, including Pregnant Women

Smoking during pregnancy reduces fetal growth, impairs lung development, and leads to preterm delivery and other serious birth complications. It also makes women more likely to miscarry and contributes to fertility problems. For the infant, exposure during pregnancy increases the risk of SIDS. Exposure to secondhand smoke after birth also contributes to SIDS risk as well as frequent upper respiratory infections and predisposes the infant to asthma when older.

MDH staff collaborate with external partners from local public health, the March of Dimes, the American College of Obstetricians and Gynecologists, and Planned Parenthood of Minnesota to reduce smoking in pregnancy and in the postpartum period including reducing infants' and children's exposures to secondhand smoke. Programs focus on using the best practice intervention, the "5 A's", and referral to Minnesota's Quit Plan for telephone counseling. American Indian women have been identified as having the highest rate of smoking during pregnancy by vital records and WIC data. Culturally specific efforts are underway to reduce smoking in this population.

Programs	Activities
Professional Education	Educates on "5 A's" intervention & motivational interviewing through conferences & exhibits
Save a Bundle (ended 7/1/08)	Provided resources to local public health and community-based organizations to encourage smoking cessation in pregnancy & postpartum
Infant Mortality Reduction Initiative	Provides leadership, education & resources on "5 A's", referral to MN Quit Plan, prevention of post-partum relapse, & secondhand smoke reduction
WIC	Educates & provides resources on "2 A's", referrals, secondhand smoke reduction
MN Quit Plan-Clearway	Provides counseling via telephone, internet, and face to face; provides medication for cessation

Prematurity Prevention

MDH staff collaborates with the March of Dimes to increase public and professional awareness of prematurity in Minnesota. From 2002 through 2006, the March of Dimes and other partners, including the Infant Mortality Consultant, sponsored five Prematurity Summits bringing together national and local speakers to address prematurity from a variety of perspectives. Currently, the Preconception Conferences have replaced the Prematurity Summits with the intention that improving the health of women before and between pregnancies will contribute to fewer premature births. State and national trends are not promising, however, with upward trends in prematurity at both levels. The National March of Dimes organization is funding clinical research into causes. Prematurity contributes to the African American infant mortality disparity in Minnesota. Other programs and practices already mentioned are currently the best approaches to reducing prematurity for all populations: assuring early and adequate prenatal care, family planning and child spacing, WIC services for healthy weight and pregnancy weight gain, support for Twin Cities Healthy Start, ongoing efforts to reduce teen pregnancy, local public health efforts to support women with home visits and education during and between pregnancies, smoking cessation, and fetal and infant mortality reviews to gain qualitative insights and a multidisciplinary focus on events leading to prematurity and fetal/infant deaths.

Programs	Activities
Infant Mortality Reduction Initiative	Partners with March of Dimes and others to present Prematurity Summits and Preconception Conferences providing professional education on contributing factors, interventions, long term consequences, research updates.
WIC	Promotes breastfeeding, early prenatal care, preconception & interconception care, risk reduction, healthy weight gain; provides nutrition education & healthy foods
Family Home Visiting	Promotes early prenatal care, preconception & interconception care, risk reduction, healthy weight gain

Data Collection and Surveillance

MDH activities and programs depend on access to reliable and timely data to update programs and understand trends regarding issues affecting programs.

Programs	Activities
Pregnancy Risk Assessment Monitoring System (PRAMS)	Survey of new mothers on their pregnancy experiences, risks, barriers, & outcomes
Perinatal Database	Data from birth and infant death records; source of infant mortality rates and disparity data
Pregnancy & Pediatric Nutrition Surveillance Systems	Data from WIC program on behaviors, health status, outcomes of pregnant & breastfeeding women, infants, & children to age 5 years
MN Birth Defects Information System	Monitors & reports trends in birth defects
Fetal & Infant Mortality Review	Community-based case reviews of fetal and infant deaths to identify contributing factors and trends and bring communities together to implement and advocate for systems changes.
Traumatic Brain Injury (TBI) Surveillance	Monitors TBIs and reports on inflicted TBIs of infants and young children

Community Input to MDH

The Maternal and Child Health Advisory Task Force (Task Force) advises the Commissioner on maternal and child health issues. The Task Force consists of state MCH experts from local public health, community-based programs, research, health care, and consumers. A work group of the Task Force completed a report on infant mortality reduction with recommendations in 2008. (See Appendix C)

Programs	Activities
MCH Advisory Task Force	Researches specific issues, provides recommendations & reports, advises the Commissioner, acknowledges achievements in MCH, participates in 5 year MCH needs assessment

Links to Services

Linking services to the people who need them is an important function of MDH staff at the state level and contributes to reducing infant mortality.

Programs	Activities
Family Home Visiting (FHV)	Statewide program for the delivery of public heath nursing services to families, assists in reducing infant mortality by supporting local public health and tribal health with funding, education, and resources to provide effective, evidence-based home visiting to expectant families and families with infants
Positive Alternatives	Statewide program supporting nonprofit organizations to provide pregnancy testing, referrals for nutrition services, prenatal care, housing, adoption services, parenting education, infant supplies and other services to support women facing unintended pregnancy
Infant Mortality Reduction Initiative	Provides leadership, consultation, and technical assistance to: • Twin Cities Healthy Start, a federally-funded program providing outreach and case management to high risk African American & American Indian pregnant & postpartum women • MN Perinatal Organization, a statewide professional organization striving to educate professionals to improve pregnancy & birth outcomes for all MN populations • Multicultural Maternity Excellence project, a metro-wide multidisciplinary group sharing resources and strategies to assure high risk women receive coordinated maternity care • Local public health, tribal health, and community-based agencies

V. TARGETED EFFORTS TO REDUCE INFANT MORTALITY DISPARITIES BY RACE/ETHNICITY

While efforts to reduce overall infant mortality rates have been a priority for MDH for many years, recent years have also brought an increased focus on reducing disparities in rates between Whites as compared to Populations of Color and American Indians. Several programs have focused on the populations with the highest infant mortality rates, African Americans and American Indians.

Eliminating Health Disparities Initiative

In 2001, the Minnesota Legislature created the Eliminating Health Disparities Initiative (EHDI), a ten-year statewide initiative to address and eliminate racial and ethnic health disparities in Minnesota through Community and Tribal Grants. The mission of the EHDI, which is housed within MDH's Office of Minority and Multicultural Health, is to support culturally appropriate public health programs implemented by racial and ethnic communities. There are a total of 51 Community and Tribal grantees working in communities across the state to eliminate health disparities in eight health areas. Grantees have been able to select more than one health area and may serve more than one population.

Ten EHDI programs are working to reducing infant mortality in their communities. Of the 10 programs, four focus exclusively on reducing infant mortality, while six include infant mortality among a group of activities that cross priority areas. Six of the grantees' communities are in Hennepin and/or Ramsey Counties, while other grantees' programs are on tribal reservations north of the Twin Cities.

Grantees have implemented several different types of interventions including doula programs which provide labor support to women before, during and after delivery, home visiting, one-to-one and group education classes, and media campaigns. Most commonly discussed topics were safe sleeping habits, prenatal care and healthy behaviors.

Grantees have made great strides to improve the birth outcomes and health of mothers and infants in their communities. They have reported an increase in the percent of normal birth weight babies, improvements in breastfeeding rates, and an increase in the percentage of women who initiate prenatal care in the first trimester.

Table 21 provides of summary of Eliminating Health Disparities Initiative (EHDI) grantees that have identified infant mortality as a health priority. The table provides the name of the organization, populations served, whether infant mortality is the only health priority area that the organization is working on, the counties served, and the number of clients reached.

TABLE 21:

Eliminating Health Disparities Grantees – Infant Mortality

Organization/Tribe	Populations Served	Inf. Mort. Only	Counties Served	Clients Served[1]
American Indian Family Center	African American, Asian, American Indian, Hispanic		Ramsey	294
Park Avenue Clinic	Asian		Hennepin	500
Centro – Healthy Youth Development	Hispanic		Hennepin	361
Centro – Infant Mortality	Hispanic	•	Hennepin	162
Stairstep Foundation	African American		Hennepin, Ramsey	353
Division of Indian Work	American Indian, Hispanic	•	Hennepin	144
Cass County/ Leech Lake Tribe	American Indian	•	Beltrami, Cass, Hubbard, Itasca	400
Fond du Lac Tribe	American Indian		Carlton, St. Louis	308
Mille Lacs Tribe	American Indian		Aitkin	85
Red Lake Tribe	American Indian	•	Beltrami, Clearwater	97

Source: 2007 Grantee Evaluation Reports, 2007 reporting year

[1]Unduplicated counts by grantee for group and one to one contact (does not include large, one-time events). Numbers may be duplicated across grantees.

Racial and Ethnic Approaches to Community Health (REACH)

Under the leadership of OMMH and MCH, MDH received a planning grant in 1999 from the Centers for Disease Control and Prevention to address the infant mortality disparity among African Americans and American Indians as compared to Whites in the Twin City Metro area. The primary achievement of the grant was an increased awareness of infant mortality in the American Indian and African American communities.

Twin Cities Healthy Start

Since 1999, Minneapolis and St. Paul have received federal funding to reduce the disparity in infant mortality in both the African American and American Indian populations compared to the White population. The Healthy Start service network model includes outreach to pregnant women, risk assessment, case management, health education, and interconceptional care until the infant is two years old. The program addresses mental health issues, substance use, and works with fathers as well as mothers. The Minneapolis Department of Health and Family Support is the fiscal agent and staffs the program.

Save 10

In 2002, the OMMH developed a public health campaign called "Save 10" to reduce infant mortality rates among African Americans in Ramsey County, based on the premise that dispari-

ties could be significantly reduced if just ten African American infant deaths could be prevented each year. The Save 10 campaign included public service announcements and "10 Ways" to have a healthy baby messages developed by community members to make the concept of saving ten infant lives annually less abstract. "10 Ways" messages were directed at men, women, churches, and the community and were disseminated at conferences and community events and programs in the African American community.

Community Health Worker Project

MDH staff partners with Minnesota State Colleges and Universities, the Health Education and Industry Partnership, Blue Cross Blue Shield, and others in ongoing efforts to implement and support the Community Health Worker Project (CHWP). The CHWP is designed to create a culturally competent work force and a career path for people of color to become health care workers, with the potential that some would move further into nursing, medicine, social service, and public health careers. The CHWP curriculum is offered at various educational sites in the state. Funding provides scholarships for low income students.

American Indian Infant Mortality Review

MDH and urban and tribal agencies and programs across the state conducted a review of 24 American Indian infant deaths occurring in 2005-2006 in Minnesota. The review was conducted using the National Fetal and Infant Mortality Review (NFIMR) model and resulted in a list of recommendations to address infant mortality in the American Indian population in Minnesota. Recommendations have been prioritized and a Community Action Team (CAT) has been formed. CAT sub committees are currently engaged in developing strategies to implement priority recommendations. To see the project report online, go to: http://www.health.state.mn.us/divs/fh/mch/mortality/

VI. RECOMMENDATIONS

As the previous discussion has made clear, the risk factors for infant mortality are complex and differ by population. Given the complexity of the relationship between maternal and infant characteristics, social, environmental and community factors, and other contributing factors for racial/ethnic groups, achieving the goal of eliminating health disparities in infant mortality can be challenging.

In recent years, MDH and community work groups have developed a series of recommendations designed to capitalize on recent improvements in infant mortality rates and reductions in infant mortality rate disparities across racial and ethnic groups. These recommendations, taken together, offer a framework for continued progress towards the elimination of health disparities in infant mortality:

1. Assure continuous access to health care for all women of childbearing age. Encourage a health care home.
2. Promote/provide preconception and interconception care to all women of childbearing age.
3. Promote/provide culturally appropriate family planning/child spacing services to all women of childbearing age.
4. Implement Culturally and Linguistically Appropriate Services (CLAS), as developed by the federal Office of Minority Health, throughout health care and the public health system.
5. Screen and refer to programs as appropriate to reduce substance use/abuse for women of childbearing age. For pregnant and parenting women, screen and refer at every visit. This includes alcohol, tobacco, and other drugs.
6. Screen and refer to programs as appropriate to address stress, social support, intimate partner violence, and depression for women of childbearing age. During pregnancy and postpartum, screen and refer at every visit.
7. Educate new parents and their families about reducing the risk of Sudden Infant Death Syndrome (SIDS) and other sleep-related infant deaths.
8. Monitor healthy weight, nutrition status, and adequacy of food supply for women of childbearing age. Educate and refer to nutrition programs as needed. Promote and support breastfeeding.
9. Expand effective teen pregnancy prevention programs, support and educate teens who are parenting, and assist teen parents to delay repeat pregnancies.
10. Assure all pregnant women have access to prenatal care in the first trimester and receive the appropriate level of care throughout pregnancy and birth based on their level of risk.
11. Periodically review fetal and infant deaths to detect emerging trends, increase community awareness, and engage communities in activities and partnerships to improve birth and infant outcomes.
12. Collaborate with partners to enhance and coordinate activities targeted at assuring healthy women, infants and families.

VII. CONCLUSION

Minnesota is consistently rated as one of the healthiest states in the nation. In several rankings including infant mortality, Minnesota often has the best rates. This is due to strong maternal and child health programs, higher insurance rates, healthier lifestyles, lower poverty rates and a number of other factors.

However, for infant mortality, several racial/ethnic groups experience higher rates, some more than twice as high as White infants. Reducing overall rates of infant mortality and eliminating disparities in infant death rates among racial and ethnic groups are high priority public health goals. The Eliminating Health Disparities Initiative is one of the efforts targeting eliminating disparities in infant mortality with an initial goal of reducing infant mortality disparities by 50 percent.

Results of this report show that Minnesota rates overall are the lowest in the country and that infant mortality rates for all racial/ethnic groups are lower than the national average. In addition, data indicate that Minnesota has made substantial progress in decreasing infant mortality rates and disparities between racial and ethnic groups as compared to Whites. Much of this progress has come about as a result of the work of MDH and its community partners to address risk factors for infant mortality and ensure that all women and infants have access to the necessary information, care, and resources necessary to ensure a healthy pregnancy and birth. However, there is also recognition that there is more work to accomplish.

The recommendations included in this report offer a framework for continued progress in both the elimination of disparities in infant mortality and a reduction of infant mortality overall. The future of Populations of Color and American Indian communities depends on continued follow through and success in these important efforts.

VIII. SOURCES

[1] Centers for Disease Control and Prevention. Achievements in public health, 1900-1999: healthier mothers and babies. Morbidity and Mortality Weekly Report, Vol. 48 No. 38; 849-858, October 1999. Atlanta, GA. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4838a2.htm

[2] Corman, H., Joyce, T., Grossman, M.. A cost-effectiveness analysis of strategies to reduce infant mortality. Medical Care, Vol. 26, No. 4, pp. 348-360, April 1988. Philadelphia, PA.

[3] National Center for Health Statistics. Infant mortality statistics from the 2005 period linked birth/infant death data set, National Vital Statistics Reports Vol. 57, No 2., 2008. Hyattsville, MD. Available from: http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_02.pdf

[4] Singh, GK, Yu, SM. Adverse Pregnancy Outcomes: Differences between U.S.- and Foreign-Born Women in Major US Racial and Ethnic Groups, *Am J Public Health*. 1996;86:837-843

[5] Minnesota Department of Health, Minnesota Diabetes Program. Diabetes in Minnesota, 2003. St. Paul, MN. Available from: http://www.health.state.mn.us/diabetes/diabetesinminnesota/toc.html

[6] Ariagno, R. Smoking and this risk For SIDS. Horizons, Vol. 1, No. 3, Fall/Winter 1994, California SIDS Program. Available from: sids-network.org.experts.smok.htm

[7] March of Dimes. Drinking alcohol during pregnancy, Quick Reference Fact Sheet. March of Dimes Foundation. Available from: http://www.marchofdimes.com/professionals/14332_1170.asp

[8] Minnesota Department of Health, Lead Program. Lead Poisoning Prevention. St. Paul, MN. Available from: http://www.health.state.mn.us/divs/eh/lead/index.html

[9] National Advisory Committee on Health and Disability. The social, cultural and economic determinants of health in New Zealand: action to improve health. June 1998. Wellington, New Zealand. Minnesota Department of Health, Minnesota Health Improvement Partnership. A call to action: advancing health for all through social and economic change. April 2001. St. Paul, MN. Available from: http://www.health.state.mn.us/divs/cfh/ophp/resources/docs/calltoaction.pdf

[10] Public Health – Seattle and King County. Racial disparities in infant mortality: an update King County, 1980-2002. Public Health Data Watch, Vol. 1, No. 1, October, 2004. Seattle, Washington. Available from: http://www.kingcounty.gov/healthservices/health/data/datawatch.aspx

[11] Public Health – Seattle and King County. Racial disparities in infant mortality: an update King County, 1980-2002. Public Health Data Watch, Vol. 1, No. 1, October, 2004. Seattle, Washington. Available from: http://www.kingcounty.gov/healthservices/health/data/datawatch.aspx

[12] Infant Mortality Task Force. Reducing infant mortality in Delaware. May 2005 Available from: http://www.dhss.delaware.gov/dph/files/infantmortalityreport.pdf

[13] Minnesota Health Improvement Partnership. A call to action: advancing health for all through social and economic change. April 2001. St. Paul, MN. Available from: http://www.health.state.mn.us/divs/cfh/ophp/resources/docs/calltoaction.pdf

[14] Coker, A.L., M. Sanderson, and B. Dong. "Partner Violence During Pregnancy and Risk of Adverse Pregnancy Outcomes." Pediatric and Perinatal Epidemiology, vol. 18, 2004, pp. 260-269.

[15] Lipsky, S., V.L. Holt, T.R. Easterling, and C.W. Critchlow. "Police-Reported Intimate Partner Violence During Pregnancy and the Risk of Antenatal Hospitalization." Maternal and Child Health Journal, vol. 8, no. 2, 2004, pp. 55-63.

[16] Minnesota Department of Health, Minnesota Health Improvement Partnership. A call to action: advancing health for all through social and economic change. April 2001. St. Paul, MN. Available from: http://www.health.state.mn.us/divs/cfh/ophp/resources/docs/calltoaction.pdf

[17] National Advisory Committee on Health and Disability. The social, cultural and economic determinants of health in New Zealand: action to improve health. June 1998. Wellington, New Zealand.

[18] Initial Findings in Infant Mortality from the Birth Certificate and Medicaid Data match Program, unpublished paper, Fall 2005. http: //www.health.state.mn.us/divs/fh/mch/mortality/initialfindings.pdf

IX. GLOSSARY

Congenital Anomalies - Physical and/or neurological defects that are present at delivery.

Domestic Violence - Any physical abuse or threat or pattern thereof, between intimately involved partners, roommates, or family members.

Fetus - Clinical name for an unborn child after the eighth week of pregnancy.

First Trimester - Time period extending from the first day of the last menstrual period through 12 weeks of gestation.

Folic Acid - A nutrient found in some green, leafy vegetables, nuts, beans, citrus fruits, fortified breakfast cereals, and some vitamin supplements. Folic acid can help reduce the risk of birth defects of the brain and spinal cord (also called neural tube defects).

Gestation Period - The period of embryonic and fetal intrauterine development.

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 or fetal death.

Infant mortality - Death of a live born infant during the first year of life.

Interconceptional Care - Relating to the care recommended to women between pregnancies or up to 24 months postpartum. Often consists of interventions to ensure that medical conditions, poor personal behaviors, and negative environmental conditions are treated and eliminated before conception, thus decreasing the likelihood of poor birth outcomes.

Low Birthweight - Refers to an infant weighing less than 2,500 grams (five pounds, eight ounces) at birth.

Neonatal Period - The first four weeks after birth.

Neural Tube Defect - A congenital defect of the central nervous system, including the spinal cord, skull, and brain, resulting from failure of the neural tube to properly close during fetal development. Defects may include absence of the skull, and protrusions of the brain or spinal cord. Most such defects can be detected before birth through amniotic fluid or blood levels of alpha-fetoprotein and by ultrasonic scanning.

Perinatal - Pertaining to or occurring in the period shortly before and after birth, variously defined as beginning with completion of the 20th to 28th week of gestation and ending 7 to 28 days after birth.

Postneonatal Period - The period from 4 weeks to 52 weeks after birth.

Preterm/Premature - Refers to an infant born before 37 weeks of gestation.

Sudden Infant Death Syndrome (SIDS) - Sudden death of an infant under 1 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.

Very Low Birthweight - Refers to an infant weighing less than 1,500 grams (three pounds, four ounces) at birth.

APPENDIX A. – INFANT MORTALITY RATES

Infant Mortality Rate per 1,000 Births by Selected Characteristics, Minnesota 2001-2005 by Race of Mother *(African American and American Indian)*

Characteristic	African American			American Indian		
	Births	Deaths	Rate	Births	Deaths	Rate
Total	26,131	241	9.2	6,683	69	10.3
Gestational Age						
Less than 37 weeks	2,588	111	42.9	655	25	38.2
37 weeks or more	18,638	81	4.3	4,788	21	4.4
Birth Weight						
Less than 2,500 g	2,761	137	49.6	476	34	71.4
2,500 grams or more	23,359	102	4.4	6,204	34	5.5
Plurality						
Single birth	25,150	207	8.2	6,504	66	10.1
Multiple	979	35	35.8	179	3	#
Medicaid Status						
Medicaid	18,512	160	8.6	5,038	45	8.9
Not Medicaid	7,616	86	11.3	1,645	28	17.0
Prenatal Care - Adequacy						
Inadequate/None	1,840	25	13.6	849	15	17.7
Intensive/Adequate	12,546	95	7.6	2,707	12	4.4
Prenatal Care - Trimester Initiation						
First	16,578	162	9.8	4,025	34	8.4
Second	5,193	37	7.1	1,670	14	8.4
Third or None	1,309	17	13.0	593	13	21.9
Tobacco Use During Pregnancy						
Used tobacco	2,140	28	13.1	2,415	30	12.4
No tobacco	21,859	184	8.4	3,980	32	8.0
Age of Mother						
Less than 20 years	3,673	24	6.5	1,618	17	10.5
20 to 34 years	19,680	187	9.5	4,601	49	10.6
35 years or older	2,778	31	11.2	464	3	#
Birthplace of Mother						
Foreign born	11,725	86	7.3	122	0	#
U.S. born	14,210	142	10.0	6,524	66	10.1
Marital Status						
Unmarried	15,097	140	9.3	5,346	53	9.9
Married	11,008	97	8.8	1,330	15	11.3
Education (Years)						
Under 12	5,800	47	8.1	2,328	27	11.6
12 to 15	15,610	138	8.8	3,776	34	9.0
16 or more	2,757	22	8.0	336	2	#

- did not calculate rates for less than 10 events

Infant Mortality Rate per 1,000 Births by Selected Characteristics, Minnesota 2001-2005 by Race of Mother *(Asian and Hispanic)*

Characteristic	Asian			Hispanic		
	Births	Deaths	Rate	Births	Deaths	Rate
Total	**19,646**	**94**	**4.8**	**24,842**	**121**	**4.9**
Gestational Age						
Less than 37 weeks	1,676	45	26.8	2,025	57	28.1
37 weeks or more	14,605	25	1.7	19,575	40	2.0
Birth Weight						
Less than 2,500 grams	1,492	64	42.9	1,473	74	50.2
2,500 grams or	18,148	29	1.6	23,359	45	1.9
Plurality						
Single birth	19,262	77	4.0	24,359	110	4.5
Multiple	382	17	44.5	483	12	24.8
Medicaid Status						
Medicaid	6,533	35	5.4	18,114	76	4.2
Not Medicaid	13,113	62	4.7	6,728	46	6.8
Prenatal Care - Adequacy						
Inadequate/None	967	7	#	1,754	15	8.6
Intensive/Adequate	10,562	40	3.8	12,399	50	4.0
Prenatal Care - Trimester Initiation						
First	13,300	59	4.4	15,675	78	5.0
Second	3,765	13	3.5	5,853	24	4.1
Third or None	719	4	#	1,281	10	7.8
Tobacco Use During Pregnancy						
Used tobacco	437	1	#	744	3	#
No tobacco	18,058	80	4.4	22,846	104	4.6
Age of Mother						
Less than 20 years	2,067	12	5.8	3,628	25	6.9
20 to 34 years	14,983	66	4.4	19,214	86	4.5
35 years or older	2,596	16	6.2	2,000	11	5.5
Birthplace of Mother						
Foreign born	16,829	66	3.9	18,256	80	4.4
U.S. born	2,783	25	9.0	6,531	39	6.0
Marital Status						
Unmarried	5,251	30	5.7	12,462	66	5.3
Married	14,389	63	4.4	12,357	54	4.4
Education (Years)						
Under 12	2,951	17	5.8	11,730	64	5.5
12 to 15	9,587	49	5.1	9,694	40	4.1
16 or more	6,041	21	3.5	1,986	6	#

- did not calculate rates for less than 10 events

Infant Mortality Rate per 1,000 Births by Selected Characteristics, Minnesota 2001-2005 by Race of Mother (White and All Races)

Characteristic	White			All Races		
	Births	Deaths	Rate	Births	Deaths	Rate
Total	282,226	1,244	4.4	346,241	1,708	4.9
Gestational Age						
Less than 37 weeks	24,697	605	24.5	30,643	813	26.5
37 weeks or more	232,082	428	1.8	278,862	568	2.0
Birth Weight						
Less than 2,500 grams	16,673	753	45.2	22,209	1,028	46.3
2,500 grams or more	265,469	480	1.8	323,904	665	2.1
Plurality						
Single birth	271,893	1,042	3.8	334,128	1,449	4.3
Multiple	10,324	211	20.4	12,094	269	22.2
Medicaid Status						
Medicaid	71,012	421	5.9	109,261	694	6.4
Not Medicaid	211,214	858	4.1	236,980	1,062	4.5
Prenatal Care - Adequacy						
Inadequate/None	6,468	47	7.3	10,899	101	9.3
Intensive/Adequate	205,803	709	3.4	237,352	878	3.7
Prenatal Care - Trimester Initiation						
First	242,086	985	4.1	284,547	1,273	4.5
Second	25,835	136	5.3	39,173	211	5.4
Third or None	4,421	29	6.6	7,692	70	9.1
Tobacco Use During Pregnancy						
Used tobacco	28,111	188	6.7	33,594	251	7.5
No tobacco	242,321	946	3.9	296,719	1,290	4.3
Age of Mother						
Less than 20 years	16,174	114	7.0	25,056	182	7.3
20 to 34 years	219,955	938	4.3	268,114	1,280	4.8
35 years or older	46,097	200	4.3	53,071	255	4.8
Birthplace of Mother						
Foreign born	18,887	93	4.9	55,626	277	5.0
U.S. born	263,116	1,147	4.4	290,008	1,395	4.8
Marital Status						
Unmarried	65,160	432	6.6	96,736	687	7.1
Married	217,018	820	3.8	249,389	1,020	4.1
Education (Years)						
Under 12	20,741	148	7.1	36,657	262	7.1
12 to 15	143,132	671	4.7	176,687	904	5.1
16 or more	114,189	377	3.3	124,393	426	3.4

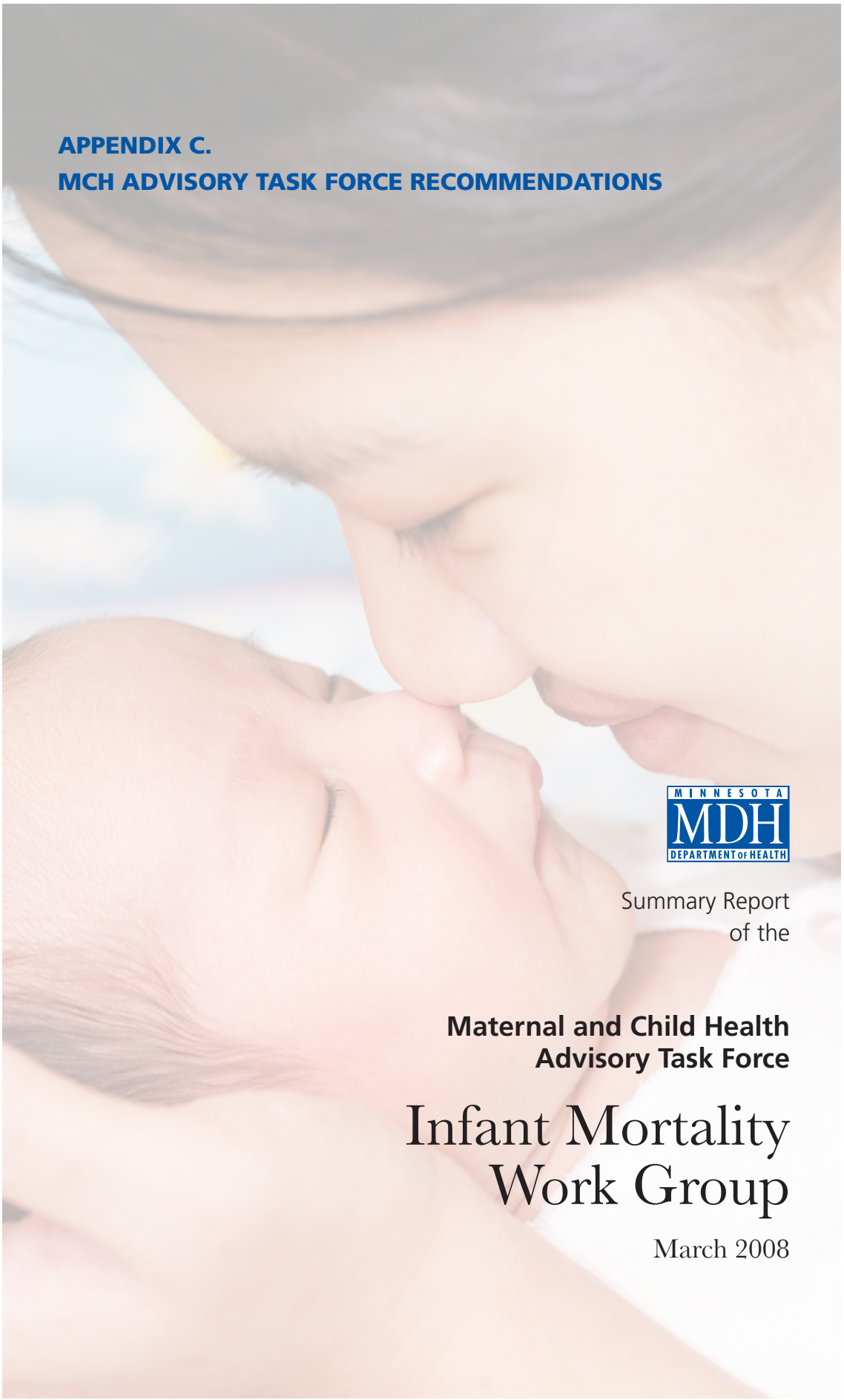
- did not calculate rates for less than 10 events

APPENDIX B. – CAUSES OF DEATH

Leading Causes of Infant Death, Definitions and ICD-10 codes

Cause of Death	Definition	ICD-10 Codes
Congenital anomalies	Birth defects of any of the major organ systems and specific anomalies such as spina bifida and anencephaly	Q00-Q99
Prematurity	Disorders related to short gestation and low birth weight, and respiratory distress syndrome	P07, P25, P22, P26, P28
SIDS and sleep disorders	SIDS and any other ill-defined asphyxia-related cause of death	R95, R96, W75, W83, W84
Any injuries	All injuries and accidents due to the environment or human actions including transport or motor vehicle accidents, accidental drowning and submersion, other accidental threats to breathing, or assaults (homicide)	V01-X59 (except W75, W83, W84), X85-Y09, Y87.1
Obstetric conditions	Multiple gestations, premature rupture of membranes, incompetent cervix, ectopic pregnancy, maternal death, malpresentation before labor, oligohydramnios, and polyhydramnios, placenta praevia, placental separation and hemorrhage, unspecified morphological and functional abnormalities of placenta	P01, P02
Birth asphyxia	abnormal fetal heart rate, fetal or intrauterine: acidosis, anoxia, asphyxia, distress, hypoxia, meconium in liquor, passage of meconium, anoxia, asphyxia, hypoxia	P20-P21

APPENDIX C.
MCH ADVISORY TASK FORCE RECOMMENDATIONS



MINNESOTA MDH DEPARTMENT OF HEALTH

Summary Report
of the

Maternal and Child Health Advisory Task Force

Infant Mortality Work Group

March 2008

Maternal and Child Health Advisory Task Force
Infant Mortality Work Group
Summary Report

Background:

In December of 2006 the Maternal and Child Health (MCH) Advisory Task Force released the *Monitoring Trends In Maternal and Child Health: Report and Recommendations of the Maternal and Child Health Advisory Task Force.* This report describes trends in the health status of mothers, infants and children in Minnesota and outlines recommendations and strategies in ten priority areas within three population groups. These population groups and priority areas include:

- Perinatal Health: Women of Child Bearing Age, Pregnant Women and Infants
  - Reduce infant mortality
  - Reduce preterm and very preterm births
  - Promote preconception and interconception health care
- Children and Adolescents;
  - Prevent child maltreatment
  - Promote the mental health of children and adolescents
  - Prevent underage alcohol use
  - Prevent teen pregnancy
- Children and Youth with special health care needs.
  - Promote early identification and early intervention for children with special health care needs
  - Promote access to health care and related services for children and youth with special health care needs
  - Promote comprehensive care and coordination of services for children and youth with special health care needs

In October of 2007, the MCH Advisory Task Force convened a group to direct the next steps in defining the strategies outlined in the *Monitoring Trends* report. Three priority areas (one from each population group) were chosen for 2008: 1) reduce infant mortality, 2) promote the mental health of children and adolescents, and 3) promote comprehensive care and coordination of services for children and youth with special health care needs. The task force recommended that the priority area of reducing infant mortality be addressed first.

The Infant Mortality Work Group:

The MCH Advisory Task Force convened an Infant Mortality Work Group in early 2008. The purpose of the work group was to review the recommendations and strategies developed to address the Infant Mortality priority area in the *Monitoring Trends in Maternal and Child Health.*

The following table identifies the recommendations and strategies from the Monitoring Trends report and summarizes the discussion from the work group meetings. This summary includes three components: 1) it identifies if the strategy recommended in the original report is still a sound strategy to reduce infant mortality; 2) it briefly describes what is currently happening to address the strategy; and 3) it describes action steps that can be taken by the Minnesota Department of Health (MDH) and other partners to reduce infant mortality.

The Infant Mortality Work Group will continue to meet periodically to review new information and data that becomes available regarding infant mortality. The group will monitor the status of the proposed action steps and make the full Task Force membership aware of information and studies that may be of interest.

Context of the Proposed Action Steps:

The action steps proposed in this document are based the information, data and recommendations presented in the ***Monitoring Trends in Maternal and Child Health Report***. The actions steps identified should be viewed in the context of the full report.

The strategies and action steps are not presented in any priority order. The action steps are activities that can be taken over time, within the context of available resources and overall MCH and MDH priorities, to achieve the corresponding strategies and recommendations.

POPULATION GROUP:

Perinatal Health (Women of Child Bearing Age, Pregnant Women and Infants)

Priority Area: Reduce Infant Mortality

Recommendations, Strategies & Action Steps

RECOMMENDATION 1: Maintain current surveillance activities and explore new methodologies that may assist in identifying targeted populations or enhance understanding of trends and disparities.

Strategy 1.1
Continue infant mortality data monitoring and reporting by race/ethnicity.

Is this a sound strategy? Yes

What is happening?

- Some preliminary studies on infant mortality by race and ethnicity have been done.
- Based on a national report that Minnesota had the lowest rates of infant mortality in the African American population, data was reviewed analyzing foreign-born vs. U.S. born African American infant mortality. This study showed higher rates of infant mortality in babies born to U.S. born mothers.
- Birth certificates ask "Mother's place of birth" so the data is available.
- There is a report on foreign-born births from 1990-2003 (http://www.health.state.mn.us/divs/chs/vitalsigns/foreignborn0705.pdf).
- Pregnancy Risk Assessment Monitoring System (PRAMS) will release a report (Fall 2008) on findings from surveys of Native American and African American mothers.
- Data can not be analyzed to compare foreign-born vs. U.S. born Asian mothers because the number of U.S. born Asian mothers is currently too small.
- A study has been done to examine pregnancy and birth outcomes in the Medicaid population http://www.health.state.mn.us/divs/fh/mch/mortality/mortalityfindings.html.
- The MCH Advisory Task Force received a comprehensive overview of infant mortality at the December 2007 meeting.

What action steps should be taken *(by whom)?*

- Separate data on American born vs. foreign born populations for all births to see if any population is more significantly affected *(MDH)*.
- Undertake review of possible reasons why foreign-born infant mortality rates are lower *(MDH, Infant Mortality WG, Task Force).*
- Review infant mortality data for Latino foreign-born birth vs. American born Latino births *(MDH, Infant Mortality WG, Task Force).*
- Update report on foreign-born births *(MDH).*
- Review the PRAMS report on Native American and African American mothers to determine if findings indicate any public health issues/programs/policies need to be addressed that will improve the health of mothers and babies *(MDH, Infant Mortality WG, Task Force).*
- Engage staff from the MDH Center for Health Statistics in ongoing activities of the Infant Mortality Work Group to provide updates on new and ongoing infant mortality studies/data *(MDH).*
- Continue to provide updates on infant mortality reduction to the MCH Advisory Task Force *(MDH, Infant Mortality WG).*

Strategy 1.2
Continue support for Minnesota's Newborn Screening Program.

Is this a sound strategy? Yes

What is happening?

- The Newborn Screening Follow-Up Unit (a recently consolidated unit in the MCHSN Section in the Community and Family Health Division) and the Public Health Laboratory Newborn Screening Unit are working jointly to implement the Newborn Screening Program in Minnesota (http://www.health.state.mn.us/newbornscreening).
- The Newborn Screening Program is an active opt-out program, however very few parents choose to opt-out. Some parents do opt-out of the long term storage of the blood spot information and it is then kept for only 2 years (see form on website).
- Results are given to the parents in the hospital if they are available before discharge. If not, the primary care provider gives the results to the parents.
- The Newborn Screening Follow-up Unit provides education and outreach to parents regarding the program. This includes the distribution of a brochure given to the new parents in the hospital about participation in the program.
- The Public Health Laboratory has the responsibility for the initial screening of newborns for 50 congenital and inherited disorders that can be treated.
- Upon identification of a disorder, the takes Newborn Screening Follow-Up Unit has the responsibility to follow up with families.
- The following activities have been done by MDH to inform the legislature:
- The Community and Family Health Division director presented to the Legislative Health Committee in December and gave an update on the newborn screening and follow up program; and
- Provided information on the Birth Defects Information System (BDIS) registry that is currently grant funded and at risk without additional state investment (see Strategy 1.3).
- The March of Dimes has a 5 minute video available to hospitals, parents and health care providers that gives an overview of the Newborn Screening Program.

What action steps should be taken *(by whom)*?

- Educate legislators (specifically targeting health committee members) on the Newborn Screening Program *(MDH, partner organizations).*
- Continue community education of providers and families on the Newborn Screening Program *(MDH).*
- Make recommendations to the Newborn Screening Unit on possible outreach activities for parent and provider education *(Infant Mortality WG, Task Force).*
- Explore the option of an ECHO broadcast on the Newborn Screening Program *(MDH, Task Force).*
- Incorporate information on the Newborn Screening Program into prenatal care practice *(MDH, partner organizations).*

Strategy 1.3 Seek resources to maintain the existing Birth Defects Information System (BDIS) that monitors 45 birth defects occurring in Hennepin and Ramsey Counties and to expand that system statewide.	**Is this a sound strategy?** Yes **What is happening?** • The BDIS is managed in the Environmental Health Division of the MDH. • The program is currently funded through a variety of resources (MCHSN, FAS), one of which is a grant from the CDC that will end in 2010. • MDH will develop a total budget for BDIS for the 2009 Legislative session. • The program currently covers Hennepin, Ramsey and Greater Minnesota areas with major medical centers – Rochester, St. Cloud, and Duluth. • The MDH is not actively seeking legislative support for BDIS in the 2008 legislative session. • This is a top priority issues for the March of Dimes for this legislative session. The March of Dimes will not seek funding this year but will use this year to educate legislators on this issue. **What action steps should be taken *(by whom)*?** • Monitor the status of resources to support the BDIS *(MDH, Infant Mortality WG, Task Force, partner organizations).* • Track legislative activity on this program *(MDH, Infant Mortality WG, Task Force, partner organizations).*
Strategy 1.4 Seek resources and authority to implement Fetal and Infant Mortality Review (FIMR) projects to assess current trends, obtain parental input, and inform program planning and resource development.	**Is this still a sound strategy?** Yes **What is happening?** • Legislation allowing for the authority to implement FIMR sunset in 2000. • An Infant Mortality Review was undertaken for the Native American population as a "point-in-time" study. • Funded the Native American Infant Mortality Review through carry-over funds, there are not resources for ongoing study. • There are currently no resources to conduct FIMR projects. **What action steps should be taken *(by whom)*?** • Examine the pros and cons of fully-implementing FIMR or implementing population-specific projects. To prepare for this examination: • Review infant mortality data (Strategy 1.1) on specific populations *(MDH, Infant Mortality WG, Task Force);* and • Identify existing statutes that can be used to support the review of fetal and infant death *(MDH).*

Strategy 1.5
Utilize data from the Perinatal Periods of Risk (PPOR) methodology to better focus strategies and resources to address general trends and disparities in fetal and infant mortality.

Is this a sound strategy? No

What is happening?

- The PPOR looks at causes of death during the fetal period, including mother's condition, neonatal and post-natal to determine the most important period affecting death.
- It is a different way of reviewing fetal and infant deaths to determine possible causes (e.g. mother's health before pregnancy, mother's health during pregnancy, infant health care at hospital, infant care at home).
- This is not an ongoing analysis, but is done upon request.
- Have done this analysis for a Healthy Start study (information on this study was sent to work group members).
- Generally done for urban areas as the data can only be analyzed in areas with large enough numbers of fetal and infant deaths (i.e. about 60 deaths/cell).
- This is not as in-depth as an infant mortality review as it is based solely on data provided in birth and death records.
- Study can not go too far into the past due to the effect of temporal changes.
- Staff from the Center for Health Statistics presented at the March Infant Mortality Work Group meeting to discuss strengths and weaknesses of PPOR methodology.

What action steps should be taken *(by whom)*?

- Utilize other existing infant and fetal mortality data to accurately identify causes and guide program direction *(MDH, partner organizations).*

RECOMMENDATION 2: Improve access to preventive services for mothers and infants by continuing to support grant programs such as Family Home Visiting and the Eliminating Health Disparities Initiative, by providing technical assistance and training, and by supporting the work of programs such as Minnesota Sudden Infant Death Center and Twin Cities Healthy Start.

Strategy 2.1
Sustain current funding and technical assistance for programs and services.

Is this a sound strategy? Yes

What is happening?

- Cuts in federal Medicare and Medicaid dollars are having an effect on health care access.
- State budget cuts have the potential to affect MCH programs.

What action steps should be taken *(by whom)*?

- Monitor funding trends throughout the legislative session *(MDH, partner organizations).*
- Support the sustainment or increase of existing programs *(partner organizations).*
- Provide information upon request on program activities and services as needed by partner organizations to support legislative issues *(MDH).*
- Monitor and assure that issues being addressed during the legislative session support services in all communities (e.g., those at highest risk, special populations) *(MDH, partner organizations).*

Strategy 2.2
Seek resources to provide baby beds and infant sleep safety information to local public health, tribal health, and community based organizations.

Is this a sound strategy? Yes

What is happening?

- MDH broadly distributes infant sleep safety information (LPH, hospitals, community groups, Positive Alternative grantees).
- American Indian infant mortality review showed that 50% of the deaths studied were sleep related.

What action steps should be taken *(by whom)*?

- Continue to distribute sleep safety information through Title V block grant programs, family home visiting programs, community health workers, doulas, and Positive Alternative programs *(MDH, partner organizations).*
- Continue ongoing support and resources for sleep safety *(MDH).*
- Continue to support the development and marketing of sleep safety materials through a variety of methods *(MDH, partner organizations).*
- Increase education of sleep related deaths, including risks associated with co-sleeping *(MDH, partner organizations).*
- Continue to monitor funding available for sleep safety programming *(MDH, partner organizations).*

Strategy 2.3
Support ongoing funding for maternal and child health home visiting programs throughout the state to help prevent intentional and unintentional injuries to infants.

Is this a sound strategy? Yes

What is happening?

- There was a significant increase in TANF dollars during the 2007 legislative session. These funds were designated to support family home visiting.
- Even with existing funding, agencies are only able to reach a portion of families within the target population.

What action steps should be taken (by whom)?

- Continue to support ongoing funding for home visiting programs, including resources for intensive case management of high-risk pregnant women *(MDH, Task Force, partner organizations).*
- Provide an update on the status of the Family Home Visiting Program at a future Task Force meeting, including information on the connection of family home visiting funding to other MCH funding to community organizations for home visiting programs *(MDH).*

Strategy 2.4
Adapt existing MDH trainings for local public health/ public health nurses to reach expanded audiences including staff from community-based organizations, community health centers, tribal health and disciplines such as

Is this a best practice? Yes

What is happening?

- In response to the 2007 Legislative revisions to the TANF Home Visiting statute, a training work group of the home visiting steering committee was formed. This group is developing a standardized framework for home visiting training. This framework is based on the training recommendations outline in statute.
- This training work group includes representatives of a broad number of partner organizations, including community based organizations, DHS, Department of Education, etc.
- The issue of dealing with health and social disparities and cultural differences will be integrated into the training.

doulas, community health workers, and other home visitors.	**What action steps should be taken (by whom)?** • Make the home visiting trainings available to all home visitors (MDH). • Partner organizations should include local public health staff in their trainings to assure coordination of programs to best serve families *(partner organizations).* • Continue to include broad representation of disciplines in training development *(MDH).* • Include education materials related to Strategy 2.2 (above) in training *(MDH, partner organizations).*
Strategy 2.5 Reach out to males and include them in services, education, and programs to reduce infant mortality	**Is this a sound strategy?** Yes **What is happening?** • There is a resurgence of programs for fathers. • The Minnesota Fathers & Family Network (http://www.mnfathers.org/) provides links to a directory of services/programs for fathers. This network also offers resources and information for fathers. • The DHS Child Mortality Review Panel reviews deaths and near fatalities of children in Minnesota, including deaths and near fatalities attributed to maltreatment or in which maltreatment may be a contributing cause. **What action steps should be taken *(by whom)*?** • If funding becomes available to support work with fathers, assure the focus of funding includes information on parenting, responsibility and emotional support for fathers *(MDH, partner organizations).* • Increase and/or develop prenatal classes for fathers *(partner organizations).* • Encourage be intentional involvement of fathers in parenting programs *(partner organizations).* • Increase the use of male trainers in parenting classes *(partner organizations).* • Support efforts to increase access of young males into the health care system, thereby allowing for more access to information about responsible parenting *(MDH, partner organizations).* • Examine the role of males in all infant deaths *(MDH, DHS).* • Share information from infant mortality panel with Fathers Network *(MDH).*
RECOMMENDATION 3: Focus efforts on eliminating racial and ethnic health disparities.	
Strategy 3.1 Continue to support or expand grant programs that provide opportunities to eliminate health disparities in infant mortality through social service organizations.	**Is this a sound strategy?** Yes **What is happening?** • Infant mortality is one of the priority areas identified as a goal for the Eliminating Health Disparities Initiative. A total of 11 EHDI grantees are providing services to address infant mortality. However, on 3 are focusing all EHDI funding on infant mortality reduction. More information can be found in the January 2007 report to the legislature http://www.health.state.mn.us/ommh/legislativerpt2007.pdf. • There was a significant increase in TANF Family Home Visiting funding to local public health and tribal governments during the 2007 Legislative session. These funds are will be used to support reduced infant mortality and successful parenting for high risk families. • EHDI grantees, as well as other public health and social service organizations continue to provide home visiting services to reduce infant mortality.

What action steps should be taken *(by whom)?*

- Continue to monitor the infant mortality by race/ethnicity (see Strategy 1.1) *(MDH, Infant Mortality WG, Task Force)*.
- Share the analysis of the impact of EHDI grants on infant mortality reduction with task force members *(MDH).*
- Report on the status of the EHDI funding which expire in 2010. If possible, share information on plans for the 2009 legislative session *(MDH).*
- Continue include a focus on eliminating health disparities in all home visiting and infant mortality reduction programs *(MDH, partner organizations)*.
- Weave methodologies to address health disparities into home visiting trainings *(MDH and partner organizations).*

RECOMMENDATION 4: Collaborate with all partners to enhance and coordinate activities targeted at reducing infant mortality rates.

Strategy 4.1
Create and sustain partnerships to help assure:

- implementation of existing standards for number of visits and content of prenatal care including early screening and identification of behavioral risks such as use of alcohol, tobacco, and other drugs, and screening for and identification of mental health issues.
- implementation of the National Standards on Culturally and Linguistically Appropriate Services (CLAS) in Health, developed by the U.S. Department of Health and Human Services, Office of Minority Health.

Is this a sound strategy? Yes

What is happening?

- Number and Content of Prenatal Visits/Screening:
- Each health care provider/provider group may have its own risk assessment tool.
- The previous requirement by DHS on the use of MPAF has been dropped. However some providers still use this tool.
- Currently no mechanism to determine what screening tools are being used or mechanism to gather the results of the screening assessments.
- Public health nursing agencies use similar screening tools for assessment of new clients. Most include a prenatal screen.
- The Metro Alliance (metro family home visiting programs) has a standardized assessment for participation in the program.
- Twin Cities Healthy Start has a standardized assessment. This has generated data that can be shared and is being validated through a HRSA grant.
- CLAS Standards:
- LPH managers and directors are required to review CLAS standards. In 2006, 75% had reviewed the standards.

What action steps should be taken *(by whom)*?

- Take this issue to the full MCH Advisory Task Force for more input on how to achieve this strategy *(MDH).*
- Number and Content of Prenatal Visits:
  - Identify existing standards being used *(MDH).*
  - Determine how screening is being implemented in the health care sector *(MDH, DHS, partner organizations).*
  - Determine if data from screening assessments is being used to identify prenatal risks *(MDH, DHS, Infant Mortality WG).*
- CLAS Standards:
  - Broadly share information on CLAS standards with local public health and community partners *(MDH).*
  - Continue to monitor review of CLAS standards by LPH *(MDH).*
  - Determine how these standards implemented in the health care sector *(MDH).*
- Maintain diversity representation on MDH committees *(MDH)*.

Strategy 4.2
Work with the Department of Human Services to evaluate the potential for third party reimbursement for doula and community health worker services. Collect data demonstrating cost savings and service benefits to encourage inclusion of these service providers in the Department of Human Services contracts with the health plans.

Is this a sound strategy? Yes

What is happening?

- Community Health Workers (CHW)
- 2007 Legislative changes allowed for the reimbursement of CHW connected to a Medicaid provider.
- A subcommittee of the Community Health Worker Policy Committee has been established to make recommendations on expanding CHW reimbursement to settings beyond those with a Medicaid provider, such as local health departments, dental clinics.
- There is a standardized curriculum to become a certified CHW.
- Doula
- The 2007 Minnesota Legislature in directed the Minnesota Department of Health to establish a registry for doulas and to provide a link to the registry through the Department of Health web site http://www.health.state.mn.us/divs/hpsc/hop/doula/.
- The legislation requires certification from a limited number of training programs.
- The EHDI grant is funding three doula programs, however much of the funding was used to support training and certification.

What action steps should be taken (by whom)?

- Continue to monitor the status of third party reimbursement for doula and community health worker services *(MDH, Infant Mortality WG, Task Force, partner organizations).*
- Continue to monitor the barriers to doula and CHS worker reimbursement *(MDH, Infant Mortality WG, Task Force, partner organizations).*

Strategy 4.3
Collaborate with the Minnesota Council of Health Plans and the Minnesota Department of Public Safety to create a universal car seat safety education and distribution program.

Is this a sound strategy? Yes

What is happening?

- Four of six health plans providing Minnesota Health Care Programs (MA & MinnesotaCare) provide some type of incentive for car seats. This may include vouchers, car seat following education or a variation of this.
- A number of agencies – through the Minnesota Child Passenger Safety Program – provide car seats to low income families. These include local public health, community agencies, police departments, ambulance services, etc. http://www.dps.state.mn.us/ots/CPS_Program/childhome.asp .
- These agencies provide car seat education with the car seat.
- These agencies and others offer car seat education and inspection clinics at no cost regardless of income.
- Most hospitals no longer provide car seats due to liability issues.

What action steps should be taken?

- Assure that lists of available car seat distribution programs are up-to-date and accurate *(MDH, partner organizations).*
- Increase awareness of existing car seat distribution and education programs among partners serving low income mothers and children *(MDH, Task Force, partner organizations).*
- Encourage the continuation of the maintenance of the perinatal services grid develop by health plans participating in Minnesota Health Care Programs *(MDH, Task Force).*

Strategy 4.4
Collaborate with the Department of Human Services' Child Mortality Review panel, the Minnesota Sudden Infant Death Center, Emergency Services for Children, Midwest Children's Resource Center, the Minnesota Chapter of the American Academy of Pediatrics and other partners to further develop and implement strategies to prevent injuries to infants.

Is this a sound strategy? Yes

What is happening?

- The two primary injuries affecting infants are sleep-related injuries and abusive inflicted head trauma (shaken baby).
- Multiple efforts are underway to increase awareness to sleep-safety information (see Strategy 2.2).
- Legislation was passed in 2005 which requires all hospitals make a commissioner of health approved video available for viewing by parents on the dangers with shaking infants.
- Commissioner-approved videos are available from the Minnesota Hospital Association and through the Midwest Children's Resource Center (both in multiple languages).
- The 2005 Legislation also requires the commissioner of health request that medical providers review the dangers of shaking infants/children with parents. MDH developed materials for this purpose that are available on the MDH website.
- Numerous child abuse prevention and home visiting programs exist throughout the state. These programs address the prevention of both shaken baby and sleep safety information.

What action steps should be taken *(by whom)*?

- Provide information to the task force on the status of 2005 legislation *(MDH)*
- Determine mechanisms for ongoing monitoring of the activities brought about by the 2005 legislation – including examination of future data added to the PRAMS survey asking parents about education they received on sleep safety and shaken baby *(MDH).*
- Continue to support the implementation of these strategies *(MDH, Task Force, partners organizations).*

Minnesota Center for Health Statistics
and
Community and Family Health Division
Maternal & Child Health Section

PO Box 64882
St. Paul, MN 55164-0882
Phone: (651) 201-3550
Fax: (651) 201-5179
TDD: (651) 201-5797

Upon request, this material will be made available in an alternative format such as large print, Braille or cassette tape.

Printed on recycled paper.