

Preterm Birth in North Carolina

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Decreasing infant mortality is closely linked to decreasing preterm births. Unfortunately, the rate of preterm births in North Carolina and in the United States, after declining in the 1980s, has been rising again for the past several years. The goal of this commentary is to examine North Carolina data related to both preterm births per se and to those factors that have been associated with preterm birth.

At times, low-birth weight (LBW) rates will be used in this paper when preterm data are not available. While both rates follow similar patterns, readers should recognize that LBW refers to the birth of infants weighing less than 2,500 grams (5 pounds, 8 ounces), while preterm births are those before 37 weeks gestation. Some of the data reported here (smoking and intimate partner violence, for example) are based on self-report by women who are pregnant or delivering; such self-reporting may result in underestimation of the true rate of the outcome or exposure reported.

Preterm births may be medically indicated because of the health of the mother or fetus, may follow preterm premature rupture of the fetal membranes, or may be the result of spontaneous onset of labor. The antecedents of preterm birth are multifactorial and vary from one birth to another. Thus, the reasons for increasing rates of preterm birth are not clear. Two factors have been identified in both national and North Carolina data as potentially contributory: increasing maternal age and an increasing number of multiple gestation births.^{1,2}

Maternal Age and Multiple Births

More women are delaying childbearing until their mid-thirties and into their forties than in previous generations. In North Carolina in 1998, 10.5% of all births were to women over the age of 35. By comparison, only 3.6% of births in 1978 and 5.8% of births in 1988 were to North Carolina women ages 35

or greater. The birth rate (births per 1,000 women in a population) for women ages 35 to 39 was more than twice as great in 1998 (32.7%) than in 1978 (13.8%). Although both rates were somewhat lower than comparable rates for the United States (34.7% and 19.0%), the trend is the same. During this same period, LBW rates for mothers in this age group increased from 8.8% to 10.2% in North Carolina.¹

Multiple births increased from 2.0 % of live births in 1980 to 2.8% in 1997, a 40% relative increase. Women over the age of 35 naturally have higher rates of multiple births.² In North Carolina the 1999-2001 rate was 43.3 for women ages 30-39 and 51.5 for women ages 40 and over, compared to 17.6 for women under age 20.2 In addition, the increased use of in vitro fertilization with the implantation of two or more embryos

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appears to be a contributory factor. The rate of preterm birth in multiple gestation pregnancies in North Carolina for 1999-2001 was 61.2, slightly higher than the rate of 59.2 for the United

States.³ The increase in multiple births between 1980 and 1997 appears to account for 70% of the increase in the LBW rate in NC during these years.²

At the other end of the childbearing age continuum, births to teen mothers have dropped each year in both the United States and in North Carolina. In the ten years from 1992-2001, pregnancy rates for North Carolina teens ages 10-14 decreased from, 3.3 per 1,000 to 1.7 per 1,000, a decrease of 48.5%. For adolescents ages 15-19 rates decreased from 30.7% to 16.4%, a decrease of 46.6%.⁴ These decreases surpass the national rate of decrease of 26% since 1991.⁵ Nevertheless, rates continue to be higher than in many developed nations.⁶ In a review of 14,718 births, teens under 15-years of age were almost 50% more likely to have a preterm infant than adult women. Teens ages 16 and 17 were not found to be at increased risk in this study.⁷

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Cigarette Smoking

Cigarette smoking and preterm labor, addressed in another paper in this issue,²⁶ has been linked to preterm and low-birth weight births for more than half a century. In a five-year study of low-income women receiving care in a public clinic in Forsyth County, North Carolina, cigarette smoking had a far greater effect on both low-birth weight and preterm births in African American women than in white women, even though fewer African American women smoked. In this study, 21.2% of African American women reported smoking cigarettes. African American women who smoked more than one-half pack of cigarettes a day had a preterm birth rate of 20.4% compared with a rate of 9.2% for non-smokers ($p=.003$ after adjusting for age and other risk factors).⁸

Physical and Emotional Stress

Stress has been associated with preterm birth in a number of studies.⁹ Accumulation of trauma over one's lifetime (allostatic load),¹⁰ job related stress,^{11,12} and racism are examples of stresses experienced by many pregnant women in North Carolina. Through a complex physiologic pathway, stress raises levels of corticotropin-releasing hormone (CRH) leading to the production of Adrenocorticotrophic hormone (ACTH) and glucocorticoids with subsequent preterm labor. Stress has also been associated with decreased immune competence, increasing the likelihood of infections which, in turn, are associated with preterm labor.

Intimate partner violence, a particular form of stress, was first identified as a correlate of preterm birth in 1989¹³ and has since been confirmed in a number of studies. In a study using data from the population-based NC Pregnancy Risk Assessment Monitoring System (PRAMS) for 1997 through 2000,¹⁴ the prevalence of physical violence during the 12-month period prior to pregnancy was 6.9% and 5.5% during pregnancy. These rates decreased from 8.4% and 8.1% for the two periods in 1997 to 6.5% and 5.2% in 2000. Rates of preterm birth were 10.1% for women experiencing violence and 9.6% for those who did not report violence. Rates of LBW were 10.1% for women reporting violence and 7.6% for those who did not. Women experiencing violence were more likely to begin prenatal care after the first trimester; to smoke before, during, and after pregnancy; to report high levels of stress in the 12 months before birth; and to experience postpartum depression.

Infection

Two groups of infections have been associated with preterm birth, infections of the genitourinary tract and periodontal infections. Genitourinary infections have been recognized as important correlates of preterm birth for a number of years. Identification and treatment of these infections necessitates access to and utilization of prenatal care.

Less attention has been given to periodontal disease. In a case control study of 124 pregnant and postpartum mothers, controlling for other risk factors, women with periodontal disease

were found to be 7.9 times more likely to have preterm LBW births.¹⁵ In a randomized study of 351 women in Chile, women treated for periodontal disease prior to 28 weeks gestation had a preterm rate of 1.84% compared to 10.11% for untreated women.¹⁶ In North Carolina the availability of periodontal care for low-income women must be examined and, if it is not adequate, this issue must be addressed in plans to reduce preterm births.

Preventive Interventions

Two studies conducted entirely or partially in North Carolina suggest potential preventive interventions. A randomized multisite study of natural progesterone (17 alpha-hydroxyprogesterone caproate: 17P) injected intramuscularly beginning at 16 to 20 weeks gestation until 36 weeks included women from two North Carolina sites. All of the women in the study had experienced one or more previous preterm births. There was a statistically significant difference in births less than 37 weeks (36.3% vs. 54.9%; $p=.0001$) and less than 32 weeks (11.4% vs. 19.6%; $p=.018$) with the lower rates in women receiving 17P. There was also a significant difference in infant mortality rates: 2.6% for the 17P group and 5.9% for the placebo group ($p=.05$), as well as a decreased incidence in morbidity, including necrotizing enterocolitis and intraventricular hemorrhage ($p=.05$).¹⁷ A study of 17P in Brazil using vaginal progesterone in a population with additional risk factors for preterm birth, also found a statistically significant reduction in preterm births.¹⁸ The American College of Obstetricians and Gynecologists Committee on Obstetrical Practice has stated that "further studies are needed to evaluate the use of progesterone" in women with conditions other than a previous documented history of preterm birth "because unresolved issues remain, such as optimal route of drug delivery and long-term safety of the drug."¹⁹

In a five-year randomized study of nurse telephone intervention in low-income women receiving care in a public clinic in Forsyth County, North Carolina was highly effective in 759 African American women aged 19 and over with a 34% reduction in LBW births and a 44% reduction in preterm births. There was no difference in younger African American women or in white women.²⁰ Telephone intervention led to a cessation in smoking in 25%, of participants and reduction in an additional 21%.²¹ Specific interventions included two or more phone calls per week with assessment, behavioral suggestions as appropriate (e.g. smoking cessation, need to contact healthcare providers at the clinic), education about preterm labor, and emotional support. When study data were examined by risk for preterm labor using a modification of the risk factors of Papiernik²² and Creasy,²³ the greatest impact was on women identified at low risk. Previous studies by others have shown that only 50% of women who will have preterm births can be identified in a risk screening; the other 50% will have no identifiable risk factors and will be considered at low risk, but should nevertheless not be ignored in prevention efforts.²⁴

A Changing Paradigm for Prematurity Prevention

The data reviewed here suggest several directions that may lead to the reduction of preterm births. As stated in the lead paper in this issue of the Journal,²⁵ the prepregnancy period is an ideal time for intervention. Unfortunately, all women do not have access to preventive healthcare during this time, and nearly half of all pregnancies are unplanned. Whenever possible, prior to pregnancy, we should:

- Educate women and their partners about the increased risk of preterm birth when pregnancy is delayed beyond age 35;
- Encourage abstinence from smoking at each health encounter and provide specific assistance for smoking cessation;
- Screen women for intimate partner violence at each health encounter and have a protocol for appropriate referral;
- Be aware of the possibility of periodontal disease and refer women for dental care;
- Encourage the use of contraception to reduce the number of unwanted pregnancies.

During pregnancy, we can:

- Support efforts to assure accessibility to prenatal care for all pregnant women;
- Continue assessment and intervention for identifiable stressors, smoking, intimate partner violence, and infection, including periodontal infection;
- Consider strategies such as nurse telephone intervention or other forms of frequent contact for pregnant women, particularly those with limited incomes and education.

Conclusion

Just as many pieces of fabric form a patchwork quilt, many factors contribute to preterm birth in North Carolina. Approaches to prevention of preterm birth must be multifaceted, should begin early in a woman's life, and must continue through the prenatal period, creating an environment in which every woman achieves the best possible pregnancy outcome. **NCMJ**

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