2-19-2020

The Effects of CenteringPregnancy Group Prenatal Care on Postpartum Visit Attendance and Contraception Use

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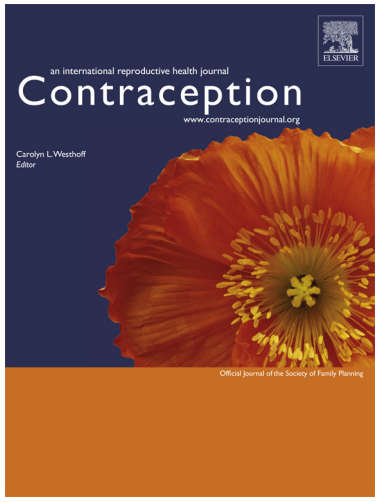
Journal Pre-proofs



Original Research Article

The effects of CenteringPregnancy group prenatal care on postpartum visit attendance and contraception use

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PII: S0010-7824(20)30063-9
DOI: https://doi.org/10.1016/j.contraception.2020.02.010
Reference: CON 9405

To appear in: *Contraception*

Received Date: 4 June 2019
Revised Date: 19 February 2020
Accepted Date: 19 February 2020

Please cite this article as: E. Heberlein, J. Smith, C. Willis, W. Hall, S. Covington-Kolb, A. Crockett, The effects of CenteringPregnancy group prenatal care on postpartum visit attendance and contraception use, *Contraception* (2020), doi: https://doi.org/10.1016/j.contraception.2020.02.010

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Abstract word count: 273

Manuscript word count: 2716

Structured Abstract

Objective

We examined whether Medicaid-enrolled women in CenteringPregnancy group prenatal care had higher rates of 1) postpartum visit attendance and 2) postpartum uptake of contraceptives, compared to women in individual prenatal care.

Study design

We linked birth certificates and Medicaid claims for women receiving group prenatal care in 18 healthcare practices and applied preferential-within cluster propensity score methods to identify a comparison group, accounting for the nested data structure by practice. We examined five standardized, claims-based outcomes: postpartum visit attendance; contraception within 3 days; and any contraception, long-acting reversible contraception (LARC), and permanent contraception within eight weeks. We assessed outcomes using logistic regression for two treatment levels: (1) any group attendance compared to no group attendance and (2) attendance at five or more group sessions to at least five prenatal care visits, including crossovers attending fewer than five group sessions (minimum threshold analysis).

Results

Women attending at least five group sessions had higher rates of postpartum visit attendance (71.5% vs. 67.5%, $p<.05$). Women with any group attendance (N=2,834) were more likely than women with individual care only (N=13,088) to receive contraception within 3 days (19.8% vs. 16.9%, $p<.001$) and to receive a LARC within eight weeks' postpartum (18.0% vs. 15.2%, $p<.001$). At both treatment levels, group participants were less likely to elect permanent

contraception (5.9% vs. 7.8%, p<0.001). Women meeting the five-visit group threshold were not more likely to initiate contraception or LARCs within 8 weeks' postpartum.

Conclusion

Participation in at least five group compared to five individual prenatal care visits is associated with greater rates of postpartum visit attendance. Additional engagement and education in group prenatal care may influence postpartum visit attendance.

Implications

Planning for postpartum care and contraception during prenatal care is an important strategy for connecting women to postpartum healthcare. Regardless of prenatal care model, women have low uptake of contraception in the postpartum period. Increased use of group prenatal care with its scheduled family planning discussion may help to increase postpartum contraceptive uptake. This benefit is dependent on availability of postpartum contraception options.

Keywords

Group prenatal care, CenteringPregnancy, postpartum visits, postpartum contraception choice

Acknowledgement of funding sources

South Carolina Department of Health and Human Services and the South Carolina Chapter of the March of Dimes supported the state-wide expansion of CenteringPregnancy and the evaluation.

1. Introduction

Comprehensive postpartum care, including family planning, is a critical preventive health service that promotes optimal health for mother and infant [1]. Yet, as many as 40-50% of women do not attend a postpartum visit 4-6 weeks after birth despite current guidelines [2]. Low attendance rates are particularly common among women with limited resources, including those with Medicaid [3–5]. This lack of engagement with postpartum care risks delay in addressing peri- and postnatal health issues, missed opportunities for identifying problems with the physical and mental adjustments to motherhood, and planning for the healthy timing and spacing of future pregnancies [6,7]. Acknowledging the historical context of fertility control and sterilization abuse, current best practice guidelines emphasize that each woman receive information on the full range of contraception options so she can make a well-informed, individualized choice [2,8]. The importance of measuring patient engagement around these two metrics – postpartum visit attendance and contraceptive use – has been recognized by the National Committee for Quality Assurance (NCQA) and the Office of Population Affairs who have each developed clinical performance measures to support quality improvement efforts aimed at increasing utilization of these services [9,10].

The CenteringPregnancy™ model of group prenatal care addresses the topics of family planning and postpartum care explicitly and in greater detail compared with traditional, individual prenatal care [11]. Medical providers deliver educational content through facilitating group discussion, which fosters patient engagement and encourages women to ask questions. This model has overall demonstrated positive outcomes, including higher rates of prenatal care use and satisfaction, improvements in preterm birth rates, and higher rates of breastfeeding [12–15]. One of the curriculum development goals was to optimize care and support for women in

the postpartum period and address postpartum contraceptive methods [16]. Several smaller observational studies have noted that group participants have higher rates of postpartum visit attendance, are more likely to utilize contraceptive care visits, and are more likely to choose long-acting, reversible contraception (LARC) [17–19].

Larger studies with standardized measures and more rigorous approaches to addressing selection bias are needed to understand CenteringPregnancy's impact on these metrics. We investigate this research gap through comparing these standardized quality of care measures using Medicaid claims in the context of an 18-site state-supported expansion of CenteringPregnancy group prenatal care.

2. Methods

2.1 Objectives

This study had two main objectives: to explore whether Medicaid-enrolled women receiving group compared to individual prenatal care had 1) higher rates of postpartum visit attendance and 2) were more likely to access contraceptives in the postpartum period, and in particular, select long-acting reversible contraceptive (LARC) methods. We define LARC methods as intrauterine devices and implants.

2.2 Group Prenatal Care

The CenteringPregnancy™ model of group prenatal care, developed and maintained by the Centering Healthcare Institute, includes all of the elements of the American College of Obstetrics and Gynecology's recommended individual care physical assessment and screening visits [20]. Prenatal care is provided in ten, two-hour group sessions with six to twelve women with similar due dates within a 4-6 week range [11,16]. The first 30 minutes of each session is dedicated to individual, routine medical assessments by the healthcare provider. The remaining

90 minutes are composed of group discussions and interactive activities facilitated by the medical care team using a curriculum focused on pregnancy, childbirth, and parenting-related topics [20]. Women will also attend traditional, individual prenatal care visits early in pregnancy (i.e. before enrolling in group), late in pregnancy (i.e. after the 10th session and before birth), as replacement for a missed group session, and if they require additional individualized follow-up.

2.3 Setting

Launched in 2012, the South Carolina CenteringPregnancy Expansion Project provides training, technical assistance, and start-up funds to obstetric practices implementing the CenteringPregnancy™ model. Practices joined the initiative in several cohorts over seven years. At the time of publication, twenty-four practices from across the state were participating in the project [21].

2.4 Data Sources and Sample Population

This study analyzes birth certificate data matched with Medicaid claims data for births occurring in 18 sites between 2013 and 2017. These practices represent academic medical centers, family medicine practices, and private OB-GYN practices where at least one CenteringPregnancy group has had all mothers deliver babies and vital statistics birth certificate data has been processed. The South Carolina Revenue and Fiscal Affairs Office (RFA) matched practice-provided group patient lists to birth certificates and identified a comparison group of deliveries, matched by the National Provider Identifier (NPI) of the delivering provider, delivery month, and year.

Our sample population included women who had viable pregnancies during the study period whose deliveries were covered by Medicaid. Women with more than one birth (including multiple gestation) during the study period were excluded, due to limitations in the de-identified

claims data to match maternal claims with specific births. This research was approved by the institutional review board at Prisma Health which did not require informed consent for the use of preexisting administrative data. The authors report no conflict of interest.

2.5 Treatment exposures

We defined two levels of prenatal care use for comparisons *a priori:* 1) any group attendance to no group attendance and 2) attendance at five or more group sessions to attendance at five or more prenatal care visits (minimum threshold analysis). The "five or more prenatal visits" cohort includes crossovers to individual care attending fewer than five group sessions, reflecting typical patterns of care. Other studies have used a five visit threshold [13,22]. The CenteringPregnancy curriculum covers postpartum family planning in session four, and group facilitators' experience suggests attending 50% of group sessions is an effective dose as groups usually become more engaged and cohesive over time, most women who drop out do so after one or two sessions, and few complete all 10 sessions. Women attending less than 50% of groups may have experienced scheduling barriers, have risk factors that led them to switch back to individual visits, or may have decided the group setting did not suit their needs. In our sample, 26% of CenteringPregnancy participants attended between one and four group sessions, 20% attended 5-6 group sessions, 47% attended 7-9 sessions; and 7% attended all ten sessions.

2.6 *Statistical Analysis*

Because randomizing women to prenatal care model was not possible in this retrospective cohort analysis, we developed propensity scores to match women participating in group to a similar cohort of women receiving individual prenatal care to reduce observable differences (e.g. that may indicate selection bias). This technique helps ensure that identifiable differences between the groups are a result of the treatment received [23,24]. All birth certificate variables

were assessed to determine their suitability to contribute to the propensity score estimation. We identified matching variables through bivariate correlation analysis with each predictor variable vs. the treatment variable (group care) and each outcome of interest. If the correlation between a predictor and treatment or any outcome was greater than |0.10|, and/or the literature supported its inclusion, then the predictor was included as a matching variable [25]. For example, diabetes, hypertension, and body mass index (BMI) were included because of unadjusted variation between the cohorts and potential influence of pregnancy health conditions on increased likelihood of postpartum visit attendance [3]. The matching variables included in the final propensity scores were: parity, Kotelchuck index (an adequacy of prenatal care measure combining prenatal care initiation with the ratio of actual to expected number of prenatal care visits between entry to care and delivery date) [26], cesarean delivery, pre-pregnancy diabetes, gestational diabetes, pre-pregnancy hypertension, gestational hypertension, body mass index (BMI), mother's age, mother's education, mother's race, delivery year, low birth weight birth, and preterm birth.

We then used a preferential-within matching technique—matching with similar propensity scores within the same practice to account for the nested nature of the data within sites. An algorithm was used to match any group care participant without a within-site match to an individual care patient at a different site. This approach reduces the number of unmatched cases that result from only matching within practice sites and improves the balance of covariates and potential cofounders relative to a pooled matching approach [27,28]. As mentioned above, in the minimum threshold analysis, the control group includes women with individual care visits who also had one to four group care sessions. Allowing women who crossed over to individual care

from CenteringPregnancy to remain in the minimum threshold analysis results in a control group more similar to the treatment group of women attending five or more group sessions.

2.7 Outcome Variables

We examined five outcomes using Medicaid claims measures: postpartum visit attendance, 'most or moderately effective' contraception within 3 days of delivery, 'most or moderately effective' contraception within 8 weeks, and permanent contraception or LARC uptake within 8 weeks. 'Postpartum visit attendance' was defined as any postpartum visit occurring between 21 and 56 days postpartum. The postpartum visit attendance measure used the published methodology from the National Committee for Quality Assurance's Healthcare Effectiveness Data and Information Set (HEDIS) [9]. 'Most or moderately effective' refers to the initiation of a healthcare prescribed contraceptive method—including oral contraceptives, injectables, the patch, the ring, diaphragm, LARCs (i.e. implant and IUD), and permanent contraception —within 3 days or 8 weeks postpartum. 'LARC uptake within 8 weeks' refers to the insertion of an IUD or implant within 8 weeks postpartum. These contraceptive measures used the published specifications for health care claims from the Department of Health and Human Services' Office of Population Affairs [10]. These standardized measures were selected to assure consistency in reporting and comparability with published reports. The impact of group care on each outcome was examined using simple logistic regression models with the matched group and individual care cohorts. The analyses were repeated for two treatment levels (section 2.5).

3. Results

3.1 Population Characteristics

CenteringPregnancy (N=2,834) and individual care (N=13,088) participants differed across demographic characteristics and adequacy of prenatal care (Table 1). Of note, group participants were younger, had lower levels of educational attainment, and were more likely to be Hispanic. This group also had a higher percentage of first-time mothers and began prenatal care earlier. Both groups also differed across risk factors for poor birth outcomes. Group participants were less likely to have a BMI greater than 45, pre-pregnancy diabetes, gestational diabetes, pre-pregnancy hypertension, gestational hypertension, or a previous preterm birth. This lower risk profile contributed to better birth outcomes, as group participants had lower rates of cesarean deliveries, preterm births, and low birthweight births.

3.2 Logistic Regression Analyses

The propensity-matching procedures increased the comparability of the treatment and comparison groups and met accepted thresholds for balancing groups prior to outcomes analysis (See Appendix Table 1. Outcomes prior to propensity score matching are shown in Table 2). Women attending at least one group compared to no group attendance were equally likely to attend postpartum visits or receive a most or moderately effective contraceptive method within 8 weeks (Table 3). Women attending at least one group were more likely to receive most or moderately effective contraception within 3 days (19.8% vs. 16.9%, p<.001) and more likely to receive a LARC within eight weeks' postpartum (18.0% vs. 15.2%, p<.001). Supplemental analyses (not shown) indicate that the IUD insertion rates within eight weeks' postpartum were similar between cohorts at either treatment level (5.8% for women attending at least one group to 5.1% for women with no group attendance). Implant insertion rates within eight weeks' postpartum were higher for women attending at least one group (12.2% vs. 10.1%, p<.01).

For women meeting at least a five-visit threshold, group participants had higher rates of postpartum visit attendance (71.5% vs. 67.5%, p<.05). At both treatment exposures, group participants were less likely to elect permanent contraception (Table 3).

4. Discussion

Group prenatal care participation is associated with greater rates of postpartum visit attendance for women who attend at least five prenatal care visits. The additional patient engagement and education in the group setting may positively impact some women's decisions to seek postpartum care, but not be sufficient to support low-income women overcoming other barriers to accessing care such as insufficient care continuity, lack of social support, childcare and transportation issues, and language barriers [17,29,30].

Our analyses indicated that women receiving individual prenatal care were more likely to undergo permanent contraception. Women in the individual care group were older, higher parity, and more likely to have had a cesarean delivery or a medical condition that makes pregnancy or childbearing difficult, all of which are factors that influence decisions to undergo permanent contraception [31,32]. While we matched on observable characteristics, propensity score methods cannot fully compensate for underlying group differences. These decisions regarding contraceptive choice may also be influenced by different contraceptive counseling practices between the two prenatal care models. While women in group prenatal care were less likely to choose permanent contraception, they were more likely to choose LARC methods. This may reflect the impact that facilitated group discussion of family planning options has on improving women's knowledge of and comfort with choosing LARC methods of contraception [33,34].

The relatively small differences and low rates in contraception outcomes suggest the limitations of prenatal care to support postpartum contraception choice. While South Carolina's

Medicaid reimbursement policy supporting immediate postpartum LARCs went into effect in 2012, we expect adoption and implementation varied during the study period and by provider (this data was not available) [35,36]. Our preferential within-cluster matching approach controls statistically for provider differences. Other studies have demonstrated that when knowledge, cost, and same-day availability barriers are removed, LARC uptake is much greater than observed in our study [37].

Few studies have examined the impact of group prenatal care on women's postpartum health and healthcare use. Among women continuously enrolled in Medicaid for 12 months, group prenatal care participants demonstrated greater utilization rates of Medicaid family planning program-covered services by six and 12 months postpartum when compared to a propensity-score matched group of individual care participants [29]. A cluster randomized control trial of adolescents in New York City found that participants who attended at least half of their group sessions were less likely to experience rapid repeat pregnancy, used condoms more frequently, and engaged in fewer acts of unprotected sex [13].

The observed rates of postpartum visit attendance in the current study are similar to other published measures with Medicaid populations [3,4,18]. The Healthy People 2020 target for postpartum visit attendance is 90.1%, using self-reported visit attendance from the Pregnancy Risk Assessment Monitoring System [38]. While not directly comparable to our study given the difference in data source (claims vs. self-report), our results indicate a clear opportunity to increase access to postpartum care for women who have Medicaid coverage for delivery.

4.1 Strengths and Limitations

Our study has a number of limitations. Because our datasets are limited to birth certificate and Medicaid claims, we were unable to control for other variables that may influence women's

choice of prenatal care model, prenatal care attendance, or outcomes. While propensity scores were used to reduce observable differences that may indicate selection bias, propensity scores do not address how unmeasured confounding variables might lead to biased results, and cannot fully compensate for group differences. Such variables could include women's contraception knowledge and preferences, and transportation or childcare issues affecting attendance at both prenatal and postpartum visits.

The claims data was limited to eight weeks' postpartum. In light of the strong clinical recommendations that postpartum visits occur within 4-6 weeks, and the availability of standardized performance measures, eight weeks remains an important timeframe for analysis, but may miss patients that come for care after this point in time. Contraceptive options such as condoms, vasectomy, or lactational amenorrhea were not considered as the study used contraceptive care performance measures—outlined by the Office of Population Affairs—based on Medicaid claims.

Study strengths include our use of data from 18 practices serving a large, diverse population (by race, age, and parity) and our examination of outcomes across treatment levels in relation to engagement in prenatal care.

4.2 Public Health Implications

Planning for postpartum care and contraception use during prenatal care is an important strategy for connecting women to postpartum healthcare. Group prenatal care can contribute modestly to increased use of these services. Additional work to assess impacts of policy and practice changes, including Medicaid expansion and inpatient postpartum LARC availability and counseling, is needed to prioritize strategies to increase Medicaid-enrolled women's postpartum visit attendance and access to contraception.

287 **Table 1. Characteristics (before propensity score matching) of women in**

288 **CenteringPregnancy group prenatal care and individual care, 2013- 2017.**

	Cohort Demographics (restricted to Medicaid)		
	Individual prenatal care (N=13,088)	Group prenatal care (N=2,834)	P- Value
	%	%	
Maternal age category			<0.01
14-17	3.2	5.1	
18-25	48.6	57.4	
26-35	41.2	33.9	
36-44	6.9	3.6	
Maternal education			<0.01
< high school	22.7	25.5	
high school/GED	36.6	35.5	
some college	29.7	27.2	
associates or higher	11.0	11.8	
Maternal race			<0.01
Black	47.0	45.2	
White	45.6	41.5	
Hispanic	6.1	12.7	
Other	1.3	0.6	
# Previous live births			<0.01
0	36.4	55.1	
1	29.8	24.3	
2+	33.8	20.6	
Month PNC began (grouped)			<0.01
0-2 months	32.5	43.2	
3-4 months	44.5	49.3	
5+ months	23.1	7.5	
Kotelchuck Index			<0.01
Inadequate	25.1	8.6	
Intermediate	5.4	4.8	
Adequate	24.3	21.9	
Adequate+	45.1	64.6	
Tobacco use in pregnancy	17.7	13.7	<0.01
Infections during pregnancy	11.4	11.4	0.94
BMI>45	5.3	2.5	<0.01
Prepregnancy diabetes	2.2	0.3	<0.01
Prepregnancy hypertension	4.4	1.8	<0.01
Previous preterm birth	8.5	3.8	<0.01
Gestational diabetes	6.2	4.2	<0.01

Gestational hypertension	10.8	12.6	<0.01
Cesarean delivery	31.5	25.1	<0.01
NICU admission	9.4	6.6	<0.01
Preterm birth	10.8	7.9	<0.01
Preterm birth (<32 weeks)	2.1	1.6	0.08
Low birthweight	9.8	7.5	<0.01
Breastfeeding at hospital discharge	67.5	75.7	<0.01

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Table 2. Outcomes (before propensity score matching) of women in CenteringPregnancy group prenatal care and individual care, 2013- 2017.

	Individual prenatal care (N=13,088)	Group prenatal care (N=2,834)	P- Value
	%	%	
Postpartum visit attendance	62.4	68.6	<0.01
Contraception (within 8 weeks postpartum)	49.3	50.1	0.44
Contraception (within 3 days postpartum)	17.3	19.8	<0.01
Permanent contraception (within 8 weeks postpartum)	11.3	5.9	<0.01
LARCs (within 8 weeks postpartum)	17.7	18.0	0.77

Table 3. Rate estimates and adjusted odds ratios for postpartum visit and contraception use, by prenatal care type

	Percent of Pregnancies			Adjusted Odds Ratio	
	Individual care estimate	Group care estimate	P-value	Estimate	95% Confidence interval
Postpartum visit	%	%			
1+ visit	67.6	68.6	0.58	1.047	(0.99, 1.11)
5+ visits	67.5	71.5	0.01	1.209	(1.13, 1.29)
Contraception (within 3 days postpartum)					
1+ visit	16.9	19.8	0.00	1.215	(1.13, 1.31)
5+ visits	19.7	20.3	0.38	1.037	(0.96, 1.12)
Contraception (within 8 weeks postpartum)					
1+ visit	47.7	50.2	0.06	1.103	(1.04, 1.17)
5+ visits	50.3	50.6	0.75	1.013	(0.95, 1.08)
Permanent contraception (within 8 weeks postpartum)					
1+ visit	7.8	5.9	0.00	0.742	(0.66, 0.83)
5+ visits	9.2	5.9	0.00	0.621	(0.55, 0.70)
LARCs (within 8 weeks postpartum)					
1+ visit	15.2	18.0	0.00	1.220	(1.13, 1.32)
5+ visits	16.9	18.3	0.34	1.101	(1.01, 1.20)

Estimated rates reflect propensity score analysis results, per pregnancy. Odds ratio <1 indicates higher rates among individual prenatal care, and an odds ratio >1 indicates higher rates among group prenatal care. The first pregnancy only within the study period is included. Variables included in the propensity score match: parity, Kotelchuck index, cesarean delivery, pre-pregnancy diabetes, gestational diabetes, pre-pregnancy hypertension, gestational hypertension, body mass index (BMI), mother's age, mother's education, mother's race, delivery year, low birth weight birth, and preterm birth.

303 **Appendix Table 1. Propensity score matching variable balance**

Matching term	Group prenatal care	Individual prenatal care (pre-matching)	Individual prenatal care (post-matching)	Variance ratio (pre-matching)	Variance ratio (post-matching)
Parity	0.65	0.97	0.64	0.91	1.07
Kotelchuck index	3.43	2.89	3.37	0.57	0.94
C-section	25.05%	31.48%	24.41%	0.87	1.02
Pre-pregnancy diabetes	0.32%	2.19%	0.23%	0.15	1.40
Gestational diabetes	4.20%	6.18%	4.79%	0.69	0.88
Pre-pregnancy hypertension	1.76%	4.44%	1.71%	0.41	1.03
Hypertension	12.63%	10.83%	15.24%	1.14	0.85
BMI	27.81	28.00	27.70	0.76	0.88
Mother's education	1.25	1.29	1.24	1.06	1.09
Mother's age	24.41	25.94	24.34	0.86	1.00
Mother's race	0.69	0.62	0.74	1.17	1.17
Low birth weight	7.48%	9.85%	7.42%	0.78	1.01
Year of birth	2015.56	2015.67	2015.45	0.94	0.87
Preterm birth	7.90%	10.82%	8.15%	0.75	0.97

305 References

306 [1] Henderson V, Stumbras K, Caskey R, Haider S, Rankin K, Handler A. Understanding
307 Factors Associated with Postpartum Visit Attendance and Contraception Choices:
308 Listening to Low-Income Postpartum Women and Health Care Providers. Matern Child
309 Heal J 2016;20:132–43.
310 [2] The American College of Obstetricians and Gynecologists. ACOG Committee Opinion
311 No. 736: Optimizing Postpartum Care. Obstet Gynecol 2018;131:e140–50.
312 [3] Bennett W, Chang H-Y, Levine D, Wang L, Neale D, Werner E, et al. Utilization of
313 Primary and Obstetric Care After Medically Complicated Pregnancies: An Analysis of
314 Medical Claims Data. JGIM J Gen Intern Med 2014;29:636–45.
315 [4] Bryant AS, Haas JS, McElrath TF, McCormick MC. Predictors of Compliance with the
316 Postpartum Visit among Women Living in Healthy Start Project Areas. Matern Child Heal
317 J 2006;10:511–6.
318 [5] Hernandez L, Sappenfield W, Goodman D, Pooler J. Is Effective Contraceptive Use
319 Conceived Prenatally in Florida? The Association Between Prenatal Contraceptive
320 Counseling and Postpartum Contraceptive Use. Matern Child Heal J 2012;16:423–9.
321 [6] White K, Teal SB, Potter JE. Contraception After Delivery and Short Interpregnancy
322 Intervals Among Women in the United States. Obstet Gynecol 2015;125:1471–7.
323 [7] Conde-Agudelo A, Rosas-Bermudez A, Castaño F, Norton MH. Effects of Birth Spacing
324 on Maternal, Perinatal, Infant, and Child Health: A Systematic Review of Causal
325 Mechanisms. Stud Fam Plann 2012;43:93–114. doi:10.1111/j.1728-4465.2012.00308.x.
326 [8] The American College of Obstetricians and Gynecologists. ACOG Committee Opinion
327 No. 695: Sterilization of Women: Ethical Issues and Considerations. Obstet Gynecol

2017;129:e109–16.

[9] National Committee for Quality Assurance. Prenatal and Postpartum Care (PPC). HEDIS Meas Tech Resour 2018.

[10] Office of Population Affairs. Performance Measures 2018.

[11] Rising SS, Kennedy HP, Klima CS. Redesigning prenatal care through CenteringPregnancy. J Midwifery Womens Health 2004;49:398–404. doi:10.1016/J.JMWH.2004.04.018.

[12] Grady MA, Bloom KC. Pregnancy outcomes of adolescents enrolled in a CenteringPregnancy program. J Midwifery Womens Health 2004;49:412–20.

[13] Ickovics JR, Earnshaw V, Lewis JB, Kershaw TS, Magriples U, Stasko E, et al. Cluster Randomized Controlled Trial of Group Prenatal Care: Perinatal Outcomes Among Adolescents in New York City Health Centers. Am J Public Health 2016;106:359–65.

[14] Robinson K, Garnier-Villarreal M, Hanson L. Effectiveness of CenteringPregnancy on Breastfeeding Initiation Among African Americans: A Systematic Review and Meta-analysis. J Perinat Neonatal Nurs 2018;32.

[15] Trudnak TE, Arboleda E, Kirby RS, Perrin K. Outcomes of Latina Women in CenteringPregnancy Group Prenatal Care Compared With Individual Prenatal Care. J Midwifery Womens Health 2013;58:396–403. doi:10.1111/jmwh.12000.

[16] Rising SS. Centering Pregnancy: An Interdisciplinary Model of Empowerment. J Nurse Midwifery 1998;43:46–54. doi:10.1016/S0091-2182(97)00117-1.

[17] DeCesare JZ, Hannah D, Amin R. Postpartum Contraception Use Rates of Patients Participating in the Centering Pregnancy Model of Care Versus Traditional Obstetrical Care. J Reprod Med 2017;62:45–9.

[18] Trotman G, Chhatre G, Darolia R, Tefera E, Damle L, Gomez-Lobo V. The Effect of Centering Pregnancy versus Traditional Prenatal Care Models on Improved Adolescent Health Behaviors in the Perinatal Period. J Pediatr Adolesc Gynecol 2015;28:395–401. doi:https://doi.org/10.1016/j.jpag.2014.12.003.

[19] Roussos-Ross D, Prieto A, Watson AK, Goodin A. Contraception/Family Planning Are Centering Pregnancy Patients More Likely Than Traditional Care Patients to Select LARC? [1F]. Obstet Gynecol 2018;131.

[20] The American College of Obstetricians and Gynecologists. ACOG Committee Opinion No. 731: Group Prenatal Care. Obstet Gynecol 2018;131:e104–8.

[21] Crockett AH, Heberlein EC, Smith JC, Ozluk P, Covington-Kolb S, Willis C. Effects of a Multi-site Expansion of Group Prenatal Care on Birth Outcomes. Matern Child Health J 2019;23:1424–33. doi:10.1007/s10995-019-02795-4.

[22] Crockett A, Heberlein EC, Glasscock L, Covington-Kolb S, Shea K, Khan IA. Investing in CenteringPregnancy Group Prenatal Care Reduces Newborn Hospitalization Costs. Women's Heal Issues 2017;27:60–6. doi:10.1016/j.whi.2016.09.009.

[23] Rosenbaum PR, Rubin DB. Constructing a Control Group Using Multivariate Matched Sampling Models That Incorporate the Propensity Score. Am Stat 1985;39:33.

[24] Rubin DB. The design versus the analysis of observational studies for causal effects: Parallels with the design of randomized trials. Stat Med 2007;26:20–36. doi:10.1002/sim.2739.

[25] Tanner-Smith EE, Katarzyna T. Steinka-Fry, Mark W. Lipsey. A multi-site evaluation of the CenteringPregnancy programs in Tennessee: Final report prepared for the Tennessee department of health. Nashville, TN: 2012.

[26] Kotelchuck M. An Evaluation of the Kessner Adequacy of Prenatal Care Index and a Proposed Adequacy of Prenatal Care Utilization Index. Am J Public Health 1994;84:1414–20.

[27] Arpino B, Cannas M. Propensity score matching with clustered data. An application to the estimation of the impact of caesarean section on the Apgar score. Stat Med 2016;35:2074–91. doi:10.1002/sim.6880.

[28] Bryson A, Dorsett R, Purdon S. The use of propensity score matching in the evaluation of active labour market policies. London School of Economics and Political Science, LSE Library; 2002.

[29] Hale N, Picklesimer AH, Billings DL, Covington-Kolb S. The impact of Centering Pregnancy Group Prenatal Care on postpartum family planning. Am J Obstet Gynecol 2014;210:50.e1-50.e7. doi:10.1016/J.AJOG.2013.09.001.

[30] Kershaw TS, Magriples U, Westdahl C, Rising SS, Ickovics J. Pregnancy as a Window of Opportunity for HIV Prevention: Effects of an HIV Intervention Delivered Within Prenatal Care. Am J Public Health 2009;99:2079–86.

[31] Garcia G, Richardson DM, Gonzales KL, Cuevas AG. Trends and Disparities in Postpartum Sterilization after Cesarean Section, 2000 through 2008. Women's Heal Issues 2015;25:634–40.

[32] Kavanaugh ML, Jerman J. Contraceptive method use in the United States: trends and characteristics between 2008, 2012 and 2014. Contraception 2018;97:14–21.

[33] Walker SH, Newton VL, Hoggart L, Parker MJ. Predictors of non-use of intrauterine contraception among women aged 18-49 years in a general practice setting in the UK. Open Access J Contracept 2016;7:155–60. doi:10.2147/OAJC.S116994.

[34] Hall KS, Ela E, Zochowski MK, Caldwell A, Moniz M, McAndrew L, et al. “I don’t know enough to feel comfortable using them”: Women’s knowledge of and perceived barriers to long-acting reversible contraceptives on a college campus. Contraception 2016;93:556–64. doi:10.1016/j.contraception.2016.02.007.

[35] Mann ES, White AL, Rogers PL, Gomez AM. Patients’ experiences with South Carolina’s immediate postpartum Long-acting reversible contraception Medicaid policy. Contraception 2019;100:165–71. doi:10.1016/j.contraception.2019.04.007.

[36] Okoroh EM, Kane DJ, Gee RE, Kieltyka L, Frederiksen BN, Baca KM, et al. Policy change is not enough: engaging provider champions on immediate postpartum contraception. Am J Obstet Gynecol 2018;218:590.e1-590.e7. doi:10.1016/j.ajog.2018.03.007.

[37] Secura GM, Allsworth JE, Madden T, Mullersman JL, Peipert JF. The Contraceptive CHOICE Project: reducing barriers to long-acting reversible contraception. Am J Obstet Gynecol 2010;203:115.e1-115.e1157. doi:10.1016/j.ajog.2010.04.017.

[38] U.S. Department of Health and Human Services. Increase the proportion of women giving birth who attend a postpartum care visit with a health care worker. Heal People 2020 2012. https://www.healthypeople.gov/node/4855/data_details (accessed May 7, 2019).