RACIAL AND ETHNIC DISPARITIES IN INFANT AND MATERNAL MORTALITY

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Despite marked improvements in lowering infant and maternal mortality rates, certain racial and ethnic groups have benefited less. The reasons for these inequalities are many and complex. This article reviews the literature to assess the extent and reasons for the disparate outcomes in infant and maternal mortality rates among different racial and ethnic groups in the United States. Some strategies aimed at reducing these disparities are also highlighted. A systematic search of OVID-MEDLINE (1970–2005) electronic databases was conducted. This review, which contains data mostly on Black/White disparities, suggests that infant and maternal mortality rates differ among racial and ethnic groups. Potential strategies to ameliorate these differences include continued funding for community health centers, equitable and timely access to health care, and training of more minority physicians. In addition, continued research on the role of stress in preterm delivery among some minority women is important in any effort to lower these disparities. (*Ethn Dis*. 2006;16[suppl 3]:S3-71–S3-76)

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INTRODUCTION

Racial and ethnic disparities in health disproportionately affect minority Americans. Although tremendous achievements have been made in reducing infant and maternal mortality, these reductions favor some racial groups more than others. Despite the dramatic decline in infant and maternal mortality during the 20th century, one of the greatest challenges facing the US healthcare system is the persistence of disparities in infant and maternal health among the different racial and ethnic groups.[1]

The exact cause of these persisting racial disparities remains unexplained. The differences in socioeconomic status, maternal risky behaviors, prenatal care, psychosocial stress, and perinatal infection do not adequately account for the disparities.[2] Some have posited a social causation as the primary explanation for health disparities.[3]

It is important to address these disparities because, as the anticipated demographic changes occur over the next few decades, the numbers involved are predicted to be much larger.[4] In the 2000 census increases in ethnic populations were found and the trend is estimated to continue in the next few decades. For example, 35.3 million persons in the United States and 3.8 million persons in the Commonwealth of Puerto Rico identified themselves as Hispanic (ie, Hispanic, Spanish, or Latino).[5] This article addresses maternal and child health disparities in the light of a changing population.

INFANT MORTALITY

Overview

At the beginning of the 20th century, approximately 100 infants per 1,000 live births died before the age of one year. From 1915–1997, the infant mortality rate (IMR) decreased by more than 90% to 7.2 per 1,000 live births.[1] During the last five decades, several factors have improved infant mortality in developed countries. These include: vaccination for childhood diseases; antibiotics for bacterial infections; supine rather than prone sleep position for the prevention of sudden infant death syndrome (SIDS); and newborn intensive care for preterm babies.[6]

Despite this remarkable improvement in infant mortality, significant disparities by race and ethnicity persist.[1] For instance, Black infants are more than twice as likely to die as White infants and this ratio is still increasing. This disparity is mainly due to Blacks having a higher incidence of low birth weight (LBW) and preterm deliveries.[1,7] Accordingly, Black infants have a 2–3 fold risk for having been born LBW and very low birth weight (VLBW) compared to White infants.[7]

Epidemiology

This disparity in healthcare outcomes does not appear to be limited to the Black community only, but rather it seems to affect all minority groups. In this context, American Indian/Alaska Native infants have higher death rates than White infants because of higher SIDS rates. Hispanics of Puerto Rican origin have higher IMRs than White infants because of higher LBW rates.[8–9]

IMRs differ not only according to the different races but also according to the different geographical regions.[10] A study of IMRs in 60 large US cities from 1995–1998 showed that cities with a large Black or Puerto Rican population have higher IMRs. Conversely, cities with the lowest IMRs tended to have a smaller proportion of

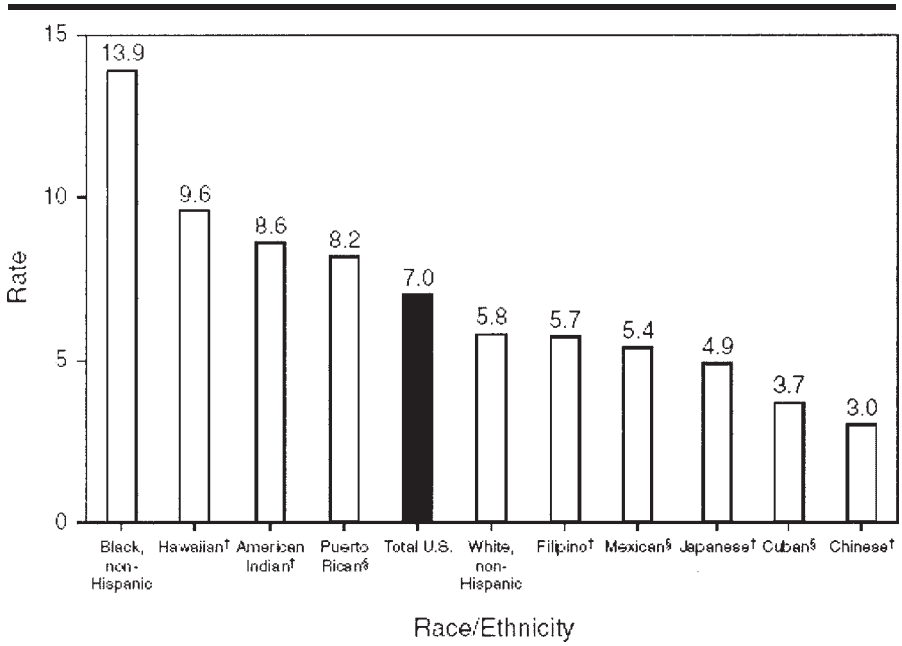

Fig 1. Infant mortality rates,* by selected racial/ethnic populations. United States, 2002.[14]
***Per 1,000 live births**
†Can include persons of Hispanic and non-Hispanic origin. §Persons of Hispanic might be of any race

Black births and a larger population of Hispanic births (excluding Puerto Ricans).[10] IMRs differed widely among those 60 cities. Overall, rates ranged from 4.5 to 15.4 infant deaths per 1,000 live births.

Non-Hispanic White IMRs were reported for 56 cities; non-Hispanic Black IMRs for 52 cities and Hispanic IMRs for 34 cities were reported. The median Black IMR of 13.9 per 1,000 live births was markedly higher than both White and Hispanic IMRs (6.4 and 5.9, respectively).[10]

The *Healthy People 2010* target for IMR is 4.5 infant deaths per 1,000 live births.[11] Based on the data for 1995–2002, this target has been achieved by racial and ethnic populations in only a few states.[12] This national health objective has been achieved for infants of non-Hispanic White mothers in Washington DC, Massachusetts, New Hampshire, and New Jersey. In addition, this target has been reached for infants of Asian/Pacific Islander mothers in eight states (Connecticut, Massachusetts, Missouri, New Jersey, New York, Oregon, Pennsylvania, and Texas). However, this target has not been reached in any states for infants of non-Hispanic Black, Hispanic, or American Indian/Alaska native mothers.[12]

In 1998, the IMR for Blacks and Whites were 13.9 and 6.0, respectively. In the same time period, Hispanics had an IMR of 5.8.[13] From 1995–2001, the overall IMR decreased 11% from 7.6 to 6.8 infants per 1,000 live births. The IMR, however, increased slightly in 2002 to 7.0 (Figure 1).[14] The explanation for this increase is thought to be due to an increase in infants, across most racial/ethnic populations, who were born at extremely low birth weight (<1 lb 10.5 oz or <750 g).[12,15] The majority of infants born weighing <750 g die within the first year of life. As such, these births contribute disproportionately to the overall IMR.[15]

Risk Factors

Approximately two thirds of the disparity in IMR is due to higher rates of preterm delivery (PTD) (delivery at <37 weeks) and LBW (<2500 g) among Black women and their newborns.[16] Black women have a higher risk of not only delivering preterm, but also delivering LBW and VLBW babies. There has been limited success in reducing rates of PTD despite marked improvements in obstetric care. Despite wide availability of prenatal care, nutrition supplementation programs and the use of tocolytics for preterm labor (PTL), the PTD rate keeps increasing. The preterm birth rate increased from 9.5% in 1980 to 11% in 1998.[17]

It is important to reduce preterm births not only because of the monetary costs of taking care of these babies, but also because of the morbidity associated with preterm births. In 2003, most of the $10 billion spent on neonatal care in the United States was spent on the 12.3% of infants who were born preterm.[18] These babies, especially the VLBW ones, are at increased risk for developmental delay, cerebral palsy, hearing and vision defects, and cognitive impairment.[19]

One major risk factor for preterm birth is maternal genital infection.[20] Others include: extremes of maternal age; maternal cigarette smoking and substance abuse; history of PTD; and maternal medical conditions such as hypertension and diabetes.

One possible explanation for the higher incidence of PTD among Black women is a higher rate of maternal stress. Stress has been hypothesized to stimulate neuroendocrine mechanisms which culminate in increased uterine irritability, cervical changes, and ultimately preterm labor.[21] It can also alter immune functions and, as a result, lead to increased susceptibility to intraamniotic infection or inflammation.[22] In addition, it may induce high-risk behaviors as a means of coping.[23] Stress is not only psychosocial but also physical and can be chronic or acute.

Racism has been posited to be an important chronic stressor leading to

increased risk of PTD in Black women.[24] Other stressors are lower socioeconomic status and living in impoverished, crime-ridden neighborhoods. Maternal stress before pregnancy, during the early newborn period and during childhood is of equal importance in altering neuroendocrine development. In fact, some research suggests that behavioral and endocrine responses to stress may have been programmed into a woman's nervous system while she was in utero.[21] This could help explain why even college-educated Black women have higher rates of PTD and LBW babies compared to White women. It is hypothesized that for well-educated Black women, the stress of living with race-associated income differentials, coupled with coping with interpersonal racism experienced throughout life may age the women prematurely and may make their fetuses more susceptible to stress-associated pregnancy complications.[24]

This hypothesis is in agreement with other researchers who found that lifelong accumulated experiences of racial discrimination by African American women was an independent risk factor for PTD.[25] Other factors, which may account for higher preterm births among Black women, are pregnancy-related anxiety and partner-associated stress.[26,27] Research by Lu and colleagues demonstrated that Black women were more likely to be separated or divorced from their husbands or partners in the 12 months before delivery (twice the rate for White women), and were more likely to be single moms.[27]

From the foregoing, it is clear that the Black-White disparity in IMR was due to a higher incidence of PTD, specifically VLBW births, among African-American women. It is equally clear that the cause of PTD in these women was due to a complex interaction between social, environmental and biologic factors.[10] As such, efforts to decrease this disparity must address these multiple risk factors.

MATERNAL MORTALITY

Overview

Remarkable achievements have been made regarding maternal mortality. In 1900, for every 1,000 live births, six to nine women in the United States died of pregnancy-related complications. There has been a 99% decline in maternal mortality rate (MMR) between 1900–1997.[1] Contributing to this decline in MMR are: improved obstetric care; discovery of antibiotics; legalization of abortion; and wide availability of prenatal care. The leading causes of maternal death are hemorrhage, including that associated with ectopic pregnancy, pregnancy-induced hypertension and embolism.[28]

Epidemiology

Notwithstanding the achievements in reducing MMRs, the gap between Black and White MMRs has steadily widened since the early 1900s. Today, Black women are more than three times as likely to die as White women.[1] In fact, Black women have a higher risk than White women for dying from every pregnancy-related cause.[29] The Black-White differential was greatest for pregnancies that did not end in a live birth, such as ectopic pregnancy, spontaneous abortion, induced abortion and gestational trophoblastic disease.[30]

Between 1987–1996, the MMR for Black women in 26 states ranged from 8.7 (Massachusetts) to 28.7 (New York) and for White women 3.0 (Massachusetts) to 9.2 (Vermont) (Table 1).[29] The disparity between the two races in the different states with data reported range from 2.6 (California, Maryland, and South Carolina) to 6.3 (Michigan).

The 2010 national target for MMR is 3.3 per 100,000 live births.[11] By 1998, this goal was achieved for White women in a few states: Massachusetts, Nebraska and Washington. No state has come close to this goal for Black women. The national MMR in 1998 was 7.1 (17.1 for Blacks, 5.7 for Hispanic or Latino and 5.1 for Whites).

Risk Factors

The racial disparity in MMR may be due to several factors. When compared to White women, Black women continue to have four times the risk for dying from complications of pregnancy and childbirth, although they have less risk for developing maternal complications. Possible causes for these risk factors could be lack of access to, and lack of timely use of, healthcare services for early diagnosis and effective treatment.[31] Differences may also exist in pregnancy-related morbidity, as well as in the content and quality of care.[30]

Furthermore, African American and Hispanic women are less likely than White women to start prenatal care early.[32] In 1998, 73% of African American women and 74% of Hispanic women started prenatal care in the first trimester, compared to 88% of White women.[14] This may negatively affect the health of both mother and baby because these women may not receive timely preventive care and education.

There may be some geographic differences in the causes of maternal mortality. For instance, in Michigan, with the highest degree of racial disparity related to maternal deaths, the most common cause of maternal mortality in Whites is motor vehicle accidents, while assaults and cardiovascular diseases were most responsible for Black maternal deaths.[33]

Many pregnancy-related deaths are preventable. Primary prevention of maternal deaths, such as those associated with ectopic pregnancy and some cases of infection and hemorrhage, is possible.[31,34]

CONCLUSION

Maternal and infant mortality are basic health indicators that reflect a nation's health status.[31] Great strides have

Table 1. Maternal mortality ratios* (MMRs) for black and white women, by state — United States, 1987–1996[29]

State	MMR		Black:White ratio§	Total MMR	(95% CI¶)	% Births to Black Women
	Black	White				
Alabama	21.1	6.7	3.1	11.7	(9.2–14.7)	34.0
Alaska	**	**	—	3.6**	(1.0–9.2)	4.5
Arizona	**	4.0	—	5.2	(3.7–7.2)	3.5
Arkansas	12.4††	4.1††	3.0	6.2	(3.9–9.4)	22.9
California	17.9	6.9	2.6	8.1	(7.3–8.8)	7.9
Colorado	**	6.5	—	6.9	(4.8–9.4)	5.2
Connecticut	**	5.0	—	5.3	(3.4–7.8)	12.5
Delaware	**	**	—	3.8**	(1.0–9.7)	23.5
District of Columbia	25.7	**	—	22.8	(16.4–34.0)	77.7
Florida	24.8	5.3	4.7	9.7	(8.3–11.1)	23.1
Georgia	20.3	5.5	3.7	10.7	(8.8–12.7)	35.3
Hawaii	**	**	—	4.8††	(2.5–7.7)	5.7
Idaho	**	6.7††	—	6.1††	(3.3–10.2)	0.4
Illinois	21.3	4.3	5.0	7.5	(6.2–8.7)	20.1
Indiana	13.3††	4.0	3.3	4.5	(3.2–6.1)	9.3
Iowa	**	5.6††	—	5.1	(3.1–7.9)	2.6
Kansas	27.3††	5.2††	6.3	(4.1–9.3)	7.3	
Kentucky	**	7.0	—	6.7	(4.7–9.2)	8.4
Louisiana	18.9	6.2	3.0	11.7	(9.3–14.5)	41.3
Maine	**	**	—	6.3††	(3.0–11.6)	0.5
Maryland	15.9	6.1	2.6	9.1	(7.1–11.5)	31.5
Massachusetts	8.7††	2.7	3.2	3.1	(2.1–4.6)	9.4
Michigan	22.6	3.6	6.3	7.5	(6.0–8.9)	19.6
Minnesota	**	3.4††	—	3.8	(2.5–5.6)	4.1
Misslssippi	20.5	5.1††	4.0	12.3	(9.2–16.1)	47.4
Missouri	15.3††	5.8	2.7	7.4	(5.6–9.6)	16.4
Montana	**	**	—	3.5**	(1.0–8.9)	0.3
Nebraska	**	3.2††	—	3.4††	(1.5–6.7)	5.4
Nevada	**	5.9††	—	6.4††	(3.5–10.8)	8.9
New Hampshire	**	**	—	1.9**	(0.4–5.4)	0.6
New Jersey	19.0	3.9	4.9	6.9	(5.4–8.5)	19.1
New Mexico	**	7.0††	—	9.5	(6.2–13.9)	1.9
New York	28.7	7.6	3.8	12.0	(10.7–13.3)	21.3
North Carolina	21.2	6.3	3.4	11.9	(9.8–14.1)	28.4
North Dakota	**	6.1††	—	7.7††	(3.1–15.8)	0.9
Ohio	16.8	4.5	3.7	6.3	(5.1–7.6)	15.3
Oklahoma	18.4††	4.6††	4.0	6.2	(4.1–8.9)	10.4
Oregon	**	3.6††	—	4.6	(2.7–7.1)	2.2
Pennsylvania	20.5	3.9	5.2	6.4	(5.2–7.7)	14.7
Rhode Island	**	**	—	4.3**	(1.6–9.3)	7.6
South Carolina	17.4	6.6	2.6	10.8	(8.2–14.0)	37.9
South Dakota	**	**	—	3.7**	(1.0–9.4)	0.7
Tennessee	19.5	4.9	4.0	8.2	(6.3–10.6)	23.2
Texas	17.4	6.3	2.7	7.7	(6.8–8.7)	13.1
Utah	**	4.5††	—	4.3††	(2.4–7.0)	0.6
Vermont	**	9.2††	—	9.1††	(3.7–18.7)	0.3
Virginia	12.0	3.8	3.2	5.8	(4.4–7.5)	23.8
Washington	**	3.0	—	3.3	(2.1–4.8)	3.9
West Virginia	**	5.7††	—	5.9††	(3.2–10.2)	3.7
Wisconsin	16.2††	3.9	4.1	5.3	(3.7–7.3)	9.7
Wyoming	**	**	—	5.9**	(1.6–15.2)	1.0
Total	19.6	5.3	3.7	7.7	(7.4–8.0)	16.0

* Maternal deaths per 100,000 live-born infants. CDC's National Center for Health Statistics uses the term ''rate'' when reporting this indicator of maternal mortality. The term ''ratio'' is used instead of rate in this report because the numerator includes some maternal deaths that were not related to live-born infants and thus were not included in the denominator.

† $n=3086$.

§ All ratios are significantly greater than 1.0 ($P<.02$).

¶ Confidence interval.

** Point estimates for states with fewer than seven maternal deaths for 1987–1996 are considered unreliable (relative standard error [RSE]: >38%).

†† Point estimates for states with seven–19 maternal deaths for 1987–1996 are considered less reliable (RSE: 23%–38%) than estimates from states with >19 maternal deaths.

been made toward improving these two indicators. One of the major problems in reproductive health outcomes facing this nation is the disparate health outcomes for some mothers and babies. The causes of this racial disparity are multifactorial and involve economics, health behaviors, social environments, community dynamics and segration.[35] Because reproductive disadvantage may be linked to a woman's neighborhood exposures, more research is needed to better understand the role of the broader social context, including neighborhood conditions.[36]

Maternal race and ethnicity may be an important risk factor that can explain some of the disparities in LBW and PTD. To this end, continued funding is needed to support studies that can further elucidate the relationship between race/ethnicity and LBW/PTD. Because Blacks have more VLBW babies and this accounts for two-thirds of the disparity between Black and White women, prevention strategies must focus on reducing LBW and VLBW births. Research aimed at preventing PTD and associated factors (eg, infection, medical complications of pregnancy, or poor prenatal care) will assist in developing such strategies.[37]

Evidence suggests that within community health centers (CHC), racial and ethnic disparities in certain prenatal services and birth outcomes may be lower, compared to the general population and despite the fact that the centers serve higher-risk groups.[38] In these centers, minority women were more likely to receive first-trimester prenatal care and, although Black women had higher rates of LBW, the disparity between Blacks and Whites was smaller.

A higher incidence of PTD and LBW among Black women, as shown previously, accounts for two thirds of this racial disparity in infant mortality. As a result, strategies to improve the racial and ethnic disparities in infant and maternal mortality should include continued funding for existing CHCs as well as the establishment of more CHCs to provide prenatal services for the under-served.

Also, adequate education and provision of services to help women avoid unintended pregnancies may be of some help.[39] Unintended pregnancy is associated with increased morbidity and mortality for the mother and infant because these women are more likely to engage in risky behaviors and are less likely to start prenatal care early.[1]

Because differences in the type of care pregnant minority women receive has been implicated as a possible cause of disparities in maternal mortality, every effort should be made to ensure all patients, regardless of race, have equal access to health care and receive the same quality of care. Educating healthcare providers in order to eliminate their susceptibility to stereotyping minority patients will help in this regard.[40]

To eliminate disparities in pregnancy outcomes, it is important to be able to identify not only where disparities exist, but also which disparities are amenable to changes in the economic situation and improvements in medical care.[41] To identify effective intervention strategies to decrease infant and maternal mortality, all states should implement active surveillance of maternal mortality and should routinely link birth and fetal death records to death records of reproductive-aged women.[31,34]

Finally, many risk factors for infant and maternal mortality can be mitigated or prevented with good preconception and prenatal care.[14] All pregnant women need access to culturally appropriate and high-quality prenatal, delivery and post-partum care.[31] Taking these steps will ensure the prevention of complications, as well as the early diagnosis and timely treatment of any complications.

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