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Original Research Article

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

Emily Heberlein, Jessica Smith, Carla Willis, Wendasha Hall, Sarah Covington-Kolb, Amy Crockett

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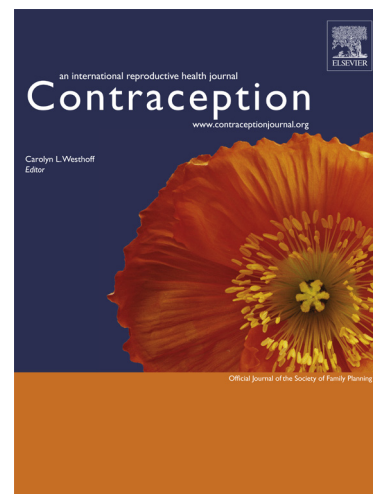
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1 **Title:** The effects of CenteringPregnancy group prenatal care on postpartum visit attendance and
2 contraception use

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16 **Abstract word count: 273**

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20 **Structured Abstract**

21 **Objective**

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

25 **Study design**

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

35 **Results**

36 Women attending at least five group sessions had higher rates of postpartum visit attendance
37 (71.5% vs. 67.5%, $p<.05$). Women with any group attendance ($N=2,834$) were more likely than
38 women with individual care only ($N=13,088$) to receive contraception within 3 days (19.8% vs.
39 16.9%, $p<.001$) and to receive a LARC within eight weeks' postpartum (18.0% vs. 15.2%,
40 $p<.001$). At both treatment levels, group participants were less likely to elect **permanent**

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

43 **Conclusion**

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

47 **Implications**

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

53 **Keywords**

54 Group prenatal care, CenteringPregnancy, postpartum visits, postpartum contraception choice
55

56 **Acknowledgement of funding sources**

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58 March of Dimes supported the state-wide expansion of CenteringPregnancy and the evaluation.

59 1. Introduction

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

75 The CenteringPregnancy™ model of group prenatal care addresses the topics of family
76 planning and postpartum care explicitly and in greater detail compared with traditional,
77 individual prenatal care [11]. Medical providers deliver educational content through facilitating
78 group discussion, which fosters patient engagement and encourages women to ask questions.
79 This model has overall demonstrated positive outcomes, including higher rates of prenatal care
80 use and satisfaction, improvements in preterm birth rates, and higher rates of breastfeeding [12–
81 15]. One of the curriculum development goals was to optimize care and support for women in

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

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

91 **2. Methods**

92 *2.1 Objectives*

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

98 *2.2 Group Prenatal Care*

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

105 90 minutes are composed of group discussions and interactive activities facilitated by the
106 medical care team using a curriculum focused on pregnancy, childbirth, and parenting-related
107 topics [20]. Women will also attend traditional, individual prenatal care visits early in pregnancy
108 (i.e. before enrolling in group), late in pregnancy (i.e. after the 10th session and before birth), as
109 replacement for a missed group session, and if they require additional individualized follow-up.

110 *2.3 Setting*

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

116 *2.4 Data Sources and Sample Population*

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

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

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

131 *2.5 Treatment exposures*

132 We defined two levels of prenatal care use for comparisons *a priori*: 1) any group
133 attendance to no group attendance and 2) attendance at five or more group sessions to attendance
134 at five or more prenatal care visits (minimum threshold analysis). The “five or more prenatal
135 visits” cohort includes crossovers to individual care attending fewer than five group sessions,
136 reflecting typical patterns of care. Other studies have used a five visit threshold [13,22]. The
137 CenteringPregnancy curriculum covers postpartum family planning in session four, and group
138 facilitators’ experience suggests attending 50% of group sessions is an effective dose as groups
139 usually become more engaged and cohesive over time, most women who drop out do so after
140 one or two sessions, and few complete all 10 sessions. Women attending less than 50% of groups
141 may have experienced scheduling barriers, have risk factors that led them to switch back to
142 individual visits, or may have decided the group setting did not suit their needs. In our sample,
143 26% of CenteringPregnancy participants attended between one and four group sessions, 20%
144 attended 5-6 group sessions, 47% attended 7-9 sessions; and 7% attended all ten sessions.

145 *2.6 Statistical Analysis*

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

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

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

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

175

176 *2.7 Outcome Variables*

177 We examined five outcomes using Medicaid claims measures: postpartum visit
178 attendance, ‘most or moderately effective’ contraception within 3 days of delivery, ‘most or
179 moderately effective’ contraception within 8 weeks, and permanent contraception or LARC
180 uptake within 8 weeks. ‘Postpartum visit attendance’ was defined as any postpartum visit
181 occurring between 21 and 56 days postpartum. The postpartum visit attendance measure used the
182 published methodology from the National Committee for Quality Assurance’s Healthcare
183 Effectiveness Data and Information Set (HEDIS) [9]. ‘Most or moderately effective’ refers to the
184 initiation of a healthcare prescribed contraceptive method—including oral contraceptives,
185 injectables, the patch, the ring, diaphragm, LARCs (i.e. implant and IUD), and permanent
186 contraception—within 3 days or 8 weeks postpartum. ‘LARC uptake within 8 weeks’ refers to
187 the insertion of an IUD or implant within 8 weeks postpartum. These contraceptive measures
188 used the published specifications for health care claims from the Department of Health and
189 Human Services’ Office of Population Affairs [10]. These standardized measures were selected
190 to assure consistency in reporting and comparability with published reports. The impact of group
191 care on each outcome was examined using simple logistic regression models with the matched
192 group and individual care cohorts. The analyses were repeated for two treatment levels (section
193 2.5).

194 **3. Results**

195 *3.1 Population Characteristics*

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

205 *3.2 Logistic Regression Analyses*

206 The propensity-matching procedures increased the comparability of the treatment and
207 comparison groups and met accepted thresholds for balancing groups prior to outcomes analysis
208 (See Appendix Table 1. Outcomes prior to propensity score matching are shown in Table 2).
209 Women attending at least one group compared to no group attendance were equally likely to
210 attend postpartum visits or receive a most or moderately effective contraceptive method within 8
211 weeks (Table 3). Women attending at least one group were more likely to receive most or
212 moderately effective contraception within 3 days (19.8% vs. 16.9%, $p<.001$) and more likely to
213 receive a LARC within eight weeks' postpartum (18.0% vs. 15.2%, $p<.001$). Supplemental
214 analyses (not shown) indicate that the IUD insertion rates within eight weeks' postpartum were
215 similar between cohorts at either treatment level (5.8% for women attending at least one group to
216 5.1% for women with no group attendance). Implant insertion rates within eight weeks'
217 postpartum were higher for women attending at least one group (12.2% vs. 10.1%, $p<.01$).

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

221 **4. Discussion**

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

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

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

241 Medicaid reimbursement policy supporting immediate postpartum LARCs went into effect in
242 2012, we expect adoption and implementation varied during the study period and by provider
243 (this data was not available) [35,36]. Our preferential within-cluster matching approach controls
244 statistically for provider differences. Other studies have demonstrated that when knowledge,
245 cost, and same-day availability barriers are removed, LARC uptake is much greater than
246 observed in our study [37].

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

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

261 *4.1 Strengths and Limitations*

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

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

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

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

280 *4.2 Public Health Implications*

281 Planning for postpartum care and contraception use during prenatal care is an important
282 strategy for connecting women to postpartum healthcare. Group prenatal care can contribute
283 modestly to increased use of these services. Additional work to assess impacts of policy and
284 practice changes, including Medicaid expansion and inpatient postpartum LARC availability and
285 counseling, is needed to prioritize strategies to increase Medicaid-enrolled women’s postpartum
286 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)		P- Value
	Individual prenatal care (N=13,088)	Group prenatal care (N=2,834)	
	%	%	
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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291 **Table 2. Outcomes (before propensity score matching) of women in CenteringPregnancy**
 292 **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

293

294

295

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

	Percent of Pregnancies		P-value	Adjusted Odds Ratio	
	Individual care estimate	Group care estimate		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)

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

302

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

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