



Toward a Strategic Approach for Reducing Disparities in Infant Mortality

Carol J. Rowland Hogue, PhD, MPH, and Cynthia Vasquez, MPH

The United States' international ranking for infant mortality slipped from 19th in the 1980s to 27th in 1997. This slippage may be related to the segregation of priorities that occurred early in the 1990s, when national concern was diverted from infant mortality to minority health.

To rekindle concern about infant mortality to the level of effective action, public health professionals must refocus the public's attention on assuring that all women are provided adequate education and services to help them avoid unintended pregnancies, that all pregnant women receive services in appropriate facilities, and that the causes of preterm deliveries are discovered. Effective action in these areas would not only improve infant mortality overall; it would also reduce racial and ethnic disparities in infant health. (*Am J Public Health*. 2002; 92:552-556)

THE UNITED STATES

experienced a 95% to 99% reduction in infant mortality during the twentieth century.¹ Despite this progress, the century's last 2 decades saw the United States ranked 20th or lower among developed countries in its infant mortality rate.² More recently the situation has deteriorated. From 1995 through 1999, the US infant mortality rate declined by only 1.3% per year, dropping the United States to 27th among comparable counties—just above Hungary and Slovakia.³

Why has this deterioration occurred, and how can it be turned around? One answer to the second question may be to renew public concern about the issue while urging public actions that are known to be effective.⁴ In this commentary, we discuss how time trends in public concern may suggest an approach toward rekindling public fervor. Then we discuss 3 actions that, if implemented, should make a difference.

INFANT MORTALITY AS A NATIONAL DISGRACE

The definition of a health problem, like that of any problem, is socially constructed; that is, claims makers describe their observations as a health problem in need of a solution. Hargraves documented the 19th-century social construction of infant mortality as a problem among poor, White, predominantly immigrant populations.⁵

This construction ignored the voices of W.E.B. DuBois and prominent African American women of the time who were well aware that African American infants were twice as likely to die as White infants. Brown has studied the concurrent late-19th-century adoption of social contagionism—paralleling social Darwinism—which supported Jim Crow laws and residential segregation.⁶ Polednak has termed residential segregation in the United States the “American apartheid” and has documented its many ill effects, including higher rates of infant mortality differentials in more segregated communities.⁷ This body of research provides a rich context for determining the impact of historical racism on current disparities in infant mortality.

Social construction of infant mortality is not limited to history, however. To illustrate how social construction affects public policy, we examined newspaper references to infant mortality from 1980 through 1999, using the LexisNexis Academic Universe database (<http://www.lexis-nexis.com/academia>). We searched for articles mentioning infant mortality and then narrowed the search to those that also contained “US.” We then scanned all of those articles that were published from 1980 through 1988 and scanned a systematic, random sample of those that were published from 1989 through 1999. During the late 1980s, the national infant

mortality ranking became front-page news. The number of newspaper articles mentioning infant mortality quintupled between 1980–1984 and between 1985–1989. It increased again, 2.5-fold, over the next 5 years but decreased by one third from 1995 to 1999. In those articles that discussed the US infant mortality rate, numbers of references to the nation's relative international standing rose and fell even more dramatically, occurring in 14% of articles during 1980 to 1984, in 33% from 1985 to 1994, and in less than 5% from 1995 to 1999.

The lessening of public interest in infant mortality (and concomitantly in related federally funded initiatives) may have occurred in part because of segregating priorities—that is, infant mortality gradually came to be seen as a problem among minorities and therefore not important or of national interest. William Raspberry, an African American columnist, published an influential column in 1991, accepting Johns Hopkins University professor George E. Graham's assessment of the causes of infant mortality as primarily behavioral and arguing that “government programs, no matter how sensitively conceived or generously funded, won't save us from our own disastrous behavior.”⁸ Raspberry's opinions were reiterated and published in numerous newspapers across the country, and it is likely that his comments gave permission to

TABLE 1—Births and Infant Deaths by Race/Ethnicity and Residence: United States, 1997

	Metropolitan Counties			Nonmetropolitan Counties		
	Hispanic	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic White	Non-Hispanic Black
All						
Births	572 059	1 142 591	401 280	137 708	1 190 772	180 151
Deaths	3393	6411	5507	833	7636	2471
IMR	5.9	5.6	13.7	6.1	6.4	13.7
Percentage of births						
<500 g	0.1	0.1	0.4	0.1	0.1	0.4
501–1499 g	1.1	1.0	2.7	0.9	1.0	2.6
1500–2499 g	5.2	5.2	10.0	5.5	5.5	10.1
≥2500 g	93.6	93.6	86.9	93.5	93.4	86.9
Birthweight-specific IMR						
500–1499 g	189.8	170.7	175.6	175.3	178.2	176.7
1500–2499 g	16.1	15.4	15.4	19.8	18.4	16.9
≥2500 g	2.2	2.2	4.1	2.7	2.8	4.1

Source. Linked birth and infant death data for 1997 were supplied by the National Center for Health Statistics and prepared by the March of Dimes Perinatal Data Center.

Note. Data exclude other and unknown race/ethnicity groups. Birthweight-specific rates exclude unknown birthweights. Percentages do not always add to 100, owing to rounding. IMR = infant mortality rate (deaths at <1 year of age per 1000 live births).

some in the majority population to consider infant mortality a marginal, minority issue. Is it a coincidence that beginning in the next year, the number of articles lamenting the US international standing in infant mortality dropped precipitously?

TOWARD AN EFFECTIVE SOCIAL CONSTRUCTION

It is clear that infant mortality is a particular problem among minority populations, regardless of whether they live in nonmetropolitan (population <250 000) or urban (population ≥250 000) counties. Among urban residents in 1997, mothers of Hispanic infants and mothers of African American infants, compared with mothers of non-Hispanic White infants, were 5% and 145%, respectively, more likely to experience the death of a baby before the infant’s first birthday (Table 1).

But it is also clear that behaviors do not explain most disparities in infant mortality. For exam-

ple, African American women smoke less than White women, so if smoking were the reason for the disparity between the 2 groups, the rate of low birthweight among African American infants should be less, not more.^{9–10} The more important issue here is that by isolating the problem to “them,” the majority population can excuse itself from concern about it.

Public health professionals, in our fundamental role of accountability, must point out when segregation by priority happens and show how to integrate the concerns of minorities into a total picture of American health. Regarding minority women’s health, these responsibilities include assuring that *all* pregnant women receive prenatal and delivery services in facilities capable of handling their problems, that *all* women are provided adequate education and services to avoid unintended pregnancies, and that the causes of *all* preterm deliveries are discovered.

Managing High-Risk Pregnancies

More than a quarter of a century ago, a consortium of health care providers led by the March of Dimes recommended the establishment of a coordinated system of regionalized perinatal services that included the transfer of high-risk infants to hospitals best equipped to care for them and the transfer of women with high-risk pregnancies to tertiary care facilities.¹¹ Since then, perinatal health care systems have evolved to deliver infants of pregnant women in risk-appropriate health care facilities. These facilities range from level I (without neonatal intensive care units or high-risk obstetric and pediatric staff) to level III (fully equipped facilities). Infants delivered in a level-III hospital have access to state-of-the-art medical care that both increases their survival chances and reduces risk of long-term developmental and physical problems. Such systems have been demonstrated to improve

outcomes for both high-risk mothers and their infants.^{12–16}

Studies in various parts of the country during the 1970s found approximately 20% to 30% of very low-birth-weight (VLBW) infants were already being delivered in level-III hospitals.^{12,15,17,18} As regionalized perinatal health care systems were established, the percentage of women who could reasonably be expected to be transferred to a level III hospital before delivery rose in areas with these systems.^{13,14,18–22} At the same time, neonatal mortality among VLBW infants was dropping dramatically, especially in level-III hospitals, leading to much greater infant survival rates in the 1990s.

The Healthy People 2010 goal that at least 90% of all VLBW deliveries occur in level-III facilities²³ is not likely to be achieved in rural areas apart from specific intervention. In Georgia, for example, this objective has been reached for women living in counties that

contain a level-III facility. However, only slightly more than one half of women who deliver a VLBW infant and who live in counties that do not border counties with level-III facilities manage to get to a level-III facility before delivery (J. Samuelson, J. Buehler, D. Norms; unpublished data; 1996–1997). Women living in counties that do not contain a level-III facility not only face distance and transportation barriers^{22,23–25} that may lead to delayed entry into prenatal care^{26–28}; they also face possible pressure from local providers who feel the need to fill their hospitals' beds.^{21,15,26–29} The type of health care insurance that a woman carries may affect decisions about delivery location, but the evidence for this is mixed.^{26,28} We believe that the referenced exploratory studies point to the need for improved outreach for prenatal care, coupled with training and supervision of prenatal care providers to identify women in need of referral. Also needed is public health monitoring to assure that health care decisions are made on the basis of the client's best interests, not the provider's.

This strategy, even when successful, will not eliminate the racial and ethnic gap in maternal and infant health. Much of the excess morbidity and mortality will remain, because the incidence of pregnancy complications and preterm delivery will not be affected by regionalized perinatal care. The disparate rates of VLBW delivery illustrate this point. In 1997, Hispanic and African American VLBW infants in urban areas were at a slightly higher risk of death compared with non-Hispanic White urban infants. However, a greater disparity consists in the fact that a

much larger proportion of minority births weigh less than 1500 grams (Table 1). This is especially true for African American infants, but it is also becoming a problem among urban Hispanic infants, who represent more than 80% of the Hispanic births in the United States. Until there are breakthroughs in preventing pregnancy complications, the most effective prevention strategy is avoiding conception of a pregnancy with a high risk of pregnancy complications.⁹ One of the key approaches to prevention of high-risk pregnancy is assuring that the pregnancy is consciously desired, with adequate attention to preconception care.³⁰

Increasing Contraceptive Access and Education

In 1995, the last year for which we have national data, nearly one third (31%) of births had not been consciously or clearly desired at conception, including 9% that were unwanted—that is, the woman indicated that she had not wanted to become pregnant then or ever.³¹ Sometime between conception and birth the parents had accepted the pregnancy and begun to love and cherish the child. However, statistics indicate that this process

can dearly cost the families. That cost translates into higher rates of marital dissolution, lower socioeconomic status, higher rates of family violence, and higher rates of developmental problems among the children.³²

Proportionally, births from unintended pregnancy decrease with increasing education.³¹ Perhaps owing to the attention paid to adolescent pregnancy prevention, some people do not think of adults when they think of unintended pregnancies. Yet, teenage pregnancies are only the tip of the iceberg for unintended pregnancies and not even the tip for unwanted pregnancies. About 75% of unintended pregnancies and 86% of unwanted pregnancies occur among adults.

The 1995 National Survey of Family Growth was the first national survey to ask women how they felt about their pregnancy. Women were asked to rate on a scale of 1 to 10 how happy they were to be pregnant, with 1 being “very unhappy to be pregnant” and 10 being “very happy to be pregnant.” Most women rated themselves as happy or very happy. Fewer than 1 in 5 of the scores were in the unhappy range of 1 to 3. But virtually all (93%) of the scores in the un-

happy range were for women with an unintended pregnancy. Two thirds of women with unwanted pregnancies were unhappy, compared with one third of women with mistimed pregnancies (and only 2% of women with intended pregnancies).

What do intentionality of pregnancy and happiness have to do with reducing infant mortality? In the United States, there is no clear causal association between unintended pregnancy and poor pregnancy outcome. However, women with unwanted pregnancies are at greater risk for poor pregnancy outcomes in comparison with women with wanted pregnancies.³² Even if we assume that the woman's attitude toward her pregnancy does not increase the risk of delivering a VLBW infant, effective primary prevention of unwanted conceptions could decrease by about 6000 per year the number of such deliveries. This represents a decrease of 19% among African Americans, 10% among Latinas, and 6% among non-Hispanic Whites (Table 2).

Very few interventions promise any reduction in the number or rate of VLBW deliveries. For this reason alone, it is imperative that a major national campaign be

TABLE 2—Distribution of Very Low-Birthweight (VLBW) Deliveries Under Various Assumptions: United States

	Hispanic	Non-Hispanic	
		White	Black
VLBW deliveries, 1997, % ^a	15.5	50.3	34.2
All deliveries from unwanted conceptions, 1995, % ³¹	10.4	6.7	19.1
Estimated VLBW deliveries attributable to ineffective primary prevention strategies, no.	837	1748	3384
VLBW deliveries with effective primary prevention of unwanted conceptions, %	15.7	53.0	31.2

Note. Numbers are based on the (conservative) assumption of no association between intentionality of pregnancy and VLBW. Percentages do not add to 100 owing to rounding.

^aLinked birth and infant death data for 1997 were supplied by the National Center for Health Statistics and prepared by the March of Dimes Perinatal Data Center.

launched to achieve the goal that every pregnancy be “consciously and clearly desired at conception.”^{30(p252)} This should include, at a minimum, universal availability and full health insurance coverage of all US Food and Drug Administration–approved contraceptives, Medicaid family planning coverage for all women eligible for Medicaid prenatal services, and full funding of the Title X Family Planning program. Additionally, substantial epidemiological and health services research must be conducted to help direct outreach, education, and services programs to adult men and women, and such research must be particularly focused on those who would be unhappy if they found themselves pregnant. For prevention of preterm deliveries when the pregnancy is desired, breakthroughs are still needed in the general understanding of how to prevent premature delivery.

Conducting Research on Causes of Preterm Delivery

Promising research studies are beginning to explore hypotheses about causes of preterm delivery, including infectious, genetic, and racially mediated stress.^{33–43} We would like to comment very briefly on the stress hypothesis, because research into stress-induced delivery of VLBW infants holds promise for all women and special promise for women of color.

The stress hypothesis for disparities in VLBW delivery among African American women has been extensively discussed, although it has yet to be well studied.⁴⁴ Discrimination-associated stress may extend to other women of color in the United States. Specifically, Mexican American women may be

experiencing an increased risk of preterm delivery as they are increasingly exposed to the stress of racism. This phenomenon may erase the advantage they carried as “healthy immigrants” when they first immigrated.^{45–47}

The relatively high birthweight of Mexican American infants has long presented a paradox to reproductive epidemiologists. As a group, Mexican Americans suffer many socioeconomic disadvantages. Paradoxically, their risk of low birthweight is comparable to that of Whites and much less than that of African Americans, who more closely resemble Mexican Americans in socioeconomic status. Buekens and colleagues have recently narrowed the paradox to preterm delivery—that is, compared with non-Hispanic White women, Mexican American women have a lower risk of preterm delivery.⁴⁵

This advantage in preterm delivery appears to lessen among US-born Mexican Americans.⁴⁵ Moreover, among foreign-born women, the protective effect of Mexican birth may erode with increased exposure to US culture.^{46,47} Increased acculturation of Mexican American women may increase their risk of preterm delivery through increased stress associated with the acculturation process. One important research question is how much of this stress results from their exposure to institutional racism, individualized racial insults, or the stress of cultural integration per se.

Stress is a very complex phenomenon: differences exist in individuals’ capacity to withstand stress, and some are more reactive than others to a stressful stimulus. Why is this? Women of all races and ethnicities are exposed to sex-related stress, but

minority women are exposed to additional stress. Does this affect their ability to carry a pregnancy to full term? Do differences in types and amounts of stress associated with different environments explain part of the racial and ethnic disparities in very low birthweight deliveries? Increased stress leads to reduced immune functioning and increased susceptibility to infections. How many, if any, of the racial and ethnic differences in infections, such as bacterial vaginosis, can be attributed to differences in experienced stress?⁴⁸ These questions are just the beginning. There is a great need for more research to be focused in this area.

REFOCUSING THE AGENDA

When infant mortality was front-page news, the nation acted. The proposed solution was universal access to prenatal care, and to begin to achieve this goal, Medicaid coverage was greatly increased for pregnant women. Minority women benefited proportionately more from this solution. Before the goal was reached, however, the nation lost interest.

Although adequate prenatal care may reduce infant mortality, it does little to reduce VLBW,⁴⁹ comes too late to influence conception, and does not completely counteract decentralization of high-risk delivery locations. The interventions we discuss would benefit all women and would help to close the racial and ethnic gap in women’s health. When advocating these interventions, however, public health professionals must propose them not primarily as means to reduce racial and ethnic disparities but rather as effective ways to reverse the continued deterioration

in the nation’s abysmal international ranking in infant mortality. ■

About the Authors

Carol J. Rowland Hogue and Cynthia Vasquez are with the Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Ga.

Requests for reprints should be sent to Carol J. Hogue, 1518 Clifton Rd NE, Atlanta, GA 30322 (e-mail: chogue@sph.emory.edu).

Contributors

C. Vasquez reviewed the literature, analyzed Georgia PRAMS data, and drafted the section on regionalized perinatal health services. C.J.R. Hogue reviewed the literature, analyzed data provided by the March of Dimes, and drafted the remaining sections of the paper. Both authors participated in subsequent revisions.

Acknowledgements

A version of this paper was commissioned by Dr Martha A. Hargraves, conference chair, for presentation at the conference “Eliminating Health Disparities Among Minority Women: Policy, Intervention and Research” at the University of Texas Medical Branch, Galveston, Texas; May 1, 2001. The conference was jointly sponsored by the University of Texas Medical Branch and the National Institutes of Health.

Data for Tables 1 and 2 were supplied by Joann Petrini, MPH, Director, and Rebecca Russell, Research Analyst, Perinatal Data Center, March of Dimes Birth Defects Foundation, White Plains, NY.

References

- Hoekelman RA, Pless IB. Decline in mortality among young Americans during the 20th century: prospects for reaching national mortality reduction goals for 1990. *Pediatrics*. 1988;82:582–595.
- Singh G, Yu S. Infant mortality in the United States: trends, differentials, and projections, 1950 through 2010. *Am J Public Health*. 1995;85:957–964.
- Eberhardt MS, Ingram DD, Makuc DM, et al. Urban and rural health chartbook. *Health, United States, 2001*. Hyattsville, Md: National Center for Health Statistics; 2001.
- Stone, D. *Policy Paradox: The Art of Political Decision Making*. Rev ed. New York, NY: W.W. Norton & Company; 2001.
- Hargraves M, Thomas RW. Infant mortality: its history and social con-

- struction. *Am J Prev Med.* 1993;9:17S–26S.
6. Brown J. Crime, commerce and contagionism: the political languages of public health and the popularization of germ theory in the United States, 1870–1950. In: Walters RG, ed. *Scientific Authority in Twentieth-Century America*. Baltimore, Md: Johns Hopkins University Press; 1997:53–81.
7. Polednak AP. *Segregation, Poverty, and Mortality in Urban African Americans*. New York, NY: Oxford University Press; 1997.
8. Raspberry W. Infant mortality, race, behavior [editorial]. *The Washington Post*. April 8, 1991:A17.
9. Hogue CJR, Yip R. Preterm delivery: can we lower the black infant's first hurdle? [editorial]. *JAMA*. 1984;262:548–550.
10. Hogue CJR, Hargraves MA. Preterm birth in the African-American community. *Semin Perinatol.* 1995;19:255–262.
11. Committee on Perinatal Health. *Toward Improving the Outcome of Pregnancy*. White Plains, NY: The March of Dimes National Foundation; 1977.
12. McCormick MC, Shapiro S, Starfield BH. The regionalization of perinatal services. *JAMA*. 1985;253:799–804.
13. Paneth N, Kiely JL, Sallenstein S, Susser M. The choice of place of delivery: effect of hospital level on mortality in all singleton births in New York City. *Am J Dis Child.* 1987;141:60–64.
14. Yeast JD, Poskin M, Stockbauer J, Shaffer S. Changing patterns in regionalization of perinatal care and the impact on neonatal mortality. *Am J Obstet Gynecol.* 1998;178:131–135.
15. Paneth N, Kiely JL, Wallenstein S, Marcus M, Pakter J, Susser M. Newborn intensive care and neonatal mortality in low-birth-weight infants. *N Engl J Med.* 1982;307:149–155.
16. Kirby RS. Perinatal mortality: the role of hospital of birth. *J Perinatol.* 1996;16:43–49.
17. Gortmaker S, Sobol A, Clark C, Walker DK, Geronimus A. The survival of very low-birth-weight infants by level of hospital of birth: a population study of perinatal systems in four states. *Am J Obstet Gynecol.* 1985;152:517–524.
18. Nugent RR. Perinatal regionalization in North Carolina, 1967–1979: services, programs, referral patterns, and perinatal mortality rate declines for very low birthweight infants. *NC Med J.* 1982;43:513–515.
19. Walker D-J, Vohn BR, Oh W. Economic analysis of regionalized neonatal care for very low-birth-weight infants in the state of Rhode Island. *Pediatrics.* 1985;76:69–74.
20. Larson EH, Hart G, Rosenblatt RA. Rural residence and poor birth outcome in Washington state. *J Rural Health.* 1992;8:162–170.
21. Menard MK, Liu Q, Holgren EA, Sappenfield WM. Neonatal mortality for very low birth weight deliveries in South Carolina by level of hospital perinatal service. *Am J Obstet Gynecol.* 1998;179:374–381.
22. Powers WF, Hedwood PD, Kim YS. Perinatal regionalization as measured by antenatal referral. *Obstet Gynecol.* 1988;71:375–379.
23. *Healthy People 2010*. Washington, DC: US Department of Health and Human Services; 2000.
24. Howell EM, Vert P. Neonatal intensive care and birth weight-specific perinatal mortality in Michigan and Lorraine. *Pediatrics.* 1993;91:464–469.
25. Gould JB, Sarnoff R, Liu H, Bell DR, Chavez G. Very low birth weight births at non-NICU hospitals: the role of sociodemographic, perinatal, and geographic factors. *J Perinatol.* 1999;19:197–205.
26. Phibbs CS, Bronstein JM, Buxton E, Phibbs RH. The effects of patient volume and level of care at the hospital of birth on neonatal mortality. *JAMA.* 1996;276:1054–1059.
27. Bronstein JM, Capilouto E, Carlo WA, Haywood JL, Goldenberg RL. Access to neonatal intensive care for low-birth weight infants: the role of maternal characteristics. *Am J Public Health.* 1995;85:357–361.
28. Vasquez C. *Maternal Risk Factors for the Delivery of Very Low Birthweight Infants Outside of Perinatal Subspecialty Centers* [master's thesis]. Atlanta, Ga: Rollins School of Public Health of Emory University; 2001.
29. Schwartz RM. Supply and demand for neonatal intensive care: trends and implications. *J Perinatol.* 1996;16:483–489.
30. Brown S, Eisenberg L, eds. *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families*. Washington, DC: National Academy Press; 1995.
31. Abma J, et al. Fertility, family planning, and women's health: new data from the 1995 National Survey of Family Growth. *Vital Health Stat* 23. 1997; No. 19:1–114.
32. Hogue CJR. Consequences of unintended pregnancy. In: Brown S, Eisenberg L, eds. *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families*. Washington, DC: National Academy Press; 1995:50–90, 296–307.
33. Johnston RB Jr, Williams MA, Hogue CJR, Mattison DR. Overview: new perspectives on the stubborn challenge of preterm birth. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):3–6.
34. Wang X, Zuckerman B, Kaufman G, et al. Molecular epidemiology of preterm delivery: methodology and challenges. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):63–77.
35. Lockwood CJ, Kuczynski E. Risk stratification and pathological mechanisms in preterm delivery. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):78–89.
36. Thorsen P, Schendel DE, Deshpande AD, et al. Identification of biological/biochemical marker(s) for preterm delivery. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):90–103.
37. Kramer MS, Goulet L, Lyden J, et al. Socio-economic disparities in preterm birth: causal pathways and mechanisms. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):104–123.
38. Rich-Edwards J, Krieger N, Majzoub J, et al. Maternal experiences of racism and violence as predictors of preterm birth: rationale and study design. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):124–135.
39. Holzman C, Bullen B, Fisher R, et al. Pregnancy outcomes and community health: the POUCH study of preterm birth. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):136–158.
40. Wadhwa PD, Culhane RF, Rauh V, et al. Stress, infection and preterm birth: a biobehavioural perspective. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):17–29.
41. Hogue CJR, Hoffman S, Hatch MC. Stress and preterm delivery: a conceptual framework. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):30–40.
42. Romero R, Gomez R, Chworapongsa T, et al. The role of infection in preterm labour and delivery. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):41–56.
43. Dizon-Townson DS. Preterm labour and delivery: a genetic predisposition. *Paediatr Perinat Epidemiol.* 2001;15(suppl 2):57–62.
44. Hogan VK, Ferre CD. The social context of pregnancy for African American women: implications for the study and prevention of adverse perinatal outcomes. *Matern Child Health J.* 2001;5:67–70.
45. Buekens P, Notzon F, Kotelchuck M, Wilcox A. Why do Mexican Americans give birth to few low-birth-weight infants? *Am J Epidemiol.* 2000;152:347–351.
46. Guendelman S, English PB. Effect of United States residence on birth outcomes among Mexican immigrants: an exploratory study. *Am J Epidemiol.* 1995;142:S30–S38.
47. Zambrana R, Scrimshaw S, Collins N, Dunkel-Schetter C. Prenatal health behaviors and psychosocial risk factors in pregnant women of Mexican origin: the role of acculturation. *Am J Public Health.* 1997;87:1022–1026.
48. Culhane JF, Rauh V, McCollum KF, et al. Maternal stress is associated with bacterial vaginosis in human pregnancy. *Matern Child Health J.* 2001;5:127–134.
49. Dubey L, Joyce T, Kaestner R, Kenney GM. Changes in prenatal care timing and low birth weight by race and socioeconomic status: implications for the Medicaid expansions for pregnant women. *Health Serv Res.* 2001;36:373–398.