

# Monitoring Infant Mortality Trends in Wisconsin, 1980 to 1999

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## ABSTRACT

Using data from the National Center for Health Statistics, this paper analyzes the trends in infant, neonatal, and postneonatal mortality in Wisconsin between 1980 and 1999. The main causes of infant death are also examined. Results indicate that whites have consistently experienced a steady decline in infant mortality, from 9.2 per 1000 live births in 1980-1984 to 6.0 in 1995-1999. The rate for black infants was 19.4 in 1980-1984, fluctuated during this period, and was 17.8 in 1995-1999. Overall, infant mortality rates in Wisconsin continue to decrease, but the disparity between blacks and whites remains large and continues to increase. Death rates due to prematurity have increased by almost 82% between 1980 and 1999, while deaths from congenital anomalies have declined. Wisconsin white infant mortality rates are decreasing at rates in line with the goals for *Healthy People 2010*, but Wisconsin black infant mortality rates must decrease significantly in order to meet the national and state goals.

## INTRODUCTION

Infant mortality is an important indicator of a population's health. It has been used frequently as a way to compare communities and countries in terms of health status and quality of life. This paper analyzes the trends in infant mortality in Wisconsin between 1980 and 1999, and investigates progress in neonatal and postneonatal mortality, and in the main causes of death. Because race is useful for identifying groups at greatest risk for infant death, this analysis examines race-specific mortality rates.

A recent report by Kvale et al, reported that infant mortality rates in Wisconsin declined from 10.3 per 1000 live births in 1980 to 7.0 deaths per 1000 live

births in 1998.<sup>1</sup> Both blacks and whites experienced declines in infant mortality, but disparities have increased over time.<sup>1</sup> This report extends the previous analysis with the most recently available data and examines trends in the neonatal and postneonatal period and by leading causes of death. We assess the progress that has been made in infant mortality in Wisconsin, and evaluate where Wisconsin stands compared to other states and to national goals.

## METHODS

Data were obtained from the Centers for Disease Control and Prevention's (CDC) Web page (<http://wonder.cdc.gov>). CDC WONDER does not provide information on ethnicity (i.e., Hispanic) or races other than blacks and whites. It is important to alert the reader that figures provided here are slightly different from those previously reported<sup>1</sup> because we are not considering non-Hispanic whites and African-Americans, but rather whites and blacks, as classified in the WONDER database.

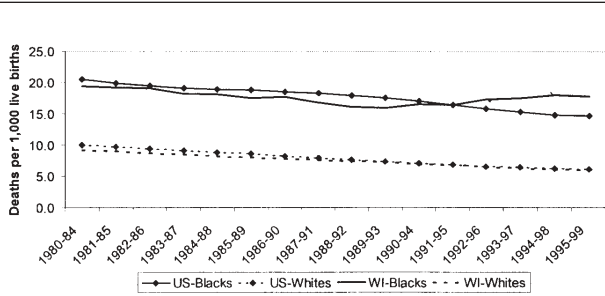
Infant mortality rates (IMR) are calculated by dividing the number of infant deaths in a given year by the number of live births in the same year. Rates are estimated per 1000 live births. Neonatal mortality refers to infant deaths that occur during the first 27 days of life, while postneonatal mortality refers to infant deaths between 28 days and 1 year. We calculated 5-year moving averages of the infant mortality rates from the number of live births and deaths per year to smooth yearly fluctuation and to assess trends over the 20-year period. Percent change between 1980-1984 and 1995-1999 and estimated lives saved annually from 1995-1999 were also estimated.

$$\text{Percent change} = \frac{IMR_{1995-99} - IMR_{1980-84}}{IMR_{1980-84}} * 100$$

$$\text{Lives saved} = \left( \frac{IMR_{1980-84}}{1000} * \# \text{live births}_{1995-99} \right) - \left( \frac{IMR_{1995-99}}{1000} * \# \text{live births}_{1995-99} \right)$$

Projections to the year 2010 were based on linear extrapolation from the 1995-1999 data points. The ICD-9 codes for the major causes of infant mortality from 1980-98 were 740-759 for congenital malformations, de-

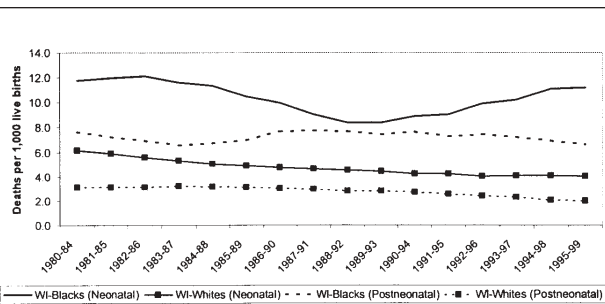
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**Figure 1.** Wisconsin African-American and white infant mortality compared with US, 1980-1999.

**Table 1.** Trends in Infant, Neonatal, and Postneonatal Mortality in Wisconsin Compared to US, 1980-1999

	1980-1984		1995-1999		Percent Change	Lives Saved
	Rate	Avg. # Deaths	Rate	Avg. # Deaths		
<b>Infant Mortality</b>						
Wisconsin	9.9	734	7.1	473	-29	191
By Race						
Blacks	19.4	90	17.8	111	-8	10
Whites	9.2	624	6.0	348	-35	185
US	11.6	42288	7.3	28485	-37	16595
<b>Neonatal</b>						
Wisconsin	6.5	480	4.6	311	-28	124
By Race						
Blacks	11.8	55	11.2	70	-5	3
Whites	6.1	414	4.0	233	-34	121
US	7.7	28054	4.8	18779	-37	11127
<b>Postneonatal</b>						
Wisconsin	3.4	254	2.4	162	-29	68
By Race						
Blacks	7.7	36	6.6	41	-14	7
Whites	3.1	210	2.0	115	-36	64
US	3.9	14233	2.5	9705	-36	5468



**Figure 2.** Wisconsin neonatal and postneonatal mortality rates by race, 1980-1999.

formations, and chromosomal abnormalities; 765 for disorders related to short gestation and low birthweight; 769 for respiratory distress syndrome; and 798 for sudden infant death syndrome. The ICD-10 codes for these conditions in 1999 were Q00-Q99 for congenital malformations, deformations, and chromosomal abnormalities; P07 for disorders related to short gestation and low birthweight; P22 for respiratory distress syndrome; and R95 for sudden infant death syndrome. It is important to note that the National Vital Statistics Reports indicate that the comparability between ICD-9 and ICD-10 codes for these causes of death is not completely sound. Congenital malformations accounted for an estimated 9% fewer deaths under ICD-10 than ICD-9 and short gestation/low birthweight accounted for 11% more deaths under ICD-10 than ICD-9 codes.<sup>2</sup>

## RESULTS

Figure 1 shows that whites have consistently experienced declines in infant mortality rates in Wisconsin, but the same is not true for blacks. The mortality rate for white infants decreased from 9.2 per 1000 live births in 1980-1984 to 6.0 in 1995-1999 at a steady rate of decline. The rate for black infants was 19.5 in 1980-1984, reached its lowest level of 15.9 in 1989-93, and then increased during the 1990s. This upward trend reversed at the end of the period and the rate in 1995-1999 was 17.9. In contrast, at the national level, both blacks and whites have experienced steady reductions in infant mortality.

Table 1 shows that Wisconsin has made less progress in reducing infant mortality during these last 2 decades than did the United States. However, Wisconsin's rates in both 1980-1984 and 1995-1999 were lower in absolute terms than the overall US rate. Wisconsin infant mortality rates decreased 29%, while the US infant mortality rates fell 37%. It is noteworthy that whites in Wisconsin experienced gains close to those obtained at national level, but improvements in Wisconsin black mortality rates were not as close.

The higher risk for blacks is related to higher mortality risks in both the neonatal and postneonatal periods. From 1980-1984 through 1995-1999, the overall neonatal mortality rate (death before age 28 days) in Wisconsin decreased 28% (6.5 to 4.6 per 1000); for white infants in Wisconsin, the rate decreased from 6.1 to 4.0 (-34%) and for black infants in Wisconsin, the rate decreased from 11.8 to 11.2 (-5%). The overall postneonatal mortality (death between 28 days to 1 year of age) in Wisconsin decreased 30% while the national rates decreased 36%. For white infants in

Wisconsin, the rate decreased from 3.1 to 2.0 (-36%), and for black infants, from 7.7 to 6.6 (-14%).

Figure 2 strengthens this finding by showing that whites have been making constant progress in both neonatal and postneonatal mortality, but blacks experienced a lack of progress in both indicators during the end of the 1980s and early 1990s. Figure 3 shows the expected trends in infant mortality in Wisconsin through 2010.

Table 2 shows the 4 major causes of death among infants in Wisconsin: congenital anomalies, prematurity, respiratory distress syndrome (RDS), and sudden infant death syndrome (SIDS). The table shows that there has been progress in reducing mortality rates in 3 of the 4 causes: congenital anomalies, RDS, and SIDS. Mortality rates due to each of these causes have decreased steadily over the past 2 decades. Overall progress can be seen in the number of lives saved due to each of these 3 causes of death. Deaths due to congenital anomalies decreased by 33% over the 20-year period; deaths due to RDS decreased 69% over the period; and deaths due to SIDS decreased by 43%.

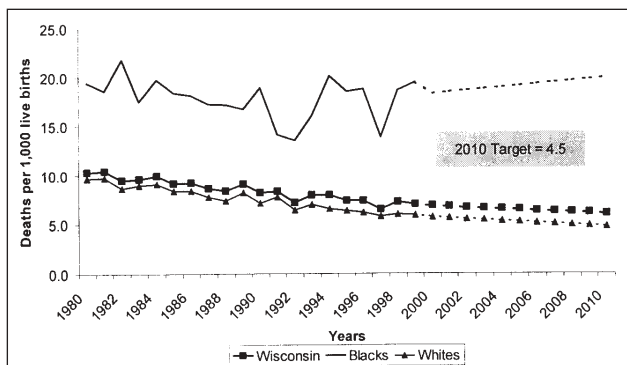
These same improvements were not seen in deaths attributed to prematurity. The death rate increased almost 82% between 1980-1984 and 1995-1999 for deaths attributable to this cause.

Figure 4 illustrates these trends by showing the percent changes in mortality due to these 4 major causes of death over the 1980-1999 period. Deaths due to congenital anomalies, RDS, and SIDS have decreased both in the United States and in Wisconsin for whites and blacks at similar rates. Deaths due to prematurity have increased in the United States and in Wisconsin, but rates in Wisconsin have increased much more than in the United States overall. Additionally, Wisconsin blacks have seen a 50% greater increase in deaths due to prematurity than Wisconsin whites.

## DISCUSSION

This analysis shows that while Wisconsin infant mortality rates are decreasing overall, the trends between blacks and whites vary widely. Black infant mortality rates are consistently more than twice as high as white rates throughout the 19-year time period, and in recent years the infant mortality rate for blacks in Wisconsin has begun to increase again. In contrast, the infant mortality rate for blacks in the United States has continued to decline. There is a wider gap between white and black mortality rates in Wisconsin than in the United States overall.

Plans to improve the health of the population have been created by both the state of Wisconsin and the United States. Wisconsin's most recent plan, *Healthiest*



**Figure 3.** Expected trends in infant mortality in Wisconsin, 1980-2010.

**Table 2.** Trends in Leading Causes of Infant Mortality in Wisconsin, 1980-1999

Cause of Death	1980-1984		1995-1999		Percent Change	Lives Saved*
	Avg. # Rate	Avg. # Deaths	Avg. # Rate	Avg. # Deaths		
<b>Wisconsin</b>						
Cong An†	2.29	170	1.54	10	-33	51
Prem‡	0.71	53	1.29	87	82	(40)
RDS§	0.95	70	0.29	19	-69	45
SIDS¶	1.6	118	0.91	61	-43	47
<b>Wisconsin Blacks</b>						
Cong An	2.74	10	2.22	14	-27	3
Prem	1.88	9	4.61	29	145	(15)
RDS	1.09	5	0.43	3	-61	4
SIDS	4.32	20	3.21	20	-26	6
<b>Wisconsin Whites</b>						
Cong An	2.23	151	1.54	101	-31	40
Prem	0.64	43	1.24	81	94	(35)
RDS	0.95	64	0.29	19	-69	38
SIDS	1.39	94	0.86	57	-38	31
<b>United States</b>						
Cong An	2.44		1.59		-35	3247
Prem	0.96		1.04		8	(306)
RDS	1.13		0.33		-71	3056
SIDS	1.46		0.77		-47	2636

\* Or lives lost

† Congenital anomalies

‡ Prematurity

§ Respiratory Distress Syndrome

¶ Sudden Infant Death Syndrome

*Wisconsin 2010*, has as its goals to (1) protect and promote the health of all, (2) eliminate health disparities, and (3) transform Wisconsin's public health system.<sup>3</sup> The US plan, *Healthy People 2010*, also has as a goal to eliminate disparity and sets target rates for infant mortality. Wisconsin should consider the goals set by the United

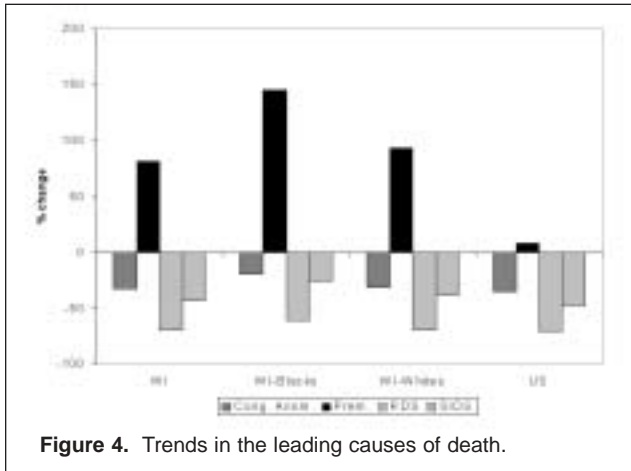


Figure 4. Trends in the leading causes of death.

States for its population. The target rate set for overall infant mortality in 2010 is 4.5 deaths per 1000 live births. For neonatal deaths the target rate is 2.9 deaths per 1000 live births, and for postneonatal mortality the goal is 1.2.<sup>4</sup>

Projections for infant mortality in 2010 show that if current trends continue, the overall infant mortality rate in Wisconsin will be 6.0 in 2010. This projection indicates that mortality rates in Wisconsin will not meet the 2010 targets. Additionally, if current trends continue, disparities between black infant mortality rates and white rates in Wisconsin will continue to grow. The black infant mortality rates, especially in the neonatal period, are increasing. Racial disparities in infant mortality rates are most likely a result of socio-economic disparities and differential access to care among blacks and whites.

Interventions in neonatal care over the past 2 decades seem to have been effective, as evidenced by the overall decrease in infant mortality. However, while infant deaths due to the other 3 main causes of death (congenital anomalies, RDS, and SIDS) are decreasing, the mortality rates due to prematurity in both blacks and whites are increasing.

One possible explanation for the increase in deaths due to prematurity could be that changes in standard care have increased the number of babies delivered who are at risk of dying after birth. Neonatal and obstetric interventions have advanced so that physicians now deliver babies at younger gestational ages and lower birthweights than they did in the past.<sup>5</sup>

Various technologies have allowed very small and very young infants to survive. However, it may be the case that some infants, no matter what advanced care they receive after delivery, will not survive. Whereas several years ago these infants would have died before they were born and counted as a fetal death, today they are delivered earlier to increase their chances of sur-

vival, but die shortly thereafter thus counting as an infant death due to prematurity.

These changes in the ways that physicians care for pregnant women and babies could be causing the increase in infant deaths due to prematurity and, at the same time, a decrease in fetal deaths. In fact, across the United States, the fetal death rate did decrease between 1980 and 1999.<sup>6</sup>

In order to target interventions that might reduce infant mortality rates, it will be important to assess possible explanations for the causes of the deaths. The death rate in Wisconsin due to prematurity is higher than the overall US death rate due to prematurity. It will be important for physicians and public health practitioners to understand why the Wisconsin rate differs from the US rate. Programs that target risk factors for poor neonatal outcomes, provided to those populations who are the most at risk, could help Wisconsin achieve lower infant mortality rates.

In conclusion, there remains a significant challenge for public health and health care workers in the years ahead to help Wisconsin meet state and national goals of reducing infant mortality rates and eliminating disparities.

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