Trends in Maternal and Child Health Outcomes: Where Does Wisconsin Rank in the National Context?

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ABSTRACT

Background: The infant mortality rate (IMR), low birth weight (LBW) rate, and first trimester entry into prenatal care (PNC) are indicators that reflect the health of a population.

Objective: To examine these indicators in Wisconsin from 1979 through 2001 and compare them to those of the United States, looking at trends and relative rank compared with other states.

Methods: Three-year averages for IMR, LBW, and PNC were analyzed for the periods 1979-1981, 1984-1986, 1989-1991, 1994-1996, and 1999-2001 from data sources published by the Centers for Disease Control and Prevention. Wisconsin's rank relative to other states was compared for the overall, black, and white populations.

Results: Wisconsin's overall IMR was consistently at, or slightly better than, the national IMR. From 1979-1981 to 1999-2001, the US black IMR decreased by 37.4%, while the Wisconsin black IMR declined 12.4%; thus, Wisconsin's rank among the states fell from third best to 32 among 34 states with a sufficient number of black births. LBW rates for Wisconsin's black population were consistently at least twice that of the white population. In 1979-1981, early entry into PNC for all Wisconsin women (82.9%) was significantly higher than that of the US population (74.1%). Wisconsin's early PNC entry rates improved slightly; as other states also improved, Wisconsin's ranking dropped. Wisconsin's relative ranks for IMR, LBW, and PNC declined for all 3 indicators from 1979-1991 to 1999-2001.

Discussion: Birth outcome disparities in Wisconsin pose challenges for physicians, public health, and private agencies; all must collaborate and act to improve health, housing, employment, education, and the social capital and support that makes up the fabric of our society.

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INTRODUCTION

Infant mortality and other measures of the well being of infants and their mothers are important reflections of a society's overall health. Infant mortality rates (the number of infants who die before the first birthday per 1000 live births) have declined steadily in the United States during the recent decades;[1] however, the rates and rates of decline vary substantially among racial/ethnic groups. The greatest disparity exists between black and white infants, where the ratio of black to white infant deaths is greater than 2:1. Specifically, in 2002 in the United States, the overall preliminary infant mortality rate (IMR) was 7.0 deaths per 1000 live births, the black rate was 14.3, and the corresponding rate for non-Hispanic white infants was 5.9 per 1000 live births.[2] Higher rates of low birth weight (LBW) births (percent of live births <2500 grams; <5 pounds 8 ounces), and, in particular, very low birth weight births (percent of live births <1500 grams; <3 pounds 5 ounces), among black infants is a major contributor to these differences.

Persistent differences in major health outcomes by

race have attracted considerable research attention.[3] Explanations for the differences are not complete, and unparalleled efforts are underway attempting to understand, reduce, and eliminate disparity for these important outcomes. The US Department of Health and Human Services has set a goal to eliminate racial and ethnic disparities in IMR by the year 2010.[4] Wisconsin's state health plan, *Healthiest Wisconsin 2010: A Partnership Plan to Improve the Health of the Public*, has a similar goal to eliminate health disparities.[5]

Recent birth certificate data from the Wisconsin Department of Health and Family Services show greater racial/ethnic disparity in IMRs in Wisconsin than in the United States (Figure 1). In 2002, although Wisconsin's overall IMR was 6.9, the black IMR was 18.3 and the white rate was 5.5, with a black-to-white infant death ratio of 3.3.[6] Although the overall and white IMRs have both declined steadily since the 1980s, the black IMR in Wisconsin, aside from some random variations, has remained essentially unchanged, thereby increasing the gap between races. These data prompted us to examine trends for other Wisconsin perinatal outcomes compared to the United States overall, and analyze Wisconsin's performance relative to other states during the past 2 decades.

Three of the most commonly used parameters in perinatal health are infant mortality rate, low birth weight, and early initiation of prenatal care.[7]

Infant mortality rate (IMR): reported as the number of deaths to live born infants prior to the first birthday in a calendar year, per 1000 live births in that year.

Low birth weight (LBW) rate: reported as the number of live births with birth weights less than 2500 grams (5 pounds, 8 ounces) per 100 live births in a calendar year.

First trimester prenatal care (PNC): reported as the number of live births to mothers who had their first medical PNC visit during the first 3 months of the pregnancy, divided by the total number of live births in a calendar year, expressed as percent.

These indicators are widely used to monitor populations' social and health status. When these indicators improve, women are receiving more timely and adequate prenatal health services, fewer babies are born too small, and fewer babies die in infancy. These indicators link directly to levels of social and economic well being in state and national comparison of perinatal outcomes. Although the IMR is an easy measure to calculate, its determinants are complex and depend on social, biological, technological, and environmental aspects of public health.[8] PNC may help prevent neonatal death

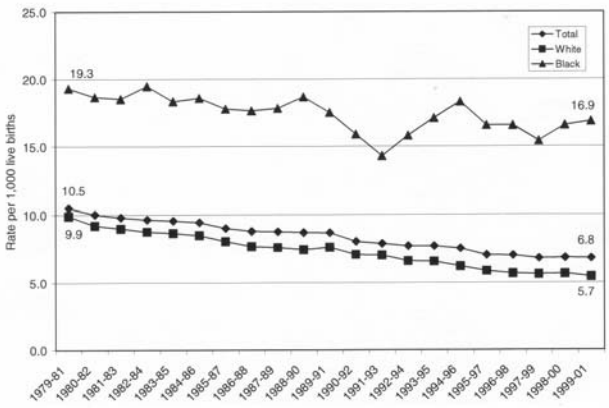

Figure 1. Three-year running averages of infant mortality rates for Wisconsin, total, white, and black infants, 1979-1991 to 1998-2001. Sources: National Center for Health Statistics. Health, United States, 1998 & Health, United States, 2001 & Health, United States, 2002; Wisconsin Department of Health and Family Services, Division of Health Care Financing, Bureau of Health Information, Annual Infant Birth and Death Reports, 1979-2001.

and avoid complications of pregnancy, such as those from placenta previa, infection, poor nutrition, behavioral risk factors (such as tobacco, alcohol, and drug use), and preterm birth.[9] LBW reflects both the health status of the infant at birth and the infant's viability during the first months of life.

In this report, we used 3-year averages for these measures to allow comparison of trends over time and to smooth random fluctuations that may occur when data are analyzed annually.

METHODS

We used conventionally accepted definitions (see above) for the primary maternal and child health indicators.[7] IMR, LBW, and first trimester PNC values were compiled for the US population overall as well as for individual states, and stratified by race. We used 2 data sources published by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention. The first source is a series of reports, *Health, United States*, that documents national health statistics and trends. These reports (chartbooks) present aggregate data for the United States overall, as well as for individual states and territories.[10-12] The chartbooks have comparable indicators for 3-year rolling averages, thus allowing comparisons over time. The second source was the *National Vital Statistics Reports.* These reports document vital statistics data that states send to NCHS through the Vital Statistics Cooperative Program. We used the following periods, 1979-1981, 1984-1986, 1989-1991, 1994-1996, and 1999-2001 to

Table 1. Rates of Infant Mortality per 1000 Live Births: United States, Wisconsin, and Wisconsin's Rank Relative to Other States by Total, White, and Black Races, 1979-1981 to 1999-2001

	Total			White			Black*		
Time Period	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=34)
1979-1981	12.5	10.5	**10**	10.8	9.9	**5**	21.9	19.3	**3**
1984-1986	10.6	9.4	**12**	9.1	8.6	**7**	19.1	18.7	**17**
1989-1991	9.3	8.5	**16**	7.6	7.7	**19**	18.0	16.6	**9**
1994-1996	7.6	7.5	**25**	6.3	6.7	**33**	15.2	19.2	**33**
1999-2001	6.9	6.8	**22**	5.7	5.7	**27**	13.7	16.9	**32**

*This ranking includes 33 states and the District of Columbia.

capture decade and mid-decade data. If data were not available for these time periods from the chartbooks, we used the National Vital Statistics Reports; we calculated the indicator for missing time periods by finding the average of the time period and calculating the appropriate rate. We limited our analyses to the overall rates and race categories of black and white infants because the number of births for other racial/ethnic groups in Wisconsin was too small for the calculation of accurate point estimates. Also, rates were not calculated for states if there were not at least 5000 births in each race category during a 3-year period. Although all states and the District of Columbia met these criteria for births of white infants, only 33 states and the District of Columbia qualified for comparison in terms of births of black infants. (States not included for analysis of black outcomes were Alaska, Hawaii, Idaho, Iowa, Maine, Montana, Nebraska, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, Rhode Island, Utah, Vermont, West Virginia, and Wyoming.) Trends for Hispanic births could not be studied because of the small size of this population in Wisconsin prior to the 1990s and the unavailability of national state-specific comparative data prior to 1989. For each time interval, Wisconsin's rates for each indicator were compared to US averages. Then, Wisconsin's value for each indicator relative to the other states' was ranked. Lower number rankings indicate a more favorable position for that state (for example, high rates of early PNC yield low rank numbers, whereas low IMR or LBW yield low rank numbers).

RESULTS

Infant Mortality Rates

Although Wisconsin's overall IMR is consistently at, or slightly better than, the national IMR, differences between black and white infant indicators is greater in Wisconsin than in the United States (see Table 1). Importantly, the US black IMR dropped dramatically from 21.9 in 1979-1981 to 13.7 in 1999-2001. Yet, during the same time period in Wisconsin, little decline occurred (19.3 in 1979-1981 to 16.9 in 1999-2001). In fact, Wisconsin data from 2002 demonstrates an IMR of 18.3 per 1000 live births, essentially unchanged from 20 years ago. The great strides in IMR reduction made by other states, compared to the lack of improvement in Wisconsin has led to sharp drops in Wisconsin's rank relative to other states. Lower than average black IMR in 1979-1981 placed Wisconsin as the 3rd best state (n=34) for this outcome. In 1999-2001, Wisconsin was among the worst states, ranking 32 among 34 states.

Low Birth Weight

LBW rates have risen since the 1980s. As shown in Table 2, rates increased both in Wisconsin (5.4% in 1979-1981 to 6.6% in 1999-2001) and nationally (6.9% to 7.6%). This trend was apparent both in black and white infants, but the rate of LBW among black infants was consistently at least twice that of white infants. (Wisconsin data for 1999-2001 showed 13.3% black LBW compared to 5.8% white LBW births.) Rates of LBW among white infants in Wisconsin have been consistently lower than national averages, while corresponding rates for black infants have been slightly higher in Wisconsin than in the United States overall. Wisconsin's rank relative to other states showed little change for this outcome, neither in the general population nor in each of the 2 race categories.

Early Initiation of Prenatal Care

Early in the study period, the percentage of Wisconsin women obtaining early PNC was significantly better than that of the US population overall, and the higher rates applied to both black and white populations (Table 3); modest improvements occurred for both races in Wisconsin (black, from 65.5% in 1979-1981 to 69.5% in 1999-2001; white, 84.4% in 1979-1981 to 87.8% in 1999-2001). In contrast, there were much larger improvements in the United States overall in women ac-

Table 2. Percent of Live Births with Low Birth Weight (<2500 grams): United States, Wisconsin, and Wisconsin's Rank Relative to Other States by Total, White, and Black Races, 1979-1981 to 1999-2001

	Total			White			Black*		
Time Period	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=34)
1979-1981	6.9	5.4	**10**	5.7	4.8	**3**	12.5	12.7	**22**
1984-1986	6.8	5.3	**10**	5.6	4.7	**3**	12.7	12.6	**21**
1989-1991	7.0	5.9	**16**	5.7	5.0	**6**	13.4	14.2	**28**
1994-1996	7.3	6.2	**15**	6.2	5.4	**8**	13.1	13.6	**25**
1999-2001	7.6	6.6	**13**	6.7	5.8	**8**	13.1	13.3	**18**

* This ranking includes 33 states and the District of Columbia.

cessing early PNC (74.1% in 1979-1981 compared to 83.2% in 1999-2001). Consequently, Wisconsin's rank for this outcome dropped from 5 to 24, as other states showed more impressive improvements. The difference in US trends compared to Wisconsin's trends was particularly pronounced among black women, where national rates of early PNC increased from 59.9% in 1979-1981 (compared with the higher Wisconsin rate of 65.5%) to 74.3% in 1999-2001, while Wisconsin demonstrated only modest improvement (to 69.5%). As a result, Wisconsin's rank in this category dropped markedly, from 8 to 27 (out of 34 states).

DISCUSSION

Public health measures must be viewed in the context of the times. Decenially, beginning with the decade ending in 1990, the US Public Health Service has issued comprehensive health objectives for the nation. Revised decennially, with interim evaluations and reviews to assist in tracking progress nationally and the state level, these objectives direct attention and funding for public health activities. National objectives exist for the 3 measures examined here. Although progress has been made in reducing the IMR nationally, the objectives for PNC initiation and LBW births have not been met for 1990 or 2000, and given current trends, the achievement of the 2010 goals is also in doubt.

Wisconsin generally enjoys a reputation of being one of the healthiest, most progressive states, both in public opinion and in national tabulations of indicators and outcomes. The United Health Foundation's recent report, *America's Health: State Health Rankings–2003 Edition*, confirms a drop in Wisconsin's overall ranking from 3rd in 1990, to 10th in 2002, and 14th in 2003.[13] Our analysis of trends in IMR, PNC initiation, and LBW births suggests that this reputation has tarnished during the past 2 decades.

State rankings such as those presented here must be used with caution. Typically, relatively small differences separate states from one rank to another, and frequently several states tie with the same value on a given measure. For this reason some have argued that rankings should not be used as a basis for comparisons.[14] Here we have compared the relative ranking of a single state among all states over time. Small differences in Wisconsin's ranking over time are probably not important; however, declines on the order of 15 or 20 in ranking should be cause for concern.

Vital records documents provide limited information concerning the influence of socio-economic status on maternal and child health outcomes. Direct measures are unavailable; variables such as educational attainment and marital status are inadequate proxies that at least partly reflect race/ethnic patterns. In this state-level analysis, the role of changes in socio-economic status in Wisconsin is difficult to assess. More focused epidemiological research may quantify the differential impact of social change on the race/ethnic disparities measure in Wisconsin.

Why have these changes occurred? With respect to IMR, at least part of the relative decline stems from the exceptionally well-organized system of regionalized perinatal care that Wisconsin enjoyed beginning in the late 1960s. Indeed, Wisconsin's approach became the model for the nation in the 1970s.[15] Other states implemented similar systems in the 1980s, and in the late 1980s and early 1990s the increasing use of exogenous surfactant therapies saved many high-risk neonates irrespective of the perinatal systems in the states in which they were born.

Changes in health care financing and public programs played some role in the early initiation of PNC services. Many states, including Wisconsin, took advantage of opportunities for presumptive eligibility for Medicaid services for pregnant women, and provided enhanced outreach programs for pregnant women that drew more into early PNC services. Although Wisconsin's welfare reform program was not designed

Table 3. Percent of Live Births with Prenatal Care Initiated in the First Trimester of Pregnancy: United States, Wisconsin, and Wisconsin's Rank Relative to Other States by Total, White, and Black Races, 1979-1981 to 1999-2001

	Total			White			Black*		
Time Period	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=51)	United States	Wisconsin	Rank (n=34)
1979-1981	74.1	82.9	**5**	77.3	84.4	**4**	59.9	65.5	**8**
1984-1986	74.5	83.0	**5**	77.8	85.4	**3**	59.8	65.2	**10**
1989-1991	74.2	81.6	**11**	77.8	85.7	**21**	58.8	59.3	**15**
1994-1996	81.1	83.6	**19**	87.0	87.7	**13**	70.0	64.8	**20**
1999-2001	83.2	84.0	**24**	88.5	87.8	**31**	74.3	69.5	**27**

* This ranking includes 33 states and the District of Columbia.

to impede access to health services, misinformation concerning eligibility for Medicaid and other programs providing health care may have prevented some pregnant women from accessing PNC in a timely manner. Though systematic changes in the organization of health insurance programs occurred during the study period, it is unlikely that the trends in early PNC utilization in Wisconsin relative to other states in recent years resulted from changes in market share of HMO or managed-care plans.

Changes in the relative position of Wisconsin's LBW births have been less dramatic, with only a modest decrease in rank for babies born to white women and a relatively stable rank for babies born to black women. This indicator has risen nationally, in part due to increasing numbers of births associated with multiple gestations, the increase in primiparous births to older women, and the rise in preterm delivery among singleton births, as well as other factors leading to improved survival of LBW babies. These secular trends are largely mirrored in Wisconsin.

CONCLUSION

Our analysis of these key indicators of the maternal and child health status of Wisconsin's population suggests a need for a renewed focus on the perinatal health care systems of this state. Although we found racial disparities in these indicators of equal or greater magnitude than for the nation as a whole, we also found relative declines in these indicators during the past 20 years for pregnancies and birth outcomes among both white and black women. These patterns reveal a combined public health and health care delivery problem; many other states have improved more rapidly than Wisconsin, and this pattern will likely continue unless concerted efforts are made now. According to the United Health Foundation report, Wisconsin's support for public health fell from 9th best in the United States in 1990, to 35th in 2002, and 49th in 2003.

What do we want for Wisconsin's women and children—average health status and health outcomes? Or do we want our citizens to enjoy the best health care, the best perinatal services, and the best health anywhere in the nation? These statistics bear an important message. Evidence-based research exists and new research is emerging that shows that health interventions during pregnancy, though necessary, are not sufficient to improve birth outcomes. Birth outcomes and racial disparities in them are determined by biopsychosocial events throughout the life course.[16]

Preparing for pregnancy during the preconceptional period by having good nutrition, taking vitamins with folic acid, quitting tobacco, drug, and alcohol use, and having caring relationships in a safe and healthy environment are all important. Within the health care delivery system, we must be culturally competent, treat patients with respect and dignity, and present health education messages in a manner consistent with the patient's health literacy level.

Although we present only numbers and statistics here, behind them are families of all races that have experienced preventable infant deaths and disabilities. Our society cannot, and should not, tolerate these outcomes. We must join together to make healthy babies our highest priority.

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