

**OUTCOMES OF PRIMARY MATERNITY CARE IN FORT SMITH, NORTHWEST  
TERRITORIES**

by

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## **Abstract**

### **Introduction**

In northern Canada women residing in rural communities without local access to maternity care must evacuate at 36-37 weeks gestation to await labour in a city with a regional hospital. Midwifery services are expanding to rural areas of Canada, yet there are few studies that evaluate the safety of rural and remote midwifery compared to routine evacuation for birth. The purpose of this study is to assess the safety of the Fort Smith Midwifery Program in the Northwest Territories, and to understand the experiences of, and the meaning of, community birth with midwives among the women of Fort Smith.

### **Methods**

A retrospective cohort study was conducted to compare birth outcomes from the Fort Smith Midwifery Program (n=281) to: 1) the Inuulitsivik Midwifery Program in northern Quebec (n=1388), and 2) the community of Hay River where women evacuate at 37 weeks to receive intrapartum care elsewhere (n=143). Maternal and newborn outcomes were compared among the three comparison groups using univariate and multivariate logistic regression. Focus groups were held with women from Fort Smith who had used the midwifery program to understand their experiences of using the midwifery service and what it means to have access to community birth. Purposive sampling was used to invite Aboriginal and non-Aboriginal participants who gave birth in the community and elsewhere.

## **Results**

There were no statistically significant differences in the odds of 5-minute APGAR scores less than 7. The odds of 1-minute APGAR scores below 7 in Fort Smith were increased compared to the Hudson coast communities, however the rate was similar to those of newborns of women who reside in Hay River and delivered in Yellowknife.

Two themes emerged from the focus groups: 1) the midwifery model of care in the community leads to positive experiences of maternity care, and 2) the benefits of and reasons for giving birth in the community. Women spoke positively about their experiences of using the midwifery service whether or not they delivered in the community.

## **Discussion**

The findings of this thesis support the development and evaluation of midwife-led models of maternity care in rural and remote communities.

## **Preface**

I was involved with the design of the data collection sheet for this project along with the committee members and obstetricians from the Stanton Territorial Hospital in Yellowknife, Northwest Territories. I collected the data from the medical charts in Fort Smith with my thesis supervisor, Dr. Janssen. I conducted the analysis of the data with guidance from my thesis supervisor and committee.

This project required approval from the UBC Clinical Research Ethics Board (H12-00355) and the UBC Behavioural Research Ethics Board (H12-01067). In addition, ethics approval was obtained from the Stanton Territorial Health Authority Ethics Committee, and a Northwest Territories Research Licence (#15306, and #15162) was obtained from the Aurora Research Institute for both the quantitative and qualitative studies.

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## **List of abbreviations**

aOR adjusted odds ratio

BC British Columbia

GNWT Government of the Northwest Territories

MCC Maternity Care Committee

NICU neonatal intensive care unit

NWT Northwest Territories

OR odds ratio

RR relative risk

SD standard deviation

UBC University of British Columbia

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I thank my mom for supporting me to continue with my education, and my sister for keeping a clear a path through the kelp forest. Thank you to the rest of my family and friends—whom I have not seen nearly enough of over the past year—for understanding my absence. Finally, a big thank you to Laura for encouraging me the entire way.

## **Dedication**

To Lesley and Gisela for the care you have provided in Fort Smith and your contribution to the advancement of rural midwifery in Canada.

## **Chapter 1: Introduction**

### **1.1 The recent history of maternity services in rural and remote Canadian settings**

#### **1.1.1 The practice of evacuation**

Prior to 1994, Canada was the only Western industrialized nation that had no formal provision of midwifery care (Bourgeault, 2000). Just over a decade after the regulation of midwifery in Canada, it became the fastest growing health care profession in Canada with a 58.8% increase in the number of midwives from 2005 to 2009 (the number of registered midwives increased from 520 to 826) (Canadian Institute for Health Information, 2009). Midwifery became regulated in eight of ten provinces and two of three territories by 2010 (O'Brien et al., 2011), however access to midwifery care in rural and remote areas remains limited (Kornelsen et al., 2005).

In communities that do not offer local maternity services, women are required either to relocate to a larger community at approximately 36 weeks or to travel long distances in labour to the nearest hospital (Kornelsen & Grzybowski, 2005). Increased risk of perinatal mortality, and higher rates of perinatal morbidity and obstetric intervention have been associated with increased distance required to travel to access maternity services (Grzybowski, Stoll, & Kornelsen, 2011). Furthermore, Kornelsen et al. reported an increased risk of stress and anxiety among women residing in communities without access to local maternity care compared to women residing in communities with local access to maternity services provided by a family physician or general surgeon (Kornelsen, Stoll, & Grzybowski, 2011).

In many rural and remote northern communities, women have been required to leave their communities to give birth since the practice of evacuation for birth began in the 1970s (Van Wagner, Epoo, Nastapoka, & Harney, 2007). While this practice was intended to reduce the infant mortality rate (Jasen, 1997) and increase the safety for parturient women (Stonier, 1990), several studies have since described negative consequences associated with the practice of evacuation (Chamberlain & Barclay, 2000; Stonier, 1990; Webber & Wilson, 1993). Women are required to stay in an unfamiliar city, most often without their partner or families, and many emotional, physical and economic stressors have been identified for evacuated women (Chamberlain & Barclay, 2000). One study from northern Quebec described loneliness, worry, anxiety, loss of appetite, and increased smoking behaviour (Stonier, 1990). Consequences for the children and family left behind include increased rates of illness, school problems and loss of understanding of the birth process among men (Stonier, 1990).

Access to any local maternity services for rural and remote women has declined significantly across Canada since the late 1990s (Grzybowski, Kornelsen, & Cooper, 2007; Hutten-Czapski, 1999; Kornelsen & Grzybowski, 2005a; Rourke, 1998). In British Columbia (BC), 14 small rural maternity care services were closed between 2000 and 2004 (Grzybowski et al., 2007). Similar closures have been experienced across Canada (Iglesias et al., 2005; Ontario Maternity Care Expert Panel, 2006). The closures of small rural maternity centres are due to resource constraints, policies that encourage centralization of health care, a shortage in maternity care providers, and the uncertainty of the safety of rural childbirth (Kornelsen, Stoll, et al., 2011). The 21% of Canadians living in rural areas

have become the most vulnerable to the shortage of maternity care providers and the centralization of health care because many parturient women must leave their communities to give birth (Society of Obstetricians and Gynaecologists of Canada, 2010).

The Society of Obstetricians and Gynaecologists Canada (SOGC) has recommended that women residing in rural and remote communities have access to maternity services as close to home as possible to address the aforementioned issues (Miller et al., 2012).

Closures of small rural maternity services in Canada and elsewhere have led to greater interest by researchers in the safety of maternity care (and the safety of midwife-led care) in rural and remote areas, as well as the experiences of women and families living in these areas.

### **1.1.2 Birth outcomes**

Lack of access to maternity care in rural communities has been associated with greater risk of complicated deliveries and premature delivery (Nesbitt, Connell, Hart, & Rosenblatt, 1990), and higher risks of adverse birth outcomes (Grzybowski et al., 2011). In contrast, communities served by small rural hospitals have been shown to have similar perinatal mortality rates as populations served by larger specialized hospitals (Black & Fyfe, 1984). The SOGC supports the return of birth to rural and remote communities for low risk women and acknowledges that more research and continuous evaluation is needed to increase the confidence of women to choose to give birth in their communities (Society of Obstetricians and Gynaecologists of Canada, 2010).

Some studies in Canada suggest that midwife-led models of care offer an economically feasible way to fill the gap in maternity services while increasing patient satisfaction



(Sandall, Devane, Soltani, Hatem, & Gates, 2010; Sandall, Soltani, Gates, Shennan, & Devane, 2013). A study by Janssen et al. in BC, reported that midwife-attended homebirths and hospital births have similar rates of neonatal morbidity as hospital births attended by physicians and have lower rates of obstetric intervention for women of similar low risk status (Janssen et al., 2009; Janssen, Ryan, Etches, Klein, & Reime, 2007). A study of homebirth in Ontario found similar results (Hutton, Reitsma, & Kaufman, 2009).

Descriptive studies have reported on the maternal and perinatal birth outcomes from the midwife-led model of care in remote communities of northern Quebec (Van Wagner et al., 2007; Van Wagner, Osepchook, Harney, Crosbie, & Tulugak, 2012). However, the safety of midwifery care in northern communities in the western Arctic has not been examined.

### **1.1.3 Midwifery practice in northern Canada and Fort Smith, Northwest Territories (NWT)**

The most extensive research investigating the practice of midwifery care in northern Canada has come from the Inuit communities of Nunavik, Quebec. In the 1970s, Inuit women and their families in Nunavik, Quebec became dissatisfied with the practice of evacuation (Stonier, 1990). Since the mid-1980s the Hudson Bay communities in Nunavik, Northern Quebec have successfully reclaimed community birth by embracing a multi-disciplinary model of care where midwives are the lead caregivers but work together with physicians and nurses (Van Wagner et al., 2007). The Inuulitsivik Midwifery Program in Nunavik is recognized globally for its innovative model of interdisciplinary care as well as for the low rates of adverse outcomes, which are comparable to nation-wide outcomes. It is also recognized as a leader in Aboriginal midwifery education, with most births attended

by locally trained Inuit midwives (Epoo, Stonier, Wagner, & Harney, 2012; Van Wagner et al., 2012).

Midwifery care was re-introduced to Fort Smith, NWT informally in 1993 as it was getting increasingly difficult to recruit physicians who would offer maternity care, due to the inability to provide cesarean section in the community (Becker, 2006). Midwifery became officially regulated in the NWT in 2005 and pregnant women in Fort Smith now have the choice of using the midwifery service for part or all of their pregnancy and labour, or giving birth outside of the community with a physician. By the third year of operation, 100% of parturient women used the Fort Smith Midwifery Program for all of, or a portion of, their care.

For women residing in rural and remote communities of northern Canada, the option of community birth is rare. However, women in Fort Smith have formally had the option of staying in the community for childbirth under the care of a midwife since 2005. More studies reporting on the outcomes associated with midwife-led care in rural and remote communities are needed to assess the safety of this practice.

## **1.2 Overall aim of thesis**

The aim of this thesis was to evaluate the safety of a midwifery model of care providing community birth in a rural and remote northern setting without local cesarean section capability, and understand women's experiences of and the meaning of community birth. Birth outcomes from the Fort Smith Midwifery Program were compared to birth outcomes from 1) the Inuulitsivik Midwifery Program which services the Hudson coast communities of Nunavik, Quebec and 2) Hay River, NWT (a community near Fort Smith

where routine evacuation for childbirth is practice). Women's experiences of using the midwifery model of care in the community of Fort Smith and the meaning of community birth were examined using a qualitative study design.

### **1.3 Research questions**

- 1) Are maternal and perinatal outcomes, including rates of intervention, preterm birth, birth weight, neonatal and maternal morbidity, and breastfeeding initiation among women living in the community of Fort Smith comparable to those of women living in:
  - (a) the Hudson coast communities of Nunavik?
  - (b) Hay River?
- 2) What are the childbirth experiences of women in Fort Smith who received care at the Fort Smith Midwifery Program?
  - (a) How has the midwifery program in Fort Smith, NWT affected the way women and their families in Fort Smith experience maternity care?
  - (b) What is the meaning of community birth for women in Fort Smith, NWT?

### **1.4 Contributions to the literature**

The safety of community birth with midwives in Fort Smith is relevant to high-resource countries such as the United States, New Zealand, Australia and other circumpolar regions where similar practices of evacuation in rural and remote communities exist (Chamberlain, Barclay, Kariminia, & Moyer, 2001; Montgomery-Andersen, 2005). Over the next four years the Government of the NWT has plans to expand access to midwifery care to two new communities, Hay River and the Beaufort Delta (Wohlberg, 2012). In rural and remote communities of the western Arctic, where the population is primarily First Nations,

research on birth outcomes and maternal experience is necessary to inform policies which govern service models for these new clinics. This study is the first evaluation of the safety of primary maternity care in the western Canadian Arctic and will be a novel addition to the limited world literature surrounding the safety of midwife-led care in rural and remote communities that do not have cesarean section capability.

## **Chapter 2: Literature review**

### **2.1 Introduction**

The declining access to maternity services in Canada has been of great interest to researchers and providers in the past few decades as centralization of health services has coincided with the closing of small rural maternity service (Black & Fyfe, 1984; Iglesias, Grzybowski, Klein, & Gagne, 1998; Kornelsen & Grzybowski, 2005b; Miller et al., 2012; Rourke, 1998). Many studies have been conducted in communities after loss of local access to maternity care. In these communities, increased maternal stress and anxiety has been associated with increased distance from care (Kornelsen, Stoll, et al., 2011). In northern Canada most communities have not had local access to maternity care in decades. Grassroots initiatives by local women in some northern communities have successfully “reclaimed community birth” with midwife-led care (Becker & Paulette, 2003; Van Wagner et al., 2007).

In the 1960s, in response to high perinatal and maternal mortality rates in northern compared to southern Canada, the federal government funded nurse-midwives, primarily from Britain, to work in nursing stations found in communities with a population of at least 100 people (Jasen, 1997). In the western Arctic, low-risk women were able to give birth in their communities attended by a nurse-midwife until the 1980s (Moffitt & Vollman, 2006). At this time, a change in immigration policy meant that more Canadian nurses were hired to work in northern Canada; these Canadian-trained nurses did not have midwifery skills (Moffitt, 2004). When recruiting and retaining nurse-midwives in remote communities became increasingly difficult, evacuating women to large referral hospitals was perceived

as providing the best care for women and babies (Chamberlain et al., 2001). This practice of evacuating all women at approximately 36 weeks gestation is commonly referred to as the 'policy of evacuation', however this is a misnomer as in fact no such written policy exists (Olson & Couchie, 2013).

When discussing the health of Aboriginal people in Canada it is crucial to first discuss both the history and intergenerational effects of colonization, and the importance of historical trauma. Many Aboriginal people today are still experiencing the intergenerational effects of colonization. Residential schools played a crucial role in the disruption of Aboriginal culture and language through the removal of children from their families (Stout & Kipling, 2003). The trauma experienced by survivors of residential schools is still felt today in the younger generations as issues of compromised identity, culture and parenting (Stout & Kipling, 2003). The colonization of Aboriginal people in Canada has greatly affected their health. Compared to non-Aboriginal women, Aboriginal women in Canada have a decreased life expectancy (75 years compared to 82 years in 1991), and higher rates of suicide, incarceration, sexually transmitted infections, and chronic disease (Stout, Kipling, & Stout, 2001). Many scholars have contextualized these disparities within a framework of historical trauma, which is described as the "multigenerational, collective, historical wounding of mind, emotions and spirit" (Mitchell & Maracle, 2005).

Maternity care for Aboriginal women, including the practice of evacuation, has been greatly influenced by colonialism (Brown, Varcoe, & Calam, 2011). It has been argued that the underlying and confounding issues, such as poverty, poor nutrition and a lack of health

education, associated with historically high perinatal mortality rates were overlooked by the government when evacuation of all women for birth became routine (Brown et al., 2011). Evacuation for birth has led to many negative consequences. For example, evacuation of parturient women results in the separation of the mother from her family and community, and, as one article suggests, causes “her to experience one of her most important life events surrounded by unfamiliar languages, culture, people and food” (Lalonde, Butt, & Bucio, 2009, p. 958). For Inuit women, leaving one’s community during a such a life transitioning event has been expressed as having ‘emotional, physical and economic’ impacts (Chamberlain & Barclay, 2000). Emotional stressors primarily arose from the separation of the woman from her family and other children; physical stressors referred to unmet needs with regard to breastfeeding because there was no one to help them; and economic stressors referred to the costs incurred from being away from home while waiting for labour to begin and during the postpartum (Chamberlain & Barclay, 2000). Furthermore, routine evacuation has been reported to recreate the trauma and social dislocation experienced in the past with residential schools for entire communities (Van Wagner et al., 2007).

Many researchers have questioned the safety of small delivery units compared to large referral centres; however, for rural women in Canada who do not have access to local care, the safety of small delivery units must be examined in relation to the safety of evacuation from home communities for childbirth. Couchie and Sanderson state that “Aboriginal women in remote and rural communities should not have to choose between their culture and their safety” (Couchie, C., Sanderson, 2007); access to midwifery and

traditional birth practices in rural communities mitigates the number of women who have to make this choice.

Furthermore, an indicator of the fifth Millennium Development Goal, “to improve maternal health”, is the proportion of births attended by a skilled attendant (World Health Organization, 2014). A skilled attendant is defined as:

An accredited health professional—such as a midwife, doctor or nurse—who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns. (World Health Organization, 2004)

To ensure the best possible outcomes for women and newborns, access to a skilled attendant throughout the continuum of pregnancy, childbirth and immediate postpartum period is needed (World Health Organization, 2004). Olsen and Couchie write that “the implementation of midwifery in rural and remote communities can address this goal [of access to skilled attendants] in Canada and fill this gap that exists in the current system of evacuation” (Olson & Couchie, 2013).

This literature review addresses two questions: 1) What maternal and newborn outcomes are associated with maternity services in rural and remote settings? and 2) What are the experiences of, and the meaning of community birth for women in rural and remote communities?



## **2.2 Perinatal outcomes and access to local skilled birth attendants**

### **2.2.1 Introduction**

Conducting a randomized control trial that assigns women to rural maternity or urban care is not feasible. Nor is it feasible to randomly assign women to deliver at hospitals with varying acuity. As such, all of the studies in this literature review have retrospective cohort or cross-sectional designs. A causal relationship between hospital acuity and birth outcomes cannot be determined explicitly, yet studies with these designs provide a foundation from which to assess the safety of childbirth among women with low-risk pregnancies in various locations and in hospitals of varying acuity.

### **2.2.2 Size of institution and perinatal outcomes**

Evaluating the safety of maternity care in small hospitals has become increasingly important as many women internationally, including women residing in rural and remote communities, are choosing to birth in low technology environments, despite birth in large tertiary centres becoming the norm (Moster, Terje, & Markestad, 2001). Many studies have compared neonatal and perinatal mortality rates from small (low acuity) hospitals to larger referral hospitals with specialized care. A population-based study conducted in Germany compared neonatal mortality rates for small delivery units (<500 births per year) and large delivery units (>1500 births per year) using birth outcomes from the perinatal birth register of the province of Hesse from 1990-1999 (n=582 655) (Heller et al., 2002). The odds of neonatal mortality (<7 days after birth) for low-risk births (defined as births of neonates weighing >2500g) in small delivery units was three times greater than in large delivery units (odds ratio (OR) 3.48, 95% confidence interval (CI) 2.64–4.58) (Heller et al.,

2002). This study did not adjust for maternal risk factors; however, birth weight <2500 was used as an indicator of differences in prenatal risk, and as such all neonates weighing >2500 g were included in this study as low-risk births (Heller et al., 2002). Birth weight has been shown to be associated with social and biological risk factors, however many researchers have questioned the significance of birth weight as an indicator of risk for infants (Hertz-Picciotto, 2003; Wilcox, 2001), let alone an indicator of prenatal risk (Tracy et al., 2006). The increased risk of neonatal mortality in small hospitals could reflect poor antenatal risk screening, or sub-optimal service by the smaller hospitals.

A population-based cross-sectional study in Finland examined birth outcomes during 1987-88 by mothers' residence (n=123 065 births) (Viisainen, Gissler, & Hemminki, 1994). In Finland, women with low-risk pregnancies are expected to attend the hospital within or the one closest to their municipality (Viisainen et al., 1994). Women who live near more than one hospital can choose to give birth at their preferred hospital. A referral system is in place if a woman or newborn requires specialized care. Women in this study were placed into comparison groups based on their location of residence, which was associated with the hospital acuity of a nearby hospital. The authors first determined which hospital in a given municipality provided care to greater than two thirds of the women; the municipality was then categorized by that hospital's acuity (Viisainen et al., 1994). Hospital acuity levels were defined as follows: Level 1A hospitals situated in remote areas generally run by general practitioners; level 1B hospitals equipped for normal birth and obstetricians not on premises but available for consultation; level 2 hospitals have obstetricians 24 hours a day as well as newborn special care units and access to pediatric consultation; and level 3

teaching hospitals have tertiary level care with in-house pediatricians and neonatal intensive care (Viisainen et al., 1994). There were no statistically significant differences among the comparison groups for birth weight after adjusting for age, parity, marital status, education, maternal risk factors and urbanism of the municipality (Viisainen et al., 1994). The odds of preterm birth (<37 weeks) was lower for all catchment areas compared to catchment Level 3: Catchment Level 2, adjusted OR (aOR) 0.81, 95% CI 0.74-0.89; catchment level 1b, aOR 0.85, 95% CI 0.76-0.95; catchment level 1a, aOR 0.53, 95% CI 0.34-0.83. The odds of a low APGAR score at 1 minute were statistically significantly lower in level 2 catchment areas (aOR 0.83, 95% CI 0.74-0.92) compared to level 3 (Viisainen et al., 1994). The odds of low 1-minute APGAR scores were decreased in the level 1a and 1b catchments as well, but the aOR was not statistically significantly different (Viisainen et al., 1994). There were no significant differences in rates of perinatal mortality for areas served by small delivery units compared to areas served by tertiary hospitals: Catchment level 2, aOR 0.92, 95% CI 0.72-1.16; catchment level 1b, aOR 1.02, 95% CI 0.76-1.36; catchment level 1a, aOR 0.58, 95% CI 0.18-1.86 (Viisainen et al., 1994). These findings suggest that with a referral system in place, communities served by small primary maternity services have similar outcomes to communities served by large tertiary hospitals (Viisainen et al., 1994).

A similar study design, using mothers' residence to assign women to comparison groups, was used in a Norwegian study to compare neonatal mortality rates for all births in Norway from 1967 to 1996 (n=1.7 million births) (Moster et al., 2001). In Norway, women are expected to choose the nearest maternity unit to their residence, and will be referred

for specialized care if necessary. For the study, mothers were assigned to comparison groups based on the most frequently used maternity care centre in their municipality (Moster et al., 2001). The comparison groups were defined by the number of deliveries per year in the hospital that was most frequently used in a given area:  $\leq 100$ , 101-500, 501-1000, 1001-2000, 2001-3000,  $>3000$  (Moster et al., 2001). The highest relative risk (RR) of neonatal mortality was for women who lived in areas where the most frequently used maternity care centre delivered  $\leq 100$  deliveries per year (RR 1.4, 95% CI 1.1-1.7 compared to the group of  $>3000$  births per year) (Moster et al., 2001). The risk of neonatal mortality decreased as the hospital size increased: RR 1.2 (95% CI 1.0-1.3) in the group with 101-500 deliveries/year; RR 1.2 (95% CI 1.1-1.4) in the group with 501-1000 deliveries/year; and RR 1.1 (95% CI 1.0-1.3) in the group with 1001-2000 deliveries/year (Moster et al., 2001). The trend of elevated risk of neonatal death in the smaller hospitals persisted when the analysis was restricted to neonates with a birth weight  $>2500\text{g}$  ( $\leq 100$  deliveries/year, RR 1.6 (95% CI 1.2-2.1); 101-500 deliveries/year, RR 1.1 (95% CI 1.0-1.2); 501-1000 deliveries/year, RR 1.1 (95% CI 0.9-1.2); 1001-2000 deliveries/year, RR 1.0 (95% CI 1.0-1.1); 2001-3000 deliveries/year, RR 0.9 (95% CI 0.8-1.0); and  $>3000$  deliveries/year, RR 0.8 (95% CI 0.7-0.9) (Moster et al., 2001). After adjustment for travelling distance (data not shown) and additional adjustment for parity, maternal age and marital status the trend persisted (Moster et al., 2001).

A population-based study using Australian data from 1999-2001 ( $n=714\ 297$  births) compared rates of obstetric intervention and newborn outcomes among low-risk pregnancies by the size of hospital where the delivery took place (Tracy et al., 2006). The

hospital sizes were determined by the number of births per year: <100, 100-500, 501-1000, 1001-2000 and >2000. The inclusion factors for a low-risk pregnancy included women aged 20-34 years with no pre-existing medical conditions (diabetes or essential hypertension), and no obstetric complications arising in pregnancy (gestational hypertension or pregnancy-induced hypertension). ORs were adjusted for maternal age, patient insurance classification, Aboriginal status and geographic residential status (major city, inner region, outer region, remote area, and very remote area). The adjusted odds of neonatal death among low-risk women was significantly lower for multiparous women who gave birth in hospitals with 100-500 births/year compared to hospitals with >2000 births/year (aOR 0.36, 95% CI 0.14-0.93) (Tracy et al., 2006). For nulliparous women there were no significant differences between comparison groups for the adjusted odds of neonatal death (Tracy et al., 2006). For low-risk primiparous women, the aOR for cesarean section was lowest in hospitals that had <100 and 100-500 births/year compared to >2000 births/year: < 100 births/year, aOR 0.67, 95% CI 0.57-0.80; and 100-500 births/year, aOR 0.87, 95% CI 0.81-0.93 (Tracy et al., 2006). For multiparous women, the aORs of cesarean section were low in all groups compared to hospitals with >2000 births/year: <100 births/year, aOR 0.73, 95% CI 0.65-0.81; and 100-500 births/year, aOR 0.88, 95% CI 0.83-0.93 (Tracy et al., 2006). The low risk women who gave birth in hospitals with <100 births/year also had significantly lower aORs of induction for labour (aOR 0.62, 99% CI 0.54-0.73), instrumental birth (aOR 0.80, 99% CI 0.69-0.93) and admission to a neonatal unit (aOR 0.15, 99% CI 0.10-0.22) (Tracy et al., 2006). This study found that women with low-risk pregnancies who delivered in small hospitals with <100 deliveries/year had

decreased risks of obstetric intervention and adverse neonatal outcomes compared to women of similar low-risk status who delivered in larger hospitals (Tracy et al., 2006).

The findings from the four studies reviewed are inconsistent and the exposure groups of these studies vary. The studies from Germany and Australia analyzed outcomes by size of hospital where the birth took place. In Germany, there was an increased risk in neonatal mortality in small hospitals compared to large hospitals (OR of 3.48, 95% CI 2.64-4.58), however the authors did not adjust for prenatal risk factors (Heller et al., 2002). In Australia, there was a statistically significant lower risk of neonatal death in hospitals with 100-500 births/year compared to hospitals with >2000 births/year for low-risk women (Tracy et al., 2006). Adjustment for maternal place of residence was included in the analysis of the Australian study (Tracy et al., 2006).

The studies from Finland and Norway compared outcomes according to size and acuity of the hospital most frequently used in the mother's community of residence (Heller et al., 2002; Moster et al., 2001). In Finland, no significant differences in perinatal mortality were reported for communities where the majority of mothers used small hospitals compared to those where the majority used large hospitals (ORs were adjusted for maternal risk factors such as smoking and history of stillbirth) (Viisainen et al., 1994). The study from Norway reported an increased risk of neonatal death in communities where mothers most frequently used small hospitals (RR 1.4, 95% CI 1.1-1.7 compared to the group of >3000 births per year) (Moster et al., 2001). While the findings were adjusted for maternal age, parity and marital status, no other indicators of prenatal risk were included (Moster et al., 2001).

Caution should be used in generalizing these findings to northern Canada and other circumpolar countries where the definition of rural is vastly different from Germany, for example, which has a high population density in comparison to Canada (Germany: 225 people/km<sup>2</sup>; Canada: 4 people/km<sup>2</sup>) (Department of Economic and Social Affairs Population Division & Division, 2013). For these northern countries, as in parts of Australia, access to local skilled birth attendants is not a reality for many rural communities. Further research to compare remote communities that have access to skilled birth attendants with communities where standard protocol is to evacuate all women for childbirth is needed to assess the safety of community birth in rural and remote communities.

### **2.2.3 Distance to care and perinatal outcomes**

A study published in 2011 examined the relationship of maternal and newborn outcomes with travel time to hospital with cesarean section capacity (Grzybowski et al., 2011). The study sample included mothers residing in BC, outside of core urban areas, who gave birth during 2000-2004 (n= 49 402 births) (Grzybowski et al., 2011). The study had six comparison groups defined by distance to a hospital with cesarean section capability if the woman lived >60 minutes from a hospital with maternity services (level 1, women living >4 hours from cesarean section capability; level 2, women living 2-4 hours from cesarean section capability; and level 3, women living 1-2 hours from cesarean section capability) or by hospital acuity if the woman lived <60 minutes from a hospital with maternity care (level 4, intrapartum care provided by family physicians or midwives; level 5, cesarean section capability performed by general practitioner surgeon or specialist; and

level 6, cesarean section capability performed by obstetrician or general surgeon) (Grzybowski et al., 2011). After adjustment for maternal characteristics (age and parity), antenatal risk factors and level of social vulnerability, the OR of perinatal mortality for women living >4 hours from cesarean section capability was 3.17 (95% CI 1.45-6.95) compared to level 6 (Grzybowski et al., 2011). Newborns in communities that were 2-4 hours and 1-2 hours away from cesarean section capability had higher rates of days spent in the level 3 NICU (179 and 100 days per 1000 births respectively compared to 42 per 1000 births for newborns in communities with access to specialist care (p value < 0.007)) (Grzybowski et al., 2011). This study also reported that the level 3 comparison group (women who lived 2-4 hours from maternity care with cesarean section capability) had the highest rates of induction at 28.4% (compared to 17.4% for level 1, 23.5% for level 2, 22% for level 4, 25.5% for level 5, and 24.4% for level 6) (Grzybowski et al., 2011). The data showed that “logistics” was most often stated as the indication for induction in the Level 3 comparison group (Grzybowski et al., 2011). For nulliparous women, higher rates of cesarean section, instrumental delivery and shoulder dystocia have been reported among women who were induced for labour without an identified indication (Dublin, Lydon-Rochelle, Kaplan, Watts, & Critchlow, 2000).

A population-based retrospective cohort examined the association between rural residence in BC and birth outcomes among older mothers ( $\geq 35$  years) during 1999-2003 (n=29,698) (Lisonkova et al., 2011). The following variables were assessed as potential confounders in the model building process to adjust ORs: parity, single parent status, socio-demographic indicators, smoking, alcohol, substance used during pregnancy, congenital



anomalies, history of spontaneous abortion and induced abortion, sex and <4 prenatal visits (Lisonkova et al., 2011). Among mothers >35 years of age, rural women were at increased risk for perinatal death (aOR 1.47, 95% CI 1.01-2.14) and large-for-gestational-age newborns (aOR 1.13, 95% CI 1.02-1.25) compared to non-rural mothers (Lisonkova et al., 2011). Rural women were at decreased risk for primary and repeat cesarean section (aOR 0.75, 95% CI 0.63-0.88 and OR 0.08, 95% CI 0.78-0.91 respectively), as well as small-for-gestational-age newborns (OR 0.8, 95% CI 0.7-0.9) compared to non-rural women >35 years of age (Lisonkova et al., 2011). Another analysis compared perinatal mortality rates among older mothers by distance category (distance to nearest hospital with cesarean section capacity: <50 km, 50-150 km, and >150 km). The risk of perinatal mortality increased with increasing distance to a hospital with cesarean section capacity (aOR 1.53, 95% CI 1.10-2.12 per distance category, p-value for trend <0.001) (Lisonkova et al., 2011).

A Northern Ontario study assessing the safety of rural hospitals reported perinatal mortality rates of all births in Ontario during 1980-82 by level of hospital acuity in the mother's community (n=24 524) (Black & Fyfe, 1984). Community types were defined as follows: Level 0 communities, no elective deliveries; level IA, elective deliveries, no anesthesia; level IB, 0-5 cesarean births per year, no anesthesia; level IC, >5 caesarean births per year, no specialists in pediatrics or obstetrics on site; level 1D, <1,000 deliveries per year, at least one specialist in pediatrics or obstetrics on site; and level II hospitals, >1000 births per year, two or more specialists in obstetrics and pediatrics on staff (Black & Fyfe, 1984). The level I hospitals accounted for 39% of all births in Northern Ontario during the time period. There were no significant differences in rates of perinatal loss defined as

stillbirth or neonatal death between community types: Level 0, 13.89/1000 (95% CI 2.87-40.60); level IA, 13.73/1000 (95% CI 7.85-22.30); level IB, 14.66 (95% CI 9.58-20.80); level IC, 10.43 (95% CI 7.61-13.96); level ID, 12.72 (95% CI 8.06-19.09); and level II, 12.13/1000 (95% CI 10.37-13.89) (Black & Fyfe, 1984). This study suggests that there is no difference in perinatal mortality rates among rural communities with varying access to level of hospital care, however this study was descriptive and thus did not compare rates or adjust for prenatal maternal age, parity or other prenatal risk factors.

The first two studies reported increased risks of perinatal mortality, obstetric intervention and adverse neonatal outcomes for older rural women compared to non-rural women (Lisonkova et al., 2011), and as distance to maternity services increased (Grzybowski et al., 2011; Lisonkova et al., 2011). The third study, reported perinatal mortality rates that were similar in rural communities with varying access to maternity services (from no births handled electively to level II hospitals that delivered >1000 births per year) (Black & Fyfe, 1984).

#### **2.2.4 Rural and remote maternity care provider and perinatal outcomes**

There are only three published studies of midwife-led care in northern Canada that report on quantitative outcomes for mothers and newborns. All studies used data from the Hudson Bay communities in Nunavik, Quebec, which are served by the Inuulitsivik Midwifery Program (Simonet et al., 2009; Van Wagner et al., 2007, 2012). This midwife-led initiative opened in 1986 (Van Wagner et al., 2007). In 1983, prior to the opening of the Inuulitsivik Midwifery Program, 91% of births to women living on the Hudson Bay occurred in southern Canada (Van Wagner et al., 2007). During 1986-2005, 80% of women

residing in the Hudson Bay communities gave birth in Nunavik (n=2253) (Van Wagner et al., 2007). This descriptive study reported that the most common reasons for transfer outside of Nunavik were preterm labour (33% of transfers), hypertension (11%) and neonatal problems (9.5%) (Van Wagner et al., 2007). A second descriptive study reported that during 2000-2007, 86.3% of all newborns born to mothers residing in the Hudson Bay communities were delivered in Nunavik and 84% of women residing in these communities were had a midwife-attended delivery (n=1382 births) (Van Wagner et al., 2012). In this “all risk” population, low rates of obstetric intervention were reported (induction: 8.6%; augmentation: 5.9%; epidural: 3.0%; cesarean section: 2.1% (Van Wagner et al., 2012). Ninety seven percent of births were delivered by spontaneous vaginal delivery, and the preterm birth rate (<36 weeks) was 10.6% (Van Wagner et al., 2012). The rates of fetal mortality (>500g and >20 weeks gestation) and neonatal mortality for the Hudson Bay communities were 2.9 per 1000 total births and 3.6 per 1000 live births respectively (compared to a fetal mortality rate in all of Canada of 6.0 per 1000 births and a neonatal mortality rate of 3.7 per 1000 live births) (Public Health Agency of Canada, 2008; Van Wagner et al., 2012). Rates of neonatal mortality in 2000 for the NWT and for Nunavut were higher than those of the Hudson coast communities in Nunavik, (7.4 per 1000 live births, 95% CI 2.4-17.3 in the NWT and 6.9 per 1000 live births, 95% CI 2.2-16.0 in Nunavut) (Public Health Agency of Canada, 2003). Because the outcomes from the Hudson Bay communities were compared to aggregate rather than individual data, direct comparisons that could adjust for sociodemographic confounders were not possible.

Currently there is only one study that directly compares the Inuulitsivik Midwifery Program to another population. This study compared maternal and newborn outcomes from the Hudson Bay communities (the Inuulitsivik Midwifery Program) of Nunavik (n=1529 births) and physician-led maternity care in the Ungava Bay communities of Nunavik (n=1197 births) (located approximately 330 km southeast, by airplane, in relation to the Hudson Bay communities) from 1989-2000 (Simonet et al., 2009). No statistically significant differences in the rates of perinatal, neonatal and post-neonatal death between the two models of care were observed, however the odds for all three mortality rates were slightly higher in the midwife-led communities (Simonet et al., 2009). The perinatal death rate in the Hudson Bay communities from 1989-2000 was 14.4 per 1000 compared to 10.9 per 1000 in the Ungava Bay communities (aOR 1.29, 95% CI 0.63-2.64) (Simonet et al., 2009). When the analysis was restricted to babies born  $\geq 28$  weeks gestation, the aOR for perinatal death decreased (aOR 1.13, 95% CI 0.48-2.47) (Simonet et al., 2009). This study only had a power of 0.126 to detect a difference of 30% in perinatal death rate (baseline of 12 per 1000 live births, two-sided test,  $\alpha=0.05$ ). Furthermore, an important factor that was not addressed by Simonet et al. was the difference in travel time to tertiary care between the two areas of Nunavik. Flight time from the hospital in Kujjuak on the Ungava coast is 2 hours, and from the Hudson coast communities 4-8 hours, therefore differences in outcomes could be due to access to tertiary care in an emergency situation rather than type of birth attendant (Vicki Van Wagner, oral communication, February 2014).

Only one of these studies was comparative (Simonet et al., 2009), and it had insufficient power to detect a difference in perinatal mortality rates between midwife- and

physician-led deliveries in a rural and remote area of northern Canada. This study found an increased risk of perinatal mortality in communities with midwife-led versus physician-led birth that was statistically insignificant (aOR 1.29, 95% CI 0.63-2.64) (Simonet et al., 2009). Larger prospective studies of midwife-led practice in rural and remote areas of Canada are needed to assess maternal and newborn birth outcomes with adequate power.

Furthermore, studies are needed to compare outcomes between rural communities with access to midwife-led care and rural communities where routine evacuation for childbirth is practiced.

### **2.3 Childbirth experiences of rural and remote women**

The midwifery model of care emphasizes birth as a normal physiological process and follows the principles of continuity of care, choice of birth place and informed decision making (Dale, Miyazaki, Pacheco, & Kilthei, 2008). These aspects of the model of care have been associated with increased patient satisfaction with midwifery care compared to standard care (Harvey, 2002; Public Health Agency of Canada, 2009; Waldenström & Turnbull, 1998).

Two Canadian studies have looked at experiences of midwife-led care in rural and remote settings. A qualitative study in Fort Smith reported on nine interviews with women about their experiences of culturally safe care with a midwife in the remote community (Becker, 2006). Women who delivered in the community were pleased with their care and expressed that “it was vital for them to remain in the community to birth”; women who planned for a community birth but were air-evacuated for medical reasons expressed disappointment and stress in response to the transfer; women who received prenatal and

postpartum care with midwives but chose to give birth in the referral hospital under the care of a physician were pleased with their care from the midwives but felt unsure about the safety of community birth. The women who chose to deliver at the referral hospital with physicians expressed increased stress, uncertainty (in relation to the care they received at the referral centre), feelings of isolation and separation from family and support networks, and financial stress (Becker, 2006). Becker writes that,

[w]hile many women and their families are happy to receive their maternity care in the local midwifery program, and see birthing in the health centre as a benefit and improvement to the previous system where birthing at the facility was not an option; others remain apprehensive about community birthing, as well as midwifery care. (2006, p. 9).

The sentiments of apprehension in regard to community birth were attributed to the possibility of unforeseen medical complications occurring in a community without cesarean section capacity, and misconceptions of midwifery among family members (Becker, 2006).

The second study describes the psychosocial implications of Inuit women from the central Arctic evacuating out of their communities to give birth (Chamberlain & Barclay, 2000). Semi-structured interviews with 23 women from two unidentified communities were carried out. Community A had a midwife-led birthing project in a health centre and Community B had four nurses and no resident physician (Chamberlain & Barclay, 2000). Postnatal follow-up in the Community B was limited (Chamberlain & Barclay, 2000). The women from Community A felt as though they had more choices offered to them during

their pregnancy, labour and delivery. Furthermore, they reported feeling more supported by their loved ones, and they experienced less stress compared to women from the community where evacuation was mandatory (Chamberlain & Barclay, 2000).

One of the first studies to explore the views of northern, rural and remote women's experiences of obstetric care was conducted with Cree women in the Moose Factory zone in northeastern Ontario. Women in this region had to evacuate their communities at 38 weeks to deliver at either the Moose Factory General Hospital or at a hospital further south (Webber & Wilson, 1993). Using a semi-structured format, 24 women were interviewed about their concerns with evacuation and how the current situation could be improved. A serious concern raised by these women was the separation from other children, followed by loneliness in the referral community (Webber & Wilson, 1993). Some women also expressed the positive aspects of evacuation such as the opportunity to shop at larger stores (Webber & Wilson, 1993). When asked whether they would give birth in their communities if they had the opportunity, at first 67% of participants responded "yes"; when certain risks of community birth were discussed (no capacity for cesarean section in the community and no access to a blood bank) the percentage of affirmative responses decreased to 30% (Webber & Wilson, 1993). However, it was acknowledged that leading questions in which the risks of community birth were described by the interviewer may have contributed to response bias (Webber & Wilson, 1993).

In part of a large study titled, "Rural Women's Experiences of Maternity Care: Implications for Policy and Practice", women from four different rural communities in BC—Sparwood, Haida Gwaii, Alert Bay and North Island—were interviewed in three focus

groups and 20 unstructured one-on-one interviews (n=45 women) (Kornelsen et al., 2005). At the time of the study, maternity services had recently been suspended in all four communities (Kornelsen et al., 2005). The themes identified in this study included women's stress over the uncertainties of care, difficulty in securing a continuous care provider, financial costs associated with evacuation, the importance of giving birth in community, awareness of the risks and risk assessments involved in rural maternity care, and recognition of their geography and how it relates to access to care (Kornelsen et al., 2005). In conclusion Kornelsen et al. write that, "[r]emoving birth from a community creates significant psychosocial consequences that are only tentatively understood, but likely to carry physiological implications for low-risk women, their babies and families" (2005, p. 91).

In another study, eleven women from a community where, at the time of the study, local maternity services had not existed for 30 years were interviewed (Kornelsen & Grzybowski, 2005b). All women in the community where the research was conducted were advised to leave at 36 weeks gestation (Kornelsen & Grzybowski, 2005b). The themes that emerged during the interviews revolved around separation from family and community, social disruption, and costs associated with separation (Kornelsen & Grzybowski, 2005b). This study shows that even after 30 years without local maternity service and an established system of referral and evacuation, the stress and costs of evacuation for birth persisted (Kornelsen & Grzybowski, 2005b).

A recent qualitative case study undertook interviews and a survey to assess the importance of community birth to women in a rural community, Bella Bella, BC, that had



recently lost its maternity care services (Kornelsen, Kotaska, Waterfall, Willie, & Wilson, 2010). Among the participants, the majority had given birth outside of Bella Bella while some gave birth in their community (Kornelsen et al., 2010). The themes that emerged in the interviews included the importance of community birth, the belief that women should be able to birth in Bella Bella, and the differences in experiences from before and after the maternity services closed (Kornelsen et al., 2010). From the survey data 80% of participants felt community birth was “very important”, and 70% of participants said that local women should deliver in Bella Bella (Kornelsen et al., 2010). Women who had experienced both a birth in Bella Bella and a birth away from the community, expressed feeling comfort in birthing in familiar surroundings in the community and a sense of alienation when birthing away from the community (Kornelsen et al., 2010). In a second publication from the same data set, the focus was on the experiences of the women who left the community to give birth (Kornelsen, Kotaska, Waterfall, Willie, & Wilson, 2011). The themes that emerged from this analysis were powerlessness over the choice of birth place and a sense of isolation in the referral community (Kornelsen, Kotaska, et al., 2011). Women also described the added financial burdens associated with evacuation as well as the stress experienced by themselves and their children over being separated for long periods of time (Kornelsen, Kotaska, et al., 2011).

Finally, in a cross-sectional study of 52 rural communities in BC, the level of stress and anxiety experienced by women who had varying degrees of access to local maternity services was compared across categories defined by travel time to maternity care (Kornelsen, Stoll, et al., 2011). Using a stress score from the validated Rural Pregnancy

Experience Scale, the authors found that women who lived over one hour away from maternity care were 7.4 times more likely to experience moderate or severe stress compared to women who had access to local maternity care (Kornelsen, Stoll, et al., 2011).

The literature allows for an understanding of how the lives of women residing in rural and remote areas have been negatively affected by the practice of evacuation and the closures of small rural maternity care services. Women in these studies shared their experiences of increased stress and anxiety, loneliness, difficulty being away from family and other children, and added financial burden. What is missing from the literature is an understanding the meaning of community birth among women residing in rural and remote communities that have access to midwife-led care.

## **2.4 Conclusion**

The goals of this literature review were to answer the following two questions: 1) What maternal and newborn outcomes are associated with maternity services in rural and remote settings? and 2) What are the experiences of, and the meaning of community birth for women in rural and remote communities?

The studies of birth outcomes by hospital size have reported inconsistent results. One study reported a decreased rate of neonatal mortality in small, rural hospitals (Tracy et al., 2006), another reported no statistically significant differences between small and large hospitals (Viisainen et al., 1994), and two found an increased risk of neonatal mortality in small, rural hospitals (Heller et al., 2002; Moster et al., 2001). Among the studies that examined the effect of distance to maternity on birth outcomes, one study reported that women in communities that were >4 hours from skilled birth attendants had an increased

risk of perinatal mortality compared to women in communities with access to cesarean capacity provided by obstetricians or general surgeons (Grzybowski et al., 2011). Another study reported that older mothers (>35 years) in rural areas of BC have an increased risk of perinatal mortality compared to non-rural mothers (Lisonkova et al., 2011). With increased rates of adverse outcomes in rural communities where mothers must travel to access maternity care, research is needed to assess the safety of midwifery care in rural communities. One comparative study of midwife- versus physician-led care in rural and remote communities reported an increased risk of perinatal mortality however this difference was not statistically significant and the study did not have adequate power to detect this rare outcome (Simonet et al., 2009).

The studies of women's experiences of childbirth in rural and remote areas reported that women and families have been negatively impacted by evacuation for childbirth. Women who have to travel to access a skilled birth attendant experience increased stress, loneliness as a result of separation from family, and financial burden compared to women who have access to skilled attendants in their community (Kornelsen & Grzybowski, 2005b; Kornelsen, Kotaska, et al., 2011; Kornelsen, Stoll, et al., 2011; Kornelsen et al., 2005). Women from rural communities that had access to midwifery services reported having the ability to make more choices throughout the pregnancy and peripartum period, and they reported feeling more supported by their families than women who face mandatory evacuation in their community (Chamberlain & Barclay, 2000).

There is a need for more research into the safety of primary maternity care (specifically midwife-led) in northern, rural and remote communities of Canada. The

current studies that report on midwife-led care in rural and remote communities are mostly descriptive or have inadequate power to assess rare outcomes such as perinatal mortality. There are currently no studies that report maternal and newborn outcomes of rural and remote maternity care in the western Arctic. With the increasing interest in midwife-led birth, population-based studies are needed to compare birth outcomes from rural and remote settings with midwives, to rural and remote settings where evacuation for birth is practiced. This would provide policy makers with a better understanding of the physical and psychosocial effects of local access to skilled birth attendants. There is also a need for qualitative studies that report on the meaning of community birth in rural and remote communities that have access to skilled birth attendants.

The first study described in this thesis evaluates population level birth outcomes from three northern communities: two with access to midwife-led care in the community and one with access to level II care upon referral, but no skilled birth attendants in the community. The second study explores the meaning of community birth and women's experiences of the midwifery model of care in Fort Smith. The findings from this research will add to the literature by being the first to report on the birth outcomes from a rural and remote community with midwife-led care, and the option of community birth, in the western Arctic.

## **Chapter 3: Outcomes of primary maternity care in Fort Smith, NWT**

### **3.1 Introduction**

The Inuulitsivik Midwifery Program in Nunavik, which is one of the few midwifery services in northern Canada, opened in 1986 and has been evaluated in a descriptive study (Van Wagner et al., 2012). Neonatal mortality rates were comparable to Canadian national rates (3.7 per 1000 live births compared to 3.6 per 1000 live births) and cesarean section rates were much lower at 2.1%. (Van Wagner et al., 2012). The Inuulitsivik Midwifery Program has been recognized internationally by the World Health Organization, and nationally by the Canadian Royal Commission on Aboriginal Peoples and the SOGC for “its success in providing safe care to women in their northern and remote communities” (Van Wagner et al., 2007).

Midwifery became a regulated profession under the Northwest Territories (NWT) Midwifery Profession Act in 2005, and is publicly funded by the Government of the NWT (GNWT). The Fort Smith Midwifery program has provided care to over 300 women from the community since 2005. No studies have been published that report on outcomes of midwifery care in the western Arctic. Furthermore, there have been no peer reviewed studies of maternity care models in northern Canada that compare midwife-led care in rural and remote communities to communities where women are routinely evacuated for childbirth (ie. communities without access to skilled birth attendants).

The research question addressed in this chapter is: Are maternal and perinatal outcomes among Canadian women living in a remote northern community that offers birthing services by midwives (Fort Smith) comparable to 1) those of women living in a

community with similar midwifery services in the remote Eastern Arctic (the Hudson coast communities of Nunavik), and 2) those of women living in a remote northern community with routine evacuation (Hay River).

## **3.2 Methods**

### **3.2.1 Study design**

A retrospective population-based cohort study was conducted to compare birth outcomes of parturient women and their infants living in Fort Smith, NWT to 1) the Hudson coast communities in Nunavik, Quebec and 2) Hay River, NWT. Our hypothesis was that there would be no differences in adverse neonatal and maternal outcomes between Fort Smith and the two comparison groups.

The exposure of interest was midwife-led maternity care in Fort Smith. Fort Smith has a level I hospital without cesarean section capability. Transfer time from Fort Smith to the level II regional hospital in Yellowknife is approximately two hours (including travel time for the medevac team to fly from Yellowknife to Fort Smith). In Fort Smith, women may choose to stay in the community for childbirth (attended by a midwife) if they are considered low-risk by the Maternity Care Committee (MCC), a group comprised of the Fort Smith midwives and obstetricians in Yellowknife that meet biweekly by teleconference for consultation regarding the risk status of pregnant women in Fort Smith. The midwives in Fort Smith must be certified in neonatal resuscitation consistent with Neonatal Resuscitation Program (NRP) standards including oral intubation, endotracheal suctioning, and placement of an umbilical venous catheter in the newborn. Women also have the option of delivering at the hospital in Yellowknife (with physician attendants and cesarean

section capability) regardless of risk status. The cost of transferring out of the community is organized through Medical Travel, which is covered by the NWT Health Care Plan. Thus, women have no travel expenses (return airfare is paid for), and receive limited support for accommodation, meals and ground transportation. The years included in this study for Fort Smith are 2005-2011; 2005 was the year that the Fort Smith Midwifery Program opened, and 2011 was the most recent year for which complete data was available at the time of our study. In 2005 only 66% of women in Fort Smith used the midwifery service; this increased to 80% in 2006 and 100% in the years following. The women who did not use the midwifery service received antenatal care by physicians in Fort Smith and were evacuated from the community for their delivery at 37-38 weeks gestation. Outcomes from pregnancies managed by physicians were not included in our study.

The first comparison group was comprised of women living in the Hudson coast communities in Nunavik during 2000-2007. Outcomes for these years were compiled for a previous study and we were given access to the data for secondary analysis. This is the only northern maternity care program where women are routinely able to give birth in the community and for which outcome data have been published. There are three community birth centres (located in Puvirnituk, Inukjuak and Salluit) that provide midwife-led care to seven communities on the Hudson coast in Nunavik, northern Quebec; these communities have a total population of approximately 5500 (Van Wagner et al., 2007). The Hudson coast communities are situated approximately 1500 km north of Montreal. Montreal is the referral centre for women and newborns in Nunavik requiring tertiary care (Van Wagner et al., 2012). A flight from Puvirnituk to Montreal can take between six to eight hours

depending on the weather; women from the other six communities must first fly to Puvirnituq to go to Montreal, which can add an additional 6-8 hours (Van Wagner et al., 2007). Costs of transferring from Nunavik for childbirth are only covered by the federal government if the woman has a high-risk pregnancy or requires a medevac. There is no capacity for cesarean section in the Hudson coast communities. General standards of competency for midwives in the Hudson coast communities include: emergency measures, procedures and interventions including stabilizing and transporting women and babies; emergency newborn care including neonatal resuscitation; teamwork with health care and social service providers including when to consult and transfer care; and continuing education in courses such as NRP, Cardiopulmonary Resuscitation (CPR) and Emergency Skills Workshop (ESW) (Epoo et al., 2012).

The second comparison group was comprised of women living in Hay River during the 2008/09-2010/11 fiscal years. Outcomes were available at the Department of Health and Social Services for these years only. Hay River has a model of maternity care that differs from Fort Smith in that all women are required to evacuate for childbirth. The same medical travel benefits as described for Fort Smith apply to Hay River. Travel costs for the woman's partner or support person are not paid for by the government. Hay River, NWT is a community near Fort Smith (situated four hours northwest in relation to Fort Smith) with a similar population size and socio-demographic. Women from Hay River must travel to the Stanton Territorial Hospital in Yellowknife at 37 weeks gestation to await their labour because delivery services do not exist in Hay River (DPRA Consultants, 2012). Women in



Hay River receive prenatal care including ultrasound assessment from physicians in the community.

#### *Inclusion criteria*

All pregnant women from the three comparison groups who carried a fetus further than 20 weeks during the respective time periods were included in the study. Women who used the Fort Smith Midwifery Program or the Inuulitsivik Midwifery Program for their antenatal and postpartum care but delivered outside of their communities were included in the study.

#### *Exclusion criteria*

We excluded women who received care at the Fort Smith Midwifery Program for spontaneous abortion <20 weeks or for contraception counselling.

### **3.2.2 Outcome measures**

Data from the Fort Smith Midwifery Program were obtained through a retrospective chart review conducted by the author and one member of the thesis committee. The Fort Smith Midwifery Program receives discharge charts for women who deliver outside of the community thus our data is complete for all 280 parturient women in Fort Smith during the time frame. For individual variables for which there was missing or unclear information, we sought clarification from additional rosters of outcomes kept by the Fort Smith midwives. For our first comparison group, the Hudson coast communities in Nunavik, data were collected prospectively and were provided for this study by the Inuulitsivik Midwifery Program. The data from Nunavik is complete for all women in the Hudson coast communities, however some intrapartum variables were poorly ascertained for women

who were evacuated for childbirth. We were given access to outcome data from the Stanton Territorial Hospital in Yellowknife for women from Hay River, however this data was not representative of the entire Hay River population as many women chose to deliver elsewhere (in British Columbia and Alberta for example). The data from Stanton Territorial Hospital represented approximately 80% of births to women residing in Hay River. Instead, we reported outcomes from the Department of Health and Social Services collected by public health nurses in Hay River. Public health nurses provide postpartum and newborn care to all new mothers and infants when they return to the community.

Our primary comparison was the rate of APGAR scores less than 7 at 1 minute after birth between Fort Smith and the Nunavik cohort. We chose this outcome as it reflects the newborn condition at birth (Casey, McIntire, & Leveno, 2001) and is most likely attributable to intrapartum rather than antepartum care. APGAR scores can be influenced by drugs, trauma, congenital anomalies, infections, hypoxia, hypovolemia and preterm birth (Freeman & Nelson, 1988). APGAR scores were not collected in Hay River by the public health nurse and thus could not be included in this comparison.

Our secondary outcomes included rates of cesarean section, induction, augmentation, epidural and episiotomy; adverse maternal outcomes including rates of prolapsed cord, 3<sup>rd</sup>/4<sup>th</sup> degree perineal tears, intrapartum blood loss; and adverse newborn outcomes including rates of preterm birth, low birth weight <2500g, congenital anomalies, stillbirth, and neonatal death <28 days. Data available from Hay River that were available for inclusion were limited to cesarean section, induction, episiotomy, perineal tears, birth weight <2500g, preterm birth, congenital anomalies, and stillbirth. Prognostic factors such

as maternal age, parity, health history and lifestyle during pregnancy were not collected in the data from Hay River.

### **3.2.3 Power calculation**

Given the numbers of births in our Fort Smith sample (n=281), we had 99% power to detect an absolute difference of 10% from the Fort Smith rate of 1-minute APGAR scores less than 7 (12.2%), in comparison with Nunavik (n=1388) (two-sided, type I error, 0.05). We had 45% power to detect an absolute difference of 10% in rates of 5-minute APGAR scores less than 7 from a baseline of 0.7% in Fort Smith (two-sided, type I error, 0.05). For low birth weight <2500g, we had 98% power to detect an absolute difference of 5% from the Fort Smith rate of 1.1% when comparing to Nunavik, and 79% power when comparing Fort Smith to Hay River (two-sided, type I error, 0.05).

### **3.2.4 Analysis**

In a univariate analysis we compared rates of prognostic factors among the comparison groups. Categorical variables were compared using the Pearson's Chi-squared statistic, and Fisher's exact test when any cell counts in a contingency table of expected values were less than five. The Yates continuity correction was applied to contingency tables that had zero cell counts. The Student's t-test was used to compare continuous variables. All p-values reported are two-sided.

Multivariate analysis using logistic regression was undertaken using stepwise backward elimination to assess for confounding in the association between maternity care model and each of the birth outcomes. A separate model was built for each outcome. The following steps were repeated in the models to determine the association between model

of maternity care and the outcome. All variables that were thought to be clinically relevant were assessed for association with the outcome variable. Variables with a p-value <0.25 or of known clinical importance were included in the initial model. If the beta coefficient of the outcome variable changed by 10% or more after removing an independent variable, it was kept in the model as a confounder. All analyses were conducted using R Statistical Software 3.0.0.

### **3.2.5 Ethical considerations**

Permission to conduct this study was obtained from the UBC Clinical Research Ethics Board and the Stanton Territorial Health Authority Ethics Committee in Yellowknife, NWT. A research license, issued by the Aurora Research Institute, was obtained as required for all research conducted in the NWT. Through this licensing process the research proposal for this study was reviewed by the surrounding First Nations and Métis community organizations: the Akaitcho Territory Government, the Northwest Territory Métis Nation, the Salt River First Nation 195, and the Smith Landing First Nation.

### **3.3 Results**

The number of births in the three comparison groups were n=281, n=1388, and n=143 for the Fort Smith, Nunavik and Hay River cohorts, respectively. Compared to the women in the Nunavik cohort, the women in Fort Smith were older (mothers <20 years old: 14.3% in Fort Smith compared to 31.1% in Nunavik, p-value<0.001) and were less likely to have a parity greater than four (1.1% compared to 11.8% in Nunavik, p-value<0.001) (Table 1). The women in Fort Smith had varied ethnic backgrounds with the majority identifying as First Nations (40.1%), followed by 36.6% non-Aboriginal, 16.7%

Métis and 6.6% Inuit/Inuvialuit. The women in the Nunavik cohort were 99% Inuit/Inuvialuit. There were lower rates of smoking and substance use during pregnancy in Fort Smith compared to the Nunavik cohort (the rate of smoking during pregnancy was 31.8% compared to 76.0% in Nunavik,  $p$ -value $<0.001$ ; and the rate of substance use was 4.3% compared to 13.4% in Nunavik,  $p$ -value $<0.001$ ). Socio-demographic and lifestyle variables were not collected in Hay River.

The Fort Smith and Nunavik cohorts differed in several aspects of their obstetric histories: previous cesarean section (17.3% in Fort Smith compared to 3.2% in Nunavik,  $p$ -value $<0.001$ ), previous postpartum hemorrhage (3.9% in Fort Smith compared to 24.2% in Nunavik,  $p$ -value $<0.001$ ), and history of pregnancy-induced hypertension in a previous pregnancy (0.6% in Fort Smith compared to 7.5% in Nunavik,  $p$ -value $<0.001$ ). The rate of sexually transmitted infections in Fort Smith was significantly lower than in the Nunavik cohort (8.2% compared to 22.4%,  $p$ -value $<0.001$ ). The rates of hypertension, gestational diabetes or any other conditions arising in pregnancy were similar and low for Fort Smith and Nunavik (Table 1 **Error! Reference source not found.**). The rates of hypertension, gestational diabetes, preeclampsia, antenatal bleeding and placenta previa between Fort Smith and Hay River were similar and not statistically significantly different (Table 1).

The numbers of prenatal visits differed significantly between Fort Smith and the two comparison groups; Fort Smith had a mean of 13.9 (sd 4.4) compared to 11.4 (sd 6.3) in Nunavik ( $p$ -value $<0.001$ ), and of 9.3 (sd 3.2) in Hay River ( $p$ -value $<0.001$ ). In Fort Smith, the average number of primary care providers seen throughout the pregnancy (mean 2.0, sd 0.7) was significantly less than in Hay River (mean of 4.8, sd 2.4,  $p$ -value $<0.001$ ). The

number of primary care providers was not documented for the Nunavik cohort, but is likely to be higher as many locum midwifery teachers come to Nunavik to support the local midwives.

Forty two percent of women in Fort Smith gave birth in the community with midwives. In the Nunavik cohort, 83.3% of the births took place in either Puvirnituaq, Inukjuak or Salluit, with only 13.9% occurring in Montreal and 0.4% in Iqaluit. Among the women from Hay River, one delivered in the community, with the majority delivering in the level II hospital in Yellowknife (79%). There were significantly more intrapartum transfers in Fort Smith compared to Nunavik (6.8% compared to 1.2%,  $p$ -value<0.001). There were no differences in the rates of postpartum transfer between Fort Smith and Nunavik (Table 2).

**Table 1. Sociodemographic and pregnancy characteristics of cohorts**

<i>Characteristic</i>	<i>Fort Smith cohort (n=280)</i>	<i>Nunavik cohort (n=1377)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Maternal age, n (%)</b>		n=1346			
≤20	40 (14.3)	419 (31.1)	<0.001		
21-24	63 (22.5)	350 (26.0)			
25-28	66 (23.6)	247 (18.4)			
29-32	60 (21.4)	190 (14.1)			
33-36	32 (11.4)	98 (7.3)			
≥37	19 (6.8)	42 (3.1)			
<b>Parity, n (%)</b>		n=1347			
Primiparas (P0)	101 (36.1)	370 (27.5)	<0.001		
Multiparas (P1-P4)	176 (62.9)	818 (60.7)			
Grandmultiparas (P > 4)	3 (1.1)	159 (11.8)			
<b>Ethnicity, n (%)</b>	n=257	n=1356	<0.001		
Inuit/Inuvialuit	17 (6.6)	1343 (99.0)			
First Nations	103 (40.1)	5 (0.4)			
Metis	43 (16.7)	0 (0.0)			
Non-Aboriginal	94 (36.6)	8 (0.6)			
<b>Lifestyle, n (%)</b>					
Smoking	89 (31.8)	1046 (76.0)	<0.001		
Alcohol	34 (12.1)	201 (14.6)	0.33		
Substance use	12 (4.3)	184 (13.4)	<0.001		
Physical violence	6 (2.1)	55 (4.0)	0.19		
	n= 208	n=80			
Weight before pregnancy, kg, mean (sd)	75.5 (43.5)	60.1 (11.0)	<0.001		
Weight gain, kg, mean (sd)	15.1 (9.7)	9.5 (4.9)	<0.001		
<b>Obstetric history in prior pregnancy, n (%)*</b>	n=179	n=977			
Previous Cesarean section	31 (17.3)	31 (3.2)	<0.001		
Postpartum hemorrhage	7 (3.9)	236 (24.2)	<0.001		
Gestational diabetes	5 (2.8)	38 (3.9)	0.62		
Pregnancy induced hypertension	1 (0.6)	73 (7.5)	<0.001 <sup>a</sup>		

<i>Characteristic</i>	<i>Fort Smith cohort (n=280)</i>	<i>Nunavik cohort (n=1377)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Conditions arising in current pregnancy, n (%)</b>					
Sexually transmitted infections	23 (8.2)	308 (22.4)	<0.001		
Urinary tract infections	32 (11.4)	159 (11.5)	1.00		
Hypertension	13 (4.6)	83 (6.0)	0.45	6 (4.2)	1.00
Gestational diabetes	13 (4.6)	47 (3.4)	0.41	7 (4.9)	1.00
Preeclampsia	5 (1.8)	44 (3.2)	0.25	0	0.17 <sup>a</sup>
Antenatal bleeding	6 (2.1)			1 (0.7)	0.72 <sup>a</sup>
Placental abruption		13 (0.9)		0	
Placenta previa					
Intrauterine growth restriction	1 (0.4) 0	7 (0.5) 16 (1.2)	1.00 <sup>a</sup> 0.09 <sup>a</sup>	1 (0.7) 0	1.00 <sup>a</sup>
<b>Number of prenatal visits, mean (sd)</b>	13.9 (4.4)	11.4 (6.3)	<0.001	9.3 (3.2)	<0.001
<b>Number of care providers, mean (sd)</b>	2.0 (0.7)			4.8 (2.4)	<0.001

\*The denominator for obstetric history is all multiparous women

<sup>a</sup>Fisher's exact test

The adjusted odds ratio (aOR) of 1-minute APGAR scores less than 7 in Fort Smith compared to Nunavik, adjusted for maternal age, parity and gestational age, was 2.15 (95% CI 1.30-3.51). The aOR of 5-minute APGAR scores less than 7 between Fort Smith and Nunavik (aOR 2.07, 95% CI 0.30-9.12) was not statistically significant. APGAR scores were not documented on available records from public health nursing in Hay River.

The rate of cesarean section in Fort Smith was 15.3% compared to 2.2% (p-value <0.001) in Nunavik and 20% (p-value <0.001) in Hay River. The aOR of cesarean section in Fort Smith compared with Nunavik was 3.96 (95% CI 2.03-7.85). The odds of cesarean section in Fort Smith was approximately half of that for Hay River although this difference was not statistically significantly different (aOR 0.55, 95% CI 0.29-1.02). For the



comparisons with Hay River we were unable to adjust for maternal age, parity or indicators of lifestyle as these data elements were not collected.

Women in Fort Smith were more likely to have an induction of labour (aOR 1.78, 95% CI 1.15-2.73), an augmentation of labour (OR 11.05, 95% CI 7.87-15.58), and epidural analgesia (aOR 5.26, 95% CI 3.22-8.63) compared to Nunavik. Compared to Hay River, women in Fort Smith were less likely to have an induction of labour (aOR 0.24, 95% CI 0.14-0.41). Differences in rates of episiotomy were not statistically significant.

Compared to Nunavik, the rate of 3<sup>rd</sup>/4<sup>th</sup> degree perineal tears in Fort Smith was reduced (aOR 0.23, 95% CI 0.03-0.85); as was the rate of intrapartum blood loss 500-1000 mL (aOR 0.48, 95% CI 0.33-0.69) and >1000 mL among vaginal deliveries (aOR 0.31, 95% CI 0.09-0.79). The rates of prolapsed cord in Fort Smith and Nunavik were the same (Table 2). There was no statistically significant difference for the odds of 3<sup>rd</sup>/4<sup>th</sup> degree perineal tears when comparing Fort Smith to Hay River, or in the rates of 2<sup>nd</sup> degree perineal tears between Fort Smith and either comparison group (Table 2). There were no maternal deaths in Fort Smith.

Newborns in Fort Smith, compared to Nunavik had a reduced odds of premature birth <37 weeks (aOR 0.25, 95% CI 0.12-0.47), and comparably low rates of premature birth <32 weeks (Table 3). There were no statistically significant differences when comparing Fort Smith to the Nunavik cohort for the adjusted odds of low birth weight <2500g, high birth weight >4000g or >4500g, or stillbirth (Table 3). The rates of congenital anomalies were not statistically significantly different, however Fort Smith had a higher rate compared to Nunavik. Nunavik reported five neonatal deaths while Fort Smith had zero, however this

difference was not statistically significant (Table 3). When comparing Fort Smith to Hay River there were no statistically significant differences in the aORs for preterm birth <37 weeks (aOR 1.25, 95% CI 0.46-3.45). After adjustment for confounders there were no differences in odds of low birth weight <2500g or congenital anomalies between the two cohorts (Table 3). Mothers in Fort Smith had higher rates of breastfeeding initiation compared to Nunavik (91% versus 69.8%, p-value<0.001) and higher rates of exclusive breastfeeding at six weeks (78.4% versus 37.0%, p-value<0.001) (Table 3). Compared to Nunavik, the OR of breastfeeding initiation in Fort Smith was 4.34 (95% CI, 2.86-6.88), and the aOR of exclusive breastfeeding at 6 weeks postpartum was 2.34 (95% CI, 1.09-5.11).

**Table 2. Place of birth, labour management and maternal outcomes of cohorts**

<i>Characteristic</i>	<i>Fort Smith cohort (n=280)</i>	<i>Nunavik cohort (n=1377)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Place of birth, n (%)</b>	n=281	n=1388			
Fort Smith cohort					
Homebirth	5 (1.8)				
Fort Smith Health Centre	120 (42.7)				
Level I elsewhere	6 (2.1)				
Hospital Level II	112 (39.9)				
Hospital Level III	37 (13.2)				
Other	1 (0.4)				
Nunavik cohort					
Nursing station		16 (1.2)			
Puvirnituk (Hudson coast)		791 (57.0)			
Inukjuak (Hudson coast)		253 (18.2)			
Salluit (Hudson coast)		113 (8.1)			
Kuujjuak (Nunavik Ungava coast)		6 (0.4)			
Montreal		193 (13.9)			
Iqaluit (Nunavut)		5 (0.4)			
Other		11 (0.8)			
Hay River cohort					
Level II (Yellowknife)				113 (79.0)	
Level III (Edmonton)				10(7.0)	
Unknown hospital acuity				20(14.0)	
<b>Birth attendant, n (%)</b>		n=1290			
Midwife	137 (48.9)	1112 (86.2)	<0.001 <sup>a</sup>		
Physician	139 (49.6)	176 (13.6)			
Nurse	4 (1.4)	0 (0.0)			
Unattended	0	2 (0.2)			
<b>Transfers, n (%)</b>					
Transfer due to condition arising in pregnancy	21 (7.5)	156 (11.3)	0.07		
Planned birth outside of community	124 (44.1)	195 (14.2)	<0.001		
Intrapartum for preterm birth	19 (6.8)	16 (1.2)	<0.001		
Intrapartum emergency (>37 weeks)	12 (4.3)	7 (0.5)	<0.001		
Postpartum emergency	3 (1.1)	10 (0.7)	0.44 <sup>a</sup>		
<b>Obstetric intervention</b>					
<b>Electronic fetal monitoring, n (%)</b>	88 (31.3)				

<i>Characteristic</i>	<i>Fort Smith cohort (n=280)</i>	<i>Nunavik cohort (n=1377)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Labour management, n (%)*</b>	n=259	n=1371		n=117	
<b>Induction</b>	41 (15.8)	108 (7.9)	<0.001	48 (41.0)	<0.001
Syntocinon	7 (17.1)	74 (68.5)	<0.001 <sup>a</sup>		
Prostin	28 (68.3)	1 (0.9)			
A.R.M.	6 (14.6)	0 (0.0)			
Herbs	0	2 (1.9)			
Unknown		31 (28.7)			
<b>Augmentation</b>	99 (38.2)	78 (5.7)	<0.001		
Syntocinon	29 (29.0)	63 (80.8)	<0.001 <sup>a</sup>		
A.R.M.	69 (69.0)	0			
Herbs	0	3 (3.8)			
Other	1 (1.0)	12 (15.4)			
<b>Analgesia/anesthesia, n (%)</b>					
Epidural analgesia	46 (17.8)	40 (2.9)	<0.001 <sup>a</sup>		
General	1 (0.4)	1 (0.07)			
<b>Mode of delivery, n (%)</b>	n=281	n=1329			
Vaginal	233 (82.9)	1290 (97.1)	<0.001 <sup>a</sup>	92 (70.8)	<0.001 <sup>a</sup>
Vacuum	4 (1.4)	9 (0.7)		12 (9.2)	
Forceps	1 (0.4)	1 (0.1)		0 (0.0)	
Cesarean section	43 (15.3)	29 (2.2)		26 (20.0)	
<b>Episiotomy (vaginal births), n (%)</b>	8 (3.4)	15 (1.2)	0.06	1 (1.1)	0.17
<b>Labour characteristics</b>					
<b>Length of labour, minutes, mean (sd)</b>					
First stage	329.1 (239.0)	479 (365.8)	<0.001		
Second stage	43.2 (55.6)	32.7 (69.3)	0.01		
Third stage	43.9 (29.3)	43 (28.5)	0.65		
<b>Time from rupture of membranes until delivery, n (%)</b>	n=186	n=1132			
<12 hours	168 (90.3)	1037 (91.6)	<0.001		
12-24 hours	11 (5.9)	40 (3.5)			
>24 hours	7 (3.8)	55 (4.9)			
<b>Maternal outcomes</b>					
<b>Labor complications, n (%)</b>					
Prolapsed cord	2 (0.7)	9 (0.7)	0.70 <sup>a</sup>		
Shoulder dystocia	8 (2.9)				

<i>Characteristic</i>	<i>Fort Smith cohort (n=280)</i>	<i>Nunavik cohort (n=1377)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Perineal tears (vaginal births), n (%)</b>	n=233	n=1290		n=92	
First degree	85 (36.5)	151 (11.7)	<0.001	1 (1.1)	<0.001 <sup>a</sup>
Second degree	29 (12.4)	119 (9.2)	0.29	7 (7.6)	0.06
Third/fourth degree	2 (0.9)	31 (2.4)	0.17	0	0.54 <sup>a</sup>
<b>Blood loss, n (%)</b>					
<b>Vaginal delivery</b>					
Blood loss 500-1,000 mL	45 (19.3)	461 (35.7)	<0.001		
Blood loss >1,000 mL	4 (1.7)	77 (6.0)	0.01		
Blood transfusion	0	15 (1.2)	0.15 <sup>a</sup>		
<b>Cesarean delivery</b>					
Blood loss 500-1,000 mL	29 (67.4)				
Blood loss >1,000 mL	2 (4.7)				
Blood transfusion	0				
<b>Syntocinon third stage (vaginal births), n (%)</b>	215 (98.2)	485 (37.5)	<0.001		
<b>Length of hospital stay, hours, mean (sd)</b>	44.9 (33.5)	43.9 (100.8)	0.78		

<sup>a</sup>Fisher's exact test

\*Planned Cesarean births excluded

**Table 3. Neonatal outcomes of cohorts**

<i>Characteristic</i>	<i>Fort Smith cohort (n=281)</i>	<i>Nunavik cohort (n=1388)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Multiples, n (%)</b>	2 (0.7)	21 (1.5)	0.41	0	0.55
<b>Presentation at delivery, n (%)</b>					
Cephalic	202 (71.9)	1263 (91.0)	0.009		
Breech	8 (2.8)	20 (1.4)	0.06		
<b>Gestational age, n (%)</b>				n=137	
Preterm births (<32 weeks)	0 (0.0)	18 (1.3)	0.06 <sup>a</sup>	1 (0.7)	0.33 <sup>a</sup>
Preterm births (<37 weeks)	10 (3.6)	137 (9.9)	<0.001	11 (8.1)	0.08
<b>APGAR &lt;7 at 1 min, n (%)</b>	34 (12.2)	81 (5.9)	<0.001		
<b>APGAR &lt;7 at 5 min, n (%)</b>	2 (0.7)	10 (0.7)	1.00 <sup>a</sup>		
<b>Resuscitation, n (%)</b>					
Bag and mask	22 (7.8)	44 (3.2)	0.001	5 (3.5)	0.12
Deep suction	0	50 (3.6)	<0.01	0	
Tracheal Intubation	2 (0.7)	13 (0.9)	1.00	0	0.55
<b>Birth weight, mean (sd)</b>	3707.7 (547.9)	3418.3 (545.7)	<0.001	3646.2 (561.8)	0.31
<b>Birth weight, n (%)</b>	n=277	n=1314		n=122	
<2500g	3 (1.1)	62 (4.7)	0.009	4 (3.3)	0.21 <sup>a</sup>
>4000g	74 (26.7)	156 (11.9)	<0.001	32 (26.2)	1.00
>4500g	19 (6.9)	21 (1.6)	<0.001	6 (4.9)	0.61
<b>Head circumference, cm, mean (sd)</b>	29.4 (9.1)	26.9 (8.3)	<0.001		
<b>Length, cm, mean (sd)</b>	51.9 (3.1)	50.2 (2.8)	<0.001		
<b>Antibiotics given, n (%)</b>	n=263				
None	258 (98.1)				
Prophylactic	3 (1.1)				
Treatment	2 (0.8)				
<b>NICU admission, n (%)</b>					
Level I nursery	13 (4.7)				
Level II nursery	9 (3.2)				
Level unknown				3 (2.1)	

<i>Characteristic</i>	<i>Fort Smith cohort (n=281)</i>	<i>Nunavik cohort (n=1388)</i>	<i>P-value</i>	<i>Hay River cohort (n=143)</i>	<i>P-value</i>
<b>Neonatal transfer, n (%)</b>	5 (1.8)	124 (8.9)	<0.001		
<b>Congenital anomalies, n (%)</b>	10 (3.6)	25 (1.8)	0.09	1 (0.7)	0.11
<b>Feeding at birth, n (%)</b>	n=266	n=1197			
Breast milk	242 (91.0)	835 (69.8)	<0.001		
Formula	11 (4.1)	316 (26.4)			
Mixed	13 (4.9)	46 (3.8)			
<b>Feeding at 6 weeks, n (%)</b>	n=236	n=46			
Breast milk	185 (78.4)	17 (37.0)	<0.001		
Formula	27 (11.4)	21 (45.7)			
Mixed	24 (10.2)	8 (17.4)			
<b>Stillbirth, n (%)§</b>	3 (1.0)	4 (0.3)	0.10	1 (0.7)	1.00
	0	5 (0.4)	1.00	0	
<b>Neonatal death &lt; 28 days, n (%)</b>					
<b>Infant death &lt; 1 year, n (%)</b>	1 (0.4)				

<sup>a</sup>Fisher's exact test

§ Two of the three still births were antepartum and one intrapartum

**Table 4. Unadjusted and adjusted odds ratios for Fort Smith versus the Nunavik cohort and Hay River cohort**

<i>Intervention/Maternal outcome</i>	<i>Odds Ratios (95% CI)</i>			
	<i>Fort Smith vs Nunavik cohorts</i>		<i>Fort Smith vs Hay River cohorts</i>	
	<i>Unadjusted</i>	<i>Adjusted</i>	<i>Unadjusted</i>	<i>Adjusted</i>
<b>Obstetric intervention</b>				
Cesarean section	8.10 (4.98-13.35)	3.96 (2.03-7.85) <sup>1,2,3,4</sup>	0.72 (0.42-1.25)	0.55 (0.29-1.02) <sup>4</sup>
Induction	2.20 (1.48-3.22)	1.78 (1.15-2.73) <sup>1,3</sup>	0.27 (0.16-0.44)	0.24 (0.14-0.41) <sup>10</sup>
Augmentation	11.05 (7.87-15.58)			
Epidural	7.19 (4.60-11.28)	5.26 (3.22-8.63) <sup>3</sup>		
Episiotomy (vaginal births)	2.66 (1.01-6.39)	1.47 (0.51-3.76) <sup>2,4</sup>	3.22 (0.56-60.57)	
<b>Maternal outcomes</b>				
Prolapsed cord	1.13 (0.17-4.40)			
Third/fourth degree tears (vaginal births)	0.36 (0.06-1.21)	0.23 (0.03-0.85) <sup>1,2</sup>	0.92 (0.09-19.92)	
Blood loss (vaginal births)				
500-1,000 mL	0.43 (0.30-0.60)	0.48 (0.33-0.69) <sup>3</sup>		
>1,000 mL	0.27 (0.08-0.67)	0.31 (0.09-0.79) <sup>2,3</sup>		
<b>Neonatal outcomes</b>				
Preterm births (<37 weeks)	0.32 (0.16-0.59)	0.25 (0.12-0.47) <sup>2,3</sup>	0.43 (0.17-1.04)	1.25 (0.46-3.45) <sup>11</sup>
APGAR <7 at 1 min	2.14 (1.39-3.24)	2.15 (1.30-3.51) <sup>1,2,5</sup>		
APGAR <7 at 5 min	0.95 (0.15-3.64)	2.07 (0.30-9.12) <sup>5</sup>		
Birth weight				
<2500g	0.22 (0.05-0.60)	0.66 (0.12-2.60) <sup>1,2,3,5,6</sup>	0.43 (0.12-1.57)	1.09 (0.10-14.71) <sup>5,11</sup>
>4000g	2.70 (1.96-3.68)	1.26 (0.30-2.55) <sup>1,3,5,7,8</sup>	1.02 (0.63-1.67)	0.85 (0.47-1.54) <sup>5,11,8</sup>
>4500g	4.52 (2.38-8.54)	2.31 (0.58-11.70) <sup>1,3,5,7,8</sup>	1.42 (0.58-3.98)	0.89 (0.29-2.92) <sup>5,11,8</sup>
Congenital anomalies	2.04 (0.93-4.18)	1.85 (0.83-3.84) <sup>2</sup>	5.32 (1.00-98.10)	4.98 (0.72-12.45) <sup>4</sup>
Stillbirth	3.75 (0.73-17.09)	2.88 (0.54-13.81) <sup>1,9</sup>	1.54 (0.19-31.24)	
Exclusive breastfeeding				
At birth	4.34 (2.86-6.88)			
At 6 weeks	3.94 (2.07-7.72)	2.34 (1.09-5.11) <sup>2,3,5</sup>		

Adjusted for: <sup>1</sup>maternal age, <sup>2</sup>parity, <sup>3</sup>smoking during pregnancy, <sup>4</sup>previous cesarean section, <sup>5</sup>gestational age, <sup>6</sup>substance use during pregnancy, <sup>7</sup>pre-pregnancy weight, <sup>8</sup>gestational diabetes, <sup>9</sup>physical violence during pregnancy, <sup>10</sup>pregnancy-induced hypertension, <sup>11</sup>number of prenatal visits



### 3.4 Discussion

We chose to compare 1-minute APGAR scores less than 7 as our primary outcome as it reflects the intrapartum period and is thus an indicator of the safety of community birth. The 1-minute APGAR represents the newborn's condition at the time of most severe depression after birth (Apgar, Holaday, James, & Weisbrot, 1985), however this score alone does not correlate with the future outcomes of the newborn (American Academy of Pediatrics, 2006). The 5-minute APGAR score is a better predictor of survival during the neonatal period (Casey et al., 2001). Newborns in Fort Smith had increased odds of 1-minute APGAR scores below 7 compared to the Nunavik cohort. However, there were no statistically significant differences in the odds of 5-minute APGAR scores less than 7. The rate of APGAR scores below 7 at 1 minute in Fort Smith (12.2%) was similar to rates reported in BC for midwife-attended (10.1%), and physician-attended births (12.9%) among low-risk women who planned hospital births (Janssen et al., 2007). In the same study, the rate of low APGAR scores at 5 minutes was 0.2% among midwife-attended births and 0.7% among physician-attended births (Janssen et al., 2007); this is consistent with our study which reports a rate of 0.7% for 5-minute APGAR less than 7 in both Fort Smith and the Hudson coast communities. The low rate of 5-minute APGAR scores less than 7 indicates that the newborns responded to resuscitation. As mentioned previously, the competencies of midwives in Fort Smith and the Hudson coast communities for neonatal resuscitation include intubation, endotracheal suction and umbilical vein catheterization. APGAR scores were not reported in the data we received from the Department of Health and Social Services, but were included in the data from Stanton Territorial Hospital in

Yellowknife (not shown). When comparing Fort Smith to the latter data set (women residing in Hay River who delivered in Yellowknife), the rates of 1-minute APGAR scores below 7 were similar (12.2% in Fort Smith compared to 15.4% in Yellowknife). In our model for low APGAR score at 1 minute, we adjusted for maternal age, parity, and gestational age. Studies have reported that low APGAR scores are associated with use of epidural analgesia, low birth weight <2500g, and high birth weight >4500g (Thorngren-Jerneck & Herbst, 2001), however, these variables did not confound the association between maternity care model and APGAR scores less than 7 in our study.

Among maternal outcomes, the differences in rates of 3<sup>rd</sup>/4<sup>th</sup> degree perineal tears and episiotomy between Fort Smith and the two comparison groups were small and not statistically significant. Women in Fort Smith had reduced odds of intrapartum blood loss compared to Nunavik. High rates of postpartum hemorrhage among Inuit populations have been documented elsewhere (Van Wagner et al., 2007, 2012). It is possible that the higher rates of intrapartum blood loss in the Hudson coast communities compared to Fort Smith could be associated with ethnicity, as several studies report that various ethnicities (Asian and Hispanic) are associated with increased risk of postpartum hemorrhage (Combs, Murphy, & Laros, 1991; Magann et al., 2005). Another explanation for this finding could be differences in diet and nutritional status, which were not captured in our study.

In Fort Smith, women had increased odds of obstetric interventions (cesarean section, induction of labour and epidural analgesia) compared to Nunavik. Higher rates of cesarean section and epidural in Fort Smith may be attributed in part to the births conducted in hospital after elective transfers. Women in Fort Smith were less likely to give

birth in their communities than the women in the Hudson coast communities (44.5% compared to 83.3%). This is most likely explained by the policy in Fort Smith of having travel costs assumed by the NWT for elective evacuation, in contrast to Nunavik, where the costs of transferring to Montreal are reimbursed to women only if the transfer is medically indicated. When limiting our comparison to women who were deemed appropriate for community birth by the MCC, we found that women who elected to give birth outside of Fort Smith had higher rates of cesarean section (17.4% versus to 5.4%, p-value <0.05) and epidural (38.5% versus to 7.6%, p-value <0.001) than women who planned to give birth in Fort Smith (data not shown). We cannot say definitively that this difference is due to the birth attendants because the women who received an epidural or cesarean section while delivering in a hospital other than Fort Smith may have required this even if they had planned a community birth with midwives. However many studies, including a Cochrane Review, have reported higher rates of obstetric intervention among physician-led births compared to midwife-led births (Hatem, Sandall, Devane, Soltani, & Gates, 2009; Janssen et al., 2007).

Despite the increased odds of cesarean section in Fort Smith compared to Nunavik, the rates in both cohorts were lower when compared to the NWT overall and Nunavut, respectively (22.5%, 95% CI 19.4–25.9, and 9.9%, 95% CI 7.8–12.2) (Public Health Agency of Canada, 2008). We chose to contextualize outcomes from our study using territorial rates reported by the Public Health Agency of Canada. Nunavut was used to compare outcomes from Nunavik because these two populations are more similar to each other geographically and sociodemographically than Nunavik is to the province of Quebec.

When comparing Fort Smith with Hay River, the odds of cesarean section were similar, however we did not have the power to detect a clinically meaningful difference as small as the observed difference of 5% for this outcome. Women in Fort Smith had reduced odds of induction for labour compared to Hay River. The rate of induction in Fort Smith was 15.8% compared to 41.0% in Hay River ( $p < 0.001$ ). Other studies comparing midwife-led to physician-led deliveries also found decreased rates of induction for labour (Janssen et al., 2007; Turnbull et al., 1996). This finding is also supported by a study that reported that rural women living 2-4 hours from maternity care with cesarean section capability had the highest rates of induction when compared to rural women who had access to maternity care in their community (Grzybowski et al., 2011). Alternatively, it may be accessibility to obstetric intervention that influences the rates of cesarean section and epidural rather than distance traveled to receive care or birth attendant. A study by Janssen et al. reports statistically significantly increased rates of obstetric intervention (augmentation of labour, epidural analgesia, assisted vaginal delivery, episiotomy and cesarean section) when comparing hospital births attended by midwives to home births attended by midwives among women of similar low-risk status (Janssen et al., 2009).

Newborns in Fort Smith had similar odds of low birth weight  $< 2500\text{g}$  and high birth weight  $> 4500\text{g}$  compared to Hay River. When comparing the adjusted odds of low and high birth weight in Fort Smith and Nunavik there was no statistically significant difference. However, the crude odds of low birth weight in Fort Smith was one fifth of the odds in the Nunavik cohort. Furthermore, the crude odds of high birth weight babies was increased in Fort Smith compared to the Nunavik cohort which is consistent with the Canadian

Perinatal Health Report (2008) that reported the NWT as having the highest rate of large-for-gestational-age babies in Canada (20.4%, 95% CI 17.3-23.8). High birth weight is associated with excess gestational weight gain and is a risk factor for maternal and neonatal outcomes such as prolonged labour, cesarean delivery, shoulder dystocia, meconium aspiration, and perinatal asphyxia (Boulet, Alexander, Salihu, & Pass, 2003). There were no differences in the rates of gestational diabetes in the three comparison groups, however women in Fort Smith weighed statistically significantly more than women in Nunavik before pregnancy. There was also a statistically significant difference in weight gain between women in Fort Smith and the Hudson coast communities. A study from Newfoundland reported that appropriate gestational weight gain for women of normal BMI is between 11.5-16 kg, and for overweight and obese women the appropriate gestational weight gain is less (7-11.5 kg) (Crane, White, Murphy, Burrage, & Hutchens, 2009). In the study by Crane et al., excess gestational weight gain was associated with higher rates of birth weight >4000 g (2009). The average weight gain during pregnancy in Fort Smith was 15.1 kg, indicating that women may be gaining weight in excess during pregnancy; this could be contributing to the higher rate of newborns weighing >4500 g in Fort Smith compared to the Hudson coast communities.

The odds of preterm birth <37 weeks were reduced in Fort Smith compared to Nunavik, and were similar to Hay River. Our model comparing rates of preterm birth between Fort Smith and Nunavik was adjusted for parity and smoking during pregnancy. Although the rate of sexually transmitted infections was significantly higher in the Nunavik cohort than in Fort Smith, it was not a confounder in our model for preterm birth. High

rates of preterm birth among Inuit and First Nations populations compared to French/English speaking populations in Quebec have been previously documented (Auger et al., 2012). Muggah et al. found that Inuit women from the Baffin Region of Nunavut who delivered preterm (<37 weeks) and those that delivered at term (>37 weeks) did not differ in many aspects of prenatal risk; however, there was a statistically significant difference in the number of prenatal visits, with those who delivered preterm having fewer visits (Muggah, Way, Muirhead, & Baskerville, 2004). While one literature review suggests that the number of prenatal visits is not associated with preterm birth (Fiscella, 1995), several studies investigating the outcomes associated with group prenatal care suggest that the quality of prenatal care can impact gestational age (J. R. Ickovics, Kershaw, & Westdahl, 2007; J. Ickovics, 2003). The number of prenatal visits in Fort Smith was significantly higher than in the Nunavik cohort, and with only two possible primary care providers in Fort Smith it is likely that the women in Fort Smith experienced greater continuity of care compared to the Hudson coast communities. From our review of the charts in Fort Smith it was evident that women were trusting of the midwives as they were disclosing histories of depression and abuse. In our focus groups (described in Chapter 4) the women who used the Fort Smith Midwifery Program spoke of their trust in the midwives and the strong relationships that developed over the course of their care. The quality of prenatal care in Fort Smith could be influencing the rates of preterm birth, however more studies are needed to investigate this.

Furthermore, the difference in preterm birth rates between Fort Smith and the Hudson coast communities could be due to the differences in health service delivery. The

Inuulitsivik midwifery program serves seven communities, however there are only birthing centres in the three largest communities. Previously, women residing in the four smaller communities would receive antenatal care by a nurse in the community with consultations by the midwives at one of the birth centers. If a woman needed to be assessed non-urgently by a midwife she would fly to Puvirnitug; if it was an urgent assessment she would be transported by medevac accompanied by a midwife, nurse and doctor. Within the past five years it has become more common for the midwives to schedule visits to fly into the communities to provide antenatal care. Thus antenatal appointments are increasingly being provided by midwives in every community. Twenty five percent of the Hudson coast population resides in the four smallest communities where women still have to travel to deliver their babies (Van Wagner et al., 2007). The 25% of women who live in communities without local intrapartum care could experience a different quality of prenatal care as well as increased stress due to the lack of skilled birth attendants in their community of residence. For many years, stress and other psychological factors have been studied for their association with preterm birth (Dayan et al., 2006). While anxiety has not been associated with preterm birth, stress and depression have (Austin & Leader, 2000; Dayan et al., 2006). The rate of preterm birth <37 weeks in Nunavut was similar to the rate reported for the Hudson coast communities in this study (12.2%, 95% CI 9.9–14.7 compared to 9.9% in the Nunavik cohort) (Public Health Agency of Canada, 2008).

The crude OR comparing Fort Smith to Hay River shows a reduced odds of preterm birth in Fort Smith. However after adjustment for number of prenatal visits, the odds increased in Fort Smith. This is possibly due to the non-linear relationship between the

number of prenatal visits and high-risk pregnancies; while fewer prenatal visits could be associated with poorer outcomes, as could excess prenatal visits which might indicate a pregnancy requiring increased medical attention. The rate of preterm birth <37 weeks in Fort Smith (3.6%) was lower than the territorial rate in NWT during 2004-2005 of 9.5% (95% CI 7.3–12.0) (Public Health Agency of Canada, 2008).

The rates of breastfeeding initiation in Fort Smith and Nunavik were statistically significantly different however they were similar to those reported for the NWT and Nunavut in 2005 (93.6%, 95% CI 86.7-100.6, and 73.7%, 95% CI 50.3-97.1) (Public Health Agency of Canada, 2008). In our study, parity, smoking during pregnancy, and gestational age were confounders for exclusive breastfeeding at 6 weeks (we found no confounders for breastfeeding initiation). Another possible reason for lower rates of breastfeeding in the Nunavik cohort could be the custom of adoption among family members. Thirty percent of babies in the Nunavik cohort were adopted, of which only 16% of adoptive parents were not related to the baby (data not shown).

Our comparison of Fort Smith with the Hudson coast communities and Hay River provides insight into the safety of returning community birth to rural and remote communities with midwife-led care in the absence of cesarean section capability. These three models of maternity care were different, however similarities exist in the competencies of the midwives in Fort Smith and Nunavik, and the interdisciplinary support by physicians and nurses in the local and referral hospitals. The midwives in Fort Smith and the Hudson coast communities provide antenatal care to all women in the community and thus serve a higher risk population than southern, urban midwives. Due to the “all-



risk” population and lack of local cesarean section capability it is imperative that northern remote midwives have strong interprofessional relationships with physicians and obstetricians in referral centres. In Fort Smith the MCC was established to create open communication and coordination of care between the local midwifery program and the regional referral centre in Yellowknife (DPRA Consultants, 2012). At the Inuulitsivik Midwifery Program the Perinatal Review Committee, which consist of midwives, students, nurses and physicians meets weekly to discuss care plans for near-term cases (Epoo et al., 2012). Sutherns wrote that there are three reasons why rural and remote midwives should develop strong interdisciplinary relationships with care providers in their community: first, midwives are in a position to detect struggles at home with violence or depression through their home visits, second, to maintain a caseload midwives may depend on referrals from physicians in the area, and third, midwives need backup from physicians and nurses for emergency situations. The interprofessional cooperation in both Fort Smith and the Hudson coast communities has contributed to the success of the programs and the ability to properly identify higher risk pregnancies.

Our research is relevant to rural communities in Canada and internationally where policies to implement community birth with regulated midwife attendants are under consideration. This comparison was carried out in two rural and remote populations that varied geographically and ethnically; the findings from Fort Smith may be more relevant to the majority of rural communities in Canada than those from the Hudson coast communities, as Fort Smith has a more diverse ethnic population and is less isolated geographically compared to Nunavik. The Fort Smith Midwifery Program has enabled

many women to have the opportunity to deliver their baby in their own community, supported by family and friends—something that many Canadian families residing in rural and remote communities do not experience.

### **3.4.1 Strengths and limitations**

This study was subject to limitations inherent to retrospective chart reviews. For example, we had access to very few outcome measurements in the Hay River data compared to the Fort Smith and Nunavik data; a limitation that could be addressed in future prospective studies by creating a central repository for birth outcomes of women residing in Hay River regardless of where they deliver. In addition to the factors that we adjusted for when comparing Fort Smith to Nunavik, there could be additional underlying health issues such as nutrition and food security, and socioeconomic differences such as education, income and marital status that could have influenced our findings. These unmeasured variables could have confounded our results for outcomes such as preterm birth and low birth weight (Blumenshine, Egerter, Barclay, Cubbin, & Braveman, 2010). This study had inadequate power to study assess congenital anomalies, stillbirth, neonatal mortality, infant mortality and maternal mortality.

Strengths of this study include the ability to collect detailed clinical data from Fort Smith which allowed us to report on many relevant maternal and newborn outcomes. Our data collection tool for Fort Smith was designed to incorporate data similar to that which was reported in studies from the Inuulitsivik maternities, facilitating our comparison of several maternal and newborn outcomes for this and future studies.

### **3.5 Conclusion**

Our study demonstrates that the midwife-led model of maternity care in Fort Smith, in which women can choose to give birth in the community or in a level II hospital, does not appear to be associated with increased risk to mothers or newborns. Previous studies have reported outcomes to suggest that rural and remote midwifery is safe (Simonet et al., 2009; Stoll & Kornelsen, 2014; Van Wagner et al., 2007, 2012). Our study adds to these findings by reporting on the comparative safety of two communities with midwife-led care and one with routine evacuation for childbirth. Our conclusions are limited by our retrospective study design, but nevertheless this first study of community birth in the western Arctic should support policy to expand midwife-led models of maternity care in other rural communities. Our data confirm that the increased rates of interventions in Fort Smith compared to Nunavik occurred among low-risk women who chose to deliver elsewhere with physicians and this finding should trigger discussion among decision-makers as to the continuation of territorial payments for elective evacuation. In Canada, midwife-led maternity care is expanding to rural and remote areas as the midwifery force grows (Stoll & Kornelsen, 2014). Future studies of maternity care models in rural and remote communities should aim to achieve adequate power to detect differences in rare outcomes (perinatal mortality and stillbirth) by using multiple concurrent comparison cohorts. Our findings support the development and evaluation of midwife-led models of maternity care in rural and remote communities.

## **Chapter 4: The experiences of community birth in Fort Smith, NWT: A qualitative study**

### **4.1 Introduction**

Experiences of maternity care and childbirth have been studied in rural and remote areas of Canada where access to care has recently been discontinued (Kornelsen et al., 2005). Kornelsen and colleagues reported that families who did not have access to care in their communities identified this as a cause of stress—having to leave the community for childbirth, and to either bring older children to the referral community or leave them behind—and financial burden (Kornelsen et al., 2005). In a study by Chamberlain et al., the psychosocial implications of transferring to a referral community were studied by comparing two remote northern Inuit communities: one with a midwife-led health centre and one with access to nurses but no resident physician (Chamberlain & Barclay, 2000). The women from the community with access to midwives reported that they had more choices offered to them during their pregnancy, labour and delivery, that they felt more supported by their loved ones and that they experienced less stress than the women from the community where evacuation was required for everyone (Chamberlain & Barclay, 2000). Sutherns and Bourgeault conducted interviews in three rural towns in Ontario and two in Alberta (2008). Midwifery services were available in four of the five towns, but levels of awareness and use of the service among women varied (Sutherns & Bourgeault, 2008). Sutherns et al. wrote that, similar to studies from other remote areas, their findings revolved around the stress of having to travel when local care is not available, having to

leave loved ones, arranging child care and receiving care from an unknown provider (Sutherns & Bourgeault, 2008).

There are fewer studies about the experiences of rural and remote women in a northern setting where access to midwives for their prenatal, intrapartum, and postpartum care was recently re-established. What is missing from the literature is an understanding of how midwifery services and community birth with midwives has been experienced by women who have gained access to it in their communities—such as the women residing in Fort Smith, NWT—and what community birth means to these women.

This exploratory study investigated women’s experiences of using a rural midwifery service and the meaning of community birth with midwives to the women in Fort Smith. Further questions were asked to elicit opinions on how new knowledge of the Fort Smith Midwifery Program and the women’s stories of community birth could be shared with a wider audience

## **4.2 Methods**

### **4.2.1 Study design**

Qualitative description was utilized as an inductive approach to describe participants’ experiences and perceptions of community birth. Qualitative description differs from other methods in that the goal is not to create new theories or to look for deeper meanings in the data (Neergaard, Olesen, Andersen, & Sondergaard, 2009), but rather, to focus on trying to capture the experience of the participants (Milne & Oberle, 2005). Unlike traditional qualitative methods such as ethnography or phenomenology, qualitative description is not

heavily grounded in any one theory but uses existing knowledge and “thoughtful linkages” between the clinical experiences of the research group (Neergaard et al., 2009).

Focus groups are often used in qualitative description method to gain a broad insight into a topic (Neergaard et al., 2009) and to diminish the role of the researcher (Milne & Oberle, 2005). Focus groups are also of use in situations where participants are dissatisfied with care, as sensitive topics may be more difficult to speak of in a one-on-one interview (Green & Thorogood, 2004).

When analyzing focus group discussions the interest is in the group not the individual (Green & Thorogood, 2004). The aim of analysis in qualitative description is “a rich, straight description of an experience or event” (Neergaard et al., 2009). Qualitative content analysis, as described by Sandelowski (2000) was used to analyze the transcripts. In qualitative content analysis the codes applied to the transcripts are generated from the data themselves rather than following a predefined coding scheme (Sandelowski, 2000).

#### **4.2.2 Setting**

Women in Fort Smith have had access to midwifery services since 1993 however midwifery was not regulated in the NWT until 2005. Fort Smith has a population of 2500 people (Statistics Canada, 2013) of mixed ethnicity. Nearly all (95-100%) of the women in the community use the midwifery service for part or all of their maternity care. A woman can electively transfer out for her delivery if she would prefer physician-led care or to access analgesia or anesthesia that are not offered in the community. Women are reviewed bi-weekly by the maternity care review committee (which includes midwives, physicians and nurses in Fort Smith and Yellowknife) for any prenatal risks. Only those women who

are low-risk are able to birth in the community with the midwives. Women receive prenatal and postpartum care in the community from the midwives even if they do not complete their delivery in the community. Access to a level two facility in Yellowknife is a 10-hour drive or a 1-hour flight away; for tertiary care in Edmonton either a 14-hour drive or a 2-hour flight is required.

#### **4.2.3 Participants and data collection**

For qualitative descriptive studies, purposive sampling is used to engage a broad range of phenomenally or demographically varied cases (Sandelowski, 2000). To recruit participants for this study, posters were distributed to all women who were attending the Fort Smith Midwifery Program for prenatal or postnatal checkups for the two weeks prior to the first focus group discussion. A nurse working with the midwifery program invited several women by phone. Purposive sampling methods were undertaken to ensure participation from both Aboriginal and non-Aboriginal women as Fort Smith has a mixed population. Approximately 50% of women actually give birth in the community with the midwives and accordingly, we invited both women who had delivered in Fort Smith and those who had evacuated out of the community before or during their labour. We also planned to have both nulliparous and multiparous women in attendance at the focus groups. In conjunction with the purposive sampling methods outlined, we used snowball sampling by encouraging participants to invite others.

The two focus groups, one in the morning and one in the evening, were advertised. Any women over the age of 18 who lived in Fort Smith, NWT and who had used the Midwifery Program for all or part of their pregnancy, labour or postpartum care were

invited to participate. Childcare, refreshments and a \$25 gift certificate to the local grocery store were available for participants. The target sample size for each focus group was eight women.

In the focus groups women were asked to consider their experiences of using the midwifery program (the advantages and challenges to community birth in a remote community), and the meaning of community birth. A topic guide with the following questions was used to prompt women for discussion after the initial introduction to the study:

- How has the midwifery program in Fort Smith, NWT impacted your lives?
- What is the meaning of community birth?
- What are the advantages to community birth vs evacuation for birth?
- What are the challenges of community birth?

The focus groups were held in the health centre which would have been familiar to all participants, and refreshments were provided for the group discussions to create a more comfortable environment. At the end of each session we asked questions which could inform future knowledge translation activities. We asked women how they would like to share their stories of reclaiming community birth. The sessions were audio recorded and transcribed verbatim by the author.

#### **4.2.4 Data analysis**

After reading through the transcripts several times to become familiar with the data, we began to apply codes inductively to each segment of the transcripts, which captured the overriding sentiment or concept described by the participant. Using manual techniques of



“cutting and pasting”, the transcripts were categorized into smaller units using coding such as: *continuity of care, proximity to support system, avoiding the stress of seeking childcare and financial burden*. The categories and themes were arrived at by consensus between two reviewers who read through the transcripts and assigned codes independently. The majority of the codes assigned by the two reviewers were congruent; consensus decision-making was used to rename the categories and arrange them into themes. Themes were identified that crossed the boundaries of categories such as *Midwifery model of care in the community leads to positive experiences of maternity care*.

#### **4.2.5 Ethical considerations**

Ethics approval for this study was obtained from the UBC Behavioural Research Ethics Board as well as from the Stanton Territorial Health Authority Ethics Committee in Yellowknife. As required for all research conducted in the NWT, the research proposal for this study was reviewed by the surrounding First Nations and Métis community organizations to obtain a research license issued by the Aurora Research Institute. This process is overseen by the Aurora Research Institute. Participants were assured that data would be unidentifiable. A short demographic survey including parity and place of delivery was collected. The midwives from Fort Smith were not in attendance nor did they have access to the transcripts. As participants spoke about the local midwives their names have been replaced by pseudonyms.

#### **4.3 Findings**

Of the five women who participated in the focus group discussions, all were in their mid-thirties, two were Aboriginal, all lived with a partner and three of the five women

worked full-time (Table 5). Two of the mothers were nulliparas and three were multiparas. Two mothers had experienced both a delivery in Fort Smith and a delivery outside of the community, one of the women had only experienced a delivery in Fort Smith and two of the women had only experienced birth in Yellowknife.

**Table 5. Socio-demographic description of participants**

Participant	Age	Ethnicity	Lives with	Years of school	Working	Partner working	# of children	Ages	Place of birth
1	34	Non-Aboriginal	Partner		Full time	Full time	1	21 months	Fort Smith
2	34	First Nations	Partner		Full time	Full time	2	6 years 6 months	Elsewhere Fort Smith
3	34	Non-Aboriginal	Partner	Undergraduate degree	At home	Full time	1		Yellowknife
4	38	Metis	Partner	Masters	Full time	Full time	4	10	Yellowknife
								8	Fort Smith
								6	Fort Smith
								2	Yellowknife
5	37	Non-Aboriginal	Partner	Undergraduate degree	At home	Full time	2	5	Yellowknife
								1	Yellowknife

Two themes emerged from the data analysis, each with six or seven sub-categories as shown in Table 6. The two themes were 1) *Midwifery model of care in the community leads to positive experiences of maternity care* and 2) *The benefits of and reasons for giving birth in the community*. The identified themes and categories are described in further detail with quotes from the transcripts.

**Table 6. Table of coding scheme showing themes and categories**

<b>Theme</b>	<b>Category</b>	<b>Sub-category</b>
Midwifery model of care in the community leads to positive experiences of maternity care	Experiences associated with midwifery care in Fort Smith	Continuity of care Personal care Available/attentive Patient autonomy/Informed care Postpartum care Stigma
The benefits of and reasons for giving birth in the community	Experiences and perceptions associated with leaving the community to birth in Yellowknife	Avoiding stress of finding childcare Travelling alone/Isolation Proximity to support system Relationship with midwife Worrying about flying during labour Financial burden

### **4.3.1 Theme 1: Midwifery model of care in the community leads to positive experiences of maternity care**

#### **4.3.1.1 Introduction**

There was an overwhelmingly positive response among the women interviewed to having access to midwifery care in the Fort Smith. When women were asked about the impact that community birth with midwives had on their lives, many of the responses revolved around aspects of the midwifery model of care during the antenatal, intrapartum and postpartum periods. Women also spoke of how access to maternity care in the community affected the lives of their families.

#### **4.3.1.2 Continuity of care**

Aspects of continuity of care were mentioned frequently, and the relationships that were developed during pregnancy, which will be discussed later, were evidently tied to continuity of care. The following quote was from a woman who was able to stay in Fort Smith to deliver her baby:

I just felt really strongly about the rapport that I had with the midwives and the ...visits and the prenatal care and it was just continuous. It was either Sue or Cara that saw me and it was Sue and Cara you know, that were there at the delivery.

#### **4.3.1.3 Personal care**

The women spoke about receiving personalized care in their visits with the midwife. The descriptions of receiving personal care often seemed to be in comparison to care they had received in a previous pregnancy or in comparison to experiences recounted by other women. In the first focus group all three women agreed that it did not feel like their midwife was just going through a checklist in their visits like care providers do in other settings:

So it was the comprehensive care and the individualized care. I didn't feel like I was getting all the "standard tests" and I didn't feel like a checklist when I walked in the door I just felt like my concerns were addressed, my questions were answered [...].

#### **4.3.1.4 Available and attentive**

Many women also mentioned that they always felt like they were the midwife's priority. One woman went so far as to say that "the world could blow up and you would still be the number one importance for the midwife". Another participant seemed to be

comparing her experience with the midwives to appointments she had had with other care providers when she said “you’re not a number. It’s not 15 minutes in and out the door”.

Women spoke frequently about the availability of the midwives. The women expressed confidence and security in knowing that they could access care by the midwives at any time. Some even seemed in awe of the fact that they could receive home care on a Sunday or get in touch by text at night if they needed to.

[...] at night time you would call the hospital and they would page the midwife. But I’ve even had Sue, um, when I’ve seen her she’s said, “I’m on call this weekend so if necessary just send a text”. Anyway that I needed to get a hold of a midwife I could. It was very easy.

#### **4.3.1.5 Patient autonomy and informed care**

The topic of participants feeling well-informed by their midwives was discussed in a variety of ways. Many women contrasted their experiences of being well-informed with a midwife to experiences with a physician where things were left unexplained:

And I had an appointment with the doctor in Edmonton. For such, I got weighed and did the whole urine test and blood pressure, and the doctor told me nothing. Like, I walked out and I didn’t know... when I left each of my appointments [with the midwife] I was informed of where my blood pressure was at, what my scary zone was, what’s going to get me medevaced out, what are things I could do to relax and try to balance my blood pressure.

One woman compared her experience to that of a friend in Vancouver who was pregnant at the same time as her:

[...] she [friend from Vancouver] learned things through me that she never learned through her doctor.

For one woman who developed pre-eclampsia during her pregnancy, the level of information received by the midwives about her condition led her to feel very confident in how to manage it:

I felt very... I never heard of pre-eclampsia before I was pregnant. And I could probably write a whole paper on it now. And it's, just with information that, like, I was very well informed of what it was and how to kind of deal with it.

#### **4.3.1.6 Postpartum care**

Similar to the appreciation the women felt about the availability of the midwives for prenatal care and during labour, the women expressed awe for the care they received postpartum:

And the care afterwards, after the delivery, is just so... amazing! [...] Yeah, you get like a daily visit. You can get a DAILY visit. You could have a DAILY visit if you needed for two weeks. Or however long. It's just amazing. They come in, you don't have to go anywhere. They come to your house.

One woman spoke about the help she received with breastfeeding and how the midwife put her at ease in a time that was a very stressful for her. The following woman spoke of the help that she received by a midwife for her colicky newborn:

Yeah, like, Sue came to the house on a Sunday and came with a bunch of different remedies that we could try and different tactics for holding the baby.

Women compared their experiences to care offered in the 'south' and to other northern communities and felt pride in getting the best care.

But the, aftercare was, amazing, amazing! Sue and Cara are like, top notch. I don't know if we'd get that anywhere else either. [...] But, um, amazing! Like that care, even hearing other people's stories in other places. Not even, not even on the same page!

One participant compared her experience in Fort Smith to a previous birth in a northern community that did not have access to maternity care in the community:

So like, if you're breastfeeding, first time breastfeeding and really having trouble, you're really on your own. And they just don't have the expertise—they didn't have the expertise to even help.

#### **4.3.1.7 External stigma**

Stigma was mentioned in one focus group. The women spoke about the changing attitudes of health care providers, friends and family towards their choice to have a midwife. The participants expressed that while they were confident in their choice of care provider, it was tiresome to have to defend their position. The following quote is from a woman who had to transfer to Yellowknife for her labour:

I found that, um, they treated us very different coming from the communities and there was some stigma around that...

The next quote is from a woman who had experienced stigma when she delivered in Yellowknife the first time and then compared it to her birth four years later:

The experience was a lot different. The reputation had really come a long way in the four years that I'd been there. You got the "oh, yes, the midwife in Fort Smith, mhmmm..." But this time, when I had him [baby], they were like "wow are you ever lucky". They've [the midwives] come a long way, they really, um, built their, it took a lot of work for them to....

These quotes served to exemplify how the women acknowledged the model of midwifery care that they were receiving. The impacts of having care in the community were not just in contrast to not having access to local care; the women were comparing their care with a midwife to other models of care.

This first theme was about the many ways in which having access to midwifery care in Fort Smith had affected the lives of the participants. Within this theme many positive

experiences with the model of care and access to local services were expressed. Stigma from other care providers, family and friends was included in this theme as an experience associated with midwifery care.

#### **4.3.2 Theme 2: The benefits of and reasons for giving birth in the community**

##### **4.3.2.1 Introduction**

The second theme that emerged from the data originated mostly from the experiences women had of leaving Fort Smith to give birth, or for the women who had not had to leave, the *perceptions* of leaving the community for delivery. The sub-categories that comprise this theme are *avoiding stress of finding childcare, travelling alone and isolation, proximity to support system, relationship with midwife, worrying about flying during labour (Medevac), and directed stigma (hospital-based)*. Three of the women were hoping for a community birth, however due to the development of health concerns late in pregnancy they were required to leave the community. As one woman described her experience of having to leave Fort Smith, “[...] I was really devastated about it. I didn’t want to go. We had worked so hard to keep my birth in the community and it was just a couple days before the due date and I got sent up.” Quotes describing the experiences of travelling to Yellowknife for childbirth are presented under this theme.

##### **4.3.2.2 Avoiding the stress of finding childcare**

For women who had other children at home, having to leave Fort Smith and arrange childcare was a significant issue. One woman compared her previous experience from



when she lived in a different northern community without access to maternity care to her most recent experience in Fort Smith:

This time around it was just so much different. And being able to stay in this community for a delivery, it's awesome. Like, I have a six year old at home, and she was in school and my husband is a pilot, so to take time off work, it's almost impossible [...] I would have felt guilty to leave her behind.

#### **4.3.2.3 Travelling alone and isolation upon arriving in Yellowknife**

Women mentioned the difficulties of having to fly to Yellowknife without their partner and waiting for them to arrive by car while not knowing if the baby would be delivered before they arrived. One woman described her experience of arriving in Yellowknife alone and interacting with a frustrated nurse while she waited to see the doctor. She described how things improved:

You know the doctor that came in, she was ... she acknowledged that I was emotional and that I was away from my family and, and my experience after that got a lot better.

Having the option to deliver in the community provides women with the opportunity to avoid the loneliness of evacuating to another city alone without their partners (whose flights would not be covered by the government) was mentioned several times:

You know, you're going up alone to a community you don't want to be in. A lot of women birth by themselves, in that circumstance.

#### **4.3.2.4 Proximity to support system**

When asked what the meaning of community birth was one woman responded with the following:

I don't have other family here, but my friends that are here are my family. So staying close to them meant everything in the world just to stay here and deliver here and have the security to be able to go to my house shortly after my delivery and be at my home with my family. And not have to travel in pain, or, you know, not have to travel and worry about the baby on the flight, or whatever.

The women expressed stress for the partner associated with transferring out of the community:

But yeah it's an eight hour drive. It was probably 10 hours with stops and snow and everything else. You know. And I mean, it was really stressful for him too. Because we didn't know if I was going to give birth when he wasn't there.

#### **4.3.2.5 Relationship with midwife**

Most of the women spoke about their relationship with the midwives that had developed during pregnancy and for some during a previous pregnancy. One woman named her newborn after her midwife and one participant even stated her relationship with the midwife as her reason for wanting to stay in the community to deliver:

Just because I was with the same health care provider, Sue, the whole time, um, you know there's a lot of things that go on in the nine months and, um, I wanted to be able to stay with this person who I had confided in for nine months and who had guided me along in this pregnancy that I wasn't prepared for in the beginning. Um... I had a lot of trust in her and so I think that's why, that's the main reason that I wanted to stay.

In the second focus group the participants described how difficult it was to leave the midwife when it came time to transfer out of the community.

It's a bit hard to not be able to stay with them.

[...] to have to leave was devastating, truly devastating. I cried. Sue and I cried together. [...] It was awful. And she was the first person we called after we had Laura. It was truly devastating. Even now I'm like [tearing]...It really...mhmmm.

#### **4.3.2.6 Worrying about flying during labour (Medevac)**

The women were asked about the challenges of community birth and in one of the focus groups the women felt that other than worrying about what could go wrong during labour there were no challenges.

I was a little worried. Just, um, I think the challenge is that... I wanted to have my birth in the community but there is the fear that if something goes wrong you have to fly out. And then, how long does it take for the plane to get here? For you to get where you have to go? What's going to happen in that amount of time? ... That's a little worrisome.

One woman mentioned a bit of fear beforehand about the potential of an emergency evacuation, however she recalls that it was not as scary as she had imagined:

And to say medevaced before... you know to hear that others had been medevaced before, to me, sounded panicky. Um, and that came out in the prenatal classes, and it wasn't panicky at all. It actually took quite a while to ... It was a bit surreal.

#### **4.3.2.7 Financial burden**

Financial stress was also mentioned. One participant described the excess money that was spent while waiting in the referral community, and women spoke of how often families cannot afford for the partner to go with the mother.

We spent a couple of grand up in Yellowknife waiting for the baby. You know, just with his travel back and forth. And just like, eating out waiting for the baby to be born. It added up really quickly. Really quickly.

Especially if you have other kids at home and then most times your partner can't even go with you because it's too expensive and they can't afford to.

#### **4.4 Discussion**

The aim of this exploratory study was to gain insight into the experiences and the meaning of community birth to the women in Fort Smith who used the midwifery program. In using the method of qualitative description the goal of the analysis was to remain true to the experiences of the participants. Many rural women face challenges in obtaining maternity care in that they must travel to receive antenatal, intrapartum and postpartum care, and often, due to shortages of rural physicians they receive care by locum health care providers. Women who are evacuated from their community for childbirth, face further challenges such as excess financial costs, separation from family and friends, and the need to find childcare for older children. Aboriginal women who evacuate for childbirth, and their families, may experience feelings of dislocation similar to experiences of residential schools (Van Wagner et al., 2007). Thus, birth in rural and remote communities must be contextualized within the concepts of social and psychosocial risks associated with evacuation.

We found that the midwifery model of care had a positive impact on the lives of women in Fort Smith even if they did not complete their birth in the community. All participants showed great enthusiasm for the quality of care they received from the midwives in prenatal and postpartum visits. Many women compared their experiences to those of friends in other communities (in northern and southern Canada), and found their experiences with the midwives in Fort Smith to be superior. Women felt well-informed, supported and had trust in the midwives similar to findings from Becker (2006) and Chamberlain et al. (2000). The women in our study highlighted the importance of the

continuity of care providers they received in Fort Smith. This was contrasted by the experiences described by rural women in another study who had to travel to access care and felt that the lack of continuity of care was a barrier to forming relationships with care providers (Kornelsen & Grzybowski, 2005a).

The experiences of these women in Fort Smith were similar to the reasons reported previously by women for not wanting to evacuate for childbirth (Chamberlain & Barclay, 2000; Kornelsen & Grzybowski, 2005b; Sutherns & Bourgeault, 2008). Positive aspects of community birth included the partner being present and not having to take time off work, not having to worry about leaving other children behind and less financial stress. These issues have contributed to dissatisfaction with the practice of evacuation in other communities (Kornelsen et al., 2005). One interesting finding was women's relationship with the midwives, which in some cases was a main factor for wanting to stay in Fort Smith for the delivery. The strong relationship built between midwife and client as well as the trust that ensues has been documented elsewhere (Sutherns, 2003). Sutherns states that the relationship with a midwife is especially suited to rural women as they may have less access to other sources of health information (2003). In Fort Smith, women on average receive 13.9 prenatal visits and each woman is assigned a primary caregiver even though there are only two midwives in the community. Midwives generally schedule longer prenatal visits in comparison to physicians (REF). These factors likely contribute to the strong client-provider relationship as well as the trust that women felt in their midwife.

The one reported negative aspect of having a community birth was the fear of something going wrong and having to medevac out of Fort Smith. Travel time from Fort

Smith to Yellowknife with medevac is approximately 2 hours. One woman expressed her fears surrounding the uncertainty of delivering in the community, although all women expressed confidence and trust in the midwives. Fear associated with the uncertainty in labour can also be a reality for women living in communities where there is no maternity care because labour at preterm gestation could result in an emergency transfer. Stigma was mentioned when women recounted stories of transferring to referral communities for their labour and even in defending their choice to have a midwife to friends and family. In a study of rural women's experiences of childbirth in Ontario, Sutherns also highlights the varying degrees of resistance to midwifery services in rural areas by doctors, clients and even some midwives (Sutherns, 2003).

In the literature on Aboriginal birthing, cultural barriers as well as language barriers were reasons given for why birth should be returned to rural and remote Aboriginal communities (Couchie, C., Sanderson, 2007). From reading studies of the Inuulitsivik Midwifery Program in Nunavik (Douglas, 2006; Van Wagner et al., 2007), one might expect that the meaning of community birth in Fort Smith might also revolve around culture, however this was not the case for these participants. From the way the women spoke in the focus groups it was evident that many were not originally from Fort Smith and many did not have family in the community. Also, unlike many of the communities that have been studied such as the Inuit communities on the Hudson coast in Nunavik, Fort Smith has a mixed ethnic population which is representative of many rural and remote communities today in Canada. The reasons stated for wanted to stay in Fort Smith surrounded the model

of maternity care, proximity of immediate family, mitigating the stress of leaving the community for birth, and the relationship with midwife.

At the end of each focus group the women were asked if and how they felt their stories of community birth should be shared with a wider audience. It was agreed that the knowledge produced from the research in Fort Smith should be shared with a wider audience than just health professionals. The participants felt that using the radio or newspaper as a medium for sharing these stories were the best options.

#### **4.4.1 Strengths and limitations**

The major limitation of this study was our inability to recruit women for the focus group who had chosen to give birth outside of the community. We know that 19% of parturient women in Fort Smith chose to electively transfer out of the community from 2005-2011, however all of the participants in this study were planning for a community birth. It would be worthwhile in future to conduct interviews with women who preferred an elective transfer to understand their perspectives of the challenges of community birth with a midwife. Furthermore, none of the women interviewed experienced a traumatic intrapartum transfer. Due to time constraints we were only able to conduct two focus groups; the small sample size is another limitation to this study.

#### **4.5 Conclusions**

Women in Fort Smith, NWT shared their experiences of using the Fort Smith Midwifery Program, which were almost all viewed positively whether or not they delivered in the community. The positive experiences shared by the women who stayed in the community for childbirth included avoiding the stress of travelling, avoiding financial

burden from spending time away from home, and being able to stay close to their older children. For the women interviewed, the meaning of community birth was being able to continue with their primary care provider for the delivery, and to stay near their families and support networks for the labour, delivery and immediate postpartum period. Our findings are transferable to other rural and remote communities with access to midwife-led care in the absence of cesarean section capability, and are relevant to rural communities without local access to skilled birth attendants that are considering the development of a midwifery program. Many of our findings, such as continuity of care, informed care and aspects of postpartum care, are likely specific to the midwifery model of care. We cannot say if the return of physician-led maternity care to a rural and remote community would have the same response seen with the participants in this study. The experiences of intrapartum transfer in this study may not reflect other rural and remote communities where travel time to a referral hospital is greater than 1-2 hours. This exploratory study contributes insight into the meaning of community birth in rural and remote areas where women have the option of birthing with a midwife in community.



## Chapter 5: Summary

The goals of this thesis were to evaluate the safety of midwifery care in the rural and remote town of Fort Smith, NWT, and to gain an understanding of the experiences and the meaning of community birth among women who used the Fort Smith Midwifery Program. Two studies were undertaken to achieve these goals: a quantitative study to compare maternal and newborn outcomes in Fort Smith with two comparison groups, and a qualitative study using focus groups with women who had used the Fort Smith Midwifery Program.

Specifically, we compared the maternal and newborn outcomes of 281 births in Fort Smith, where women have the option of community birth with midwives, to 1388 births in the Hudson coast communities of Nunavik, where midwives are the primary attendants for all low-risk women, and to 143 births in Hay River, NWT, where routine evacuation to a level II hospital for childbirth is practiced. Our primary outcome for this study was the rate of APGAR scores less than 7 at 1 minute. We found that the odds of 1-minute APGAR scores less than 7 were increased in Fort Smith compared to Nunavik (aOR 2.15, 95% CI 1.30-3.51), while there was no statistically significant difference in the odds of 5-minute APGAR scores less than 7. The rate of 1-minute APGAR scores below 7 in Fort Smith (12.2%) was similar to that reported for women residing in Hay River who delivered in Yellowknife (15.4%); thus, this finding did not raise any concerns into the safety of midwifery care in Fort Smith. Compared to the Nunavik cohort, the rates of cesarean section, induction of labour and epidural analgesia were increased in Fort Smith. Our data demonstrates that these increased rates are attributed to low-risk women from Fort Smith who electively

delivered elsewhere with physicians. Fort Smith was associated with decreased rates of cesarean section, preterm birth <37 weeks and induction of labour compared to Hay River. We did not have adequate power to assess differences in rates of congenital anomalies, stillbirth, neonatal mortality, infant mortality or maternal mortality.

The purpose of the qualitative study was to understand the experiences of midwifery care in a remote community and the meaning of community birth to the women of Fort Smith. The women in our study described their experiences of midwifery care in a positive manner regardless of whether they delivered in the community with midwives or in Yellowknife at the regional hospital. Many of the categories and themes identified in the transcripts were consistent with the philosophy of midwifery care: informed choice, continuity of care and continuous care throughout the postpartum period. Having the option of community birth with midwives meant that women could stay with their families and friends without having to worry about the added financial costs associated with leaving the community or arranging childcare for older children. The women in our study spoke fondly of their relationships with the midwives and listed that as one of the main reasons for wanting to stay in Fort Smith for the delivery.

The findings of this thesis support the safety and the importance of returning childbirth to rural and remote communities through the development of midwifery models of maternity care.

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# Appendix

**Figure 1. Flow chart describing place of birth in Fort Smith (including some deliveries in 2012)**

