

## Effect of a collaborative interdisciplinary maternity care program on perinatal outcomes

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### ABSTRACT

**Background:** The number of physicians providing maternity care in Canada is decreasing, and the rate of cesarean delivery is increasing. We evaluated the effect on perinatal outcomes of an interdisciplinary program designed to promote physiologic birth and encourage active involvement of women and their families in maternity care.

**Methods:** We conducted a retrospective cohort study involving 1238 women who attended the South Community Birth Program in Vancouver, Canada, from April 2004 to October 2010. The program offers comprehensive, collaborative, interdisciplinary care from family physicians, midwives, community health nurses and doulas to a multi-ethnic, low-income population. A comparison group, matched for neighbourhood of residence, maternal age, parity and gestational age at delivery, comprised 1238 women receiving standard care in community-based family physician, obstetrician and midwife practices. The primary outcome was the proportion of women who underwent cesarean delivery.

**Results:** Compared with women receiving standard care, those in the birth program were more likely to be delivered by a midwife (41.9% v. 7.4%,  $p < 0.001$ ) instead of an obstetrician (35.5% v. 69.6%,  $p < 0.001$ ). The program participants were less likely than the matched controls to undergo cesarean delivery (relative risk [RR] 0.76, 95% confidence interval [CI] 0.68–0.84) and, among those with a previous cesarean delivery, more likely to plan a vaginal birth (RR 3.22, 95% CI 2.25–4.62). Length of stay in hospital was shorter in the program group for both the mothers (mean  $\pm$  standard deviation 50.6  $\pm$  47.1 v. 72.7  $\pm$  66.7 h,  $p < 0.001$ ) and the newborns (47.5  $\pm$  92.6 v. 70.6  $\pm$  126.7 h,  $p < 0.001$ ). Women in the birth program were more likely than the matched controls to be breastfeeding exclusively at discharge (RR 2.10, 95% CI 1.85–2.39).

**Interpretation:** Women attending a collaborative program of interdisciplinary maternity care were less likely to have a cesarean delivery, had shorter hospital stays on average and were more likely to breastfeed exclusively than women receiving standard care.

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In the last 2 decades, Canada has seen a dramatic reduction in the number of physicians providing maternity care.<sup>1,2</sup> Reasons for this decline have included liability concerns, lifestyle issues and perceived competence.<sup>3</sup> A large proportion of obstetricians and family physicians who practise maternity care will reach retirement age in the next 10 years.<sup>4</sup> The reduction in maternity care providers has been linked with hospital closures in rural settings and increasing difficulty in accessing obstetric care for women in all settings.<sup>4</sup> Although the introduction of regulated midwifery promises some relief, midwives currently attend less than 10% of births.<sup>5</sup>

Recent times have also seen a dramatic increase in the rates of interventions during childbirth, particularly cesarean delivery, which has risen from 17% in the 1990s to 28% in 2009 in

Canada.<sup>6</sup> This increase has occurred despite a lack of evidence that maternal and neonatal outcomes are improved with cesarean delivery.<sup>7–10</sup> Increasing rates of surgical delivery have placed an added burden on care provider resources, because of the associated intrapartum and postpartum complications<sup>11</sup> and increased length of stay in hospital.<sup>12</sup>

In addition, increasing diversity, especially in urban settings, has made the delivery of maternity care more challenging. In the province of British Columbia, 16% of the population speaks neither official language at home.<sup>13</sup> This proportion is as high as 32% in Vancouver, the province's largest city and the setting of our study. There is evidence that immigrant women are at increased risk of receiving obstetric interventions and less likely to breastfeed.<sup>14,15</sup>

In response to these issues, the South Community Birth Program was established to provide comprehensive, collaborative maternity care from family physicians, midwives, community health nurses and doulas to a multiethnic, low-income population. The program aims to promote physiologic birth while encouraging women and their families to assume an active role in their maternity care. In the current study, we evaluated the impact of the program on perinatal outcomes.

## Methods

We conducted a retrospective cohort study to compare perinatal outcomes between healthy women attending the South Community Birth Program and a matched group of women receiving standard care in community-based practices. Women in both groups delivered their babies at the BC Women's Hospital and Health Centre. We report on all births among women in the study from Apr. 1, 2004 (when the first birth in the program occurred), to Oct. 31, 2010.

### Setting

South Vancouver is an ethnically diverse area with about 122 000 people that encompasses the neighbourhoods of Oakridge, Marpole, Killarney and Sunset. It has an immigrant population of 45%, with 18% of immigrant families having arrived within the last 5 years.<sup>13</sup> Recent immigrants can experience difficulties in understanding their rights to maternity services, management of appointments and expectations of care providers.<sup>16</sup> Before the establishment of the program, there were no midwives or obstetricians and few family physicians providing maternity care in South Vancouver.

### South Community Birth Program

The South Community Birth Program was started in January 2004 with funding from the Federal Primary Health Care Transition Fund and the Provincial Health Services and Vancouver Coastal Health Authorities in British Columbia. Midwives, family physicians, nurses and doulas provide care in a team-based shared-care model. Midwives and physicians pool their Medical Services Plan billings and are remunerated at the same rate on a sessional basis for their services. Women refer themselves to the program or are referred by their primary care physician if the physician does not provide maternity care. The program is free of charge.

After 2 or 3 one-on-one visits with a midwife or physician, during which a physical examination, ordering of laboratory tests, medical his-

tory-taking and genetic counselling have been completed as needed, women and their partners are invited to join group prenatal care, based on the CenteringPregnancy model.<sup>17,18</sup> Women may also opt to continue receiving care in a traditional one-on-one format, and about 20% of nulliparous women so choose. Groups are composed of 10–12 women and their partners who have an expected due date within 2 to 4 weeks. Each of the 10 group sessions has a curriculum ranging from exercise and nutrition to labour and birth preparation and care of the newborn. The groups are facilitated by a family physician or a midwife, together with one of the program's nurses. Women who have complications of pregnancy also receive one-on-one visits between group sessions and are referred to an obstetrician as needed.

Doulas working in the program have completed a 2-day certificate course in labour support.<sup>19</sup> The program currently has 42 doulas who in total speak 25 languages in addition to English. Doulas meet the patients once before labour and then provide one-on-one continuous support during latent and active phases of labour.

The program has 6 full-time positions filled by midwives and physicians who share primary care. The midwife or physician on call admits the patient in labour and remains in hospital throughout the labour. Although their scope of practice is similar, midwives are required to consult an obstetrician for vacuum extraction and have more limited prescribing rights.

Women are generally discharged from hospital within 24–48 hours after delivery. Postpartum home visits are provided by a midwife or physician the next day, with additional home visits as needed. Postpartum and breastfeeding support is provided in the clinic by a clinical nurse specialist with a master's degree in nursing who is also a certified lactation consultant. At 6 weeks postpartum, women and their newborns are discharged to the care of their family physicians or referred to one as needed. A weekly drop-in clinic is available for up to 6 months postpartum.

The team meets each month to review patient care. The reviews are supported by the use of electronic medical records, which allow instant access to patient information.

### Standard care

Outcomes of women in the South Community Birth Program were compared with those of women of similar risk status who received standard care in community-based family physician, obstetrician and midwife practices. Women in the comparison group were drawn from the hospital's database. They were matched to women

in the program by place of residence (first 3 digits of the postal code), age (within 1 year), parity (nulliparous or multiparous) and gestational age (within 1 week). The first 3 digits of the postal code correspond to a geographic region in which there are between 5000 and 13 000 households.

### Eligibility

Health records of all women enrolled in the South Community Birth Program were included in the study. Records were selected for the women in the control group if they met the following inclusion criteria for the program: they had a single fetus, were 14 years of age or older and did not have a pre-existing renal, cardiac or autoimmune disease or a body mass index greater than 40 at presentation for prenatal care. All of the women provided written informed consent for their hospital charts to be reviewed.

### Outcome measures

Sociodemographic, pregnancy and outcome data were obtained from the hospital's database. Validation studies have recorded accuracy rates of 97% over all data fields in this database.<sup>20</sup> The proportion of data that are missing is less than 0.01%.<sup>20</sup>

The primary outcome measure was the proportion of women who underwent cesarean delivery. Secondary outcome measures included obstetric interventions and maternal outcomes (method of fetal assessment during labour, use of analgesia during labour, augmentation or induction of labour, length of labour, perineal trauma, blood transfusion and length of stay) and neonatal outcomes (stillbirth, death before discharge, Apgar score less than 7, preterm delivery, small or large for gestational age, length of hospital stay, readmission, admission to neonatal intensive care unit for more than 24 hours and method of feeding at discharge).

### Statistical analysis

At the start of the study, the overall proportion of women who underwent cesarean delivery was 27% at the BC Women's Hospital and Health Centre. With 1238 women in each group, we had 88% power to detect a relative decrease of 20% in the proportion, to 21.6%, with a type I error, one-sided, set at 0.05.

Baseline characteristics of the two cohorts were compared in a univariable analysis. We report relative risks (RRs) and 95% confidence intervals (CIs) to quantify the association between the maternity care model and interventions during labour, and maternal and newborn outcomes. Adjustment for diabetes or previous cesarean delivery altered estimates of risk (odds ratios [ORs]) by less than 10% and did not alter any

study conclusions. Therefore, we present unadjusted RRs, which do not overestimate risk when outcomes of interest are not rare, as do ORs.<sup>21</sup> We compared outcomes based on continuous variables using general linear regression. Analyses were undertaken using SPSS software, version 16.

### Results

The two groups of women were similar with respect to age and parity (Table 1), which was expected because they were matched on these variables. The groups did not differ with respect to use of alcohol or other substances. Diabetes was significantly more prevalent among women in the comparison group than among those in the

**Table 1:** Characteristics of women enrolled in the South Community Birth Program and matched controls who received standard maternity care

Characteristic	Group; no. (%) of women*		p value
	Birth program n = 1238	Standard care n = 1238	
Age, yr			1.0
14–19	15 (1.2)	11 (0.9)	
20–24	115 (9.3)	109 (8.8)	
25–29	311 (25.1)	312 (25.2)	
30–34	447 (36.1)	452 (36.5)	
35–39	293 (23.7)	296 (23.9)	
≥ 40	57 (4.6)	58 (4.7)	
Nulliparous	830 (67.0)	830 (67.0)	1.0
Smoker	39 (3.2)	38 (3.1)	0.9
Alcohol use	1 (0.1)	3 (0.2)	0.3
Other substance use	7 (0.6)	14 (1.1)	0.2
Hypertension			
Pregnancy-induced	66 (5.3)	66 (5.3)	1.0
Pre-existing	8 (0.6)	16 (1.3)	0.1
Diabetes			
Gestational	56 (4.5)	98 (7.9)	< 0.001
Pre-existing	2 (0.2)	10 (0.8)	0.02
Previous cesarean delivery	75 (6.1)	105 (8.5)	0.02
Gestational age at entry to prenatal care, wk, mean ± SD	10.7 ± 5.6	10.9 ± 5.2	0.4
Primary caregiver			
Midwife	792 (64.0)	143 (11.6)	< 0.001
Family physician	423 (34.2)	456 (36.8)	0.3
Obstetrician	23 (1.9)	639 (51.6)	< 0.001
Delivery by			
Midwife	517 (41.9)	92 (7.4)	< 0.001
Family physician	281 (22.7)	284 (22.9)	0.9
Obstetrician	440 (35.5)	862 (69.6)	< 0.001

Note: SD = standard deviation.  
\*Unless stated otherwise.

South Community Birth Program. More women in the comparison group than in the birth program group had a previous cesarean delivery. Overall, 41.9% of the births in the program were conducted by midwives, as compared with 7.4% in the comparison group.

Women in the birth program were at significantly reduced risk of cesarean delivery (RR 0.76, 95% CI 0.68–0.84); this finding was true for both nulliparous women (RR 0.81, 95% CI 0.72–0.91) and multiparous women (RR 0.63, 95% CI 0.50–0.78) (Table 2). Women in the birth program were not at increased risk for assisted vaginal delivery (RR 0.99, 95% CI 0.88–1.09). Among women whose primary caregiver was an obstetrician, those in the program were significantly more likely than those receiving standard care to have a cesarean delivery. Among women whose primary caregiver was a midwife or a family physician, cesarean delivery was less likely among those in the program than among those in

the comparison group; however, the differences were not statistically significant. Among women who had a previous cesarean delivery, more of those in the program than in the comparison group planned a vaginal birth in the current pregnancy (RR 3.22, 95% CI 2.25–4.62). The proportion of women whose attempted vaginal birth was successful did not differ between the groups (RR 1.00, 95% CI 0.74–1.36).

Compared with women receiving standard care, women in the birth program were more likely to have their baby monitored during labour with intermittent auscultation as opposed to electronic fetal monitoring (RR 1.41, 95% CI 1.31–1.53) and to use nitrous oxide and oxygen alone for analgesia (RR 1.12, 95% CI 1.02–1.23), and less likely to use epidural analgesia (RR 0.75, 95% CI 0.69–0.81) (Table 3). They were also less likely to have labour induced (RR 0.83, 95% CI 0.74–0.93). Indications for inductions did not differ between the groups (data not shown).

**Table 2:** Mode of delivery among women in the South Community Birth Program and matched controls receiving standard care

Mode of delivery	Group; no. (%) of women		RR (95% CI)
	Birth program <i>n</i> = 1238	Standard care <i>n</i> = 1238	
Spontaneous vaginal delivery	784 (63.3)	653 (52.7)	1.25 (1.15–1.36)
Assisted vaginal delivery	193 (15.6)	198 (16.0)	0.99 (0.88–1.09)
Vacuum	79 (6.4)	104 (8.4)	0.85 (0.72–1.01)
Forceps	114 (9.2)	94 (7.6)	1.11 (0.97–1.26)
Cesarean delivery	261 (21.1)	387 (31.3)	0.76 (0.68–0.84)
Nulliparous ( <i>n</i> = 830 per group)	200 (24.1)	269 (32.4)	0.81 (0.72–0.91)
Multiparous ( <i>n</i> = 408 per group)	61 (15.0)	118 (28.9)	0.63 (0.50–0.78)
By primary caregiver			
Midwife			
Spontaneous vaginal delivery	527 (66.5)	98 (68.5)	0.96 (0.90–1.03)
Assisted vaginal delivery	108 (13.6)	11 (7.7)	1.08 (1.01–1.16)
Cesarean delivery	157 (19.8)	34 (23.8)	0.96 (0.90–1.04)
Family physician			
Spontaneous vaginal delivery	255 (60.3)	269 (59.0)	1.03 (0.90–1.18)
Assisted vaginal delivery	79 (18.7)	80 (17.5)	1.04 (0.87–1.24)
Cesarean delivery	89 (21.0)	107 (23.5)	0.93 (0.78–1.10)
Obstetrician			
Spontaneous vaginal delivery	2 (8.7)	286 (44.8)	0.12 (0.02–0.52)
Assisted vaginal delivery	6 (26.1)	107 (16.7)	1.71 (0.69–4.25)
Cesarean delivery	15 (65.2)	246 (38.5)	2.88 (1.23–6.70)
Previous cesarean delivery	<i>n</i> = 75	<i>n</i> = 105	
Attempted vaginal birth	48 (64.0)	16 (15.2)	3.22 (2.25–4.62)
Successful vaginal birth*	33 (68.8)	11 (68.8)	1.00 (0.74–1.36)

Note: CI = confidence interval, RR = relative risk.  
\*Among women who attempted vaginal birth.

Third-degree perineal tears were more common among women in the birth program (RR 1.23, 95% CI 1.08–1.40), whereas episiotomy was performed less frequently in that group than in the comparison group (RR 0.78, 95% CI 0.68–0.90). Length of hospital stay was significantly shorter in the program group than in the comparison group, for both mothers (mean 50.6 v.

72.7 h,  $p < 0.001$ ) and newborns (mean 47.5 v. 70.6 h,  $p < 0.001$ ) (Table 4).

Newborns of women in the birth program were at marginally increased risk of being large for gestational age (RR 1.13, 95% CI 1.01–1.63) (Table 4). Although more newborns in the program group than in the comparison group were readmitted within 28 days after birth, the major-

**Table 3:** Obstetric interventions and maternal outcomes of women in the South Community Birth Program and matched controls receiving standard care

Intervention/outcome	Group; no. (%) of women*		RR (95% CI)*
	Birth program <i>n</i> = 1238	Standard care <i>n</i> = 1238	
Fetal assessment during labour	<i>n</i> = 1196	<i>n</i> = 1125	
Intermittent auscultation only	410 (34.3)	216 (19.2)	1.41 (1.31–1.53)
External fetal monitoring	726 (60.7)	826 (73.4)	0.77 (0.71–0.83)
Scalp electrode	243 (20.3)	210 (18.7)	1.05 (0.96–1.16)
Analgesia during labour	<i>n</i> = 1196	<i>n</i> = 1125	
Nitrous oxide and oxygen only	250 (20.9)	193 (17.2)	1.12 (1.02–1.23)
Narcotic IV or IM without epidural	60 (5.0)	44 (3.9)	1.13 (0.95–1.33)
Epidural	506 (42.3)	645 (57.3)	0.75 (0.69–0.81)
Augmentation of labour	<i>n</i> = 1196	<i>n</i> = 1125	
Any	565 (47.2)	573 (50.9)	0.93 (0.86–1.01)
Amniotomy only	268 (22.4)	259 (23.0)	0.98 (0.89–1.08)
Oxytocin	297 (24.8)	314 (27.9)	0.93 (0.84–1.02)
Induction of labour	<i>n</i> = 1196	<i>n</i> = 1125	
Any	201 (16.8)	253 (22.5)	0.83 (0.74–0.93)
Prostaglandins without oxytocin	46 (3.8)	56 (5.0)	0.87 (0.70–1.08)
Any oxytocin	146 (12.2)	190 (16.9)	0.82 (0.72–0.93)
Oxytocin or prostaglandins	192 (16.1)	246 (21.9)	0.82 (0.73–0.92)
Oxytocin and prostaglandins	47 (3.9)	44 (3.9)	1.00 (0.82–1.23)
Length of labour, mean ± SD			
First stage, h	8.8 ± 6.8	9.1 ± 6.3	0.3†
Second stage, h	1.7 ± 1.8	1.8 ± 2.0	0.6†
Third stage, min	7.7 ± 9.8	7.1 ± 11.1	0.3†
Presentation at delivery			
Vertex	1174 (94.8)	1165 (94.1)	1.07 (0.90–1.29)
Breech	57 (4.6)	65 (5.3)	0.93 (0.77–1.13)
Transverse	3 (0.2)	4 (0.3)	0.86 (0.36–2.02)
Unknown	4 (0.4)	4 (0.4)	1.00 (0.50–2.00)
Perineal outcome among vaginal births	<i>n</i> = 977	<i>n</i> = 851	
First- or second-degree tear	635 (51.3)	596 (48.1)	1.07 (0.98–1.15)
Third-degree tear	96 (9.8)	53 (6.2)	1.23 (1.08–1.40)
Fourth-degree tear	1 (0.1)	2 (0.2)	0.62 (0.13–3.09)
Episiotomy	109 (11.2)	145 (17.0)	0.78 (0.68–0.90)
Blood transfusion required	2 (0.2)	7 (0.6)	0.44 (0.13–1.51)
Length of stay, h, mean ± SD	50.6 ± 47.1	72.7 ± 66.7	< 0.001†

Note: CI = confidence interval, IM = intramuscular, IV = intravenous, RR = relative risk, SD = standard deviation.  
\*Unless stated otherwise.  
†*p* value.

ity of readmissions in both groups were because of jaundice; in this subgroup, there was no excess risk associated with the program. The occurrence of other adverse neonatal outcomes did not differ between the groups. Exclusive breastfeeding at hospital discharge was significantly higher in the program group than in the comparison group (RR 2.10, 95% CI 1.85–2.39).

## Interpretation

In our study, women who received collaborative, multidisciplinary, community-based care in the South Community Birth Program were less likely to have a cesarean delivery, had shorter hospital stays on average and were more likely to breastfeed exclusively than women who received standard care.

Although our study design did not permit us to discern which components of the birth program were responsible for the observed differences, clinicians working in the program believe

that their close working relationship, including their ability to discuss patient care facilitated by immediate and remote access to electronic medical records, fosters an environment in which they can continually support and learn from each other. Consistency in care is achieved through these discussions at monthly meetings and team retreats, as well as through adherence to local and national practice guidelines. Self-selection to work in the program by providers who are particularly committed to physiologic birth may also be a factor. As well, the CenteringPregnancy model of prenatal care has been shown to improve women's knowledge about pregnancy.<sup>17</sup>

The frequency of cesarean delivery among women whose primary caregiver was a midwife or a family physician did not differ significantly between the groups. In the control group, 1.4 times as many women had an obstetrician as had a family physician as their primary care provider, and 4.4 times as many had an obstetrician as had a midwife. Because cesarean deliv-

**Table 4:** Outcomes of newborns of women in the South Community Birth Program and of matched controls receiving standard care

Outcome	Group; no. (%) of newborns*		
	Birth program <i>n</i> = 1238	Standard care <i>n</i> = 1238	RR (95% CI)*
Stillbirth	2 (0.2)	6 (0.5)	0.50 (0.15–1.66)
Death before discharge	1 (0.1)	1 (0.1)	1.00 (0.25–4.01)
Apgar score < 7 at 1 min	131 (10.6)	113 (9.1)	1.08 (0.91–1.23)
Apgar score < 7 at 5 min	18 (1.5)	19 (1.5)	0.97 (0.70–1.36)
Gestational age < 37 wk	64 (5.2)	86 (6.9)	0.84 (0.70–1.02)
Gestational age at birth, wk, mean ± SD	39.2 ± 1.7	38.8 ± 1.9	< 0.001†
Birth weight, g, mean ± SD	3395.3 ± 538.2	3315.9 ± 552.7	< 0.001†
Small for gestational age	66 (5.3)	52 (4.2)	1.13 (0.95–1.33)
Large for gestational age	174 (14.1)	140 (11.3)	1.13 (1.01–1.63)
Length of hospital stay, h, mean ± SD	47.5 ± 92.6	70.6 ± 126.7	< 0.001†
Readmission < 28 d	35 (2.8)	22 (1.8)	1.24 (1.00–1.52)
Reason for readmission	<i>n</i> = 35	<i>n</i> = 22	
Jaundice	31 (88.6)	21 (95.5)	1.12 (0.96–1.50)
Congenital anomaly	2 (5.7)	0	
Dehydration	0	1 (4.5)	
Apnea	2 (5.7)	0	
Admitted to NICU for > 24 h	21 (1.7)	27 (2.2)	0.87 (0.63–1.20)
Feeding at discharge	<i>n</i> = 1234	<i>n</i> = 1230	
Breast milk only	1057 (85.7)	764 (62.1)	2.10 (1.85–2.39)
Formula	9 (0.7)	26 (2.1)	0.51 (0.29–0.90)
Breast milk and formula	163 (13.2)	439 (35.7)	0.47 (0.41–0.54)
Unknown	5 (0.4)	1 (0.1)	

Note: CI = confidence interval, NICU = neonatal intensive care unit, RR = relative risk, SD = standard deviation.  
\*Unless stated otherwise.  
†*p* value.

ery was performed more frequently among women whose primary care involved an obstetrician than among those seen by a midwife or a family physician (1.6 times more frequently compared with either a midwife or family physician in the control group, and 3.3 and 3.1 times more frequently, respectively, in the program group), the difference in the overall frequency of cesarean delivery between the two groups may have been related to primary care by an obstetrician being more prevalent in the control group.

We observed more newborns who were large for gestational age in the program group than in the comparison group. Screening for gestational diabetes was conducted in both groups following national guidelines from the Society of Obstetricians and Gynecologists of Canada.<sup>22</sup> However, because data were not available on the uptake of screening, we could not assess the possibility that differences in uptake between groups may have contributed to the differences in birth weight.

Although findings of reduced obstetric interventions have been reported among midwife practices compared with physician-led maternity care units, we were not able to find reports of shared caseloads among midwives and physicians. Studies have reported reduced rates of cesarean delivery associated with collaborative care models; however, they were conducted in clinics in which midwives and obstetricians worked together but had their own distinct caseloads<sup>23</sup> or in which nurses and allied health professionals supported physician-led care.<sup>24</sup>

### Limitations

Our study is limited by its nonrandomized design. We believe that much of the population from which we drew our participants would not have agreed to randomization and that a subgroup of women who may have agreed to randomization would not have been a representative sample. However, self-referral to the South Community Birth Program may have introduced selection bias. Future studies may be able to use a randomized design if selection bias can be minimized.

Information about race and ethnicity is currently not available in the hospital's database. Outcomes from an earlier analysis (unpublished) in which we compared data for the first 500 participants in the birth program with a comparison group for which we did have ethnicity data were not confounded because the distribution of racial and ethnic groups was similar between groups. This initial cohort was part of our current sample.

The presence of a doula was not recorded in our data. However, North American trials have not shown benefit of support in labour in reducing the frequency of cesarean delivery.<sup>25</sup>

Finally, our study offered maternity care in an area previously underserved by providers. It is unclear whether our results are generalizable to areas that are well supplied with maternity care providers. Our program has recently been replicated in Surrey, a suburban area in British Columbia, and further evaluations will determine the relevance of our findings to other settings.

### Conclusion

Women attending a collaborative program of maternity care, in which family physicians and midwives shared a patient caseload and worked closely with nurses and doulas, were less likely to have a cesarean delivery, had shorter hospital stays on average and were more likely to breastfeed exclusively than women who received standard care. These findings have important implications given the decreasing numbers of maternity care providers in Canada. Our findings should encourage the implementation and evaluation of this interdisciplinary approach in other settings.

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