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Research Article

Comparison of Birth Outcomes in Relation to Health Behaviors of Women: Group Prenatal Versus Individual Prenatal Care Visits

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Abstract

Introduction: The purpose of the study was to discover if different birth outcomes and/or health behaviors (engagement/type of exercise, healthiness of diet, and total weight gain) existed for women who attended group prenatal care versus individual prenatal care in a setting that offers both types of prenatal care.

Methods: A retrospective, descriptive, correlational study was performed with data from 5 years (2007-2011) of survey data collected at a birth center in the southwestern US. After consent, women (N = 2,247) who sought care at the birth center had data collected at 3 datapoints (first visit, birth, and 6 week postpartum) for a national birth center database. This research focused on data points that were necessary for descriptive data and those that pertained to health behaviors and birth outcomes. Multivariate models were performed to predict outcomes.

Results: Mothers in Centering Pregnancy (CP) were more likely to be primiparous, married, planning a birth center birth, have higher educational levels and private insurance. Prior to controlling for differences, these women gained significantly more weight even though they self-reported excellent diets during pregnancy. Activity levels did not differ significantly amongst the two groups. Similar results were noted for birth outcomes and mood at 6 weeks postpartum between types of prenatal care. After controlling for differences, women in CP had a significantly longer, term gestational age, longer exclusive breastfeeding, and women in CP (who had more guidance in diet, exercise and weight gain) gained less total weight during pregnancy.

Discussion: Centering Pregnancy has shown to have strengths in health outcomes over individual prenatal care. The integration of guidance and discussion for diet, exercise and evaluation of weight gain that occurs with each CP visit needs to be incorporated into IPC visits with women. Evaluation of weight gain is routinely performed at each IPC visit but with the outcomes of lower weight gain and slightly longer, term gestations for those who attended CP, this additional focus is valuable for all women. Breastfeeding education and social support provided in CP led to longer exclusively breastfeed babies. Addition of discussion about breastfeeding or women in IPC being encouraged to attend a breastfeeding class may help improve their rates and subsequently their babies lives.

Keywords: Centering Pregnancy; maternal weight gain; Diet in pregnancy; Exercise in pregnancy; prenatal care; breastfeeding

Quick Points

- Women express a desire to have specific instruction on diet, recommended weight gain and exercise during pregnancy.
- Mothers in Centering Pregnancy were more likely than mothers who had individual prenatal care to be exclusively breastfeeding at 6 weeks post-birth.
- Mothers in Centering Pregnancy had significantly longer, term gestational ages.
- More education and discussions on diet, exercise and weight gain correlated with a lower total weight gain in Centering Pregnancy moms.

Introduction

The American College of Nurse Midwives (ACNM) position

statement on models of group prenatal care notes that this model should improve perinatal outcomes through growth and life-style changes and by empowering women to make those changes [1]. One of the goals in the CenteringPregnancy (CP) group prenatal care model is to empower women to choose health-promoting behaviors [1]. Health behaviors of interest in this study were total gestational weight gain, the impact of nutrition/activity education and healthiness of diet on weight gain, and exercise during pregnancy. Group interaction has been found to increase women's motivation to change behaviors [1]. The Institute of Medicine (IOM) [2] published updated guidelines for gestational weight gain with the knowledge that women becoming pregnant are older and have higher body mass indexes. Women engaged in CP participate in a two-hour class dedicated to nutrition. The topic is introduced in the first session and is a theme that is revisited in each session. The supportive group setting and facilitative method may provide a means to internalize the topics discussed. This could be the impetus toward healthier decision-making for nutrition and exercise in pregnancy leading to healthier birth outcomes.

Study Objectives

Purpose of Research

The purpose of this research was to discover if pregnant women who attended CP group prenatal care with facilitated discussion versus women with individual prenatal care visits had different pregnancy health behaviors (engagement/type of exercise, healthiness of diet, and total weight gain) and subsequent birth outcomes.

Box 1:Research Questions

1. Do women who attend group prenatal care versus women with individual prenatal care gain less weight secondary to a more thorough nutritional education or better diet?
2. Do women who attend group prenatal care versus women with individual prenatal care engage in more exercise during pregnancy?
3. Do women who attend group prenatal care versus women with individual prenatal care have different birth outcomes?

Review Of Literature

Weight Gain in Pregnancy

While the IOM recognizes the benefit of appropriate weight gain (Table 1) in pregnancy and provides suggestions for interventions, obesity in women is a multi-faceted issue. Stengel et al [3] interviewed obese and overweight women to identify advice provided on gestational weight gain and physical activity in pregnancy. Advice on weight gain was not consistent or evidence based. Women were advised to gain too much weight or given no recommendations at all [3].The women perceived their providers as being unconcerned about excessive weight gain [3]. However, women noted that they would value weight gain advice from their provider [3].Women received limited or no advice on physical activity during pregnancy and felt that provider knowledge on the frequency and intensity of exercise in pregnancy was limited [3]. Without guidance on appropriate physical activity in pregnancy, women tended to be cautious and limited their exercise [3]. The authors identify a need for evidence-based interventions to help women to attain healthy weight gain and perform adequate physical exercise [3].

BMI	Recommended weight gain (lbs)
< 18.5	28-40
18.5-24.9	25-35
25.0-29.9	15-25
≥ 30	11-20
Adapted from Institute of Medicine [2].	

Table 1: Institute Of Medicine weight gain guidelines for pregnancy

Another study examined who was counseled on prenatal weight gain [4]. The study population included 311 predominately low-income prenatal patients at several urban clinics. Caucasian women who had the highest rates of excessive weight gain nationally were least likely to receive counseling about nutrition in pregnancy [4]. Former smokers were more likely to receive nutrition and exercise information than non-smokers [4]. More advanced gestational age was associated with a higher rate of counseling on weight gain [4].

In reviewing gestational weight gain Tanner-Smith et al.'s [5] retrospective chart review, with propensity scoring to offset bias, included 393 women (76% African American, 13% Latina, 11% White) in the southern US found women in CP had less excessive weight gain with reduced risk of excessive weight gain by 54% in CP compared to IPC. The largest effect was for this largely African American population starting overweight or obese prior to thepregnancy [5]. The hypothesis that CP may be able to slow the intergenerational cycle of obesity in this population can not be overlooked [5]. Trotman et al.'s [6] retrospective chart review of 150 pregnant adolescents within a multiple provider group concurred and found that CP clients met the 2009 IOM gestational weight gain guidelines more than IPC. Trudnakand colleagues [7]

retrospective cohort study of 487 patients, 247 of whom were in CP, showed lower odds of gaining below recommended weight gain.

This contradicts Brumley et al.'s [8] matched case control study (65 women in group and 135 in IPC) which showed no difference in gestational weight gain. Gogelet al. [9] concurred with Brumley et al. [8] in his 2 year retrospective chart review of 173 women in CP compared to 170 in IPC with CNM providers. Gogel et al [9] found no difference in pre-pregnant weight and subsequent gestational weight gain between the two groups.

Physical Activity in Pregnancy

Management of weight gain in pregnancy and physical activity are two variables in maternal health that are that are modifiable and have been shown to have benefits for mother and infant. However, both of these health behaviors are multifaceted determinants of health that are related to sense of self, pre-pregnancy level of exercise, BMI, and community and cultural mores. Sagedal et al.[10] point out that there are few studies that actually measure the effectiveness of such lifestyle interventions when applied to mothers and infants. Other authors note that there are no unique strategies or techniques consistently associated with positive outcomes [11,12].

There are several guidelines on physical activity in pregnancy [13-16] (Table 2). In a systematic review of physical exercise in pregnancy, Nascimental, Surita and Cecatti [17] found that exercise during pregnancy is associated with higher cardiorespiratory fitness, prevention of urinary incontinence and low back pain, reduced symptoms of depression, gestational weight control, and a reduction in the need for insulin in women with gestational diabetes. Exercise; however, is not associated with birth weight or preterm birth rate and the type of exercise does not affect the outcome measure [17].

Source	Guidelines
ACOG, [13] 2002	30 minutes or more of moderate exercise on most, if not all, days of the week.
ACNM , [14] 2009	
US Department of Health and Human Resources, [15] 2008	Engage in at least 150 minutes of moderate intensity aerobic activity each week.
Canadian Society for Exercise Physiology,[16] 2011	150 minutes of weekly moderate to vigorous intensity aerobic activity in bouts of 10 minutes or more.

Table 2: Guidelines for physical activity in pregnancy

Studies do show that there is a difference in providing information about expected weight gain and level of exercise and enrolling women in structured programs toward affecting outcomes. Ruiz, et al.[18]studied the benefit of a supervised exercise-based intervention. Healthy pregnant women were randomized to standard care or an exercise intervention group [18]. The intervention consisted of light-to moderate-intensity aerobic and resistance

exercises 3 days a week for 50-55 minutes per session [18]. Women with a BMI less than 27 in the intervention group gained less weight and were less likely to gain more weight than the IOM recommendations [18].Women who were overweight or obese did not benefit from the intervention [18].

Food Security in Pregnancy

Food Security was studied in GPC and IPC in a large outpatient hospital based clinic in southeastern US [19]. Heberleinand colleagues [19] discovered after multiple logistic regression analysis that women in GPC had higher food security than IPC; both in late pregnancy and postpartum. They also discovered women who initially started out food insecure - became more food secure in late pregnancy- more in GPC than IPC, and GPC women were more likely to maintain food security [19]. GPC women were also [9]. Lastly women in early pregnancy with food insecurity in GPC demonstrated higher maternal/i more likely to change their perception of ability to afford healthy foods and stretch their resources than IPC[Infant attachment than IPC [19].

Preterm Birth

In the most recent systematic review and meta-analysisCarter et al [20] reviewed 1346 studies with 14 studies in final analysis and found no statistically significant difference in preterm birth rates (PTB) between CP and IPC. However in the subgroup of pooled results of two high-quality studies reviewed African Americans had a statistically significant (CP 8% versus IPC 11.2%) decrease in PTB rates [20].

The latest Cochrane review included 2350 women in 4 RCTs showed some contradictory findings compared to Carter's systematic review and meta-analysis with no statistically significant difference in LBW [7,21]. However, this review was based on four randomized control trials (RCT) [22-25] with one of these studies contributing 42% of all data. Also of note is that of these four RCT studies only two were from the United States with one Iranian and one Swiss RCT. This Cochrane review showed no statistically significant difference in PTB [21].

Perinatal outcomes

Centering Pregnancy results in perinatal outcomes and perception of care comparable to or better than individual care

[7,22,24,26-28].Women receiving CP have shown less incidence of fetal demise while showing longer gestations, higher birth weights, breastfeeding, and improved psychosocial outcomes [7,22,24,26-28].Small for gestational age and perinatal mortality also showed no differences in RCT studies [21].

Low birth weight (LBW) was decreased in CP compared to IPC (7.5% v. 9.5%) but was not statistically significant in the RCT studies (7.9% v. 8.7%) [20].This LBW would be clinically significant even if not statistically significant in these studies. There were no differences in NICU admissions or breastfeeding initiation between the groups [20].The Cochrane review showed significant overall reduction in LBWbut no significant differences when limited to RCT studies [21].

Client satisfaction was marginally better in group than IPC but there was no difference in NICU admissions, initiation of breastfeeding or spontaneous vaginal birth [29]. Brumleyet al. [8] noted gestational age at birth, birth weights and mode of birth were similar for both types of care but group showed more exclusive breastfeeding at 6 weeks than IPC. In a large RCT conducted in two urban sites there was a greater likelihood of improved utilization of care and breastfeeding initiation, reductions in sexually transmitted infections, improved psychological and social outcomes, and increased satisfaction with care [22,30].

Methods

The study population consisted of 2247 women receiving prenatal and birth care with a single group of CNMs during a five-year period from 2007-2011. This time frame was chosen as it provided a strong sample size and the dataset was updated in 2012. Women received prenatal care at a single site. Birth care was provided at either the free standing accredited birth center or the nearby hospital providing Level IV neonatal care. A retrospective, descriptive, correlational study was performed with data that was accessed from the American Association of Birth Center's (AABC) Uniform Data Set. The Uniform Data Set was an online data registry for collection of peripartum data in all settings and includes the 3 data points of prenatal, intrapartum, and postpartum information that were collected and entered by the CNMs throughout the course of care.

The couples/women self-selected entry into either group or individual care. At the first prenatal appointment both types of care were discussed. Before 14-18 weeks the women self-declared if she wanted to attend CP; each group is designated by month due and included on average 8 couples. A variable in the data set indicates whether the participant attended CP or IPC. The Centering Pregnancy book is the guide for the facilitators of each session; this comes with standardized lessons/topics for discussion and education. There are nine regular sessions and one postpartum session for each group. The facilitators received training to conduct the sessions and periodically the clinic has refreshers. Informally the CNM's share what works well and what doesn't for them. For each group there are two facilitators, a CNM and an RN.

The pre-pregnancy BMI for each woman was recorded on their chart as was the recommended weight gain, which was discussed with women at their first prenatal visit regardless of type of care. For the CP women there is a two-hour session on nutrition. Additional nutritional education and assessment of weight gain occurs at each session in an unstructured format and generally begins with the facilitator asking questions of the group. Appropriate and safe exercise is discussed as it comes up in discussion and about 3 group sessions.

Nutritional education, weight gain and exercise were covered as part of the education needed for each pregnant woman and took about 5-10 minutes in the initial visit. The only other time nutrition or exercise was covered during IPC was when the individual woman would ask; this was recorded in the notes.

The variables to measure these for both prenatal care groups were initial pre-pregnancy weight, last recorded weight, total weight gain (no BMI in this dataset), inclusion in CP or IPC, level of diet (self-reported as poor, good or excellent) and level of physical activity as well as type of physical activity (self-reported); all of the variables were collected in the intrapartum portion of the dataset with the exception of pre-pregnancy weight which was collected and entered at the first prenatal visit. The birth outcome variables are part of the intrapartum and postpartum data collected from each participant. There was no correlation to the points of data collection and the routine of the prenatal care and variables.

All births of infants weighing greater than 500 grams were included. Using this criterion, one case was excluded. Eighty cases were excluded because the variable of participation in either CP or IPC was not indicated. Missing data accounted for less than 5% of the total sample with the exception of the ethnicity variable that had 8% missing data. After exclusion there were 2166 cases further divided into two groups by type of prenatal care; 1780 IPC, 386 CP. Significant differences in demographics were noted between mothers selecting CP and those selecting IPC; however, data analysis included controlling for these differences.

After reviewing the data and performing descriptive statistics, chi-square was used to evaluate differences between the two groups. Linear and logistic regression was used to predict birth outcomes for those participating in group and those in individual

care. The data was controlled for age, level of education, marital status, type of insurance, parity, planned place of birth, and timing of first visit, number of birth center visits and ethnicity. Analysis was performed using R, version 3.1.0.

All participants signed consent at onset of care for their data to be included in the Uniform Data Set. Permission to access the Uniform Data Set for study purposes was given by the AABC. Institutional review board approval for this study was granted by Frontier Nursing University. Institutional approval was obtained from a Federally Qualified Health Center located in the Southwestern United States.

Results

Demographics and Characteristics

Mothers in CP were significantly older and had more years of education than mothers receiving IPC. Table 3 presents the comparisons of characteristics and demographics by type of prenatal care. There was a significant difference between types of care in terms of race and ethnicity. Mothers receiving CP were more likely to be married than those attending IPC. Mothers in CP were also more likely to have private insurance than governmental insurance, but mothers with IPC were more evenly split between private and governmental insurance.

Characteristics & Demographics	Type of prenatal care		n/t	n/χ2	P
	Group	Non Group			
Age (M)	29.22	27.8	2173 = -4.72		< .001
Years of education (M)	16.02	14.42	2098 = -11.44		< .001
Race/Ethnicity (%)				4 = 15.02	< .01
White	79.1	74.5			
Latina	15.8	19.2			
African-American	1.1	3.9			
Asian-American	3.1	1.8			
Other	0.9	0.7			
Married (%)	76.4	67.8		1 = 11.15	< .001
Insurance coverage (%)					
Private	70.7	46			
State	14.2	36.6			
Multigravida (%)	21.4	64.2		1 = 238.14	< .001
Planned birth site (%)				1 = 36.37	< .001
Birth Center	92.3	7.7			
Hospital	79.2	20.8			
Initiation of care (EGA)	11.92	14.49	2175 = 6.48		< .001
Number of prenatal visits (M)	12.61	10.03	2173 = -15.68		< .001

Table 3: Comparison of characteristics and demographics by type of prenatal care

Pregnancy Differences

CP mothers were more likely to plan birth center births than the IPC mothers. More mothers in GPC initiated care in the first trimester and had more prenatal visits compared to mothers in IPC who initiated care in the second trimester.

Health-Related Outcomes

Mothers in CP gained significantly more weight than mothers receiving IPC. The CP versus IPC outcomes did not significantly differ from each other in terms of activity level. They did, however, differ in terms of self-declared diet during pregnancy (Table 4), with CP mothers being significantly more likely to report an excellent diet and IPC mothers being more likely to report a fair diet.

Diet	Group %	Non-Group %
Poor	1.8	1.3
Fair	9.9	15.7
Good	61.8	62.1
Excellent	26.5	20.9

Table 4: Self-reported diet by type of prenatal care

Birth Outcomes

A significant finding for birth outcomes was that mothers in CP were more likely to have cesarean births and assisted births than mothers attending IPC; CP had more primigravidas. CP gestational ages were slightly longer than mothers receiving IPC; however, no significant differences in infant weight at birth between groups. Mothers in CP were significantly more likely than mothers in IPC to be exclusively breastfeeding at 6 weeks post-birth. There was no significant difference in postpartum mood for women from either type of prenatal care.

Results With Multivariate Models

To further assess whether or not differences between CP or IPCinhealth-related outcomespersisted after accounting for demographic and pregnancy differences, the researchers conducted a series of linear models predicting outcomes while controlling for age, education level, marital status, type of insurance, parity, planned place of birth, the timing of the first birth center visit, and the number of birth center visits. As is shown in Table 5, once demographic differences between the groups was accounted for, the only significant difference between mothers receiving CP and mothers receiving IPC and health-related outcomes was a significantly longer term gestational age at birth for mothers in CP.

Outcomes	Beta Estimate	Standard Error	t	Wald	Type of Regression
Weight gain	0.56	0.74	.77, ns		Linear
Activity levela					Multinomial logistic
Walking	-0.59	0.23		-2.59, ns	
Yoga/Tai Chi	-0.5	0.41		-1.23, ns	
Aerobic Activity	-0.73	0.27		-2.66, ns	
Diet	0.02	0.12	0.19, ns		Ordinal logistic
Birth typeb					Multinomial logistic
NSVD	-0.21	0.16		-1.32, ns	
Assisted	0.47	0.42		1.13, ns	
Gestational age	-0.29	0.1	-3.05*		Linear
Infant weight	-35.72	30.7	-1.20, ns		Linear Multinomial Logistic
Feeding at 6 wksc					
Breastfeeding and Formula	-0.31	0.21		-1.48, ns	
Formula only	-0.47	0.26		-1.85, ns	
Current mood	0	0.13	0.01, ns		Ordinal Logistic

a Comparison group is "Sedentary."

b Comparison group is "Cesarean Birth."

c Comparison group is "Breastfeeding only"

Table 5: Birth outcomes predicted by CP or IPC, controlling for demographic and pregnancy differences

The researchers were also interested in whether or not demographic characteristics and pregnancy differences interacted with prenatal care type to affect birth outcomes. A series of models including simultaneous interaction terms between condition and characteristics were run for each outcome. Due to cell sizes, Asian-American, African-American, and "other" races/ethnicities were combined into one "other" group (Table 6); with a slightly greater percentage of Caucasian couples attending CP.

Prenatal care	Race/Ethnicity		
	Latina	Caucasian	Other
Individual	406	1579	135
Group	71	356	23
Ethnicity in CP (%)	0.148	0.184	0.145

Table 6: Demographic differences by race/ethnicity and type of prenatal care

Weight gain interaction with type of care

A linear regression found there was no abnormal pattern for CP mothers weight gain; however, IPC mothers who presented late to prenatal care gained more weight in pregnancy than those who presented earlier in gestation. Mothers in CP who had more prenatal visits gained less weight versus mothers attending IPC with more visits gained more weight. Factors that could influence weight gain were minimal in this population (Table 7). Only 3.8% of women were overweight, 5.9% obese and 0.9% underweight pre-pregnancy. Even though the data set did not gather information on GDM with present pregnancy, only 1.1% of the sample had a history of GDM.

Prenatal Care	Overweight	Obese BMI <19 GDM		Anorexia/Bulimia	Hx
Individual	71	109	17	18	18
Group (CP)	10	19	3	9	5
% of Sample	3.8	5.9	0.9	1.3	1.1

Table 7: Past Medical History Factors that could influence weight gain

Physical activity interaction with type of care

A multinomial regression was conducted with interactions between CP or IPC and mothers' demographics for physical activity; not statistically significant. The level and type of physical activity was self-reported by mothers in both groups. Table 8 displays the types of activity by type of prenatal care; around 70% of pregnant women walked during pregnancy despite type of prenatal care. Women in CP engaged slightly more in running, yoga/tai chi, aerobic activities and resistance training.

Prenatal Care	Yoga/Resistance					
	Sedentary	Walking	Running	Tai Chi	Aerobics	Training
Individual	159	1284	29	35	200	5
Group	27	272	7	15	50	2

Table 8: Types of Activity pregnant women engaged in by type of care

Diet interaction with type of care

An ordinal regression was conducted with interactions between CP or IPC and mothers' demographics for healthiness of diet. Multiparas in CP had self-reported worse diets than mothers in IPC or primiparas in CP. Mothers in CP who desired hospital births had better diets than mothers in IPC desiring hospital or birth center births.

Birth outcomes

Birth type

A multinomial regression was conducted to assess the interaction between prenatal care type and demographics. Because of their small number (n = 38), women who had an assisted birth were dropped from these analyses. Interactions between CP or IPC and maternal demographics did not statistically predict the type of birth (vaginal or cesarean).

Gestational Age and Infant Weight

A linear regression including prenatal care type by demographic characteristics was conducted regarding infants' gestational age and predicting infant weight. CP women who presented later for their initial visit in pregnancy or who had more prenatal visits had significantly shorter, term gestational ages than similar mothers receiving IPC. Mothers in CP who intended to have their infants in the hospital had significantly heavier babies than those who intended to have their babies in the birthing center. This difference was not found form others in the IPC group. Mothers attending IPC who had more prenatal visits had significantly heavier babies than those who had fewer prenatal visits, but this difference was not found in GPC.

Discussion

Health Behaviors: Weight gain, Diet, and Exercise in Pregnancy

The discussion will address the research questions posed for this study. Women in CP who had more prenatal visits gained less weight which agrees with both Tanner-Smith et al.'s [5] and Trotman et al.'s [6] retrospective reviews. In contrast, in this study, women who attended IPC that started care late or had more visits gained more weight. Klimaet al. [31] and Trudnak et al. [7] reported increased weight gain in pregnancy for CP women but Klima et al.'s study collected only total weight gain. Even though the finding of less weight gain may contradict previous literature that Caucasians tend to gain more weight in pregnancy [4], and there being no difference in weight gain among types of prenatal care [8,9] this study's population has a number of additional variables that may influence this population having less weight gain. A strength of this population was that approximately 90% of them had a pre-pregnancy BMI less than 27. In addition, this study had a lot more subjects than any of the comparative ones adding strength to the results. Anecdotally, women are motivated to control their weight if they want to birth out of hospital as this is a requirement at this birth center to adhere to IOM guidelines. For the women who had less weight gain and more prenatal visits this is a positive reflection of the attentiveness to weight control education during CP.

One could postulate that the additional education and discussions provided in CP positively impacted weight gain and diet. Women in CP self-declared their diets as excellent while IPC women stated theirs was only fair. Multiparous women in CP had the worst diet of any other mothers. Prospective mothers from CP who chose hospital births had a better diet than IPC mother choosing hospital or birth center. This could be reflected as in Heberlin et al.'s[19] participants' outcomes as women in CP could be feeling more secure in food, able to make better food choices, and subsequently eat healthier and gain less weight [19].

The researchers are aware the subset of the population who came to the birth center for care is not the norm for childbearing women in the US. In 2011, per March of Dimes [32], 66% of women of childbearing age were overweight, the birth center's rate within this data set was only 3.65%. In addition, the rate of obesity within this practice was 6.03% compared to 20.5% nationally [33], so the birth center has a minimal number of mothers with a BMI > 27. Rothberg et al. [34] pointed out that 63% of childbearing women exceeded the IOM guidelines (Table 1) for weight gain in pregnancy. Since the national dataset did not have a variable for BMI the researchers were not able to determine how the women in this study fared in relation to this outcome.

There was no statistically significant difference between physical activity levels and either type of prenatal care. The women in CP had slightly more women engage in more physical activity than walking alone. There is no specific data on how much/time exercise was performed by the participants; instead they self reported level of activity and chose the predominant type of activity they engaged in during pregnancy. Nascimental et al. [17] reported women who exercised in pregnancy had higher cardiovascular fitness and less gestational weight gain which can be associated with the CP women in our study being a bit more engaged in fitness and having less gestational weight gain. For women with a BMI less than 27, the majority of our study population, Ruiz et al. [18] noted women who engaged in exercise 3 days a week gained less weight and stayed lower than the IOM guidelines. This scripted exercise regimen would benefit the study population and possibly bring women in both types of prenatal care closer to adhering to guidelines for weight gain.

These positive findings may reflect the earlier evidence that healthier behaviors are associated with discussing health-promoting activities [31]. In CP a portion of every appointment is spent on diet and exercise that the members have the opportunity to share and exchange. This finding could lend support to ACNM's (2011)1 Position Statement about group interaction motivating a change in behaviors. It definitely strengthens the CP goal of empowering women to choose health-promoting behaviors.

Birth Outcomes

Neither type of prenatal care predicted type of birth for the mothers; however of note, there were more cesarean and vacuum assisted births for women in CP prior to adjusting for differences. The CP groups tended to primarily be primiparous women and partners. Women in CP who presented later in pregnancy for care or who had more visits had shorter gestational ages. It was not known if the increase in visits was due to medical conditions such as gestational diabetes where more visits were required; however, there were no significant influencing factors. Overall the gestational age for women attending CP was longer. Centering Pregnancy appears to have a small but significant effect on lengthening the infant's gestational age; congruent with a number of studies [5,22,24,26,28,29,30,35].The CNM's group practice preterm birth rate is already impressive at 0.028%.

Women who attended CP who chose hospital birth over a birth center birth had heavier babies. This was not seen among women who attended IPC; however, women in IPC with more visits gave birth to heavier babies. A requirement at the birth center is for women to stay within IOM guidelines to birth out of hospital. In general birth outcomes were similar between types of care. This would concur with the CP studies to date in that there are no worse perinatal outcomes for CP as compared to IPC: birth weights, perinatal and infant health [36,37] of significant note regarding birth outcomes, Magriples et al. [27] reported that pre-pregnancy BMI was a more significant predictor of cesarean birth over maternal weight gain in young women aged 14-25; over half the participants were overweight or obese limiting comparability to our population in this study.

Post birth mothers from CP groups (84.2%) were more likely to be exclusively breastfeeding at 6 weeks than IPC women (73.4%). This agrees with Brumley et al.'s [38] study which also found more exclusive breastfeeding in those women who attended CP. The social interaction, support and discussions that occur in CP could likely be a factor for these mother's and their persistence with breastfeeding. Bonds are often created amongst families who attended CP and that support extends well beyond pregnancy alone. Organizational measures of reporting breastfeeding exclusively at 6 weeks are not common in the literature. Healthy People 2010 [39] targets for exclusive breastfeeding in general have not been met. In 2007, the rate for exclusive breastfeeding at 3 months was 33.5 with Healthy People 2010 [39] and 2020 [40] goals of 40 and 46.2 respectively. The CDC reports 39.4% of women in Arizona are exclusively breastfeeding at 3 months post-birth and 83.2% report they have ever breastfeed [41].With such good statistics for exclusive breastfeeding at 6 weeks post-birth the projection, if even half of the women cease the rate, would still be around

42%-above the average for Arizona and the national rate.

Clinical Implications

The researchers noticed some important aspects about weight gain, diet and exercise from the study's findings. All pregnancies ideally should begin with pre-conceptual counseling. Preconception counseling should incorporate identification of a healthy BMI, adequate exercise, healthy diet, and evidence-based pregnancy outcomes for various ethnic groups.

Shared decision-making should occur for all women but especially for those who fall in the BMI categories of overweight or obese on healthier pregnancies leading toward healthier maternal-newborn outcomes. Women need and desire advice and guidance on what the desired weight gain for them should be during pregnancy [3]. Discussions should incorporate the IOM guidelines [2] for weight gain in pregnancy. Scott and Kominiarek [42] noted providers lack adherence to IOM guidelines-providers can be the change agents. Women in this study population did receive an initial discussion about IOM guidelines that set the foundation for their pregnancy.

Nutritional assessments should be done with each client upon entry to care to develop an appropriate plan and referral if needed. For pregnant women who attend IPC recommendation to periodically fill out a diet and exercise log to bring back with their visits for evaluation and discussion would be optimal. For women in CP these discussions, guidance, and education are built in to the sessions but need to be included at each session to continue the success noted by this study population.

Guidelines from ACNM, ACOG or DHHS for exercise in pregnancy should be incorporated into prenatal care visits [13-15]. These guidelines are generally discussed as part of the initial visit but need revisiting throughout pregnancy. Specifically a discussion should ensue about continuous versus episodic exercise recommending daily exercise as the optimal regimen. Ruiz et al. [18] noted for women with a normal BMI light to moderate

intensity of aerobic and resistance exercise 3 days per week for 50-55 minutes each time was beneficial for controlled weight gain in pregnancy. Exercise in pregnancy has been shown to be beneficial for more than maternal weight gain in women with a normal pre-pregnancy BMI [18] and should be encouraged. Women need education to be comfortable engaging in exercise along with specific parameters of safety for them and their unborn child. Any of the patient friendly guidelines such as Share with Women: Exercise in Pregnancy [14] makes perfect teaching tools.

Since breastfeeding is such an important factor for infants it is significant to not only note that mother's who attended CP were exclusively breastfeeding longer but that around 84% of them still were at 6 weeks post-birth. The rate for IPC mothers was also impressive at around 73% in this study population. Educating all prospective mothers on the benefits of breastfeeding exclusively for the first 6 months of life and up to a year as food is being introduced is crucial for the health of the infant. Education could take place during each trimester, via a specific breastfeeding class or with a one-on-one with a lactation consult. If efforts are made to increase education and guidance on breastfeeding we could possibly meet the attainable goals for Healthy People 2020.

Further Research

Plans for future research are to perform a national study with the UDS dataset looking at health outcomes and birth outcomes for both types of prenatal care. From the national dataset we will be able to support or refute the findings from this single site study. All Centering Pregnancy sessions regardless of site in the US should follow the same format in the evidence-based structured prenatal care format. Even though this was a large sample size, the numbers of participants from birth centers in the national dataset will provide strength to the study.

The researchers did note the lack of a few indicators that could be more descriptive such as amount and frequency of exercise performed as well as pre-pregnancy BMI. The next study will have these same limitations as the UDS dataset was not updated with any of these variables. Even with these limitations the findings will help guide and create evidence-based practice.

Another goal is to provide feedback to AABC so they can consider refining data parameters for more thorough data collections and stronger research findings on healthy behaviors (diet and exercise) and weight gain in pregnancy. One recommendation is to have more specific data gathered via the dataset on exercise to include amount, duration and frequency. Another is to have pre-pregnancy BMI in addition to pre-pregnant weight.

Future research plans will continue on pre-pregnancy BMI and pregnancy weight gain compared to IOM guidelines and lifestyle habits. This includes the creation and testing of a pregnancy exercise-tracking app. A client interactive app addressing nutrition and exercise choices specific to their IOM guidelines could help women comply with recommendations thereby minimizing weight gain, eating healthy and staying fit. With evidence-based outcomes driving the care that we deliver; strong instruments are needed to optimize the health of mothers and babies.

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Precis

Centering Pregnancy prenatal care lengthens the term of gestation and breastfeeding, while attentive monitoring/guidance and education about diet, exercise, and weight gain decreases total pregnancy weight gain.

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