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Randomized Controlled Trial on the Effect of Group Versus Individual Prenatal Care on Psychosocial Outcomes

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Abstract

Objective: To assess the effect of group prenatal care (GPNC) compared to individual prenatal care (IPNC) on psychosocial outcomes in late pregnancy, including potential differences in outcomes by subgroups.

Design: Randomized Controlled Trial.

Setting: An academic medical center in the Southeastern United States.

Participants: A total of 2,348 women with low-risk pregnancies who entered prenatal care before 20 6/7 weeks gestation were randomized to GPNC (n = 1,175) or to IPNC (n = 1,173) and stratified by self-reported race and ethnicity.

Methods: We surveyed participants during enrollment (M = 12.21 weeks gestation) and in late pregnancy (M = 32.51 weeks gestation). We used standard measures related to stress, anxiety, coping strategies, empowerment, depression symptoms, and stress management practices in an

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intent-to-treat regression analysis. To account for non-adherence to GPNC treatment, we used an instrumental variable approach.

Results: The response rates were high: 78.69% of participants in the GPNC group and 83.89% of participants in the IPNC group completed the surveys. We found similar patterns for both groups, including decrease in distress and increase in anxiety between surveys and comparable levels of pregnancy empowerment and stress management at the second survey. We identified greater use of coping strategies for participants in the GPNC group, particularly those who identified as Black or had low levels of partner support.

Conclusion: Group prenatal care did not affect stress and anxiety in late pregnancy; however, the increased use of coping strategies may suggest a benefit of GPNC for some participants.

Precis

Participants in the group prenatal care group had increased use of coping strategies in late pregnancy compared to participants in the individual prenatal care group.

Keywords

Prenatal care; group prenatal care; pregnancy; anxiety; stress management; coping strategies; randomized control trial

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While pregnancy is often idealized as a happy and fulfilling time, it can also be a stressful period of transition brought on by the physical changes of pregnancy; concerns about medical complications, childbirth, and adapting to parenthood; the effect on employment and finances; and changing relationships (Ibrahim et al., 2019). Life circumstances, including an unplanned or unexpected pregnancy, limited support from the family or the father, and financial pressure can compound the effects of pregnancy-specific stress and anxiety (Guardino & Dunkel Schetter, 2014; Ibrahim et al., 2019). Elevated psychological distress during pregnancy, including depression, anxiety, and stress, has been associated with increased risk for preterm birth (McLemore et al., 2018; Ramos et al., 2019; Staneva et al., 2015). However, the adverse effects of stress responses on birth outcomes can be mitigated when pregnant women have access to vital resources such as social support from family and friends and when they employ effective coping strategies (Cheadle et al., 2021; Guardino & Dunkel Schetter, 2014).

Health care providers have an opportunity to address their patients' levels of stress, anxiety, and coping during regularly scheduled prenatal care visits, which may improve pregnancy outcomes and psychosocial health. Pregnancy-specific stress, defined as feeling worried about particular aspects of pregnancy (e.g., physical symptoms of pregnancy, labor and birth, and taking care of the newborn) may be a stronger predictor of birth outcomes than general stress or anxiety (Ibrahim & Lobel 2020) and more likely to be positively affected by health care providers through patient education and social support.

Callout 1

Further, the nature of patient-provider interactions and health care experiences during the prenatal period, whether positive or negative, contribute to patients' psychosocial well-being

(McLemore et al., 2018; Wishart et al., 2021). Pregnant patients benefit when prenatal care providers take time to listen; provide education; demonstrate respect, empathy, and reassurance; and connect them to care coordination and other resources (Wishart et al., 2021). The structure of traditional, individual prenatal care limits the ability to meet these preferences because visits are focused on the identification and management of medical risk factors that cause pregnancy complications. Limited time is available for health education and psychosocial support (Maloni et al., 1996; Peahl & Howell, 2021).

The CenteringPregnancy model of group prenatal care was developed to improve patient-provider communication, create opportunities for social support, and maximize time for patient education while maintaining the individual medical assessment and monitoring set forth in clinical practice guidelines for prenatal care (Rising, 1998; Rising et al., 2004). The model is based on the midwifery framework in which symmetry in the relationship between provider and patient, including shared decision-making, and empowerment, is emphasized. Groups consisting of eight to 12 individuals, all expecting to give birth in the same month, engage in ten 2-hour sessions of group prenatal care (GPNC). These sessions adhere to the suggested schedule for individual prenatal care (IPNC) outlined by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists (2017). Participants are actively engaged in their health care assessment by monitoring their own blood pressure and weight gain at each session. The group sessions are organized by topics relevant to gestational age (see Supplemental Table 1). Specifically, the curriculum includes information, coping strategies, and resource sharing to decrease patients' distress and teach new skills for managing aspects of the pregnancy, birth, and postpartum period (Chen et al., 2017). Through group social support, participants may feel less alone and more empowered and therefore experience less anxiety or symptoms of depression. Through monitoring their own health and the expanded time with providers, participants may establish more positive relationships with providers and take greater responsibility for their health and health care decisions (Rising, 1998; Rising et al., 2004).

Overall, participants in GPNC reported increased patient satisfaction and positive experiences of care (Heberlein et al., 2016b; Ickovics et al., 2007; Kennedy et al., 2011; Mazzoni & Carter, 2017; Renbarger et al., 2021). Evidence that GPNC increases psychosocial well-being and social support is inconclusive (Mazzoni & Carter, 2017). In studies comparing GPNC to IPNC, researchers found no differences or small positive differences of questionable clinical significance in stress and depression outcomes, prenatal knowledge, readiness for labor, and readiness for infant care (Catling et al., 2015; Ickovics et al., 2007, 2011; Saleh, 2019). Researchers in one study examined differences in coping as an outcome and found that GPNC participants scored higher on use of prenatal coping strategies (Heberlein et al., 2016a). Many existing observational studies of CenteringPregnancy are limited by self-selection bias and small sample sizes (Carter et al., 2016; Chen et al., 2017) and include a range of scales used to assess psychosocial outcomes, which makes comparisons across studies difficult.

Outcomes are likely to be influenced by the extent of involvement in care, typically measured by the number of attended group sessions (e.g., meeting a threshold of five visits; Crockett et al., 2019). It may be that subgroups of GPNC participants differentially benefit,

including those who are pregnant for the first time, identify as Black, or feel greater levels of stress or lower social support in early pregnancy (American College of Obstetricians & Gynecologists, 2018; Heberlein et al., 2016a; Ickovics et al., 2011; Mazzoni & Carter, 2017). In summary, although there is agreement that GPNC is positively received by those who choose this model and does not have adverse effects, uncertainties remain regarding its effects on psychosocial outcomes during pregnancy. Further investigation is needed to determine whether positive outcomes necessitate a minimum level of engagement and whether the model provides distinct advantages for Black participants or other subgroups. Therefore, the purpose of our study was to assess the effect of GPNC compared to IPNC on psychosocial outcomes in late pregnancy, including potential differences in outcomes by subgroups.

Methods

Design

The Centering and Racial Disparities (CRADLE study) randomized controlled trial (RCT) was conducted to address three aims to compare the effectiveness of GPNC to IPNC on 1) selected birth outcomes and pregnancy complications, 2) racial disparities in these outcomes and 3) psychosocial and behavioral outcomes in late pregnancy (Chen et al., 2017; Crockett et al., 2022). In this article, we address the third aim, including potential differences in psychosocial and behavioral outcomes by subgroups, including race. The psychosocial outcomes included prenatal distress, pregnancy anxiety, symptoms of depression, stress management practices, prenatal coping strategies, and pregnancy-related empowerment. The subgroups included participants who were Black, had low family or partner support, were nulliparous, and had unplanned or unwanted pregnancies or ambivalence about their pregnancies.

The CRADLE study was conducted at a single large obstetric practice located within a major academic medical center in the Southeastern United States. The study recruitment began in February 2016 and finished in March 2020. At the time of enrollment and randomization in the CRADLE study, participants completed a comprehensive survey (survey 1) that included detailed demographic questions, maternal health behavior assessments, and psychosocial measures (Crockett et al., 2022). A second survey (survey 2) with similar content was administered after 30 weeks gestation. Participants were encouraged to complete all questions in survey 1 and survey 2. They were able to select “prefer not to answer” or “do not know” for every question to encourage survey completeness. Trained research nurses who were not involved in the provision of prenatal care managed study recruitment, randomization, and survey completion. The study was approved by the Prisma Health Institutional Review Board (Pro00043994) and registered with ClinicalTrials.gov on December 29, 2015 (NCT02640638).

Sample

Women were eligible for inclusion in CRADLE if they were between the ages of 14 and 45 and entered prenatal care before 20 6/7 weeks gestation. Eligible participants who consented to participate (N = 2350) were stratified by self-reported race and ethnicity and randomized

1:1 to GPNC or IPNC using REDCap (Harris et al., 2009). Because prenatal care in both study arms was provided by nurse practitioners, enrollment was limited to medically low-risk participants consistent with other prenatal care provision in the practice. Participants with medical and/or pregnancy complications that could not be managed in the group setting and those with planned preterm births were also excluded. The full study protocol (Chen et al., 2017) and CONSORT diagram and results for the first two aims (Crockett et al., 2022) have been previously published.

Procedures

Participants randomized to the IPNC arm received prenatal care following the schedule and content of visits recommended by the Academy of Pediatrics and the American College of Obstetricians & Gynecologists (2017). Participants randomized to GPNC received prenatal care following the schedule and content of visits outlined by the CenteringPregnancy model (Centering Healthcare Institute, n.d.) During the first 30 minutes of each GPNC session, a health care provider conducted a brief physical assessment in the group space. The remaining 90 minutes were spent in a facilitated discussion. The same health care provider facilitated all 10 GPNC sessions for the purpose of relationship building, group cohesion, and continuity of care. All providers of group care received facilitation training. Over the course of the study, 12 providers delivered group prenatal care. Providers had flexibility to customize the topics according to participants' needs and priorities. Group prenatal care participants had additional IPNC visits outside of the 10 scheduled GPNC sessions as needed. All GPNC providers in the practice also provided IPNC services. The study site was able to offer sessions in English or Spanish.

Measures

The selection of outcomes for survey measures was based on the GPNC model, prenatal care and pregnancy stress literature, and a prospective mixed-methods cohort study conducted by members of the research team (Heberlein et al., 2016a; Rising, 1998). Our prior qualitative results suggested that GPNC imparts greater benefits, including reduced stress, increased confidence, knowledge, and motivation for health, and informed decision-making and engagement in health care (Heberlein 2016b). We hypothesized that participants in GPNC would worry less about their pregnancies, do more to prepare for birth and parenting and to manage their stress, and have more positive relationships with providers.

Participants completed scales used to measure perceived prenatal distress, pregnancy anxiety, and symptoms of depression in surveys 1 and 2. Differences in scores between surveys 1 and 2 were used as the outcome variable for each measure. All scales were used previously with pregnant participants and had validated Spanish translations. Scales with missing values were excluded from analyses.

We measured prenatal distress or common pregnancy-specific worries with the updated Prenatal Distress Questionnaire (NUPDQ). Examples include concerns about labor and giving birth; paying for the baby's expenses; and managing work, relationships, and childcare (Lobel, 1996; Lobel et al., 2008; Ibrahim & Lobel, 2020). For each item, participants indicated how worried or bothered they felt at this point in their pregnancy

using a three-point scale: 0 = *not at all*, 1 = *somewhat*, *or* 2 = *very much*. Items were summed for a total score that ranged from 0 to 34, and 34 represented the highest level of prenatal distress.

We measured pregnancy anxiety with the Pregnancy Specific Anxiety Scale (PSA; Roesch et al., 2004). Participants responded how often they felt anxious, concerned, afraid, or panicky in the past week about being pregnant using a five-point scale: 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, and 5 = *always* (Guardino et al., 2014). Items were summed for a total score that ranged from 5 to 20, and 20 represented the highest level of pregnancy-related anxiety.

We used the Center for Epidemiological Studies Depression Scale (CES-D) to measure symptoms of depression (Radloff, 1977). Five of the 20 items in the CES-D were not used in this study because they overlap with common pregnancy symptoms (Ickovics et al., 2011). Participants responded how often they experienced a symptom in the past week: 0 = *rarely or none of the time (less than 1 day)*, 1 = *some of the time (1–2 days)*, 2 = *occasionally or moderate amount of the time (3–4 days)*, 3 = *most or all of the time (5–7 days)*. Items were summed for a total score that ranged from 0 to 45, and higher responses represented higher levels of symptoms of depression.

At survey 2, participants were asked about their use of stress management practices, prenatal coping strategies, and pregnancy-related empowerment. We used the Health Promoting Lifestyle Profile II to estimate use of stress management practices; participants reported the frequency of using eight practices (Walker et al., 1987, 1990). Response options were 0 = *never*, 1 = *sometimes*, 2 = *often*, 3= *routinely*. The mean score, which ranged from 0 to 3, was used as the outcome variable.

To measure coping strategies specific to pregnancy, we used the Revised Prenatal Coping Inventory (R-PCI) scale (Hamilton & Lobel, 2008), including 11 items from the planning-preparation subscale. For each item, participants indicated how often they used a strategy during the last month to try to manage the challenges of being pregnant. Responses options were 0 = *never*, 1 = *almost never*, 2 = *sometimes*, 3 = *fairly often*, and 4 = *very often*. Summed scores ranged from 0 to 44, and higher scores indicated greater use of coping strategies. To reduce survey burden, we assessed stress management practices and coping strategies in survey 2 only.

Finally, we used the Pregnancy-Related Empowerment Scale to measure empowerment as a multidimensional construct, including health decision-making knowledge and capacity, awareness of rights, improved provider relationships and quality of health care, and strengthened social support (Klima et al., 2015). We included four items from the provider connectedness subscale (I can ask my health care provider about my pregnancy, I have enough time, My provider listens to me, and My provider respects me), one item representing skilled decision making (Since I began prenatal care, I have been making more decisions about my health) and one item from the gaining voice subscale (I know if I am gaining the right amount of weight). Participants indicated their level of agreement with each statement using a four-point scale: 0 = *strongly disagree*, 1= *disagree*, 2 = *agree*, 3

= *strongly agree*. We used the mean, which ranged from 0 to 3, as the outcome measure; higher means indicated higher levels of pregnancy empowerment. Because participants had not experienced exposure to their randomly assigned prenatal care model at the time of survey 1, we assessed these questions at survey 2 only.

Subgroups

In addition to analyzing the effect of GPNC participation on psychosocial outcomes among all study participants, we examined effects among subgroups hypothesized to be at risk for high levels of pregnancy-related stress and anxiety: nulliparous participants, Black participants, participants who lacked partner support, participants who lacked family support, and participants with unplanned or unwanted pregnancies or ambivalence about their pregnancies.

Participants self-reported race in survey 1 and were able select multiple categories for race and ethnicity. Because of historical racial discrimination in the United States, we grouped participants who identified as Black and other races or ethnicities with participants who reported Black only (Crockett et al., 2022). Because a focus of the CRADLE RCT was to assess whether participation in GPNC had differential effects on Black and White participants, as there are significant disparities in maternal health and birth outcomes between these groups, the subgroup analysis was important to identify the effect size for Black participants.

We measured level of partner support using seven questions adapted from existing questionnaires (specifically the Behavior in Pregnancy Study Time 3 Interview) and variants of the questions that were used in other studies of maternal social stress and birth outcomes (Ghosh et al., 2010; Hahn-Holbrook et al., 2013; Lobel et al., 1992; Turner et al., 1990). At survey 2, participants reported how often their partners provided support in different capacities with responses that ranged from 0 = *never* to 4 = *almost always*. We calculated the mean to generate level of partner support; the subgroups of participants considered to lack partner support were those with average levels of partner support less than 3.

We identified the subgroup of participants who lacked family support using seven questions adapted by Hahn-Holbrook et al. (2013) at survey 1. We asked participants to indicate the extent to which they disagreed or agreed (scores ranged from: 1 = *strongly disagree* to 4 = *strongly agree*) with statements about their families' levels of social, emotional, and financial support. We calculated the mean value across all items to generate level of family support; an average score of less than 3 indicated a lack of family support.

We identified the subgroup of participants with unplanned or unwanted pregnancies or with ambivalent feelings about their pregnancies with questions adapted from the Pregnancy Risk Assessment Monitoring System questionnaire (Centers for Disease Control and Prevention, 2014). Participants who reported that they were not intending to get pregnant when they conceived and reported feeling very unhappy, somewhat unhappy, or unsure about how they felt about their pregnancies were included in the subgroup.

Analysis

To generate unbiased estimates of the treatment effect in RCTs, the standard approach is an intent-to-treat (ITT) analysis. In the ITT approach, all participants, regardless of study adherence, are analyzed in the group they were randomized to (McCoy, 2017). Because the potential for GPNC to affect health outcomes is conditional on session attendance, we also employed an instrumental variable (IV) approach in our regression analysis (Angrist et al., 1993). Instrumental variables have a causal effect on the outcome of interest but only through a second variable. In this case, random assignment to GPNC is the only way participants are expected to receive and thereby be affected by GPNC, but only if they comply with GPNC treatment. In the CRADLE study (Crockett et al., 2022), we defined compliance as participants with five sessions or visits in their assigned treatment arm (GPNC and IPNC). This approach has been described as the "contamination adjusted intention to treat" (CA ITT) method to address biases introduced by non-compliance to randomized treatment in the ITT sample (Sussman & Hayward, 2010, p. 1).

We estimated the IV effects through two-stage least squares regression. In the first stage, as seen in (1), we regressed treatment uptake (meeting the threshold for compliance to GPNC; x_i) on random assignment to GPNC (z_i). The coefficient estimated in the first stage regression (γ) represents the compliance rate for GPNC (Huang, 2018). In the second stage, as seen in (2), we regressed the dependent outcome of interest (y_i) on the predicted compliance variable value estimated in stage 1 for participants in the GPNC group (x_i) to estimate the effect of GPNC among individuals receiving treatment (β; Huang, 2018).

$$x_i = \partial + \gamma(z_i) + \varepsilon_i \tag{1}$$

$$y_i = \alpha + \beta(x_i) + \epsilon_i \tag{2}$$

We first examined the effects of GPNC on changes in reported prenatal distress, pregnancy anxiety, and symptoms of depression between the completion of survey 1 and survey 2. Second, we used responses from survey 2 to compare use of prenatal coping strategies, use of stress management practices, and pregnancy-related empowerment scores. In our subgroup analyses, we included interaction terms to identify heterogeneous effects among subgroups of sample participants.

Results

The primary and subgroup analyses included 1,175 participants randomized to GPNC and 1,173 participants randomized to IPNC. Of those randomized to GPNC, 624 (53.19%) attended a minimum of five GPNC sessions and were considered compliant with GPNC treatment.

Baseline characteristics for each treatment arm and unadjusted outcome estimates are presented in Tables 1 and 2. Randomization resulted in a sample balanced across demographics. Black participants represented 40.55% of the sample, and nulliparous participants represented 44.46% of the sample. Roughly one-third of participants reported that their current pregnancies were unplanned and that they felt unhappy or ambivalent about their pregnancies. Two-thirds of participants felt supported by their partners, and 84.20% of participants felt they were supported by their families.

Callout 2

Table 2 includes self-reported measures of prenatal distress, pregnancy anxiety, and symptoms of depression for all participants who completed survey 1 and survey 2. While the unadjusted, baseline levels of prenatal distress and pregnancy anxiety were lower among participants in the IPNC group, they were not significantly different than levels among participants in the GPNC group. Baseline levels of symptoms of depression were lower for participants in the GPNC group. We observed similar differences in prenatal distress and pregnancy anxiety between participants in IPNC and GPNC who completed survey 2. At survey 2, the unadjusted level of symptoms of depression was lower for participants in the IPNC group. The unadjusted measure of use of prenatal coping strategies was higher among participants in the GPNC group, while use of stress management practices and pregnancy-related empowerment scores were slightly higher for participants in the IPNC group.

The results of our main analysis are presented in Table 3. If a participant completed all survey questions used to construct a measure, they were included in that outcome measure analysis (see Supplemental Table 2 for participants with complete data in each treatment group by outcome). Both treatment arms exhibited a decrease in prenatal distress and an increase in pregnancy anxiety between survey 1 and survey 2. While symptoms of depression scores decreased among participants in IPNC and increased for participants in GPNC, this difference was not significant. Group prenatal care participants and IPNC participants reported similar levels of pregnancy-related empowerment and application of stress management strategies. We found that GPNC participation is associated with a statistically significant greater use of prenatal coping strategies relative to participants in the IPNC treatment arm (IPNC: 27.64 vs. GPNC: 29.52, $p = 0.004$).

Subgroup Analysis

Table 4 reports findings for each subgroup. To provide additional context to the results, Supplemental Table 3 includes unadjusted means for subgroup participants. In two of our five subgroups, we observed an increase in the use of positive prenatal coping strategies among GPNC participants. Among the subgroups, there were no significant differences in prenatal distress, pregnancy anxiety, or levels of pregnancy-related empowerment. We present findings of statistically significant differences between treatment groups, organized by each subgroup below.

Nulliparous Participants—Changes in symptoms of depression scores for participants who were pregnant for the first time differed between the participants in the IPNC and

GPNC groups. Between survey 1 and survey 2, symptoms of depression scores among participants in IPNC decreased while scores increased among participants in GPNC (IPNC: −0.84 vs. GPNC: 0.86, $p = 0.02$).

Black Participants—Similar to the nulliparous group, Black participants in IPNC exhibited a decrease in symptoms of depression scores between survey 1 and survey 2, while the GPNC participants' scores increased (IPNC: −0.77 vs. GPNC: 0.86, $p = 0.03$). Consistent with the primary findings, we found that participation in GPNC was associated with greater use of prenatal coping strategies for Black participants.

Participants with Unintended Pregnancies and Ambivalence About Pregnancy —We found that the application of stress management strategies at survey 2 was greater among IPNC participants with unplanned pregnancies, unwanted pregnancies, and ambivalence about pregnancy compared to their counterparts in GPNC (IPNC: −1.62 vs. GPNC: 1.44, $p = 0.02$).

Participants Who Lacked Partner Support—Reported use of prenatal coping strategies was significantly higher among GPNC participants with low levels of partner support compared to their counterparts in IPNC (GPNC: 29.75 vs. IPNC: 25.48, $p < 0.001$).

Discussion

We found that participation in GPNC was not associated with significant improvements in self-reported prenatal distress, symptoms of depression, or pregnancy-related anxiety between early and late pregnancy compared to participation in IPNC. Use of stress management practices and pregnancy-related empowerment also did not differ between care models. We observed a statistically significant greater use of prenatal coping strategies by GPNC participants, specifically among Black participants and participants who lacked partner support.

In previous randomized studies on GPNC, researchers reported mixed results about changes in psychosocial outcomes. In a cluster randomized trial of an enhanced CenteringPregnancy GPNC model, GPNC participants (ages 14–21) experienced a greater decrease in symptoms of depression compared to IPNC participants from baseline to 12 months after birth (Felder et al., 2017). In other randomized studies, researchers did find changes in symptoms of depression, perceived stress, or anxiety during pregnancy (Ickovics et al., 2007; Kennedy et al., 2011; Tubay et al., 2019). In the current study, we did not replicate the greater psychosocial improvements observed among higher-risk subgroups who participated in GPNC (Ickovics et al., 2011; Heberlein et al., 2015). We found nulliparous and Black participants in IPNC had slightly improved symptom of depression scores, although the less than 2-point difference in change scores is likely not clinically significant. For our measures assessed at survey 2, pregnancy empowerment, stress management practices, and pregnancy-specific coping strategies, the literature provides limited opportunity for comparison. While the full GPNC sample and the Black GPNC subgroup reported greater use of coping strategies, the 2 to 3-point difference likely has limited clinical significance. Group prenatal care participants reported greater satisfaction with prenatal care in other

RCTs compared to IPNC participants (Ickovics et al., 2007; Kennedy et al., 2011). While patient satisfaction may be influenced by the quality of patient-provider interactions, it is not directly comparable to the pregnancy empowerment scale used in this study.

We offer possible explanations for our largely null findings specific to the clinical setting of the CRADLE RCT and study design decisions. First, the study site has been a certified CenteringPregnancy site since 2009, and the clinical team has significant experience in facilitating group prenatal care sessions. The same clinical team provided IPNC and GPNC to the study population, and the relationship-building, facilitation, and health education skills honed in the group setting by these experienced clinicians likely influenced their delivery of IPNC. This may have contributed to the similar changes in pregnancy-related distress, anxiety, and symptoms of depression observed in both treatment arms. Further, IPNC and GPNC study participants, including Black participants, reported high levels of pregnancy empowerment (2.48 IPNC and 2.42 GPNC, measured on a 3-point scale). Scale items reflect aspects of quality patient-provider interactions, including having sufficient time with the provider, the provider listening and showing respect, and patient-driven decision-making. Providers, through both models of prenatal care, met many of the preferences for care described in the literature (McLemore et al., 2018; Wishart et al., 2021).

Second, the trial design required that participants complete survey 2 between 30 and 34 weeks gestation, which is earlier than when most preterm births occur. Study participants randomized to GPNC completed the second survey slightly earlier in pregnancy (32.38 weeks gestation compared to 32.63 for IPNC, p =0.01). Therefore, many GPNC participants completed the survey before or early in their third trimesters and experienced the early monthly GPNC sessions only. Timing the survey later in pregnancy after greater exposure to GPNC may have produced different results. For example, differences in the use of planning and preparation coping strategies may have been greater if they were assessed after attendance at GPNC discussions on labor and birth, newborn care, and transition to parenting. Based on prior research that demonstrated that the benefits of GPNC may extend well into the postpartum period and affect stress management, symptoms of depression (Felder et al., 2017), maternal functioning (Heberlein et al., 2016a), and quality of parent-child interactions (Hackley et al., 2019), there is a need for measuring psychosocial and behavioral outcomes not only later in pregnancy but periodically after birth.

Third, although it is well-established that maternal distress and coping mechanisms are significant factors in various negative outcomes, accurately measuring these constructs and establishing causal relationships continue to present challenges (Guardino & Dunkel Schetter, 2014).We selected measures grounded in the CenteringPregnancy model and prior research, but other scales may have been more sensitive to change during the pregnancy data collection period (i.e., generalized feelings of life stress) or more aligned with participants' coping behaviors (i.e., positive reappraisal or avoidant coping strategies).

Callout 3

Limitations

The most significant limitation of the study was treatment compliance for participants in the GPNC arm. Many participants randomized to GPNC (n = 277; 23.57%) did not attend a single GPNC session, and very few (n = 52; 4.42%) attended all 10 assigned sessions. When we explored reasons for missed GPNC sessions with a subset of study participants, leaving the practice (34.3%), scheduling conflicts (23.2%), and dislike of the GPNC model (16.4%) were the most common reasons reported (Francis et al., 2019). Our instrumental variable approach provided a way to adjust the ITT results for treatment compliance. However, this approach may still distort the effect of GPNC on those who complied with care. In its simplest form, our IV approach adjusts the ITT effect (which is typically diluted by treatment non-compliance) by dividing the ITT estimate by rate of compliance. Since the compliance rate will always be less than one in the presence of non-compliance, this adjustment increases the magnitude of the ITT effect, regardless of effect directionality. Other researchers have usually chosen to model "as treated" samples, which limits the analytic samples to those who chose or are able to attend a minimum threshold of group sessions (most often five or more). While we selected a five-visit threshold as a control based on other studies, the number of total sessions needed for women to benefit on average may be greater than five or may vary based on other unmeasured characteristics.

The study was conducted at a single large academic medical center in the Southeastern United States, and the extent to which the results can be generalized to other populations is unclear. We measured coping and stress management practices cross-sectionally in late pregnancy, so changes in these outcomes could not be assessed. In addition, we used modified measures for a subset of outcomes (e.g., excluding five items from the CES-D to measure symptoms of depression and only using 11 items from the R-PCI to measure use of coping strategies). The decision to modify existing measures may introduce measurement bias.

A high proportion of patients was ineligible for the study (N = 3,818, 41.58% of patients assessed); patients were most often ineligible because of late entry to care (n = 1,758, 46.05%) or complex medical comorbidities (n = 824, 21.58%). More than half of eligible patients declined participation (n = 3,019, 56.87%). When the study team surveyed 107 eligible patients who declined, 70% indicated that they preferred IPNC or GPNC (13%), 21% had scheduling conflicts or uncertain work schedules, 19% did not want to participate in a clinical trial, and 11% had transportation challenges (unpublished data, April 2018). The study population also had a lower-than-expected rate of preterm birth (Crockett et al., 2022). The frequency of ineligibility and study refusal indicates the potential effect of GPNC on a large subset of pregnant patients remains unknown.

Implications

While the effect of increased prenatal coping on pregnancy or postpartum outcomes remains an opportunity for future research, our results suggest GPNC has the potential to influence behaviors. For participants to benefit from GPNC, sufficient exposure and engagement are needed. Participation in GPNC has been shown to positively influence attendance at postpartum family planning visits (Hale et al., 2014), emergency department use (Marton

et al., 2022), attendance at pediatric well-child visits (Heberlein et al., 2022), and stress management and quality of interactions with children well after birth (Hackley et al., 2019), which suggests that the model has benefits for some beyond the immediate perinatal period. Additional studies to examine psychosocial and behavioral outcomes among participants who receive greater exposure to GPNC (i.e., attending all or nearly all of the 10 sessions) may provide further insight into the benefits of group care.

In future analyses, researchers should also incorporate life stressors that contribute to health disparities, for example, housing instability, food insecurity, employment opportunities, and experiences of discrimination. This could illuminate further why more patients do not elect GPNC and subgroups beyond those included in our analyses who may benefit the most or the least from the model.

Finally, our results demonstrate the need for continued innovation within GPNC models. Deliberate modifications to the curriculum or structure of GPNC programs to better address the psychosocial well-being of patients, especially those who belong to vulnerable subgroups, have the potential to yield more substantial improvements to clinical outcomes.

Conclusion

Group prenatal care is an innovation worthy of implementation because it is well-received by patients and can improve prenatal coping strategies. Our results suggest that participation in GPNC may be particularly effective for specific populations, including Black patients and patients who lack partner support. Recruitment and retention to GPNC, as observed in our study, is a common challenge to implementation (Berman et al., 2020; McDonald et al., 2016; Pekkala et al., 2020, Francis 2019). Developing and testing other innovative interventions that meet the needs and preferences of additional populations of pregnant patients is needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Dr. Crockett is the co-PI of the CRADLE study and coauthor of this article. Dr. Heberlein was a co-investigator on the original study team. Dr. Smith joined the team to lead the analysis and authoring of this article. Dr. Britt joined the study team during the recruitment phase of the CRADLE study. Ms. Domingue and Ms. LaBoy joined the Georgia State University study team for analysis and article development.

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Callouts:

1. Uncertainties remain regarding the optimal level of engagement for group prenatal care and whether it provides distinct advantages for specific subgroups.
2. Group prenatal care was not associated with improved self-reported outcomes except for prenatal coping strategies, particularly among Black participants and those without partner support.
3. Further research could offer additional evidence about the effects of group prenatal care on psychosocial well-being.

Table 1

Sample Characteristics by Treatment Arm

Maternal characteristic	Individual Prenatal Care *N* = 1,173	Group Prenatal Care *N* = 1175	Between group difference
	***n* (%)**	***n* (%)**	***p***
Black	476 (40.58)	476 (40.51)	0.94
Hispanic	249 (21.23)	253 (21.53)	0.82
White	433 (36.91)	430 (36.60)	0.87
Other race	15 (1.28)	16 (1.36)	0.86
Had health insurance (prior to pregnancy)	579 (49.36)	563 (47.91)	0.46
Had a high-school education	819 (73.26)	830 (75.05)	0.34
Nulliparous	522 (44.42)	522 (44.51)	0.97
Unplanned and unhappy/ambivalent about pregnancy	412 (36.33)	399 (34.79)	0.44
Lacks partner support	343 (35.92)	323 (36.29)	0.87
Lacks family support	176 (15.00)	195 (16.60)	0.29
	M	**M**	**p**
Age	25.01	25.27	0.22
Gestational age at entry to care, weeks	9.37	9.21	0.24
Initial body mass index	28.80	29.03	0.44

Table 2

Outcomes Measures by Treatment Arm

Outcome measures	Individual Prenatal Care *n* = 1,173		Group Prenatal Care *N* = 1175		Between group difference
	M	*SD*	*M*	*SD*	*p*
Prenatal distress score survey 1	10.85	8.15	11.01	8.23	0.67
Prenatal distress score survey 2	9.56	8.34	10.39	8.69	0.04
Prenatal anxiety score survey 1	9.32	3.80	9.33	3.85	0.93
Prenatal anxiety score survey 2	9.31	3.86	9.48	3.80	0.32
Prenatal depression score survey 1	9.37	7.35	9.30	7.65	0.83
Prenatal depression score survey 2	8.77	7.07	9.13	7.34	0.29
Prenatal coping strategies score at survey 2	27.64	9.72	28.88	8.80	0.004
Stress management practices score at survey 2	1.66	0.63	1.63	0.64	0.19
Pregnancy empowerment score at survey 2	2.48	0.52	2.44	0.56	0.10

Note. M = mean, *SD* = standard deviation. Scale used for each measure: prenatal distress = updated Prenatal Distress Questionnaire (NUPDQ); prenatal anxiety = Pregnancy Specific Anxiety Scale (PSAS); prenatal depression = Center for Epidemiological Studies Depression Scale (CES-D) Scale; use of coping strategies = Revised Prenatal Coping Inventory (R-PCI) Scale; stress management practices score = Health Promoting Lifestyle Profile II; pregnancy empowerment score = Pregnancy-Related Empowerment Scale.

Table 3

Summary of Regression Results Comparing Individual Prenatal Care to Group Prenatal Care

Outcome measure	*n*	Individual Prenatal Care CA ITT [95% CI]	Group Prenatal Care CA ITT [95% CI]	*p*
Prenatal distress score change from survey 1 to 2	1,772	−1.20 [−1.74, −0.67]	−0.16 [−1.06, 0.73]	0.08
Prenatal anxiety score change from survey 1 to 2	1,877	0.13 [−0.10, 0.35]	0.25 [−0.11, 0.62]	0.61
Prenatal depression score change from survey 1 to 2	1,714	−0.44 [−0.87, −0.02]	0.24 [−0.45, 0.94]	0.14
Prenatal coping strategies score at survey 2	1,877	27.64 [27.06, 28.22]	29.52 [28.56, 30.47]	0.004
Stress management practices score at survey 2	1,874	1.66 [1.62, 1.70]	1.61 [1.54, 1.67]	0.19
Pregnancy-Related Empowerment score at survey 2	1,876	2.48 [2.45, 2.51]	2.42 [2.36, 2.47]	0.10

Note. CA ITT = contamination adjusted intent to treat effect. Scale used for each measure: prenatal distress = updated Prenatal Distress Questionnaire (NUPDQ); prenatal anxiety = Pregnancy Specific Anxiety Scale (PSAS); prenatal depression = Center for Epidemiological Studies Depression Scale (CES-D) Scale; use of coping strategies = Revised Prenatal Coping Inventory (R-PCI) Scale; stress anagement practices score = Health Promoting Lifestyle Profile II; pregnancy empowerment score = Pregnancy-Related Empowerment Scale. Each sub analysis included the entire analytic sample (see Table 3 for *n* associated with each measure); the *n* in Table 4 represents the number of participants in each subgroup.

Table 4

Summary of Regression Results Comparing Individual Prenatal Care to Group Prenatal Care in Subgroups of Participants

Nulliparous				
Outcome measure	***n***	**Individual Prenatal Care CA ITT [95% CI]**	**Group Prenatal Care CA ITT [95% CI]**	***p***
Prenatal distress score change from survey 1 to 2	780	−2.16 [−2.96, −1.34]	−0.80 [−2.20, 0.60]	0.15
Prenatal anxiety score change from survey 1 to 2	820	0.02 [−0.31, 0.35]	0.48 [−0.09, 1.06]	0.23
Prenatal depression score change from survey 1 to 2	761	−0.84 [−1.48, −0.18]	0.86 [−0.22, 1.94]	0.02
Prenatal coping strategies score at survey 2	827	31.58[30.74, 32.42]	31.54 [30.09, 32.97]	0.12
Stress management practices score at survey 2	821	1.76 [1.69, 1.81]	1.65 [1.54, 1.75]	0.13
Pregnancy-Related Empowerment score at survey 2	815	2.51 [2.45, 2.55]	2.41 [2.32, 2.49]	0.11
Black				
Outcome measure	***n***	**Individual Prenatal Care CA ITT [95% CI]**	**Group Prenatal Care CA ITT [95% CI]**	***p***
Prenatal distress score change from survey 1 to 2	722	−1.29 [−2.13, −0.44]	0.45 [−0.91, 1.81]	0.06
Prenatal anxiety score change from survey 1 to 2	735	0.05 [−0.30, 0.4]	0.38 [−0.19, 0.96]	0.39
Prenatal depression score change from survey 1 to 2	687	−0.77 [−1.44, −0.08]	0.86[−0.21, 1.94]	0.03
Prenatal coping strategies score at survey 2	742	28.83 [27.90, 29.74]	31.66 [30.16, 33.14]	0.01
Stress management practices score at survey 2	737	1.72 [1.65, 1.78]	1.60 [1.49, 1.7]	0.08
Pregnancy-Related Empowerment score at survey 2	739	2.50 [2.44, 2.55]	2.48 [2.38, 2.56]	0.69
Unintended and Ambivalent About Pregnancy				
Outcome measure	***n***	**Individual Prenatal Care CA ITT [95% CI]**	**Group Prenatal Care CA ITT [95% CI]**	***p***
Prenatal distress score change from survey 1 to 2	628	−1.72 [−2.61, −0.82]	−0.65 [−2.15, 0.85]	0.29
Prenatal anxiety score change from survey 1 to 2	654	−0.07 [−0.44, 0.29]	−0.26 [−0.88, 0.37]	0.67
Prenatal depression score change from survey 1 to 2	608	−1.39 [−2.09, −0.68]	−0.28 [−1.45, 0.89]	0.16
Prenatal coping strategies score at survey 2	656	27.40 [26.42, 28.38]	29.50 [27.84, 31.14]	0.06
Stress management practices score at survey 2	652	1.62 [1.55, 1.69]	1.44 [1.33, 1.55]	0.02
Pregnancy-Related Empowerment score at survey 2	649	2.46 [2.40, 2.51]	2.43 [2.33, 2.52]	0.68
Lacked Partner Support				
Outcome measure	***n***	**Individual Prenatal Care CA ITT [95% CI]**	**Group Prenatal Care CA ITT [95% CI]**	***p***
Prenatal distress score change from survey 1 to 2	626	−1.19 [−2.09, −0.28]	−0.88 [−2.38, 0.62]	0.76
Prenatal anxiety score change from survey 1 to 2	654	−0.07 [−0.44, 0.3]	0.33 [−0.29, 0.94]	0.34
Prenatal depression score change from survey 1 to 2	608	−0.40 [−1.12, 0.32]	0.38 [−0.78, 1.54]	0.32
Prenatal coping strategies score at survey 2	663	25.48 [24.5, 26.45]	29.75 [28.15, 31.35]	<0.001
Stress management practices score at survey 2	659	1.51 [1.44, 1.57]	1.41 [1.3, 1.51]	0.18
Pregnancy-Related Empowerment score at survey 2	658	2.40 [2.34, 2.46]	2.43 [2.33, 2.52]	0.68
Lacked Family Support				
Outcome measure	***n***	**Individual Prenatal Care CA ITT [95% CI]**	**Group Prenatal Care CA ITT [95% CI]**	***p***
Prenatal distress score change from survey 1 to 2	273	−0.13 [−1.50, 1.23]	−0.01 [−2.36, 2.35]	0.94
Prenatal anxiety score change from survey 1 to 2	290	0.19 [−0.38, 0.75]	−0.26 [−1.23, 0.72]	0.50

Prenatal depression score change from survey 1 to 2	262	−0.65 [−1.73, 0.44]	−1.60 [−3.53, 0.34]	0.46
Prenatal coping strategies score at survey 2	288	26.24 [24.76, 27.72]	27.92 [25.29, 30.56]	0.34
Stress management practices score at survey 2	287	1.41 [1.31, 1.51]	1.58 [1.40, 1.76]	0.15
Pregnancy-Related Empowerment score at survey 2	285	2.32 [2.23, 2.41]	2.45 [2.30, 2.61]	0.20

Note. CA ITT = contamination adjusted intent to treat effect. Scale used for each measure: prenatal distress = updated Prenatal Distress Questionnaire (NUPDQ); prenatal anxiety = Pregnancy Specific Anxiety Scale (PSAS); prenatal depression = Center for Epidemiological Studies Depression Scale (CES-D) Scale; use of coping strategies = Revised Prenatal Coping Inventory (R-PCI) Scale; stress management practices score = Health Promoting Lifestyle Profile II; pregnancy empowerment score = Pregnancy-Related Empowerment Scale. Each sub analysis included the entire analytic sample (see Table 3 for *n* associated with each measure); the *n* in Table 4 represents the number of participants in each subgroup.