

Group Prenatal Care and Preterm Birth Weight: Results From a Matched Cohort Study at Public Clinics

Jeannette R. Ickovics, Trace S. Kershaw, Claire Westdahl, Sharon Schindler Rising, Carrie Klima, Heather Reynolds, and Urania Magriples

OBJECTIVE: To examine the impact of group versus individual prenatal care on birth weight and gestational age.

METHODS: This prospective, matched cohort study included pregnant women ($N = 458$) entering prenatal care at 24 or less weeks' gestation; one half received group prenatal care with women of the same gestational age. Women were matched by clinic, age, race, parity, and infant birth date. Women were predominantly black and Hispanic of low socioeconomic status, served by one of three public clinics in Atlanta, Georgia or New Haven, Connecticut.

RESULTS: Birth weight was greater for infants of women in group versus individual prenatal care ($P < .01$). Among those born preterm, infants of group patients were significantly larger than infants of individual-care patients (mean, 2398 versus 1990 g, $P < .05$). Although not statistically significant, infants of group patients were less likely than those of individual-care patients to be low birth weight (less than 2500 g; 16 versus 23 infants); very low birth weight (less than 1500 g; three versus six infants);

early preterm (less than 33 weeks; two versus seven infants); or to experience neonatal loss (none versus three infants). There were no differences in number of prenatal visits or other risk characteristics (patient age, race, prior preterm birth).

CONCLUSIONS: Group prenatal care results in higher birth weight, especially for infants delivered preterm. Group prenatal care provides a structural innovation, permitting more time for provider-patient interaction and therefore the opportunity to address clinical as well as psychological, social, and behavioral factors to promote healthy pregnancy. Results have implications for design of sustainable prenatal services that might contribute to reduction of racial disparities in adverse perinatal outcomes. (Obstet Gynecol 2003;102:1051-7. © 2003 by The American College of Obstetricians and Gynecologists.)

Receipt of adequate prenatal care has been associated with reductions in the risk of preterm delivery and low birth weight.¹⁻³ Adequacy of prenatal care reflects not only timing of initiation and number of visits, but also quality and content of care^{4,5}; indeed, content of prenatal care might be a more important predictor of perinatal outcomes than number of visits.⁶⁻⁸ Several studies have documented that enhanced prenatal care that includes patient education, behavioral interventions, and/or psychosocial support has resulted in reductions in low birth weight.^{3,9,10} For example, in a nationally representative sample of women with live births, Kogan et al⁹ found that those who reported receiving sufficient health behavior advice were at lower risk of delivering an infant with low birth weight. Similarly, in an observational study of 3073 low-income women, those receiving psychosocial services (ie, more content) reduced the risk of low birth weight even after controlling for number of prenatal visits and gestational age.¹⁰ On the other hand, it is important to recognize that other interventions designed to enhance prenatal care were not effective in reducing preterm birth and subsequently low birth weight.¹¹

From the Departments of Epidemiology and Public Health and Obstetrics and Gynecology, and the Center for Interdisciplinary Research on AIDS, Yale University School of Medicine; Yale University School of Nursing, New Haven, Connecticut; Department of Gynecology and Obstetrics, Emory University and Grady Hospital System, Atlanta, Georgia; and Centering Pregnancy and Parenting Association, Cheshire, Connecticut.

Carrie Klima is currently at the University of Illinois at Chicago, College of Nursing.

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One structural innovation, not yet empirically evaluated, that could enhance prenatal care is the provision of prenatal care in a group setting. Group care has been used with some documented and anecdotal successes with pediatric^{12,13} and geriatric patients,¹⁴ as well as patients with diabetes.^{15,16} Group care permits more time for providers and patients to develop a relationship and to discuss recommended content of care compared with traditional individual prenatal care (eg, 120 versus 15 minutes, respectively).

The Centering Pregnancy Program is an innovative model for providing group prenatal care that has been implemented at prenatal care sites around the United States since 1995.¹⁷ The Centering Pregnancy Program has ten defined 2-hour sessions implemented from weeks 16 through 40 of pregnancy. All prenatal care occurs within the group setting except for the initial intake done before group assignment, medical concerns involving the need for privacy, and cervical assessments late in pregnancy. In this group setting, up to 12 women of the same gestational age receive basic prenatal risk assessments, can share support from other women, and obtain knowledge and skills related to pregnancy, childbirth, and parenting. Groups are led by an obstetric provider and an assistant trained in the Centering Pregnancy Program model. Group prenatal care is designed to address the recommended content for optimal care,⁵ and as such is designed to improve the quality of care and consequently perinatal outcomes.

The primary objective of this study was to examine the impact of group versus individual prenatal care on birth weight and gestational age among women receiving care at urban clinics that primarily serve economically disadvantaged and minority women at high risk for adverse perinatal outcomes. Reducing the risks for low birth weight and preterm delivery is particularly important for black women and Latinas, because of persistent disparities in adverse perinatal outcomes.^{18,19} We hypothesized that infants of women in group prenatal care would have significantly higher birth weight and be less likely to be delivered preterm compared with those who received individual prenatal care. We focus on these perinatal outcomes because of their critical association with neonatal morbidity and mortality.

MATERIALS AND METHODS

Obstetric patients who entered prenatal care at less than 24 weeks' gestational age and voluntarily received prenatal care in a group setting were included. A comparison group of patients who received individual standard of care at the same clinics were matched one-to-one by age (19 or less, 20–25, 26–30, 31–35, and 36 or more

years), race or ethnicity (black, Latina, white, other), and parity (nulliparous versus multiparous). With population-based records of births at each hospital, all data needed to select the matched cohort were entered into a computerized database (with no patient-identifying information). To reduce potential bias, random selection of comparison group patients was conducted by a computer program designed to select the first available patient with the closest delivery date who met all matching criteria. Patients with severe medical or psychiatric problems requiring individualized assessment were excluded (eg, human immunodeficiency virus infection, preexisting insulin-dependent diabetes, poorly controlled hypertension, seizure disorder, psychiatric illness, or active substance use that results in cognitive impairment). A total of 458 patients were included: 229 received group care, and 229 received individual care.

Participants were enrolled from two affiliated hospital-based public clinics in Atlanta, Georgia and one hospital-based public clinic in New Haven, Connecticut. These clinics primarily serve minority women (more than 85%) of lower socioeconomic status who are Medicaid recipients or self-pay. Each clinic had implemented group prenatal care at least 6 months before the start of this study. Enrollment took place between August 1999 and March 2002.

Institutional review boards at each site approved the study. Comparison-group patients received routine individual prenatal care at the clinics. With regard to group prenatal care, 1 to 2 groups per month were started at each clinic, with up to 12 women per group. Women were enrolled based on month of expected delivery; therefore, group patients concurrently experienced similar physiologic/psychologic changes associated with pregnancy. Over ten sessions, group discussions focused sequentially on education and skills-building specific to prenatal and postpartum care (eg, nutrition, labor preparation, infant care). Group procedures promoted self-care activities and taught women to actively track changes associated with pregnancy.

Specifically, the structure of the Centering Pregnancy Program is based on three essential components: assessment, education and skills-building, and support. All prenatal care occurs within the group setting except for the initial nursing and medical assessment, medical concerns involving the need for privacy, and cervical assessments late in pregnancy. Formal intake is done at initial visits before group assignment (eg, history, physical examination, baseline laboratory assessment). Groups are facilitated by a nurse midwife or obstetrician and one assistant, both trained in group process and the Centering Pregnancy Program model. When participants arrive, they first engage in self-care activities of weight and

blood pressure assessment; they record and chart their own progress in their medical records. Then, individual prenatal assessments are completed by the practitioner during the first 30 minutes of each session (eg, fetal heart rate, fundal height). Each session focuses on formal discussion, education, and skills-building on issues related to pregnancy, childbirth, and parenting. The curriculum is designed to include relevant content that is developmentally appropriate, but facilitators are trained to be sufficiently flexible to meet the needs of individual patients or to address specific topics as they arise in the group. Session themes include: 1) prenatal nutrition and fetal development, 2) common discomforts of pregnancy, 3) relaxation and labor, 4) family and parenting, 5) the birth experience, 6) decisions of pregnancy and developing a birth plan, 7) infant feeding, 8) postpartum adjustment, 9) new baby care, and 10) baby and mother care (including postpartum contraception). Providers are trained in a facilitative process, such that group sessions are not didactic lectures but rather an integrated discussion with input from health care providers as well as patients.

Primary outcome measures were obtained in the same way for women in group and individual prenatal care. Birth weight was measured in grams as recorded on the standard labor logs for each patient. Gestational age was determined by last menstrual period, with ultrasound confirmation for all patients; if major discrepancies existed, ultrasound was used for determination. Categorization followed routine standards as preterm (less than 37 weeks' gestational age at time of delivery) or term. Infants were categorized as small for gestational age based on birth weight and gestational age, less than the tenth percentile of in utero fetal weight standards for the United States.²⁰ Patient demographics (age, race or ethnicity), reproductive health history (parity, prior preterm birth), and number of prenatal care visits were obtained via medical record abstraction.

McNemar analyses were used to evaluate potential differences in preterm delivery based on type of prenatal care (group versus individual). Mixed-effects models that adjusted for the correlations among the matched pairs were used to identify differences in birth weight and any potential interaction between birth weight and preterm delivery by type of care. Because of the relatively small number of outcomes, descriptive analyses stratified by type of prenatal care were used to identify the number of women who had early (less than 33 weeks' gestational age) versus moderate (33–37 weeks' gestational age) preterm deliveries, infants of low (less than 2500 g) or very low (less than 1500 g) birth weight, and neonatal deaths. All analyses were conducted by treatment group, with intent-to-treat used for women

Table 1. Background Characteristics Stratified by Treatment Group

	Centering group prenatal care (<i>n</i> = 229)	Individual prenatal care (<i>n</i> = 229)	<i>P</i>
Race			
Black	182 (79.5)	182 (79.5)	N/A*
Latina	35 (15.3)	35 (15.3)	
White	12 (5.2)	12 (5.2)	
Age, (y)			
14–19	90 (39.3)	90 (39.3)	N/A*
20–25	104 (45.4)	104 (45.4)	
26–30	28 (12.2)	28 (12.2)	
≥31 (range 31–41)	7 (3.1)	7 (3.1)	
Parity			
Nulliparous	108 (47.2)	108 (47.2)	N/A*
Multiparous	121 (52.8)	121 (52.8)	
Site			
Atlanta, Georgia	125 (54.6)	125 (54.6)	N/A*
New Haven, Connecticut	104 (45.1)	104 (45.1)	
History of preterm labor	7 (3.1)	9 (3.9)	.62
Total number of prenatal care visits	9.78 (2.72)	9.64 (3.66)	.65

N/A = not applicable.

Data are presented as *n* (%), except total numbers of prenatal care visit, which are mean (standard deviation).

*These variables were used as matching criteria for this matched cohort design; therefore, *P* values are not applicable.

who attended at least one group prenatal care session compared with individual prenatal care.

Power analysis was conducted to assess the power of detecting differences between group and individual care on our primary outcome of birth weight (in grams). Assuming a small to moderate correlation between the matched pairs ($r = .3$), 229 pairs had a power of .80 to detect a small effect (Cohen's $d = .2$), reflecting the ability to detect a difference between the two treatment groups of 155 g.²¹

RESULTS

There were 458 women enrolled in this study: 229 received group prenatal care, and 229 received standard individual care (Table 1). The majority of patients (80%) were black, 15% were Latina, and 5% were white. Eighty-five percent of women were 25 years of age or younger (range 12–40; mean = 21.6, standard deviation = 4.2). Forty-seven percent were nulliparous; 25% had carried one prior birth to term (range 1–6 births; mean = 1.0). Patients were matched on race or ethnicity, age, and parity, so there were no differences between the treatment groups based on these characteristics.

Table 2. Birth Outcomes Stratified by Treatment Group

	Centering group prenatal care (n = 229)	Individual prenatal care (n = 229)	P
Birth weight (g)	3228.2 (540.1)	3159.1 (640.7)	<.01
Preterm	21 (9.2)	22 (9.6)	.83
Early (< 33 wk)	2 (0.9)	7 (3.1)	
Late (33–36.9 wk)	19 (8.3)	15 (6.5)	
Low birth weight (< 2500 g)	16 (7.0)	23 (10.0)	.38
Very low birth weight (< 1500 g)	3 (1.3)	6 (2.6)	N/A*
Neonatal deaths	0 (0)	3 (1.3)	N/A*

Abbreviation as in Table 1.

Data are presented as n (%), except birth weights (top row), which are mean (standard deviation).

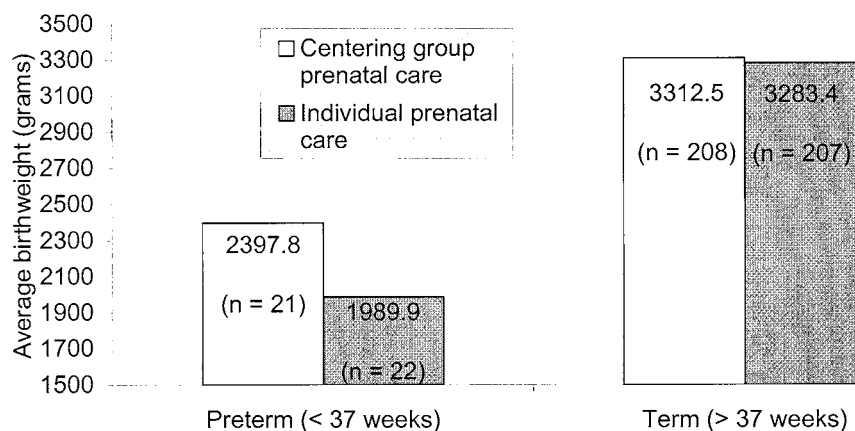
* Cell sizes too small to permit statistical testing.

Because prior preterm birth is a leading risk factor for subsequent preterm birth, we confirmed that there was no baseline difference between the two groups in history of preterm labor (McNemar $\chi^2 = 0.25$, $P = .62$). There was no difference in the number of prenatal visits obtained by prenatal patients in group compared with prenatal care: mean number of visits was 9.78 versus 9.64, respectively (matched $t = 0.46$, $P = .65$). Finally, there were no significant differences in birth weight or rates of preterm delivery between cities, so data from Atlanta and New Haven were combined for all analyses.

Table 2 provides a description of birth outcomes stratified by treatment group. Birth weight was greater for the infants of patients in group prenatal care compared with those in individual care ($F = 7.68$, $P < .01$). There was no difference in preterm delivery, with

slightly more than 9% of women in both treatment groups having a preterm delivery ($P = .83$). There was a statistically and clinically significant interaction effect between birth weight and preterm delivery (Figure 1). Although there was no significant difference in birth weight between group and individual prenatal care patients among infants carried to term (3312.5 versus 3283.4 g; $P = .54$), preterm infants of group prenatal care patients were significantly larger than those who received individual prenatal care: 2397.8 versus 1989.9 g, a difference of 407.9 g ($F = 5.66$, $P < .05$). Descriptive analyses (see Table 2) indicated that infants of group prenatal care patients were less likely than infants of individual prenatal care patients to be considered low birth weight (less than 2500 g; 16 versus 23 infants); very low birth weight (less than 1500 g; three versus six infants); early preterm births (less than 33 weeks; two versus seven infants); or to experience neonatal loss (none versus three infants).

Post hoc analyses were conducted to determine whether the differences in preterm birth weight could be attributed to differences based on gestational age. For term infants, there was no difference in average gestational age at delivery ($P = .35$); for preterm infants, average gestational age was greater for infants of group prenatal care patients than individual prenatal care patients (34.8 versus 32.6 weeks, respectively). This result indicates that group patients maintained pregnancies for 2 weeks longer than individual care patients ($P < .001$). There was no difference in percentage of infants classified as small for gestational age when women in group were compared those receiving individual prenatal care: 23.8% versus 27.3% of preterm births ($P = .80$), respectively.

**Figure 1.** Average birth weight for preterm and term infants, stratified by group versus individual prenatal care.

Ickovics. Group Care Improves Birth Weight. *Obstet Gynecol* 2003.

DISCUSSION

Results of this study indicated that group prenatal care was associated with statistically and clinically significantly better weight gain for preterm infants. Preterm infants of mothers who obtained group prenatal care were of nearly “normal” birth weight (more than 2500 g). Overall, group prenatal care resulted in lengthened gestation, which in turn resulted in higher birth weight. Group prenatal care also seemed to protect against early preterm delivery, low and very low birth weight, and neonatal mortality, although these results should be interpreted with caution, owing to the small number of outcomes. However, even modest reductions in these rare events can be important, given the high rates of medical complications and associated costs of intensive medical care for preterm infants.²²

We speculate that these results might be due to the content and intensiveness of prenatal care received in the group context. We believe that more time together results in a better understanding of the physiology of a healthy pregnancy, more knowledge and skills acquired, and ultimately increased health-promoting behaviors and decreased health-damaging behaviors. For example, group patients likely spent substantially more time discussing the importance of adequate nutrition during pregnancy, which might have resulted in better weight gain and the choice of more nutritious foods, thus increasing infant birth weight.²³ In addition, group prenatal care might have promoted changes in social norms to reduce high-risk behaviors during pregnancy (eg, smoking cessation). Another potential mechanism is that group prenatal care patients mobilized more support and felt better prepared for labor and delivery, thus reducing stress that might contribute to preterm birth.²⁴ Overall, the Centering Pregnancy Program provides an intensive, multidimensional approach to prenatal care, integrating clinical and psychosocial care. Further research is needed to identify the precise mechanism(s) by which group prenatal care might have its salutary effects.

In general, advantages of group interventions include, but are not limited to, improved learning and skills development, attitude change and motivation, social support, and enhanced insight through sharing of common life experiences. Specific advantages of group prenatal care include the opportunity to discuss behavioral changes that might be required to maintain a healthy pregnancy; exposure to sensitive issues, such as the risks of interpersonal violence and sexually transmitted diseases (for all women, even those too embarrassed to raise questions in a one-on-one visit); increased contact time, improving patient-provider communication and en-

abling better depth and scope of coverage of essential knowledge and skills; and nurturing support among group participants. In turn, groups can hasten the development of new community norms for health-enhancing behaviors that are supported by members of the group.

Results of this study have important public health implications for reducing low birth weight among women at risk for preterm births. There are many programs designed to reduce the risk of low birth weight and neonatal mortality; however, most do not appear to be effective.¹¹ Even a large structural intervention—Medicaid expansions for pregnant women—had limited impact on birth weight and preterm births.²⁵ Preterm birth and low birth weight account for the majority of neonatal and infant deaths as well as nearly half of all cases of neurologic disability; result in prolonged hospitalization, including use of the neonatal intensive care unit; and, might continue to have life-long adverse consequences.²⁶ If prenatal care provides a window of opportunity for health promotion and risk reduction, then group prenatal care might be a useful tool in the reduction of adverse perinatal outcomes, reducing racial or ethnic disparities.

This study was limited by lack of randomization that could have resulted in self-selection bias for women selecting group versus individual care. It is possible that those who selected group prenatal care might have had better health status or behaviors. However, our matched design on important predictors (eg, age, race, parity) likely reduced this potential bias substantially. Medically at-risk patients and those who entered prenatal care after 24 weeks' gestational age were excluded, and post hoc analyses indicated no differences in history of prior preterm birth or number of prenatal care visits. Therefore, the two study groups were not known to be at differential risk for adverse birth outcomes. Moreover, the strength and consistency of findings gives us confidence in the results. The mechanisms by which preterm infants might be protected by group prenatal care are postulated to be secondary to reduction of at-risk behaviors, but these data were not collected as part of this study. Results must be replicated to ensure validity and generalizability of these findings to other pregnant women.

In contrast to these limitations, there were notable study strengths. This was a relatively large patient sample from two cities with high rates of adverse birth outcomes. Women were at increased risk for adverse perinatal outcomes because of race or ethnicity, age, low social class, and the associated impoverished environments. This study had a prospective, longitudinal design, and provided objective indicators of important birth outcomes.

We believe that one of the greatest strengths of group prenatal care is its potential sustainability. Because prenatal care is reimbursable by public and private insurance, group prenatal care is an innovative model of care that could be adopted in a variety of health care settings. With more than 4 million births in the United States annually, prenatal care is one of the most important and well-used healthcare services. The impact of content, comprehensiveness, and quality of prenatal care programs has not yet been rigorously investigated. A randomized, controlled trial is under way that will permit the most unbiased estimates of effects of group prenatal care on perinatal risks as well as other reproductive health outcomes. More detailed measures will enable us to better understand how social and clinical factors translate into the biologic mechanisms that can affect pregnancy outcomes.² Results of this study might have a significant impact on the design and delivery of future prenatal care services. We are not naive about the challenges of implementing a structural change to a broader population. However, individual health care providers and their institutions often are seeking improved models for delivering quality, cost-effective prenatal services; the Centering Pregnancy Program of group prenatal care might provide such a model.

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Address reprint requests to: Jeannette R. Ickovics, Yale University, Department of Epidemiology and Public Health, 60 College Street, Suite 415, PO Box 208034, New Haven, CT 06520-8034; E-mail: jeannette.ickovics@Yale.edu.

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