MATERNAL AND PERINATAL COMMUNITY OUTCOMES ASSOCIATED WITH HAVING A "NO CAESAREAN SECTION POLICY"

by

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ABSTRACT

A retrospective study was done comparing obstetrical outcomes for two rural remote hospitals in northwestern British Columbia – one with caesarean section capability and one without caesarean section capability. The rural remote hospital with caesarean section capability was the Bella Coola General Hospital; the rural remote hospital without caesarean section capability was the Queen Charlotte Island General Hospital. The population of interest for both communities were women beyond 20 weeks gestation who gave birth between January 1, 1986 to December 31, 2000. Maternity outcomes were based on the maternal residence rather than place of delivery to ensure that all births, local and non-local, were accounted for. Postal codes corresponding to each hospital's defined catchment area were obtained from Canada Post and forwarded to the Department of Vital Statistics in Victoria. Vital Statistics personnel then provided obstetrical data for the two communities. A chart audit of local births at the Bella Coola Valley and Queen Charlotte City hospitals was done to validate Vital Statistics data, and to capture births by women who listed postal codes other than catchment area code on their birth certificates. Data collected included maternal age, First Nation status, date of delivery, gravidity, parity, gestational age at delivery, mode of delivery, birthweight, apgar score, labor outcomes and interventions. There was no difference in adverse maternal or perinatal outcomes between the two communities. More women, however, chose to deliver in the community with caesarean section capability (Bella Coola). This finding suggests local caesarean section capability does influence the decision of rural women contemplating whether or not to deliver locally.

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Chapter One

OVERVIEW

Approximately 30% of Canada's population lives in communities of less than 10,000 people (Statistics Canada, 1997). There was a time, not that long ago, when Canadian women living in rural communities took it for granted that they would receive their maternal care and deliver their babies within their own communities. Physicians working in these same communities felt they had an obligation to provide this service, and they also understood that the ability to provide caesarean section capability was an integral part of standard obstetrical care. A Joint Position Paper on Rural Maternity Care affirms "every woman in Canada who resides in a rural community should be able to obtain quality maternity care as close to home as possible" (Iglesias, Grzybowski, Gagne, Klein, and Lalonde 1998, p. 393).

Across Canada, however, the practice of obstetrics in rural communities is undergoing profound change. For a variety of reasons, fewer rural physicians are offering obstetric services. Consequently, more rural women are being forced to go elsewhere to deliver their babies. Women who choose to stay and deliver in their rural communities are increasingly being told they do so at their own peril because caesarean section capability no longer exists. The extent and implications of these changes in obstetric delivery to rural women are only just being understood (Society of Obstetricians and Gynecologists of Canada Policy Statement, 1996)

A recent survey of rural community hospitals in Northern Ontario reveals that the number of hospitals no longer offering obstetrical care increased 500% from 3 hospitals in 1981 to 15 hospitals in 1997 (Hutten-Czapski, 1999). Residents of communities in which maternity service has been eliminated have a sense this loss of service is a result of

an inferior level care provision in smaller hospitals. Loss of obstetrical care is sometimes also perceived as the first step in a process which will eventually threaten the very existence of the smaller community hospital. (Buckle, 1994; Canadian Medical Association, 1998; Chaisson and Roy, 1995). With loss of anesthetic and surgical capability, small community hospitals transfer ill patients to larger care centers and lose the ability to care for patients other than those who are relatively well. These communities lose the ability to attract physicians interested in providing comprehensive care (Iglesias' 1999).

In 1984 an average of 56.5% of Canada's family physicians were the providers of maternity service within their community (Klein, Reynolds, Boucher, Malus, & Rosenberg, 1984). This percentage declined to 37.1% by 1994 (Buckle, 1994) and to 20% by 1997 (The Janus project, 1998). In 1997 British Columbia identified that 36% of family physicians provided intrapartum care (The Janus Project, 1998). Factors felt to have influenced the discontinuation of obstetrical services were multi focal and included cost of liability insurance, fear of litigation, lifestyle, poor remuneration, occupational stress, lack of confidence, and lack of professional support (Buckle, 1994; Hutten-Czapski & Iglesias, 1998; Levitt & Kaczorowski, 1999; Shapiro, 1999). These issues influenced, and continue to influence the decision-making process of physicians, medical students, and family practice residents as to whether or not they will include maternity care within their scope of practice.

Practitioners who chose to continue providing obstetrical service, particularly in isolated areas without access to specialists, identified the need to acquire advanced maternity skills in order to promote safe, high quality, accessible maternity care to low-risk women. These skills ranged from forceps delivery, manual extraction of the placenta,

repair of severe lacerations, administration of anesthetic agents, and caesarean sections based on the level of care provision in their community (Hutten-Czapski & Iglesias, 1998). In the 1960's and 1970's Canadian medical schools provided their graduates with these skills. In the 1980's and 1990's the acquisition of these skills were increasingly felt to be better left to obstetric and anesthesia specialists. This thinking was prevalent despite the fact that studies failed to show an increase in adverse maternal and perinatal outcomes in low-risk deliveries when family practitioners and specialist care were compared. As long as physicians carefully identified and referred high-risk pregnancies, pregnant women could reasonably be served by a small facility with a limited scope of interventions (Black & Fyfe, 1984; Grzybowski, 1998; Nesbitt, 1996).

In retrospect, obstetricians and anesthesiologists graduating from urban-based Canadian medical school were not interested in practicing in rural settings where the volume of complex cases was small, night and weekend shifts too excessive, and incomes required supplementation from a general practice (Iglesias, 1999). There quickly emerged a serious shortfall of Canadian trained service providers in obstetrics, anesthesia, and general surgery in rural Canada.

Rural communities increasingly began recruiting foreign trained medical school graduates as a way of meeting the obstetrical needs of its citizens. In the 1990's it was estimated that one-half of Canada's rural general-practitioner surgeons and one- third of general practitioner anesthetists were trained elsewhere (Chaisson & Roy, 1995). Foreign trained physicians represented two distinct populations: family practitioners with advanced training as well specialists whose certification was not recognized by the Royal College of Physicians and Surgeons of Canada. These physicians chose a limited procedural practice with a family practice in rural Canada. The door for immigration has

now been largely closed for these foreign educated physicians preventing their eligibility to practice medicine in Canada (Chaisson & Roy, 1995; Iglesias, 1999). As the supply of foreign educated rural physicians dried up, so too did the hospital's ability to provide caesarean section coverage for women choosing to deliver in their home towns.

A 1995 questionnaire survey undertaken by Rourke determined changes that took place in small hospital obstetrical services in Ontario between 1988-1995. For the 35 hospitals that met all inclusion criteria, the results indicated they performed fewer births, had fewer family physicians attending births, and fewer General Practitioner Anesthetists (GPA's) in 1995 than 1988. As well, availability of anesthesia, epidurals, and caesarean section services were significantly lower than in 1988 (Rourke, 1998). In 1995 there were 576 hospitals in Canada that provided maternity care and of these 126 did not perform caesarean sections. In the hospitals that did, 40% provided fewer than 20 caesarean sections per year making it unrealistic to expect these services to be provided by specialists (Levitt, Hanvey, Avard, Chance, and Kaczorowski 1995; Hutten-Czapski & Iglesias, 1998).

One of the more serious consequences of rural family physicians choosing not to include obstetrics in their practice was that the workload for those physicians continuing to deliver babies increased. With this increased workload, there was increased risk of developing emotional exhaustion, burnout, and ultimately departure from the community. In 1996 the average workload of obstetricians/gynecologists increased by 50% from the previous 5 years as a result of the decline in maternity services offered by family practitioners (SOGC Policy Statement, 1996). In rural Canada there were only 38 practicing obstetricians, leaving generalists as the only providers of maternity care (Canadian Medical Association, 1998; Hutten-Czapski, 1999). This trend is ominous as

many physicians are reconsidering the inclusion of deliveries in their practice as a result of social and economic realities. The skyrocketing cost of malpractice insurance, increasing incidence of lawsuits, as well as the increasing age of Canadian obstetricians with a full one -third reaching retirement over the next decade speak of an impending crisis (SGOC Policy Statement, 1996).

Presently, there are fewer rural physicians with the special skills necessary to deal with complicated obstetric cases; and even fewer rural physicians with the ability to perform caesarean section surgery and/or the ability to administer anesthesia for the caesarean section. Women living in rural communities still want to deliver their babies at home. This desire for women to have their baby within the supportive circle of their community has led to some interesting questions such as:

1. What exactly are the risks and benefits to rural women who choose to deliver in obstetric units located far away from family and friends?

2. How necessary is it to have caesarean section capability?

Chapter Two

REVIEW OF THE LITERATURE

Risks and Benefits to Rural Women Who Choose to Deliver in Tertiary Care Obstetric Units.

Studies in the last two decades have identified that perinatal and maternal outcomes associated with delivery in a large tertiary care center is not necessarily the best environment for low-risk mothers. Medical research literature suggests that women who deliver in larger tertiary care centers are more likely to have a more aggressive interventionist approach in the intrapartum stage. The implementation of high level technology results in more adverse outcomes that in turn negate the advantage of access to more expert care (Black & Fyfe, 1984; Hutten-Czapski, 1998). Low-risk mothers have more positive outcomes when a low level of intervention approach is used (Klein, 1993).

Negative physical, emotional, and social impact may occur with women who travel outside their community for their confinement. This effect could range from disruption in the continuity of care provided by the family practitioner, a reluctance to leave family and circle of support, higher rates of prematurity, more complicated deliveries, increased infant mortality, and prolonged hospitalization resulting in increased cost to the health care system (Nesbitt, Connell, Hart, & Rosenblatt, 1990; Iglesias et al., 1998; Hutten-Czaski, 1999)

Women who deliver locally may have fewer options in the kind of obstetrical care they choose because family practitioners have less interventionist practice styles than obstetricians (Shapiro, 1999). Increasing evidence indicates that well-prepared women, with good support from a formal or informal doula, are unlikely to require analgesia or anesthesia and are unlikely to require a caesarean section (Kennell, Klaus, & McGrath,

1991; Nesbitt, 1996). Low-risk mothers fare better in low technology environments where the level of care provided is appropriate for the circumstances (Klein, 1993). Avoidance of epidural anesthesia and other interventions will more likely result in a spontaneous vaginal birth without complications (Nesbitt, 1996).

Black & Fyfe (1984) did a population based study of 24,524 births evaluating the safety of obstetrical care in Northern Ontario and concluded that residents served by communities with Level 1 services (facilities prepared to look after normal deliveries) received obstetrical care that was as safe as the care provided in larger secondary and tertiary centers. They found that women from the 11 communities where caesarean sections were performed by non-obstetricians tended to have the lowest perinatal mortality (10.4/1000) when compared to the other levels of communities studied. Black & Fyfe also noted that the inclusion of the native population did not adversely affect the mortality rate for any community type although there was the possibility that more stillbirths were taking place among deliveries outside the hospital setting (Black & Fyfe, 1984).

The literature also suggests that loss of obstetrical services leads to potential isolation and compromise of women living in those rural communities. In a 1991 study done in rural Florida, Larimore and Davis (1995) looked at the association between the availability of maternity services and obstetrical outcomes. The results of their study showed a quantifiable increase in infant mortality due to a decrease in maternity caregivers (Larimore & Davis). In a study by Nesbitt et al. (1990) access to obstetrical care and birth outcomes were looked at in rural areas of Washington State. Communities were grouped based on the rate of local hospital deliveries and were given the designation of high outflow (<1/3 deliveries in local hospital) to low outflow (> 2/3 deliveries in

local hospital). The most striking difference in the outflow communities was the local availability of obstetrical services. High outflow communities had 50% higher rates of prematurity, women were 67% more likely to experience birth associated complications and double the health care costs than low outflow communities. (Nesbitt et al., 1990)

There are women in rural communities who cannot afford the travel costs and the often lengthy stay away from home in order to access antepartum and intrapartum care in distant communities (Iglesias et al. 1998; 1996 Report. Biannual Hospital Perinatal Survey and Nursing Skills and Competency Survey). Geographic barriers and distance, often worsened by weather, are additional hazards and risks to women attempting to comply with prenatal recommendations (Nesbitt, 1996).

How necessary is it to have cesarean section capability?

Approximately 20 % of Canadian women give birth each year via caesarean section. (SOGC Policy statement, 1997). Caesarean section rates around the world vary from 10 to 30%. (SOGC Policy statement, 1997). Leitch and Walker (1998) conducted a study in the United Kingdom that compared the incidence of caesarean sections in the year 1962 to the year 1992 and identified an overall increase of 11.3%. The caesarean section rate for primigravidae increased from 5.9% in 1962 to 22.4% in 1992, and the rate for parous women increased from 5.9% to 14.8%. The authors identified that the decision threshold to perform caesarean sections had lowered in the intervening 30 years (Leitch and Walker, 1998).

Factors that contributed to the increase in this surgical intervention were multifactorial with fear of litigation and the consequences of not carrying out a caesarean section a major issue (Savage & Francome, 1994). Other indicators were the perceived

safety of the procedure compared to the early 1960's, increased use of continuous electronic fetal monitoring, as well as the changed demographics of pregnant women predisposing them to complicated deliveries (McNab, 1997). Caesarean sections became a more common intervention for dystocia, fetal distress, and breech presentations (Pavan & Makin, 2000). These factors contributed to a shift in the perceived risk/benefit balance towards the caesarean section procedure (MacMahon, Luther, Bowes, & Olshan, 1996; Sultan & Stanton, 1996, Leitch & Walker, 1998).

Clinical Competency and Frequency of Caesarean Section Performance

How Many Caesarean Sections a Year are Necessary to Maintain Competency and skill?

The SOGC has taken the position that family practitioners who have acquired the skill of performing caesarean sections can maintain this skill with relatively few cases, as low as 5 per year, and the quality of the initial training is the more critical indicator. A study by Rosenblatt, Reinken, & Shoemach (1985) showed no minimum number of deliveries were required for a hospital to achieve excellent outcomes.

Should small isolated hospitals without caesarean section capability and less than 50 deliveries a year offer obstetrical services to low risk pregnant women? (Grzybowski, Cadesky, & Hogg, 1991) Although many community hospitals continue to provide maternity services without caesarean section capability, they do so under considerable stress. Even in the best of circumstances it is not possible to eliminate all women who will develop complications at some point during pregnancy or labor. In communities where greater than 75% of the births occurred outside the community, health care professionals experience a crisis of confidence in their ability to manage a broad scope of maternity situations they might encounter. (Hutten-Czapski & Iglesias, 1998). Advances

in technology and management interventions, as well as a decrease in continuing education opportunities have created in family practitioners a sense of inadequacy in their ability to maintain a level of confidence and competence in implementing these strategies and has contributed to the belief that obstetrics is a specialty area and best left to the experts. (Klein, 1993)

In 1996, 22 hospitals in British Columbia delivered up to 250 babies annually without on-site caesarean section capability (1996 Report. Biannual Hospital Perinatal Survey and Nursing Skills and Competency Survey, 1997). A population based study done in the Queen Charlotte Islands showed no adverse perinatal outcomes attributed to a lack of caesarean section availability as long as practitioners carefully identified and referred high-risk pregnancies. (Grzybowski, 1998)

Some researchers have indicated that in order to achieve a safe environment, the quality of care parameters should include accessible obstetric service within one hour's transportation from the woman's community of residence. Anesthesia, transfusion services, vacuum and forceps extraction, manual removal of the placenta, suction curettage, and capability to perform caesarean section should be available within 30 minutes notice. (Sultan & Stanton, 1996; Hutten-Czapski, 1998).

The advantage of having local caesarean section capability is that women can have their baby in their home community.

Summary of Literature Review

This review of rural obstetric issues suggests that a rural community does not necessarily have to have on site caesarean section capability to provide safe obstetrical services for low-risk women. At the present time there is no information available on whether having caesarean section capability in a rural community is associated with lower or higher maternal and / or perinatal outcomes compared to a rural community which chooses to deliver low risk pregnant women closer to home.

Research Question

This thesis project attempts to answer the question: What are the maternal and perinatal outcomes associated with a rural community having no caesarean section capability as compared to a rural community which has caesarean section capability?

Hypothesis

My hypothesis, based on the literature, indicates that the population based outcomes from two models of care, one model of care having caesarean section capability and the other model without caesarean section capability, will be similar.

Chapter Three

METHOD

Research Design

A retrospective study was done comparing obstetrical outcomes for two rural remote hospitals in northwestern British Columbia – one with caesarean capability and one without caesarean section capability. The rural remote hospital with caesarean capability was the Bella Coola General Hospital; the rural and remote hospital without caesarean capability was the Queen Charlotte Island General Hospital.

The two communities selected were determined by community size, rural remoteness, type of medical facility available, provision of obstetrical services, percentage of aboriginal population, and caesarean section capability (BC Statistics, 1996; Revenue Canada; McKim, 2001). Rural remoteness was identified by the Northern and Isolation Allowance (NIA) designation, a rurality index score developed by the British Columbia Medical Services plan (British Columbia Medical Association & Ministry of Health, 2000).

Table 1

Determinants For Selection of Rural Remote Communities

Community	Pop	NIA	Hospital Facility	Obstetric Services	Aboriginal Population	Caesarean Section Capability
Bella Coola	2,750	130	yes	yes	40%	yes
QCC	2,739	130	yes	yes	29%	no
Stewart	1,195	130	yes	no	3%	no
Waglisla	1,569	130	yes	no	74%	no
Dease Lake	1,800	155	no	no	52%	no
Hudson Hope	1,125	130	no	no	4%	no
Massett	2,862	130	yes	yes	35%	no

Bella Coola Valley (BCV) and Queen Charlotte City (QCC) are identical in terms of census population size, NIA designation, type of facility available, and the availability of local obstetrical services. Bella Coola differed from Queen Charlotte City in having a greater aboriginal population (40% vs 29%), and in having caesarean section capability throughout the study period.

The Bella Coola General Hospital is located in the Bella Coola Valley and serves a geographic region which includes the communities of Bella Coola, Hagensborg, Firvale, Stuie, Anaheim Lake, and Nimpo Lake (figure 1). An estimated 2,750 people live in the Bella Coola Valley. According to the 1996 Vital Statistics Report, 8% of the census population is between age 0-4; 7% of the population is greater than 65 years of age; the

overall unemployment rate is approximately 10%; and the average family income is $20,711 (British Columbia Statistics, 1996; Revenue Canada; McKim, 2001).

Approximately 40% of the population (1100 people) is aboriginal, most of these people being of Nuxalk decent. The Nuxalk Indians are a tribe of Salish-speaking Coastal Indians who settled in the Bella Coola Valley, but formerly lived throughout the surrounding British Columbia Central Coast area (Thommasen, Loewen, & Mcinnes, 1995; Acheson, 1995; Thommasen, Newbery & Watt, 1999). Bella Coola is one of the most isolated communities in British Columbia. The closest referral hospital is over 450 km by road to Williams Lake or a two-hour flight by air to Vancouver. Bella Coola is serviced by three physicians at any given time. Each year the Bella Coola physicians see over 8,000 patients in the clinic, 2,500 patients in the emergency department, admit approximately 400 patients to the hospital and deliver up to 40 babies (Thommasen et.al., 1999).

The Queen Charlotte Island General Hospital is located on Queen Charlotte Islands (figure 2) and serves a geographic region, which includes the communities of Queen Charlotte City, Sandspit, Skidegate, Tlell, and Port Clements. Queen Charlotte City is located 150 km off the northwest coast of British Columbia and serves a population of approximately 2700. According to the 1996 vital statistics report, 8% of the census population is between the ages 0-4; 5% of the population is greater than 65 years of age; the overall unemployment rate is approximately 13% and the average income is $27,938 (British Columbia Statistics, 1996).

Queen Charlotte Island General Hospital has 21 beds staffed by five family practitioners that do offer obstetrical services but are without anesthetic or caesarean section capability. The closest referral center with surgical capability is a 6-hour ferry trip or 2-hour float plane trip to Prince Rupert. The nearest center with obstetricians and

pediatricians is a 4-hour plane trip to Vancouver. For both communities inclement weather can be an intervening factor making transport to a larger center nearly impossible.

Ethics

Ethics approval for this project was granted prior to start of data collection by the University of British Columbia's Clinical Research Ethics Board on July 13, 2000.

Figure 1:Relationship of Queen Charlotte City, Bella Coola and Vancouver

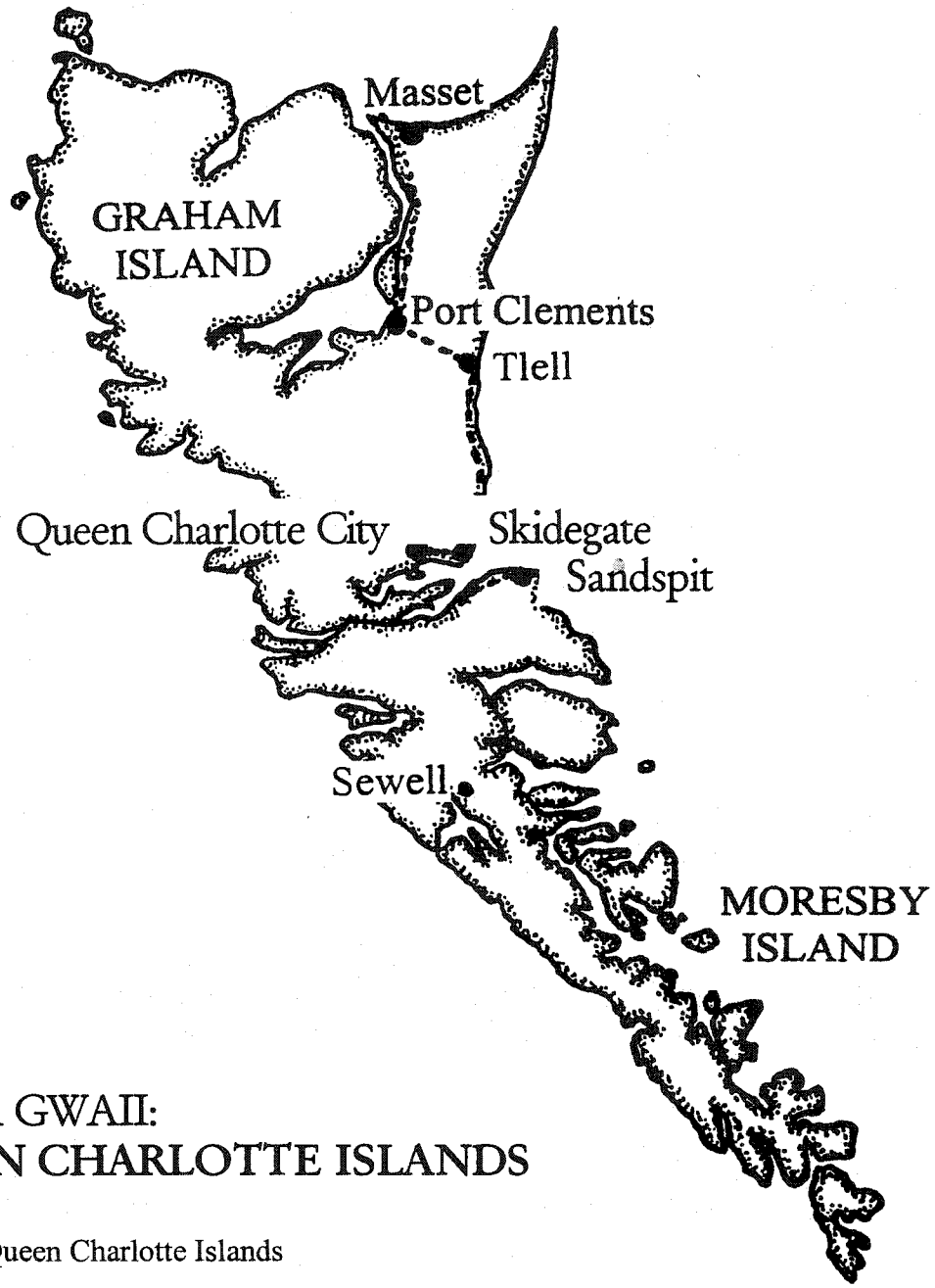


Figure 2: Queen Charlotte Islands

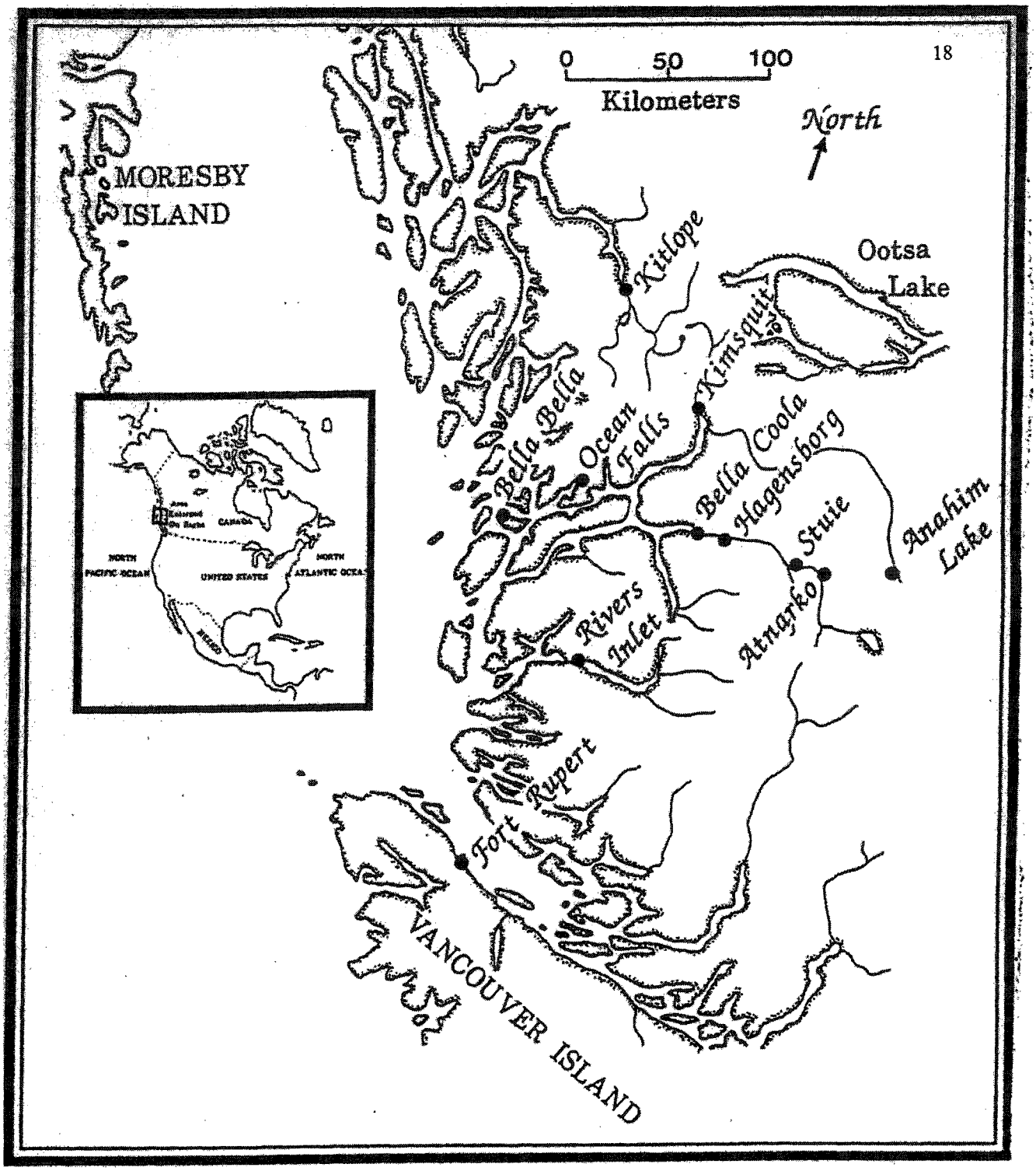


Figure 3: Bella Coola Valley

Study Population

The population of interest for both communities were women beyond 20 weeks gestation who gave birth between January 1, 1986 to December 31, 2000. Maternity outcomes were based on the maternal residence rather than place of delivery to ensure that all births, local and non-local, were accounted for. This population was inclusive of women who delivered in their community, women transferred out in labor as a result of an unforeseen emergency, women who were assesses as high-risk and were referred out, and women who electively chose to deliver in a larger center.

Postal codes corresponding to each hospital's defined catchment area were obtained from Canada Post and forwarded to the Department of Vital Statistics in Victoria. Vital Statistics personnel then provided obstetrical data for the two communities. The Department of Vital Statistics identified the mothers as native/non-native with status obtained through record linkage from their data base, the Federal Indian Registry and the medical services plan (MSP). Descriptive data related to maternal identity was removed to maintain anonymity. Information collected included maternal age, First Nation status, gravidity, parity, date of delivery, gestational age at delivery, mode of delivery, birthweight, apgar score, labor outcomes, procedural interventions, and delivery outcomes.

Ideally, the study populations would be allocated to one of the following groups.

Group A	Women admitted to their rural hospital in labour who delivered locally and who gave a local rural address as their permanent address when they registered their baby with Department of Vital Statistics
Group B	Women admitted to their rural hospital in labour, transferred to a larger center for delivery, and who gave a local rural address as their permanent address when they registered their baby with Department of Vital Statistics

Group C — Women who delivered outside of their rural community by choice or on physicians advice due to high-risk behaviors. These women gave a local rural address as their permanent address when they registered their baby with Department of Vital Statistics

Group D — Women admitted to the rural hospital in labour who delivered locally but who did not give a local rural address as their permanent address when they registered their baby with the Department of Vital Stats.

In reality, we could not differentiate "Group B" and "Group C" deliveries for Bella Coola Valley, so we chose to combine them to reflect those who gave birth locally and those who gave birth non-locally.

Group A′ - combined Groups A + D. Local births

Group C′ - combined Groups B + C. Non-local births

A chart audit of local births at the Bella Coola Valley and Queen Charlotte City hospitals was done to validate Vital Statistics data, and to capture births by women who listed postal codes other than catchment area code on their birth certificates; i.e., Group D women.

Statistical summary

Differences in the outcomes between the two communities, as well as the differences between native and non-native groups, were evaluated using Pearson's chi-square with a significance level of $P \leq 0.05$ for each outcome measure. Duration of labor comparison was determined by a 2- tailed t Test and mean birthweight variability was determined by total sum of squares.

Results

Table 2

Summary of results (#) for all women in both cohorts from 1986 – 2000

	BCV			QCC		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Population	570	247	817	427	424	851
Vaginal delivery	503	170	673	427	297	725
Caesarean section	67	77	144	0	126	126
Epidural	90			0		
Episiotomy	52			35		
VBAC*	22			0		
Forceps / Vacuum	58	16	74	17	53	70
Premature delivery	20	31	51	18	57	75
APO[l]	46	26	72	26	43	69
Perinatal mortality	6	4	10	3	7	10
Maternal mortality	0	0	0	0	0	0

*VBAC- Vaginal birth after cesarean section

[l] APO – Adverse Perinatal Outcome; Perinatal death; birth weight less than 2500 grams; apgar score of less than 7 at 5 minutes; newborn transfer to a secondary or tertiary care facility (Lefevre, Williamson, & Hector, 1989)

Table 3
Summary of results (%) for all women – 1986-2000

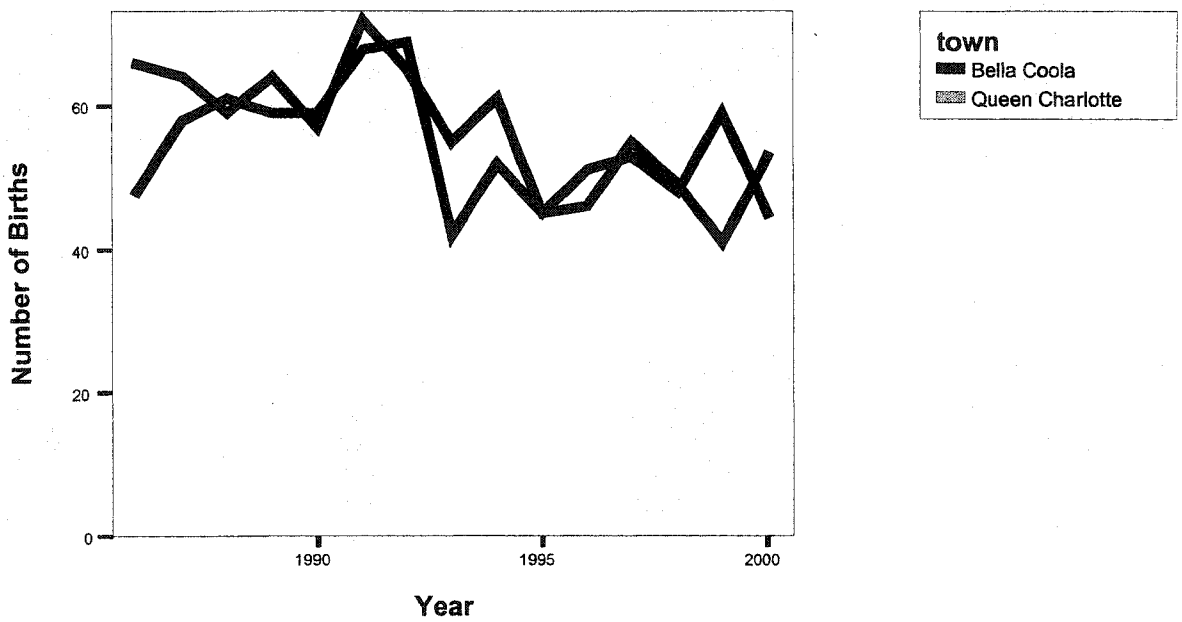
	BCV			QCC		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Population	69.7	30.3	100	50.2	48.8	100
Vaginal Delivery	61.6	20.8	82.4	50.2	35.0	85.2
Caesarean section	8.2	9.4	17.6	0	14.8	14.8
Epidural	11			0		
Episiotomy	6.4			4.1		
VBAC	2.7			0		
Forceps / vacuum	7.0	2.0	9.0	2.0	6.2	8.2
Premature delivery	2.4	3.8	6.2	2.1	6.7	8.8
APO	5.6	3.2	8.8	3.1	5.1	8.2
Perinatal mortality	0.7	0.4	1.1	0.4	0.8	1.2

Table 4

Statistical results comparing both cohorts using chi square (1986 –2000)

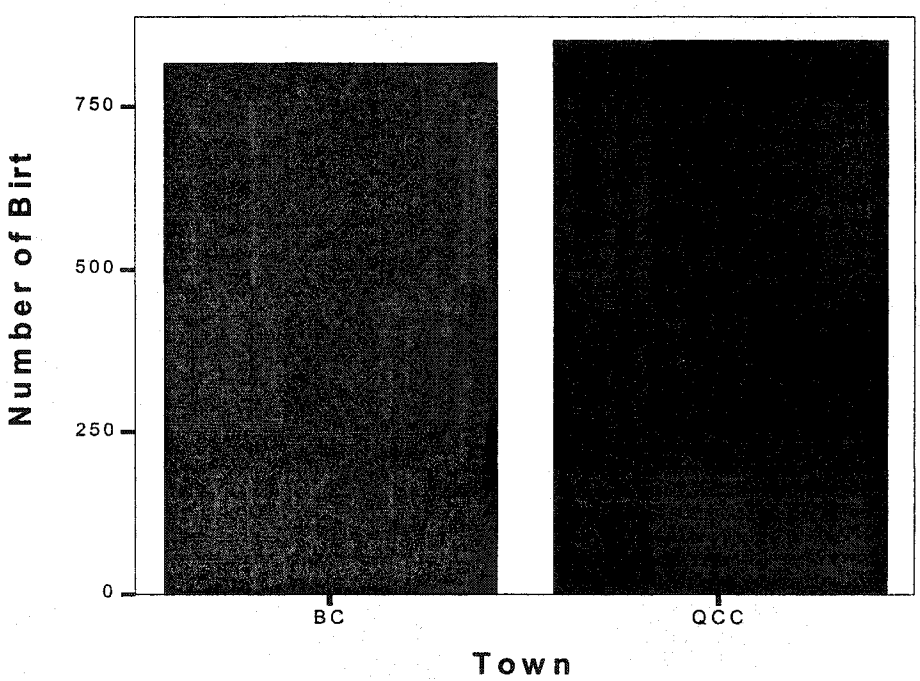
Variable	Group BCV vs QCC	*P* value $\alpha = 0.05$	Graph
Total births	A′ vs C	≤ 0.000	3
Caesarean section vs vaginal delivery	A′ + C′	0.118	5
Caesarean section vs vaginal delivery	A′	≤ 0.000	8
Caesarean section vs. vaginal delivery	C′	0.706	8
Caesarean section	A′ vs. C′	≤ 0.000	10
Vaginal delivery	A′ vs. C′	≤ 0.000	10
Epidural	A′	≤ 0.000	12
Episiotomy	A′	0.316	14
VBAC	A′	≤ 0.00	16
Forceps / vacuum	A′ + C′	0.70	18
Forceps / vacuum	A′	≤ 0.00	20
Forceps / vacuum	C′	0.00	20
Premature delivery	A′	0.564	25
Premature delivery	C′	0.684	25
APO	A′	0.232	27
APO	C′	0.914	27
APO	A′ + C	0.50	29
Perinatal mortality	A′ + C′	0.741	31

Total Births Per Year for All Women



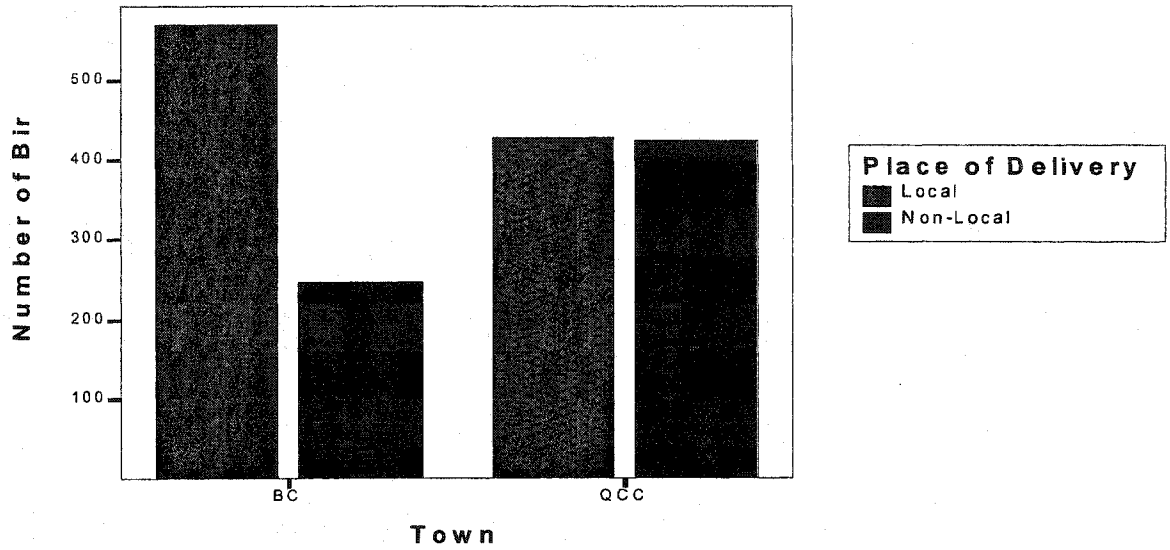
Graph 1

Total Births for all women (1986-2000)



Graph 2

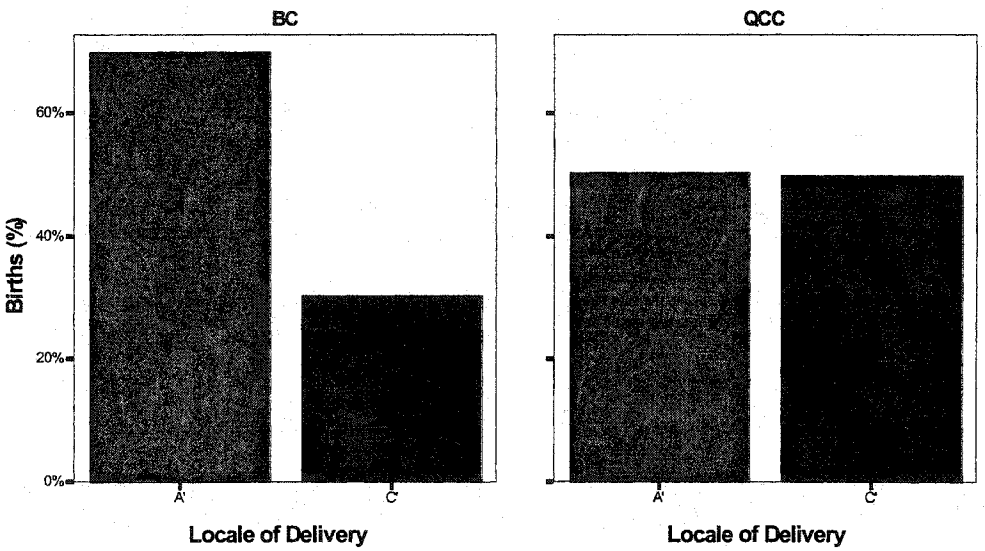
Local Births vs. Non-Local Births (1986-2000)



The number of local births vs non-local births was dependent on the community in which the delivery occurred. More women from BCV delivered locally than women from QCC.

Graph 3 ($P \leq 0.000$)

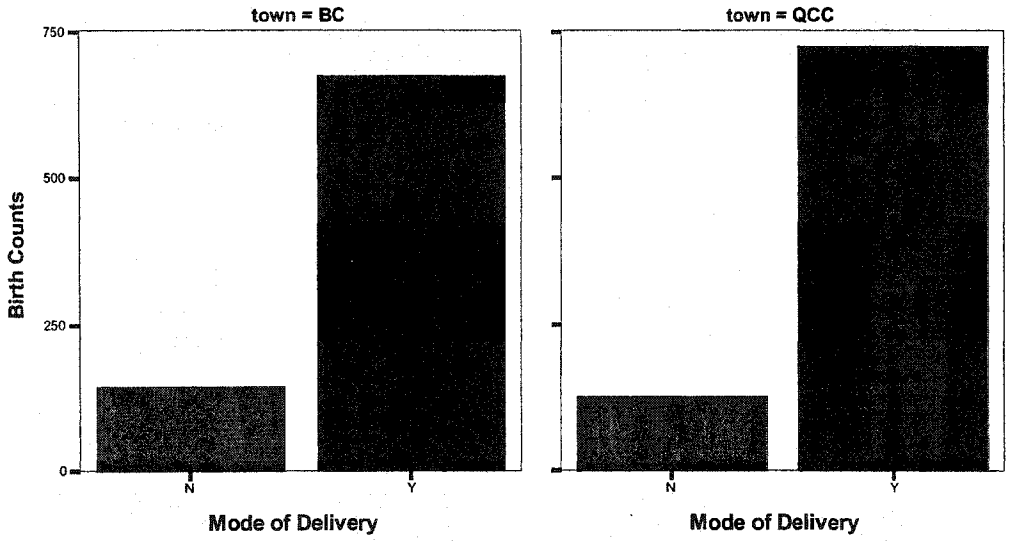
Percentage of Local Births vs. Non-local Births, (1986-2000)



The % of local births vs non-local births was dependent on the community in which the delivery occurred. More women from BCV delivered locally than women from QCC.

Graph 4 ($P \leq 0.000$)

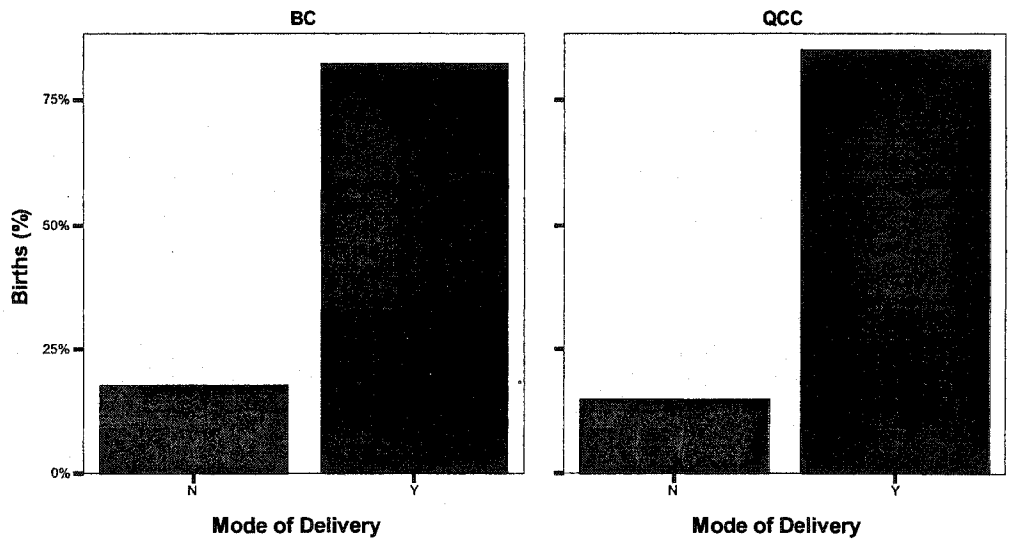
Caesarean Sections Births vs. Vaginal Births (1986-2000)



The number of caesarean section births vs vaginal births for all women was independent of the community. There was no difference between BCV and QCC.

Graph 5 (P= 0.118)

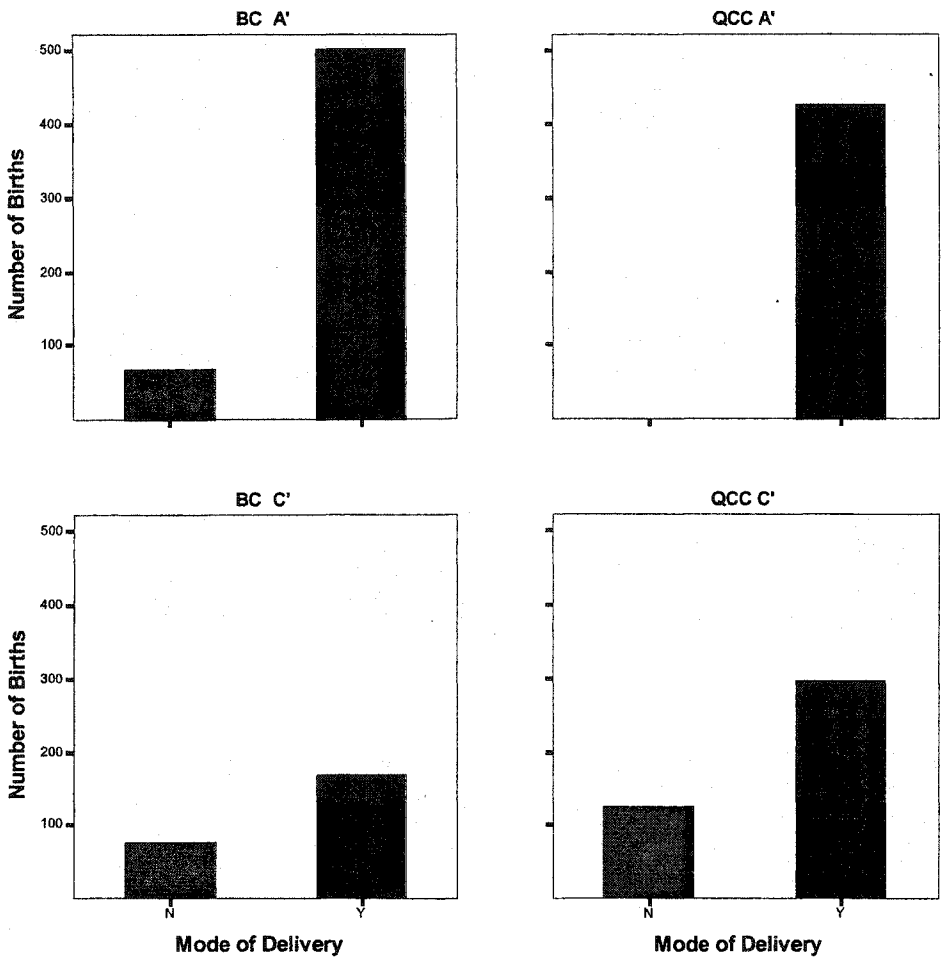
Percentage of Caesarean Section Births vs Vaginal Births (1986-2000)



The % of caesarean section births vs. vaginal births for all women was independent of the community. There was no difference between BCV and QCC.

Graph 6 (P =0.118)

Caesarean Section Births (#) Local vs Non-Local Births (1986-2000)

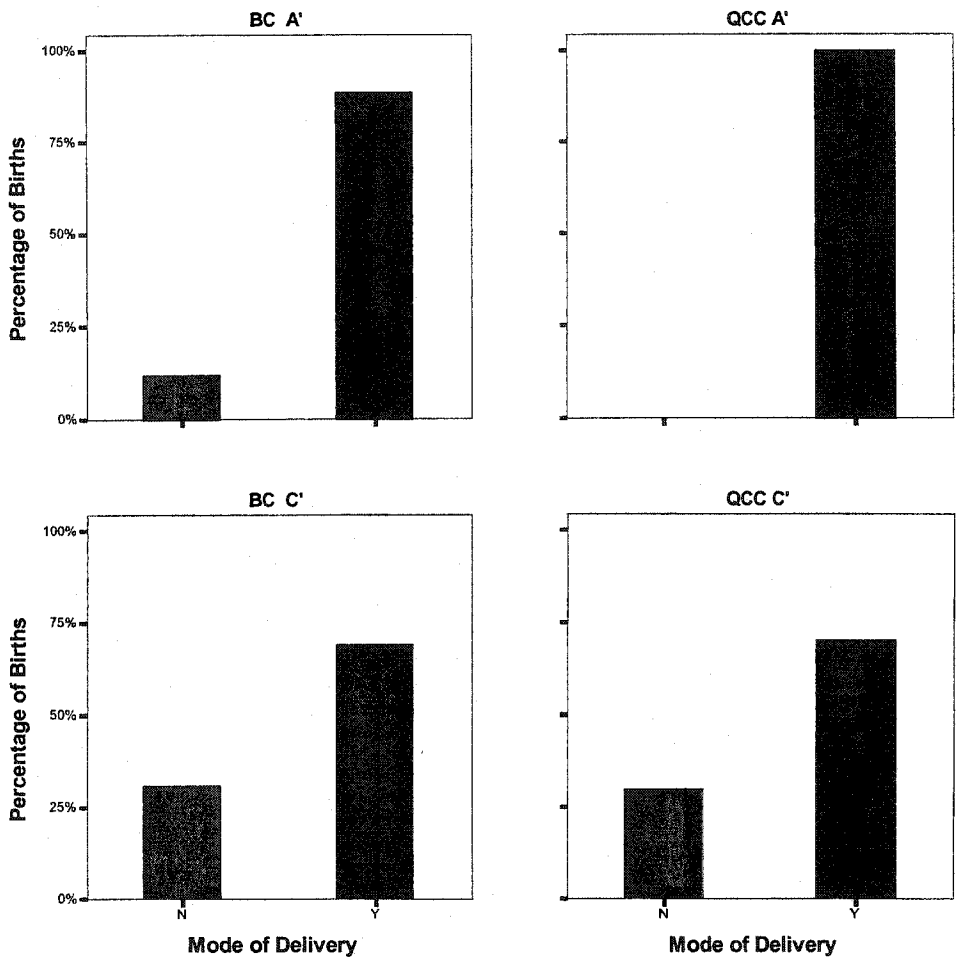


There were caesarean section deliveries in BCV and none in QCC

The number of caesarean section births vs. vaginal births for non-local deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 7 A′ ($P \leq 0.000$)
C′ ($P = 0.706$)

Caesarean Section Births (%) vs. Vaginal Births (%) in Local and Non-Local Deliveries (1986-2000)

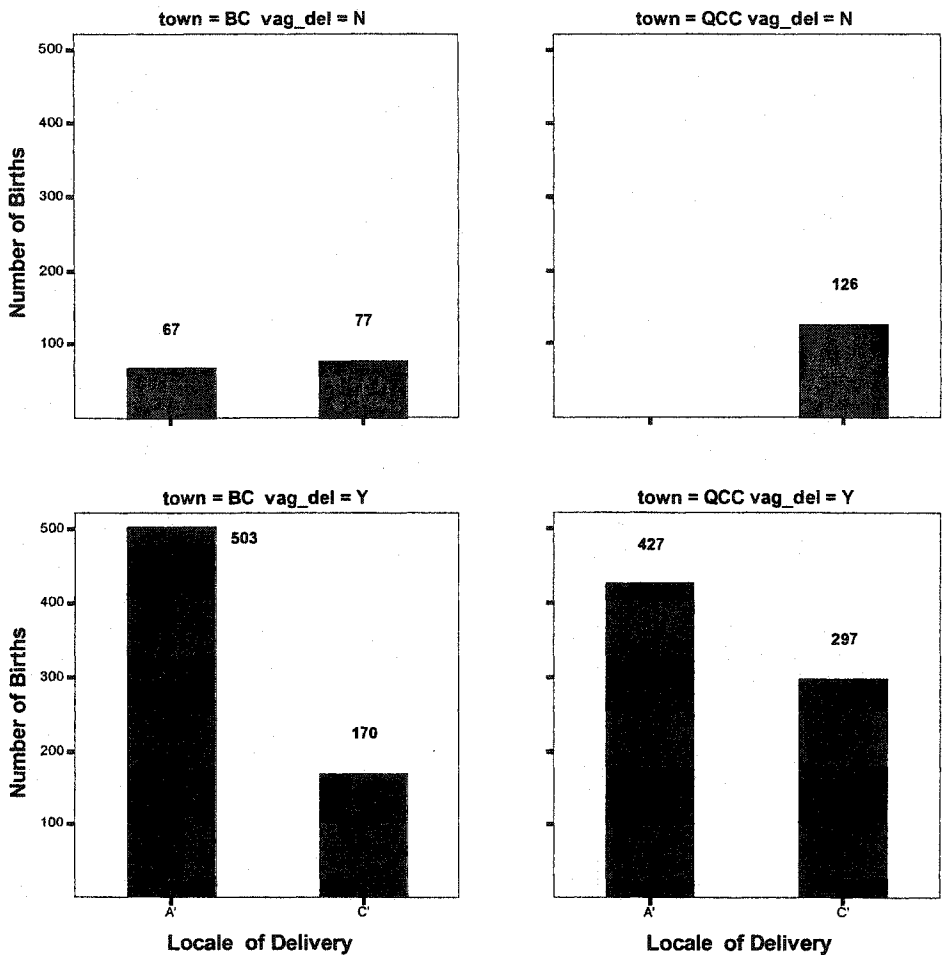


The percentage of caesarean section births vs. vaginal births performed locally was dependent on which community the woman was from. There were caesarean section deliveries in BCV and none in QCC

The percentage of caesarean section births vs. vaginal births for non-local deliveries was independent of the community the woman was from. There was no difference between BCV and QCC.

Graph 8 A′ ($P \leq 0.000$)
C′ ($P = 0.706$)

Caesarean Sections: Local (#) vs. Non-Local (#), (1986-2000);
Vaginal Deliveries: Local (#) vs. Non-Local (#), (1986-2000)

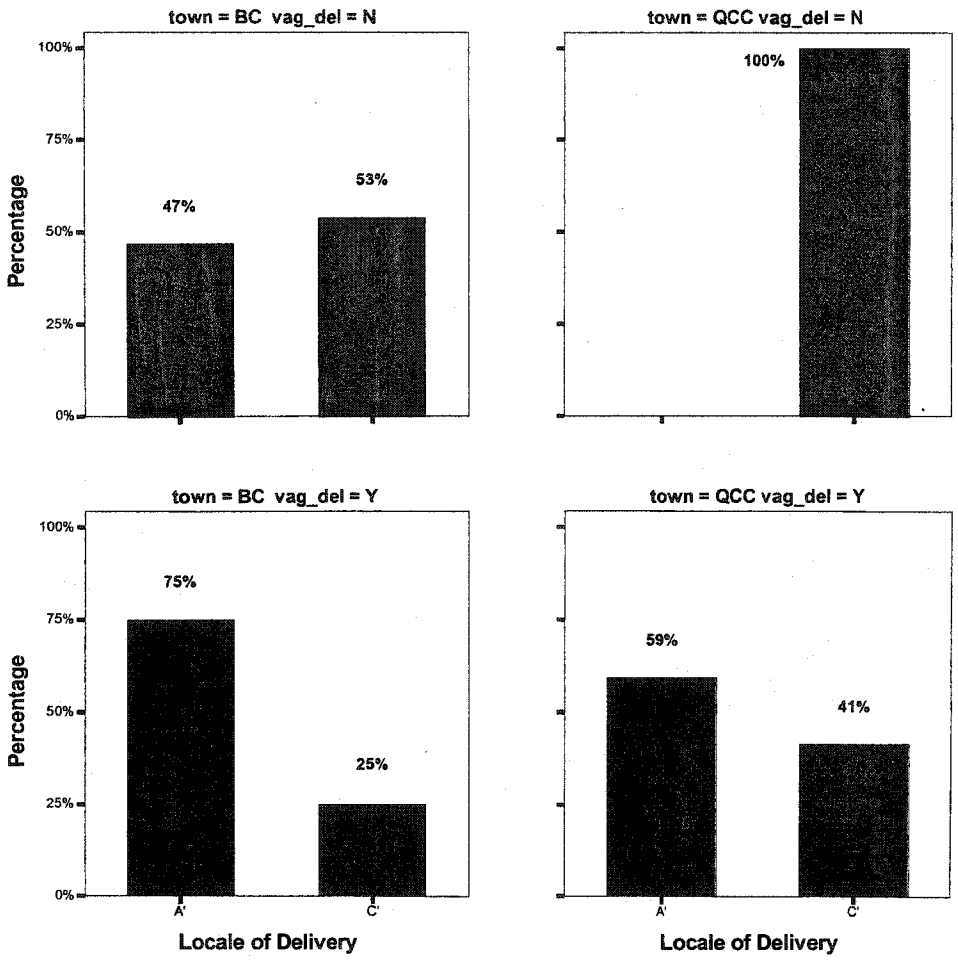


The number of caesarean section deliveries performed locally was dependent on the community. Women were able to have a local caesarean section delivery in BCV and not in QCC.

The number of vaginal deliveries performed locally was dependent on the community. A greater number of women had a local vaginal delivery in BCV than in QCC.

Graph 9 A′ ($P \leq 0.000$)
C′ ($P \leq 0.000$)

Caesarean Section Births: Local (%) vs. Non-Local (%) (1986-2000)
Vaginal Deliveries: Local (%) vs. Non-Local (%) (1986-2000)

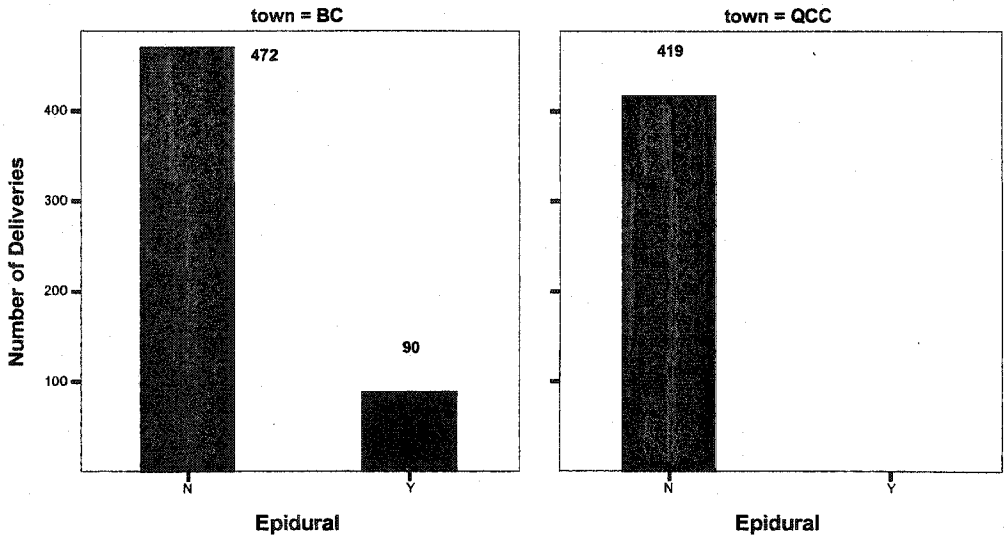


The percentage of caesarean section deliveries performed locally was dependent on the community. There were caesarean section deliveries performed in BCV and none in QCC.

The percentage of vaginal deliveries performed locally was dependent on the community. A greater percentage of women had a local vaginal delivery in BCV than in QCC.

Graph 10 A′ ($P \leq 0.000$)
C′ ($P \leq 0.000$)

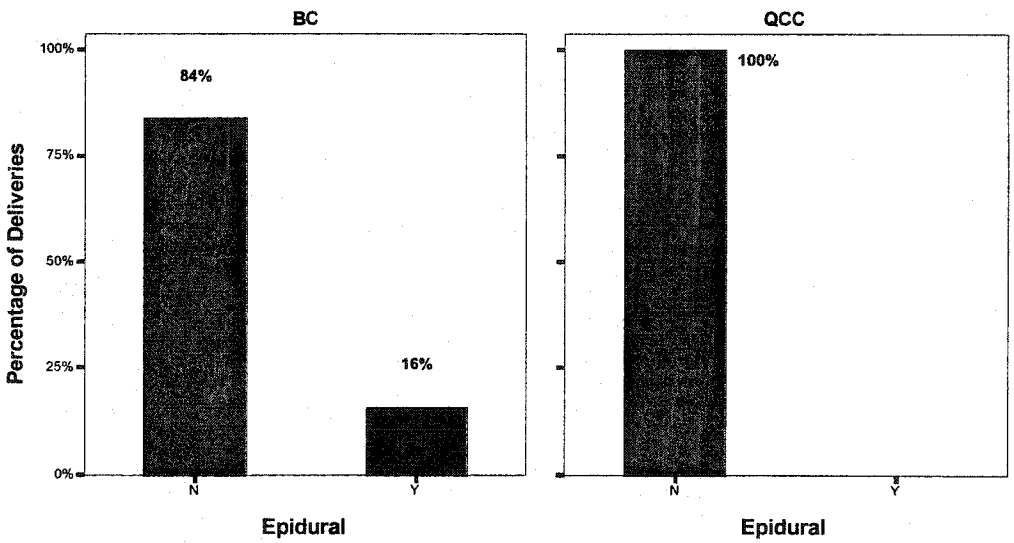
Epidural Usage (#) in Local Deliveries (1986-2000)



The number of women who had local epidural usage was dependent on the community. There were no epidurals performed in QCC

Graph 11 ($P = \leq 0.000$)

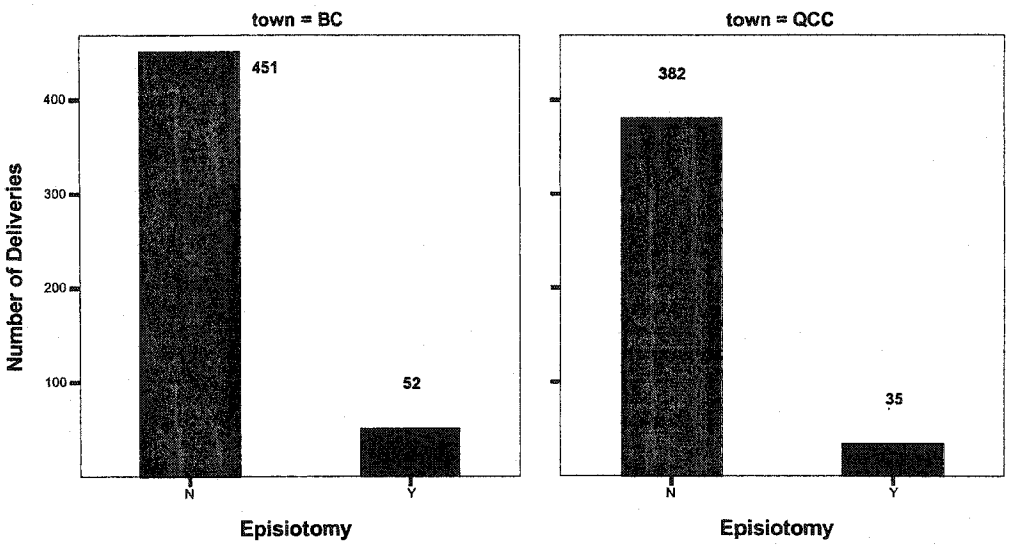
Epidural Usage (%) vs. Non-Epidural Usage (%) in Local Deliveries (1986-2000)



The percentage of epidural usage vs. non-epidural in local deliveries was dependent on the community. There were no epidurals performed in QCC.

Graph 12 ($P = \leq 0.000$)

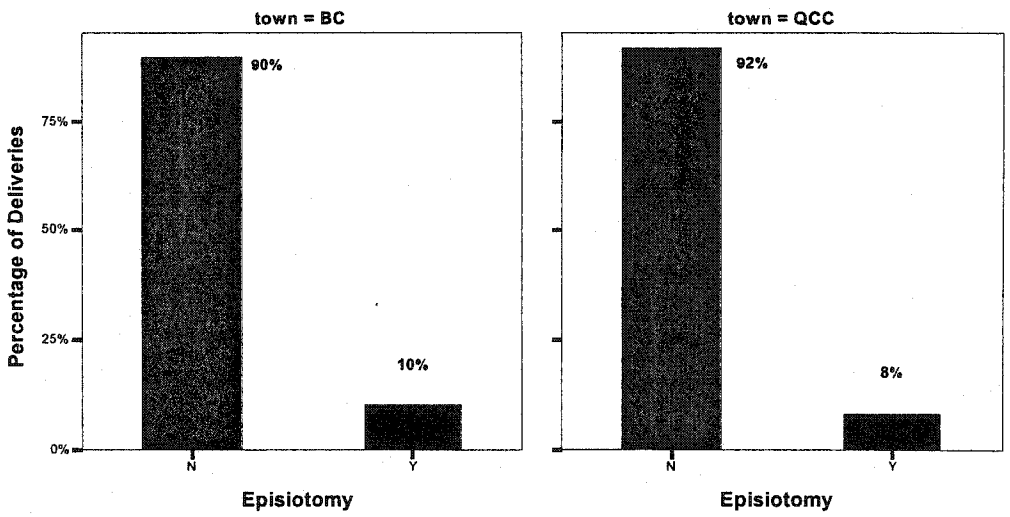
Episiotomy (#) vs. No Episiotomy (#) for Local Deliveries (1986-2000)



The number of episiotomies performed for local deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 13 (P= 0.316)

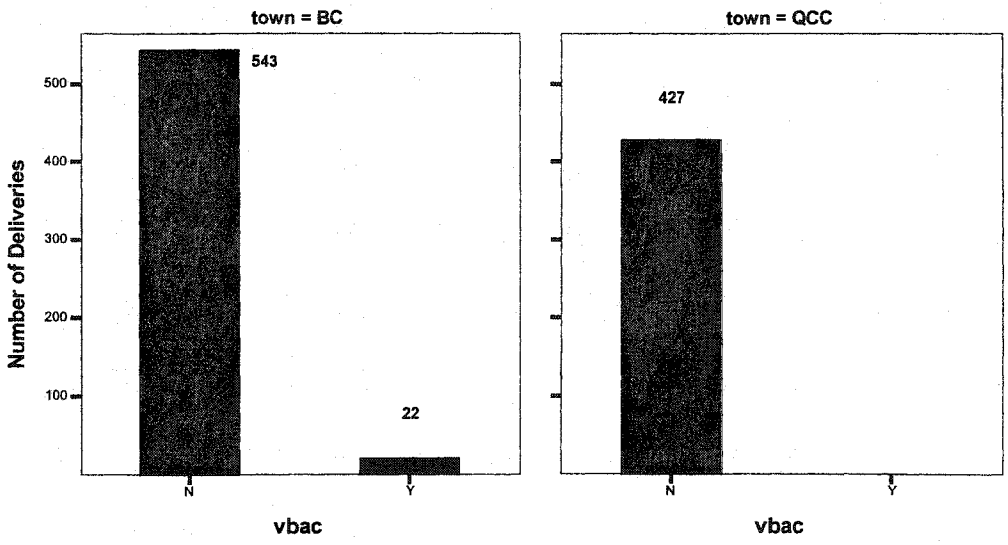
Episiotomy (%) vs. No Episiotomy (%) for Local Deliveries (1986-2000)



The percentage of episiotomy performed for local deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 14 (P= 0.316)

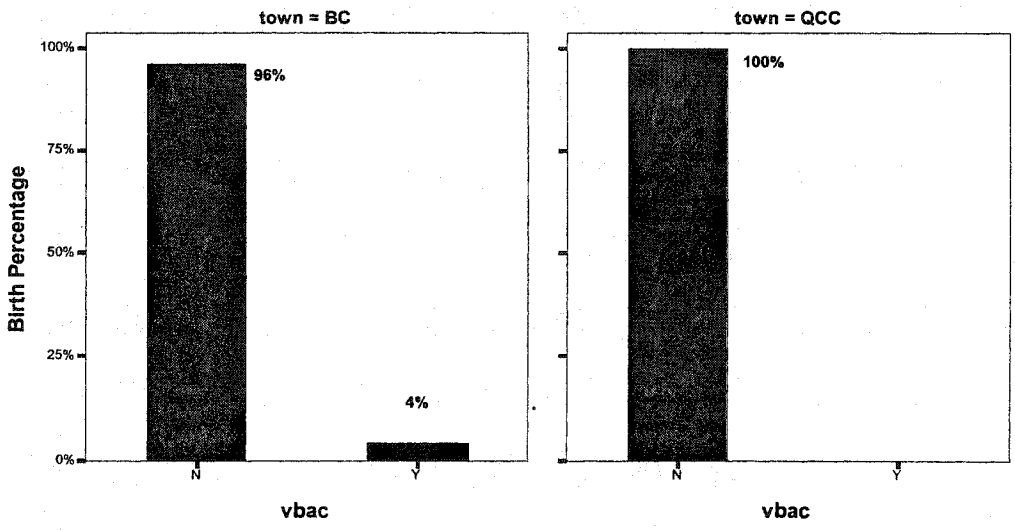
VBACs (#) for Local Deliveries (1986-2000)



The number of VBACs performed for local deliveries was dependent on the community. There were no VBAC deliveries performed in QCC.

Graph 15 ($P =\leq 0.000$)

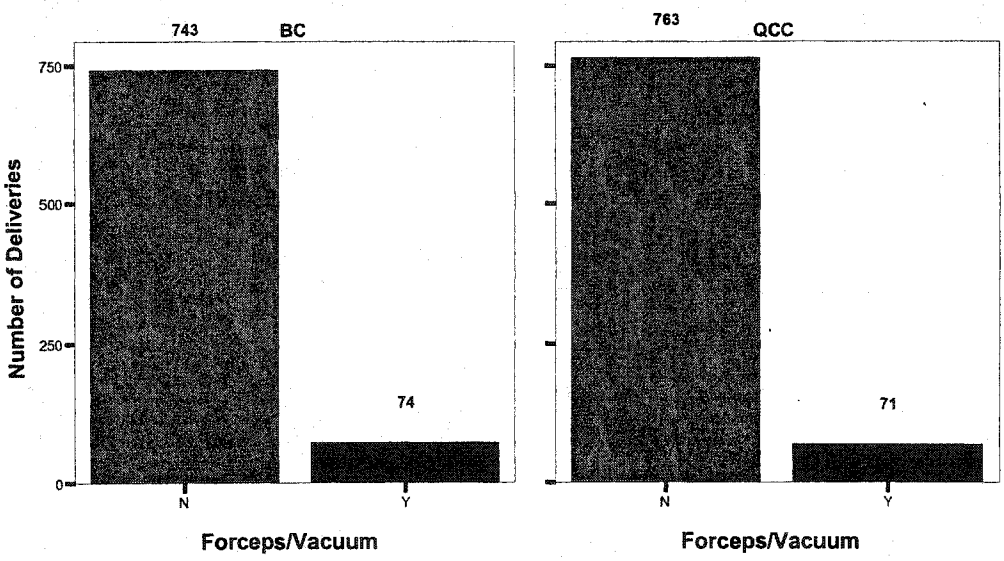
VBACs (%) in Local Deliveries (1986-2000)



The percentage of VBACs performed for local deliveries was dependent on the community. There were no VBAC deliveries performed in QCC.

Graph 16 ($P =\leq 0.000$)

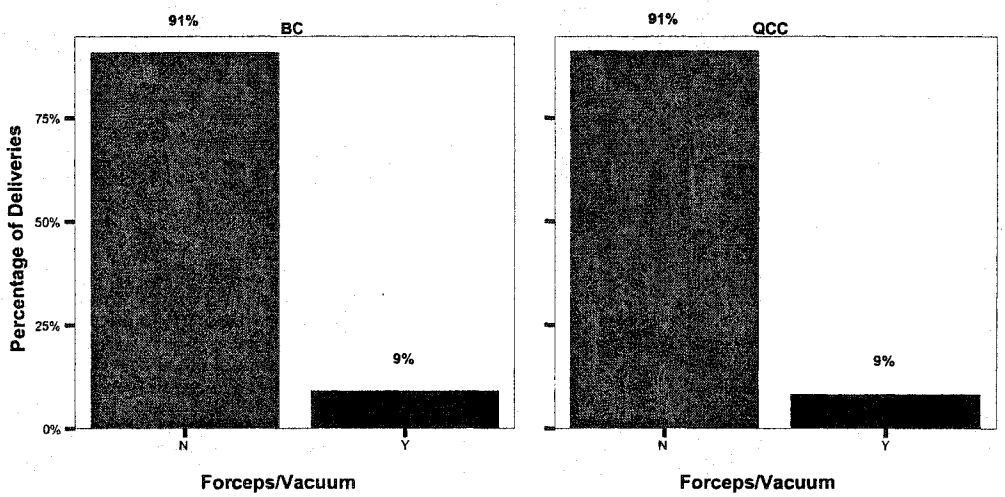
Forceps/Vacuum Assisted Deliveries (#) for all Locales (1986-2000)



The number of forceps/vacuum assisted deliveries performed for all locales was independent of the community. There was no difference between BCV and QCC.

Graph 17 ($P = 0.70$)

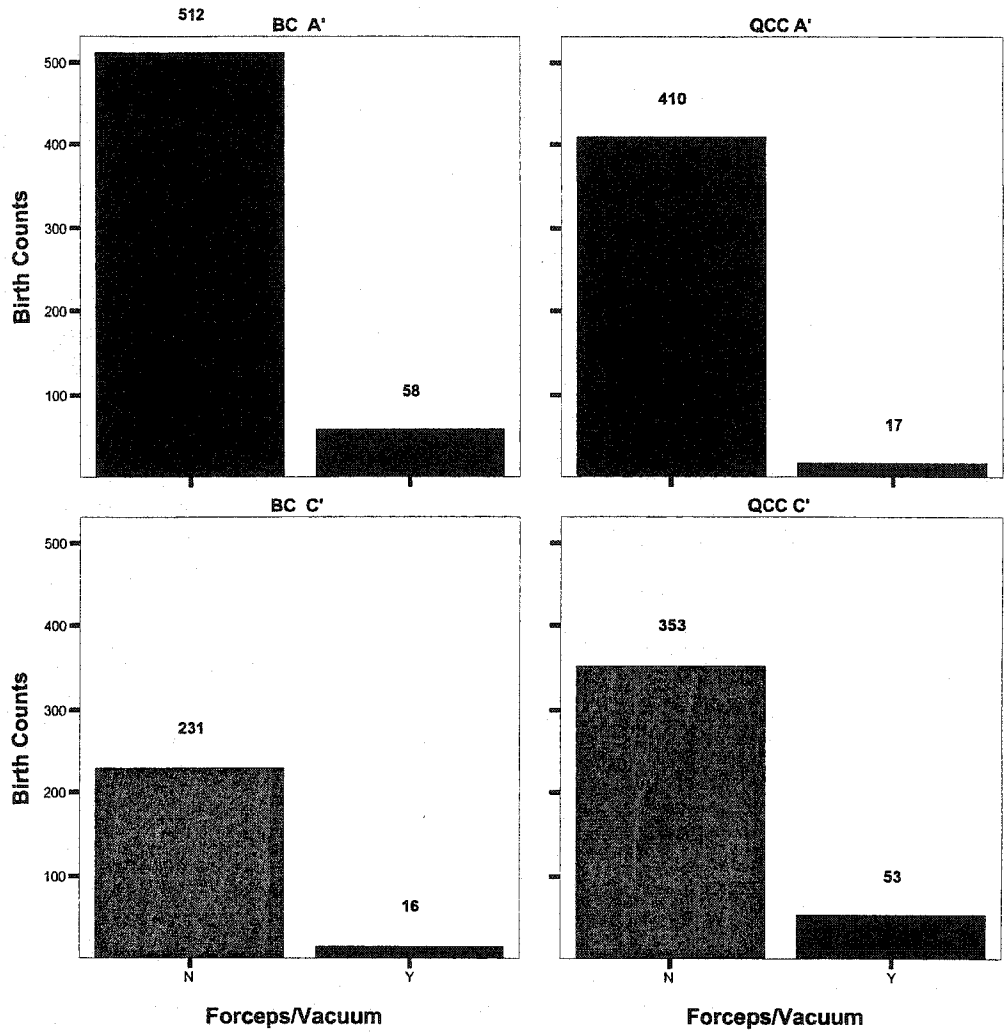
Forceps/Vacuum Assisted Deliveries (%) for all Locales (1986-2000)



The percentage of forceps/vacuum assisted deliveries performed for all locales was independent of the community. There was no difference between BCV and QCC.

Graph 18 ($P = 0.70$)

Forceps/Vacuum Assisted Deliveries (#) for Local and Non-local Births (1986-2000)

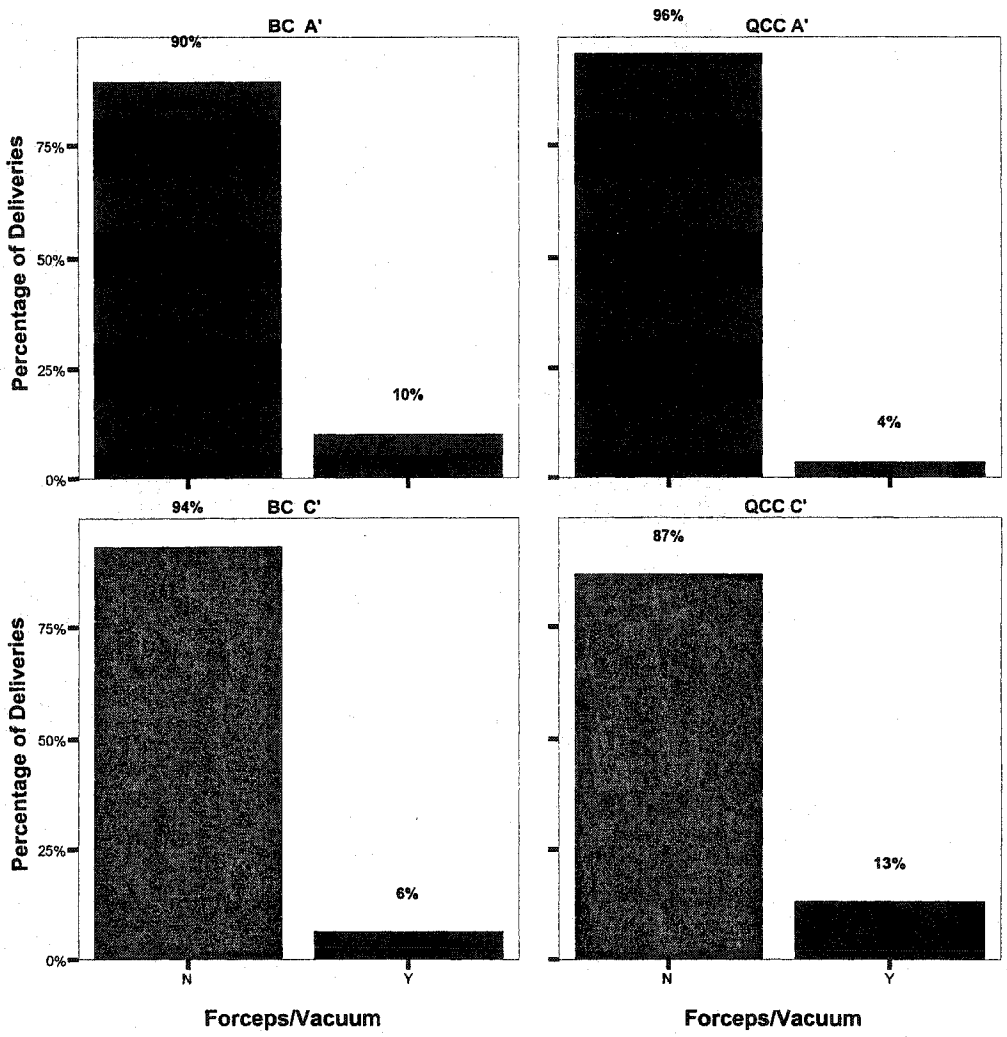


The number of forceps/vacuum assisted deliveries for local births was dependent on the community. There was a greater number of forceps/vacuum deliveries performed locally in BCV than in QCC.

The number of forceps/vacuum assisted deliveries for non-local births was dependent on the community. There were less forceps/vacuum deliveries performed for women from BCV than women from QCC.

Graph 19 A′ ($P = \leq 0.000$)
C′ ($P = \leq 0.008$)

Forceps/Vacuum Assisted Deliveries (%) for Local and Non-local Births (1986-2000)

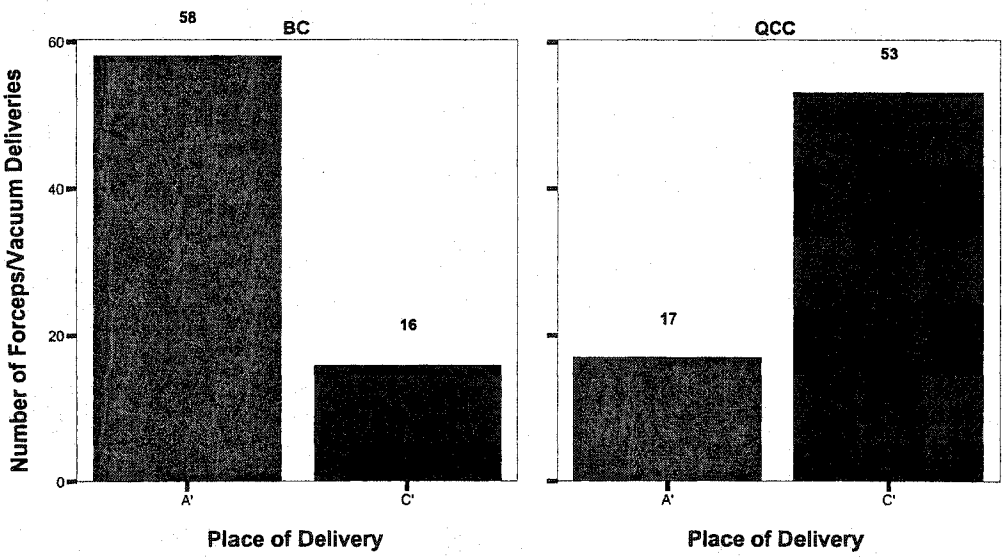


Forceps/Vacuum assisted deliveries for local births were dependent on the community. There was a greater percentage of forceps/vacuum deliveries performed locally in BCV than in QCC.

Forceps/Vacuum assisted deliveries for non-local births were dependent on the community. There was a smaller percentage of non-local forceps/vacuum deliveries performed for women from BCV than women from QCC.

Graph 20 A′ ($P = \leq 0.000$)
C′ ($P = \leq 0.008$)

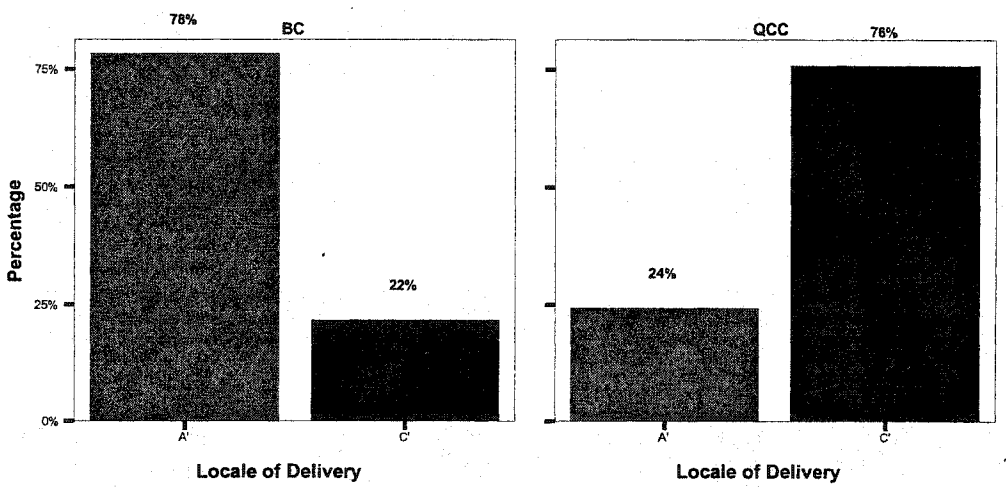
Local vs. Non-local (#) Forceps/Vacuum Assisted Deliveries (1986-2000)



The number of forceps/vacuum usage for local vs. non-local deliveries was dependent on the community. There was greater local usage in BCV vs. QCC, and a greater non-local usage with women from QCC vs. BCV

Graph 21 A′ ($P = 0.000$)
C′ ($P = 0.008$)

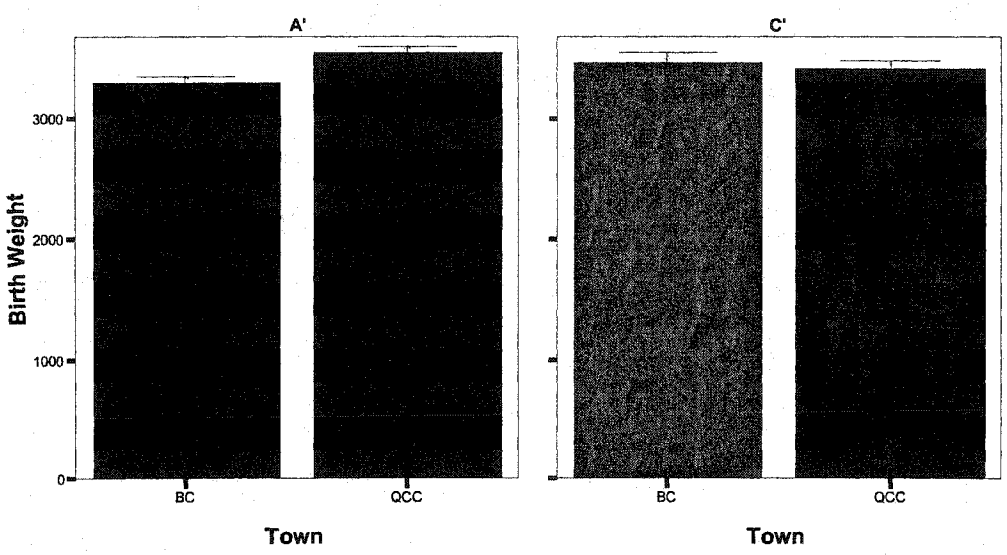
Local vs. Non-Local (%) Forceps/Vacuum Assisted Deliveries (1986-2000)



Percentage of forceps/vacuum usage for local vs. non-local deliveries was dependent on the community. There was greater local usage in BCV vs. QCC, and a greater non-local usage with women from QCC vs. BCV.

Graph 22 A′ ($P = 0.000$)
C′ ($P = 0.008$)

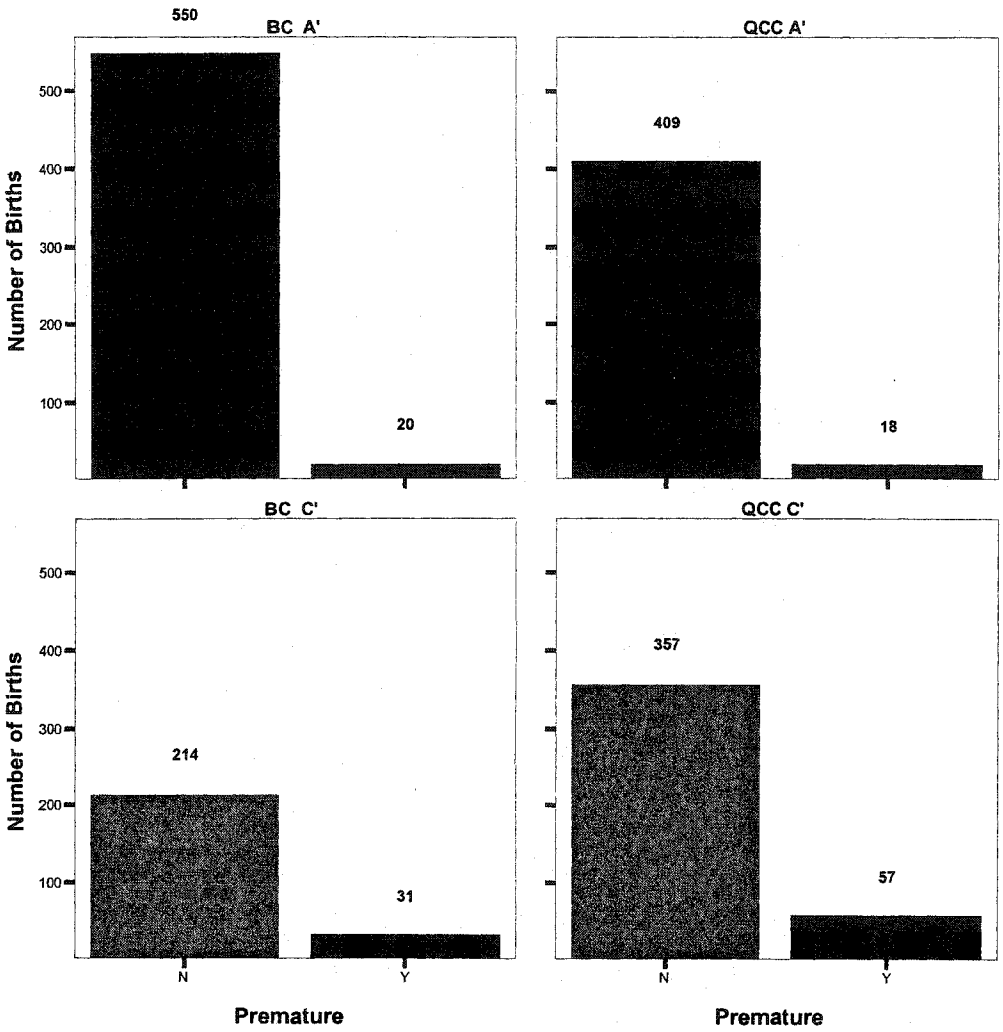
Comparison of Mean Birthweights for Local and Non-local Deliveries (1986-2000)



There was no difference in the local and non-local mean birthweights between BCV and QCC infants.

Graph 23 between groups ($P = 0.622$)

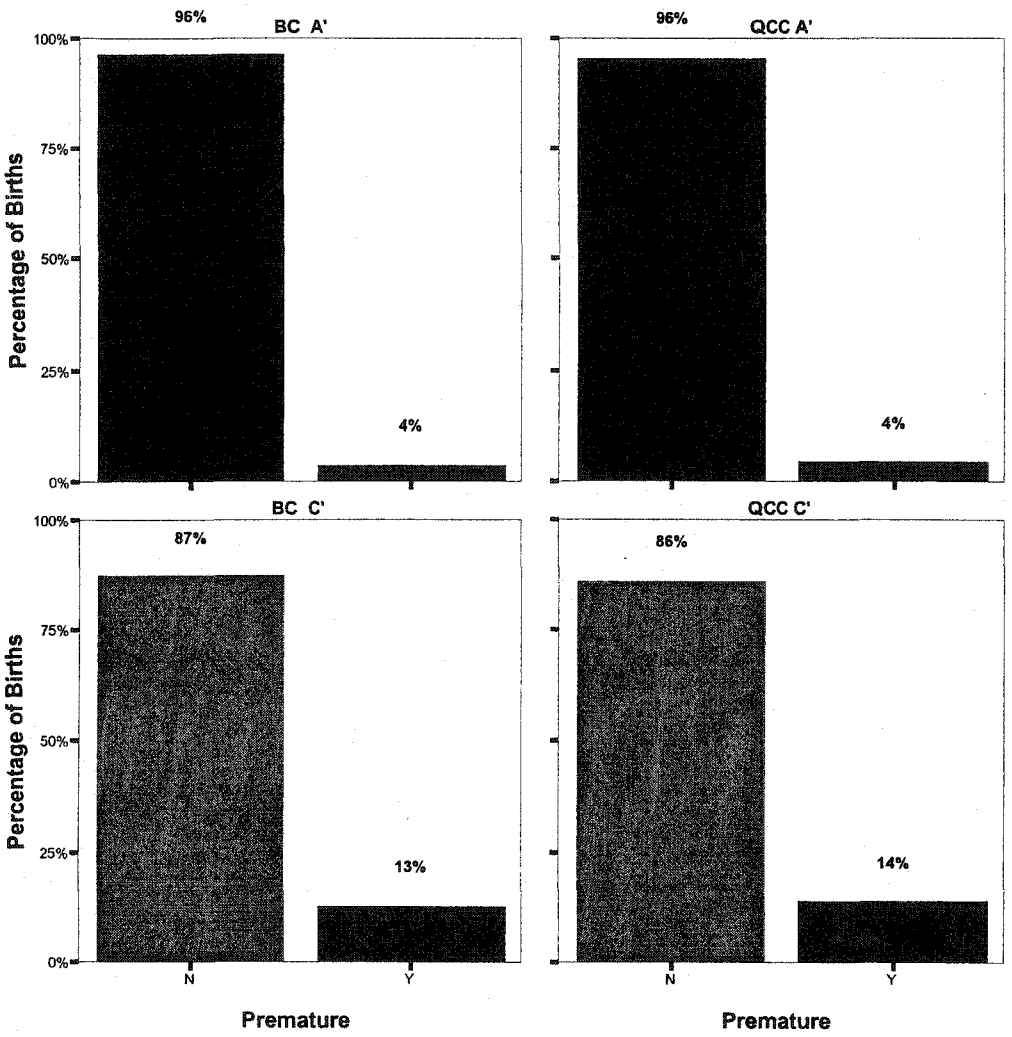
Premature Births (#) for Local and Non-local Deliveries (1986-2000)



The number of premature births for local and non-local deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 24 A′ ($P = 0.564$)
C′ ($P = 0.684$)

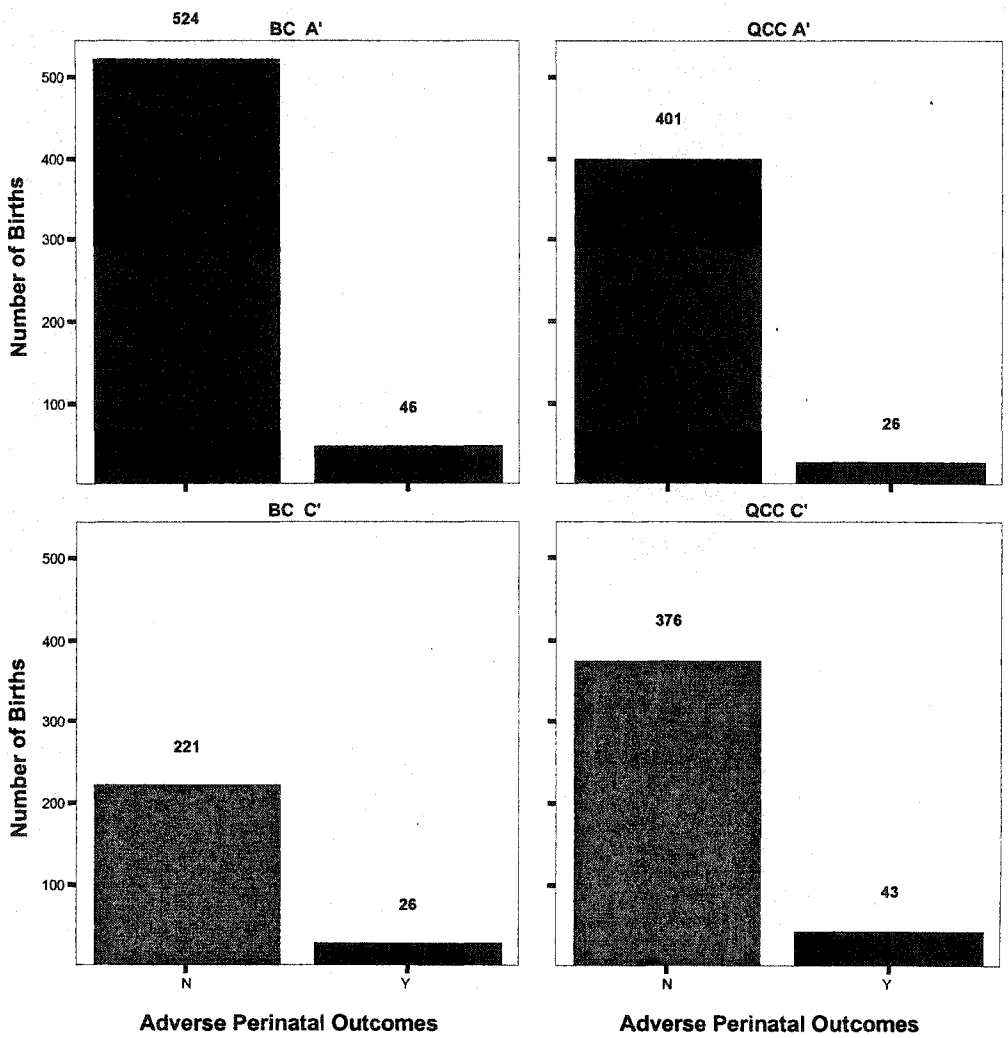
Premature Births (%) for Local and Non-local Deliveries (1986-2000)



The percentage of premature births for local and non-local births were independent of the community. There was no difference between BCV and QCC.

Graph 25 A′ ($P = 0.564$)
C′ ($P = 0.684$)

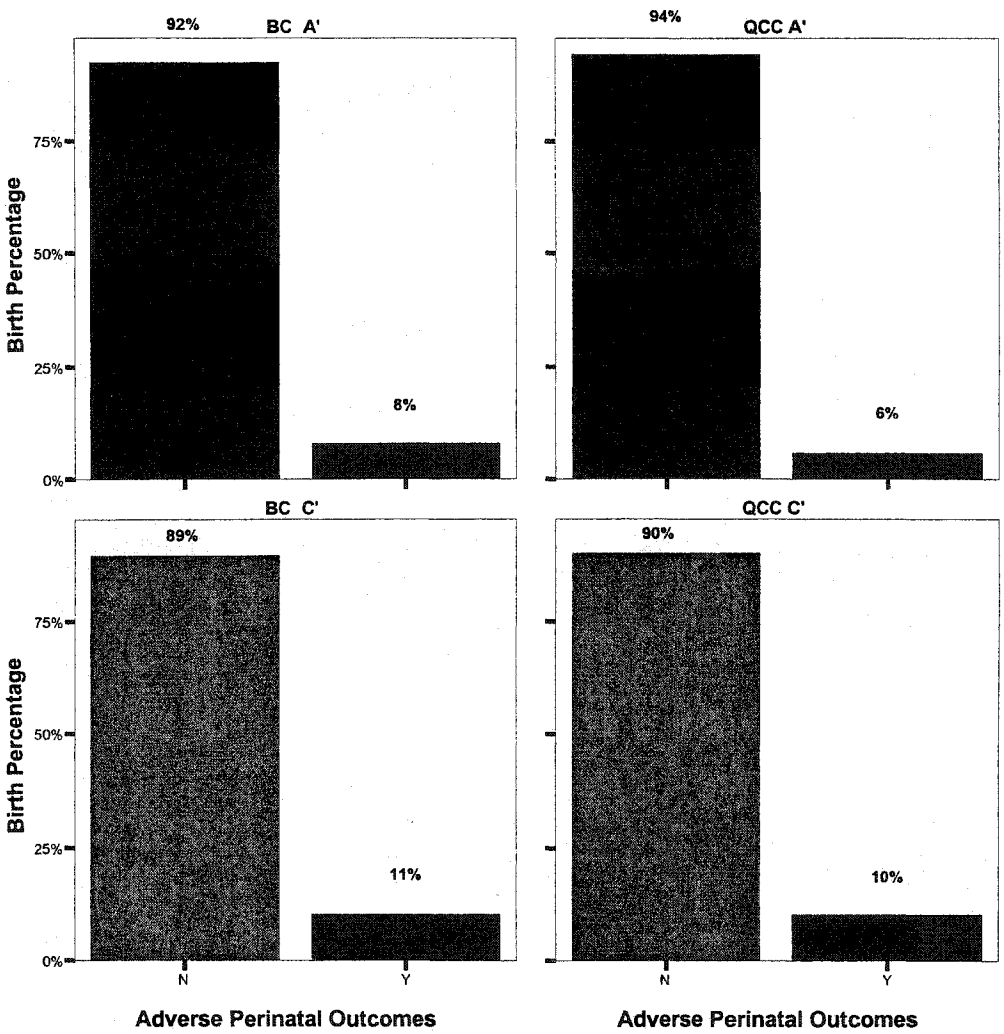
Perinatal Outcomes (#) for Local and Non-local Deliveries (1986-2000)



The number of adverse perinatal outcomes for local and non-local deliveries was independent of community. There was no difference between BCV and QCC.

Graph 26 A′ (P =0.232)
C′ (P =0.914)

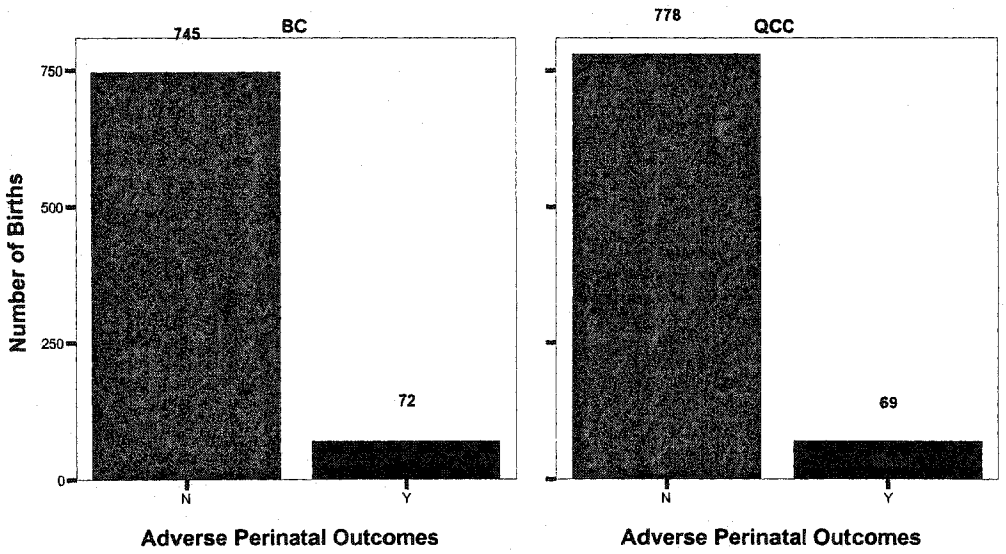
Perinatal Outcomes (%) for Local and Non-local Deliveries (1986-2000)



The percentage of adverse perinatal outcomes for local and non-local deliveries was independent of community. There was no difference between BCV and QCC.

Graph 27 A′ (P =0.232)
C′ (P =0.914)

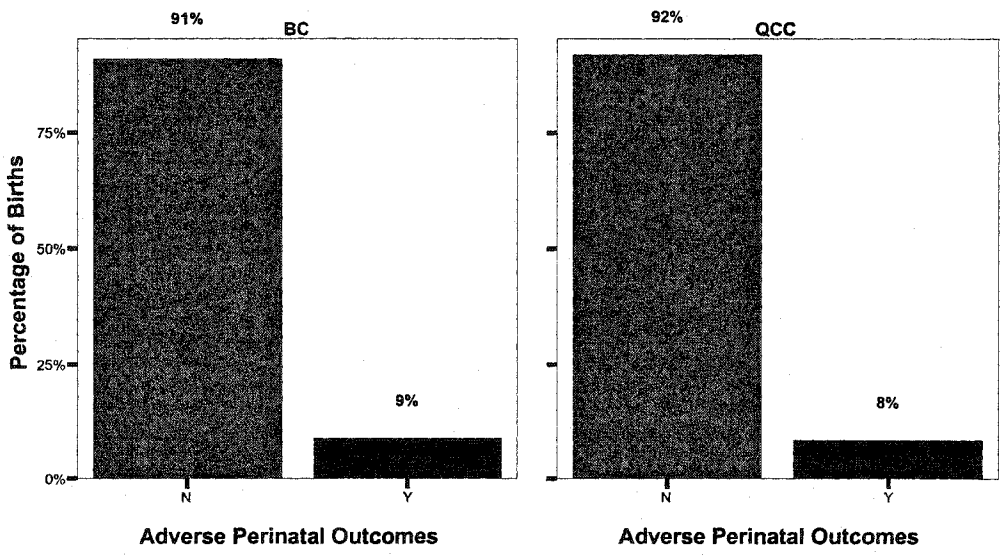
Perinatal Outcomes (#) for Bella Coola Valley and Queen Charlotte City (1986-2000)



The number of adverse perinatal outcomes for all deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 28 ($P = 0.50$)

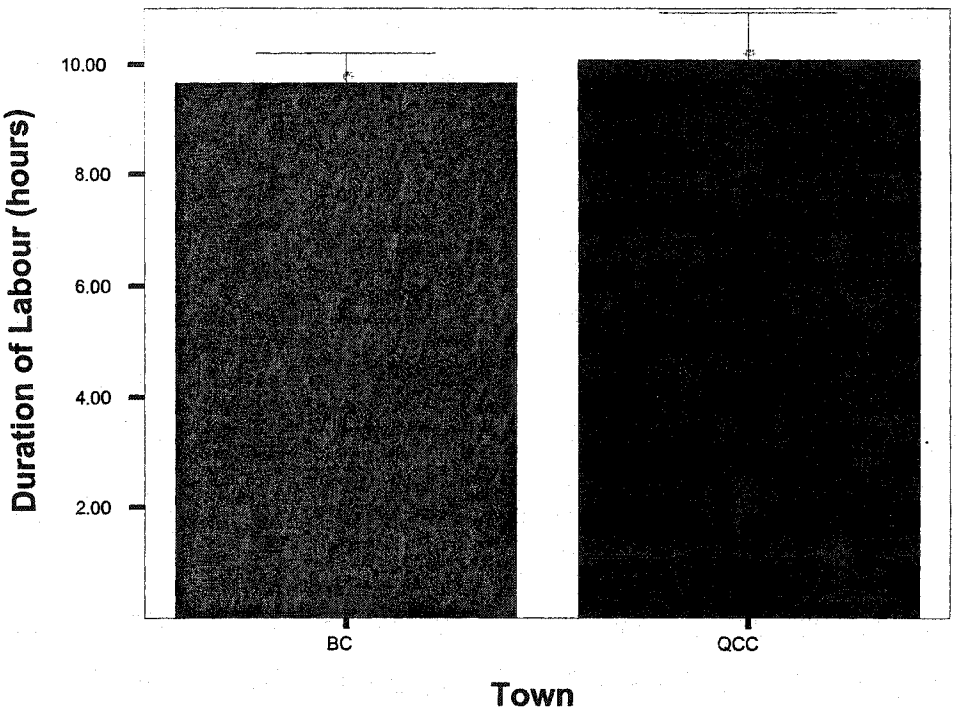
Perinatal Outcomes (%) for Bella Coola Valley and Queen Charlotte City (1986-2000)



The percentage of adverse perinatal outcomes for all deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 29 ($P = 0.50$)

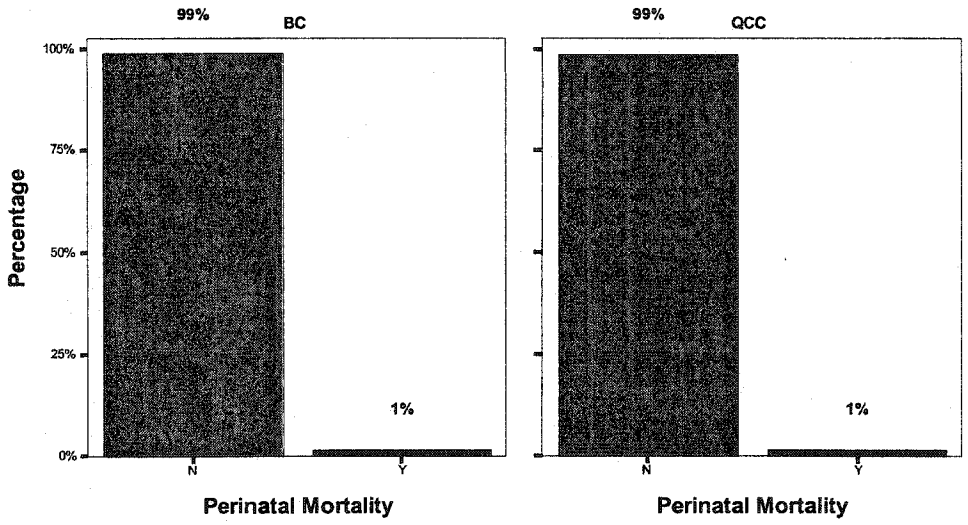
Mean Duration of Labour for Local Deliveries (1986-2000)



The mean duration of labour for local deliveries was independent of the community. There was no difference between BCV and QCC.

Graph 30 ($P = 0.367$)

Live births vs Perinatal Mortality for Bella Coola Valley and Queen Charlotte City (1986-2000)



The percentage of perinatal mortality was independent of the community. There was no difference between BCV and QCC.

Graph 31 ($P = 0.741$)

The data analysis was repeated to determine whether there were differences in native and non- native women within and between both communities. The data collection identifying native versus non-native status extends from January 01, 1991 to December 31, 2000. Prior to this, the department of vital statistics did not identify women by this criterion. The obstetrical outcomes between native and non-native women in both communities were no different with the exception of the increased percentage of premature deliveries for native women in QCC.

Table 5

Summary of results (#) for native women (1991-2000)

	Bella Coola Valley			Queen Charlotte City		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Total Population	189	114	303	74	84	158
Vaginal delivery	165	75	240	74	56	130
Caesarean section	24	39	63	0	27	27
Epidural	23			0		
Episiotomy	4			3		
VBAC	13			0		
Forceps / vacuum	16	4	20	2	13	15
Premature delivery	3	17	20	6	11	17
APO	12	11	23	6	10	16
Perinatal mortality	0	1	1	2	2	4

Table 6

Summary of results (#) for non-native women (1991-2000)

	Bella Coola Valley			Queen Charlotte City		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Total Population	161	68	229	164	196	360
Vaginal delivery	138	44	182	164	132	296
Caesarean section	23	24	47	0	64	64
Epidural	22			0		
Episiotomy	6			8		
VBAC	9			0		
Forceps / vacuum	17	9	26	7	24	32
Premature delivery	6	6	12	2	24	26
APO	12	8	20	10	18	28
Perinatal mortality	2	3	5	0	1	1

Table 7

Summary of results (#) for women from Bella Coola Valley (1991-2000)

	Native			Non-Native		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Total Population	189	114	303	161	68	229
Vaginal delivery	165	75	240	138	44	182
Cesarean section	24	39	63	23	24	47
Epidural	23			22		
Episiotomy	4			6		
VBAC	13			9		
Forceps / vacuum	16	4	20	17	9	26
Premature delivery	3	17	20	6	6	12
APO	12	11	23	12	8	20
Perinatal mortality	0	1	1	2	3	5

Table 8

Summary of results (#)) for women from Queen Charlotte City (1991-2000)

	Native			Non native		
	Group			Group		
Variable	A′	C′	A′ + C′	A′	C′	A′ + C′
Total Population	74	84	158	164	196	360
Vaginal delivery	74	56	130	164	132	296
Caesarean section	0	27	27	0	64	64
Epidural	0			0		
Episiotomy	3			8		
VBAC	0			0		
Forceps / vacuum	2	13	15	7	24	32
Premature delivery	6	11	17	2	24	26
APO	6	10	16	10	18	28
Perinatal mortality	2	2	4	0	1	1

Table 9

Comparison of chi square statistical results for native and non-native women (1991-2000)

		BCV	QCC	BCV vs. QCC	BCV vs. QCC
Variable	Group	Native vs. Non-Native	Native vs. Non-Native	Native	Non-Native
Total births	A′ vs. C′	0.056	0.788	≤0.001	≤0.000
C-section vs VD*	A′ + C′	0.940	0.884	0.357	0.397
C-section vs. VD	A′	0.664		≤ 0.001	≤0.000
C-section vs. VD	C′	0.882	0.984	0.805	0.691
Vaginal delivery	A′ vs. C′		0.984		
Epidural	A′	0.655		0.002	≤0.000
Episiotomy	A′	0.369	0.760	0.466	0.732
VBAC	A′	0.622		0.020	0.002
Forceps / vacuum	A′ + C′	0.053	0.819	0.241	0.362
Forceps /vacuum	A′	0.504	0.558	0.096	0.030
Forceps / vacuum	C′	0.014	0.463	0.002	0.910
Premature	A′	0.208	0.006	0.009	0.145
Premature	C′	0.237	0.867	0.698	0.450
APO	A′	0.208	0.208	0.611	0.627
APO	C′	0.237	0.237	0.610	0.538

*VD- Vaginal delivery

Chapter Four

DISCUSSION

The findings of this study strongly suggest that having caesarean section capability as well as a more interventionist approach played a role in the decision of women from Bella Coola Valley to have their baby locally. There was no difference in adverse perinatal outcomes or perinatal mortality between both communities with local as well as non-local deliveries. The obstetrical outcomes between native and non-native women in both communities were no different with the exception of the increased percentage of premature deliveries for native women in QCC. The data presented in this research thesis supports the SOGC position that rural hospitals should, within a regionalized risk management system, offer maternity care to low risk populations without local access to operative delivery (Iglesias et al., 1998). The data in this research thesis also indicates that there is no apparent downside (e.g. higher maternal or perinatal mortality) to having caesarean section capability available in isolated rural communities like Bella Coola.

These results are relevant to both health care planners and to women struggling to decide whether they should stay or leave their isolated rural communities to give birth. Women in Queen Charlotte City can be reassured that the lack of caesarean section capability does not negatively impact obstetric or perinatal outcomes. Women in Bella Coola can be reassured that the presence of caesarean section capability does not expose them to greater iatrogenic associated obstetric or perinatal risks. Relatively more women stayed home to deliver in Bella Coola suggesting that this medical model of obstetrics delivery was perceived as the one with safer outcomes. Being able to stay home and deliver has many benefits. Avoidance of travel and reduction in travel costs, avoidance

of accommodation costs (i.e. waiting around to deliver for up to a month or more), avoidance of unnecessary specialist consultations, and the ability to maintain support of family and friends are all obvious benefits to rural women. As mentioned previously, the obstetric literature suggests perinatal and maternal outcomes associated with delivery in a large tertiary care center is not necessarily the best environment for low-risk mothers because these women are more likely to have a more aggressive interventionist approach in the intrapartum stage (Black & Fyfe, 1984; Hutten-Czapski, 1998). Low-risk mothers and their babies have more positive outcomes when a low level of intervention approach is used (Klein, 1993; Rosenblatt, Reinken, & Shoemach, 1985).

Administrators responsible for the delivery of health services to Bella Coola could use the data in this thesis to argue that caesarean section capability is not necessary for safe obstetric practice for low-risk expectant mothers and use this argument to justify eliminating operative services. Eliminating operative services has some obvious cost-saving implications for a local hospital. A hospital with no operative capacity does not have to budget costs for the provision of operating room nursing and post-operative nursing services; it does not have to budget costs for having physicians on call for surgery and anesthesia; it does not have to maintain or replace out-dated equipment; and it does not have to budget for continuing education upgrades. Bella Coola health care providers could however argue that having caesarean section capability does seem to allow more women to stay home, as well they can form a global perspective there is an overall savings to the health care system when women stay home to have their babies.

There have been two plane crashes associated with air transports attempting to land on the Queen Charlotte Islands and one could argue that these crashes should be factored into the overall safety associated with having a "no caesarean section" policy. The first plane crash was in 1995 in Massett. All 5 people on board, including the pilot, infant transport team, obstetrician, and nurse died when the plane crashed into the sea as it was coming in for landing. The second crash occurred in Sandspit in 2002. No lives were lost, but many people feel it was a miracle any one survived this incident. Ironically, it appears that the greatest danger associated with rural women delivering closer to home is to the staff of the medical transport system – a system which was set up with the expressed purpose of saving lives by delivering patients to facilities where they would be taken care of by more specialized health care professionals.

LIMITATIONS

There are some limitations in this study. The population size for each community was less than 900 births over the 15 year time period. Reported maternal mortality rates for Canadian women during this time period of study is in the order of 1 in 10,000 births (Grzybowski et al, 1991; Hoyerts, D., Danel, I., & Tully, P. 2000) and reported Canadian perinatal mortality rates are in the order of 10 per 1000 births (Nault, F. 1997; Ohlsson, A. & Fohlin, L. 1983) so these variables are at risk of suffering a type II statistical error – a false negative finding. We do believe the population studied was large enough with respect to the other variables studied; in particular, caesarean section rates and proportion of women electing to go out for delivery.

It is possible that other factors are responsible for the difference in proportion of women staying in each rural community; e.g. physician and/or nursing attitudes; public

opinion, or subtle differences in weather and geography which predispose one community to recommend relatively more women leave their community to deliver their baby. Future studies, both qualitative and quantitative, should be done to address the relative importance of these issues.

CONCLUSION

A central component of rural living is the sense of belonging to a community. While rural women will always have the choice of whether or not they will deliver outside of their community, many will choose not to deliver their babies at home. Mothers in remote communities must be provided full disclosure in order to make informed choices regarding antepartum and intrapartum care. This disclosure would include the advantages and disadvantages of local services, potential obstetrical risk and the possibility of transport problems at time of delivery (Iglesias et al; 1998). It is given that the standard of care for low-risk maternity patients should be consistent with care provided in larger centers.

Implementation of maternity services in remote rural areas without specialist and high technology support on-site should not be construed as a lower quality of maternity care as compared to larger centers. The available evidence suggests that rural areas with limited services, with and without caesarean section capability, offer acceptably safe maternity care and that maternity services should be continued for low-risk populations. Populations served by rural hospitals that do not provide obstetrical care and transfer out at time of delivery seem to have worse perinatal outcomes such as premature infants and prolonged hospitalizations with higher costs. (Nesbitt et al., 1990; Iglesias et al., 1998; Nesbitt, 1996).

RECOMMENDATIONS

It is important for medical schools to encourage residents and family physicians to do obstetrics. Recognition and support must be directed towards those rural physicians who continue to practice obstetrics in their communities and assist in the reversal of the downward spiral that is present.

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Appendix A:

Certificate of Approval

The University of British Columbia
Office of Research Services and Administration
Clinical Research Ethics Board

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	NUMBER
Grzybowski, S.C.W.	Family Practice	C0-0296

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT

Bella Coola Hospital, Queen Charlotte City Hospital

CO-INVESTIGATORS:

Baillie, Jane, ; McIlwain, Ray,

SPONSORING AGENCIES

Burroughs Wellcome Inc.

TITLE:

Safety of Canadian Rural Obstetric Services

APPROVAL DATE	TERM (YEARS)	DOCUMENTS INCLUDED IN THIS APPROVAL:
JUL 13 2000	1	

CERTIFICATION:

The protocol and consent form for the above-named project have been reviewed by the Committee and the experimental procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval of the Clinical Research Ethics Board by one of:
Dr. B. McGillivray, Chair
Dr. A. Hannam, Dr. J. Oger, Associate Chair
Dr. R. D.Spratley, Director, Research Services

This Certificate of Approval is valid for the above term provided there is no change in the experimental procedures