Outcomes of births attended by private midwives in Gauteng

C Jordaan
23593334

Dissertation submitted in partial fulfilment of the requirements for the degree *Magister Curationis* at the Potchefstroom campus of the North-West University

Supervisor: Dr. CS Minnie

April 2015

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT ®

It all starts here ™

Declaration of candidate

I declare herewith that this dissertation entitled *Outcomes of births attended by private midwives in Gauteng* which I submit to the North-West University is my own work, and has not already been submitted to any other university. I have refrained from plagiarism and sources have been duly recognised in the text and the bibliography. The study was approved by the North-West University Ethics Committee and I complied with the ethical standards of the university.

C Jordaan

April 2015

ACKNOWLEDGEMENTS

ABSTRACT

Pregnancy and childbirth are critical life events and women and their families require physical as well as emotional support and care. The concepts continuity of care, choice and a sense of control are prominent in the literature on women's satisfaction with as well as outcomes of care. Midwives have globally been identified as important role players in women-centred care for low risk pregnant women. To be able to offer their women safe, supportive care they need not only a certain degree of autonomy, but also the support of other health care professionals such as obstetricians to whom they can refer women with risk factors or complications.

Maternity care has become "medicalised" and the overuse of interventions such as caesarean section is prevalent in many countries. South African women make use of either the public or private health sector for care during pregnancy and birth. The public sector is overburdened and women do not have a high level of continuity of care. The private sector is mainly obstetrician-led and intervention-driven, even for low risk women. The estimated caesarean section rate is higher than 70%. Private midwife-led care is available in South Africa, but is concentrated in the major cities. Private midwives practise at hospitals, birth centres, "active birth units" and women's homes. No evidence could be found on the outcomes of private midwife-led care in South Africa. The objectives of this study were to explore and describe the outcomes of births attended by private midwives in Gauteng over a two year period and to compare these outcomes with the latest Cochrane review on midwife-led care. A retrospective cohort design was chosen to audit the birth registers of private midwives in Gauteng and conduct quantitative analyses.

Gauteng midwives' patients, when compared with the Cochrane review that juxtaposes midwife-led care with other models of care, had a significantly lower percentage of interventions such as induction of labour (9.6% versus 18.6%) but caesarean sections were performed significantly more frequently (19.3% for the women in Gauteng versus 12.5% for the women in the review). Women in Gauteng also made significantly less use of medications in labour. Maternal and neonatal outcomes were reassuring. Significantly more Gauteng women had intact perineums (53.4% versus 31.4%). A higher percentage of postpartum haemorrhage was found in the Gauteng sample (7.9% versus 6.2%). The difference is significant, although, only three women were admitted to high care units as a result of postpartum haemorrhage. Overall foetal loss (4.3% versus 6.7%) and neonatal ICU admissions (0.3% versus 2.9%) occurred significantly less frequently in the Gauteng sample. The study findings indicate that private midwife-led care in Gauteng compared well with that in the rest of the world in terms of intervention rates and outcomes.

Key words: maternity care models, midwife-led care, private midwives, natural birth, retrospective cohort design

OPSOMMING

Swangerskap en kindergeboorte is belangrike gebeurtenisse in enige familie en fisiese sowel as emosionele ondersteuning en sorg is noodsaaklik. Die konsepte volgehoue sorg, vryheid van keuse en 'n ervaring van beheer is voorop in die literatuur oor vroue se tevredenheid met en uitkomste van sorg. Vroedvroue word wêreldwyd gesien as belangrike rolspelers in pasiënt-gesentreerde sorg vir laerisiko swanger vroue. Om veilige, ondersteunende sorg te kan bied, behoort vroedvroue 'n mate van outonomiteit te hê. Vroedvroue kan egter nie ten volle funksioneer sonder die ondersteuning van ander gesondheidswerkers soos ginekoloë na wie hul pasiënte kan verwys wanneer risikofaktore of komplikasies geïdentifiseer word nie.

Swangerskapsorg het intervensie-gedrewe geword en die oorgebruik van prosedures soos keisersnitte is aan die orde van die dag in baie lande. Suid-Afrikaanse vroue maak gebruik van die publieke of privaat gesondheidsektore vir sorg tydens swangerskap en geboorte. Die publieke sektor het 'n baie hoë pasiëntlading en volgehoue sorg deur dieselfde gesondheidswerker is skaars. Vroue het ook beperkte keuse in hoe en waar om geboorte te skenk. Sorg in the privaatsektor word veral deur ginekoloë gebied en is intervensie-gedrewe selfs in die geval van laerisisko swanger vroue. Die beraamde insidensie van keisersnitte is hoër as 70%. Privaatvroedvrousorg is beskikbaar in Suid-Afrika, maar hoofsaaklik net in die groter stede. Vroedvroue praktiseer in hospitale, vroedvrou-klinieke, aktiewe geboorte-eenhede en vroue se eie huise. Geen bewyse kon in die literatuur gevind word wat betref die uitkomste van privaatvroedvrousorg in Suid-Afrika nie. Die doelwitte van hierdie studie was om die uitkomste van geboortes hanteer deur privaatvroedvroue in Gauteng oor 'n twee-jaar-tydperk te ondersoek en dit te vergelyk met die uitkomste van die jongste Cochrane-oorsig oor vroedvrousorg. 'n Retrospektiewe, kwantitatiewe studie is gedoen deur die geboorteregisters van privaatvroedroue in Gauteng te oudit en die bevindinge te analiseer.

Vergeleke met die Cochrane-ondersoek, wat vroedvroubegeleiding teenoor ander sorgmodelle stel, het pasiënte van vroedvroue in Gauteng 'n beduidend laer persentasie intervensies soos induksies gehad (9.6% teenoor 18.6%). Keisersnitte is egter beduidend meer dikwels uitgevoer (19.3% vir vroue in Gauteng teenoor 12.5% vir vroue in die oorsig). Vroue in Gauteng het ook beduidend minder medikasie tydens die kraamproses gebruik. Moeder- en neonatale uitkomste was gerusstellend. Beduidend meer Gauteng vroue het intakte perineums gehad (53.4% teenoor 31.4%). 'n Hoër persentasie postpartumbloeding het in die Gauteng-steekproef voorgekom (7.9% teenoor 6.2%). Die verskil is beduidend, alwhoewel slegs drie vroue as gevolg van pospartumbloeding in hoësorgeenhede opgeneem is. Totale fetale verlies (4.3% teenoor 6.7%) en neonatele intensiewesorg-opnames (0.3% teenoor 2.9%) het beduidend minder in die Gauteng-steekproef voorgekom. Die bevindinge van die studie dui daarop dat

privaat-vroedvroubegeleide sorg in Gauteng goed vergelyk met dié in die res van die wêreld in terme van die voorkoms van intervensies en uitkomste.

Sleutelwoorde: swangerskapsorgmodelle, vroedvroubegeleide sorg, privaatvroedvroue, natuurlike geboorte, retrospektiewe kohort studie

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ABU   Active Birth Unit

ACNM   American College of Nurse-Midwives

AIDS   Acquired Immune Deficiency Syndrome

AROM   Artificial rupture of membranes

BHF   Board of Healthcare Funders

BMI   Body mass index

CAM   Canadian Association of Midwives

CI   Confidence interval

CNM   Certified nurse-midwife

CPD   Cephalo-pelvic disproportion

DEM   Direct entry midwives

DVT   Deep venous thrombosis

EBP   Evidence-based practice

END   Early neonatal death

HEBS   Health Education Board of Scotland

HELLP   Haemolysis, elevated liver enzymes and low platelets

HIV   Human Immunodeficiency Virus

HREC (NWU)   Human Research Ethics Committee (North-West University)

HST   Health Systems Trust

ICM   International Confederation of Midwives

IUD   Intra-uterine death

KNOV   Koninklijke Nederlandse Organisatie van Verloskundigen

MOU	Midwife Obstetric Unit
NARM	North American Registry of Midwives
NICE	National Institute for Health and Clinical Excellence
NICU	Neonatal intensive care unit
NVD	Normal vaginal delivery or normal vertex delivery
NWU	North-West University
PPMA	Private Practicing Midwives' Alliance
PPH	Postpartum haemorrhage
PRN	Stichting Perinatale Registratie Nederland
RCT	Randomised Controlled Trial
RR	Risk ratio
SANC	South African Nursing Council
SAS	Statistical Analysis System
SPSS	Statistical Package for the Social Sciences
TOLAC	Trial of Labour after Caesarean
TTN	Transient tachypnoea of the new-born
UK	United Kingdom
UNFPA	United Nations Populations Fund
VBAC	Vaginal Birth after Caesarean
WHO	World Health Organisation

DEFINITIONS OF KEY CONCEPTS

Active birth unit (ABU): In the Gauteng context an active birth unit is also known as a midwife unit. It is a homelike birthing environment separate from but on hospital premises. Active birth units are midwife-led and women are usually allowed to follow the principles of active birth as described by Balaskas (1982:1).

Active birth: The term, "active birth" was coined by Balaskas (1982:1). It proposes that women should be given freedom of movement during labour and be allowed to birth in positions they would be naturally inclined to use. According to the Active Birth Manifesto, women should follow their instincts and give birth standing, crouching, kneeling, or whatever position they prefer. The "Active Birth Movement" opposes confining a woman to a bed during labour and making her birth in recumbent or semi-recumbent positions as it is done in most industrialised countries (Balaskas, 1982:1).

Apgar score: Apgar scoring is the standard way of assessing an infant's adaptation to extra-uterine life. At one- and five minutes after birth a score out of 10 is given with zero, one, or two points each for heart rate, breathing efforts, muscle tone, response to stimulation, and colour. Apgar scoring is mainly done to assess and infants need for resuscitation. A score below seven out of 10 indicates the infant's need for immediate support (De Kock & Van der Walt, 2004:16-3).

Asphyxia: Asphyxia is defined as inadequate oxygen supply and excess carbon dioxide in the body (Merriam-Webster Dictionary, 2015). Birth asphyxia refers to inadequate oxygen supply during the process of birth which could lead to death or permanent disability.

Augmentation of labour: Augmentation of labour is defined as using artificial means to increase the intensity, frequency and duration of uterine contractions of a woman in labour (WHO, 2014:3).

Bicornuate uterus: A uterus in which the fundus is divided in two parts is referred to as a bicornuate uterus (Taber's Cyclopedic Medical Dictionary, 1997:2047).

Birth centre/ freestanding birth centre: A birth centre is a non-hospital facility, usually midwife-led, where a low risk pregnant woman can have a natural birth in a more family-centred environment (Taber's Cyclopedic Medical Dictionary, 1997:224). The birth centre referred to in this study is equipped with a theatre for caesarean sections and a small neonatal unit. Complicated cases need to be transferred to a regular hospital.

Birth house: The birth house referred to in this study is a house owned by a midwifery practice where home births are conducted away from women's own homes. Just as the case with other freestanding birth centres, complicated cases are referred to a hospital.

Caesarean section: A caesarean section is the delivery of an infant via its mother's abdominal wall by means of a surgical procedure (Taber's Cyclopedic Medical Dictionary, 1997:502).

Doula: A doula is a non-medical labour support person or companion. Also referred to as a labour coach (Enkin *et al.,* 2000:252)

Early neonatal death (END): Death of a viable, live born infant within a week after birth is known as early neonatal death (De Kock & Van der Walt, 2004:4-4).

Ectopic pregnancy (E): When conception takes place, but the fertilised ovum implants outside of the uterine cavity it is referred to as an ectopic pregnancy. Implantation can occur in a fallopian tube; an ovary; or in the abdominal cavity (Taber's Cyclopedic Medical Dictionary, 1997:600).

Evidence-based practice (EBP): Evidence based practice entails the integration of current, well researched evidence with clinical expertise and consideration of patient needs and values. (Burns & Grove, 2009:699).

Gestation: The duration of pregnancy from conception to birth (Taber's Medical Dictionary, 1997:791). In medical terms gestation is expressed in weeks.

Gestational hypertension: Hypertension during pregnancy, occurring for the first time after 20 weeks gestation (De Kock & Van der Walt, 2004:20-2).

Grand multipara: Grand multiparity refers to a woman having had five or more previous viable pregnancies (after 24 weeks gestation) and births (De Kock & Van der Walt, 2004:9-7). She will be referred to as a grand multipara or being grand multiparous.

Gravidity (G): Gravidity refers to woman's total number of pregnancies including the current pregnancy (Taber's Cyclopedic Medical Dictionary, 1997:823).

Home birth: A home birth is a birth that takes place in a woman's own home with the assistance of a skilled and experienced caregiver and the backup of a suitable hospital (Enkin *et al.*, 2000:250).

Induction of labour: Induction of labour is defined as using artificial means, whether medication or mechanical, to stimulate the commencement of labour (WHO, 2011:6).

Instrument assisted birth: An instrument assisted birth is accomplished by applying an obstetric forceps or specifically designed vacuum device to an infant's head to assist vaginal birth.

Intra-uterine death (IUD): Demise of a viable foetus whilst still in utero is referred to as intra-uterine death (De Kock & Van der Walt, 2004:24-4).

Maternity care: Maternity care is the care of women during pregnancy, childbirth and the postpartum period (Wiegers, 2006:163).

Midwife: A midwife is someone who is educated and trained to have specific proficiencies for the care of women during uncomplicated pregnancy, childbirth and the postnatal period. Having the necessary midwifery licensure or registration according to the legislation in the specific country of practice is compulsory (ICM, 2011:10). In South Africa a midwife has to be registered as such under the Nursing Act (33 of 2005). Renfrew *et al.* (2014:1) describe a midwife as "skilled, knowledgeable, and compassionate" in the care of women and their families during pregnancy, childbirth and the first few weeks of the new-born infant's life. Midwives work at different settings: women's homes, the community, antenatal clinics, hospitals and maternity centres. They are specialists of normal, low risk pregnancy and birth. They need the skills to be able to identify possible complications and refer to higher levels of care when necessary (WHO, 2013).

Midwife-led care/ midwifery-led care: Midwife-led care is continuity of care provided from early pregnancy until the postnatal period by a specific midwife or small group of midwives (Waldenström & Turnbull, 1998:1160).

Miscarriage (M): Miscarriage is the loss of a pregnancy before the foetus has attained viability. It can refer to spontaneous expulsion of the foetus or intra-uterine foetal demise (Taber's Cyclopedic Medical Dictionary, 1997:1219).

Multipara: Multipara refers to a woman who has previously given birth to one or more viable infants whether or not the infant(s) were born alive (Taber's Cyclopedic Medical Dictionary, 1997:1243).

Normal vaginal birth: Normal vaginal birth, also known as spontaneous vaginal birth or normal vaginal delivery (NVD), is the birth of an infant through the birth canal. Normal vaginal delivery is accomplished by the woman's own bearing down efforts without the use of external aid (Taber's Cyclopedic Medical Dictionary, 1997:502).

One-to-one midwifery care: One-to-one midwifery care is a midwifery practice model in which a named midwife is the primary health care provider for a specific woman throughout her pregnancy, the birth and the postnatal period. A midwife colleague only intervenes where the named midwife is not available (Page *et al.*, 1999:244). It is also known as "individual" or "caseload" midwifery.

Parity (P): Parity refers to the number of previous pregnancies a woman has carried to the point of viability irrespective of outcome (Taber's Cyclopedic Medical Dictionary, 1997:1415).

Poor obstetric history: Women with a history of stillbirth/neonatal death or three or more consecutive early pregnancy losses is said to have a poor or bad obstetric history (Singh & Sidhu, 2010:118).

Postnatal/ postpartum: Postnatal or postpartum refers to any event that occurs after a woman has given birth (Taber's Cyclopedic Medical Dictionary, 1997:1532).

Postpartum haemorrhage (PPH): Postpartum haemorrhage is severe vaginal bleeding after having given birth (DOH, 2007: 12). For the purpose of this study blood loss of more than 500ml after vaginal birth and more than 1000ml after a caesarean section are considered postpartum haemorrhage.

Pre-eclampsia: Pre-eclampsia is characterised by hypertension and proteinuria after 20 weeks gestation with one or more affected organ/s. Renal insufficiency, liver disease, neurological problems, haematological problems and foetal growth restriction may occur (De Kock & Van der Walt, 2004:20-2).

Preterm birth: Birth before 37 weeks gestation is considered preterm and is associated with an increase in neonatal morbidity and mortality (Verklan & Walden, 2010:28).

Primigravida: A woman currently pregnant for the first time is referred to as a primigravida (Taber's Cyclopedic Medical Dictionary, 1997:1561).

Primipara: A woman giving birth to a viable infant for the first time is referred to as a primipara (Taber's Cyclopedic Medical Dictionary, 1997:1561).

Private midwives (also known as independent midwives): A private midwife is a midwife who works in private practice either on her own or with a group of midwives. She takes on her own caseload of pregnant clients for which she conducts antenatal care; labour and birth care as well as postnatal care. Some private midwives practise at hospitals to which they have pre-arranged access while others work at designated "Active Birth Units"; "Birth Houses" or midwife clinics. Some private midwives also conduct home births. Legally a private midwife has to hold

current midwifery registration with the South African Nursing Council. It is preferable, but not compulsory, to have Advanced Midwifery registration. In South Africa private midwives have to be registered with the Board of Health Care Funders (BHF) to be reimbursed by medical aid schemes. Private midwives work in collaboration with private obstetricians or public hospitals to which they are able to refer complicated cases.

Reiter's syndrome: A syndrome characterised by urethritis, arthritis and conjunctivitis. Chlamydia is the pathogen most frequently associated with Reiter's syndrome (Taber's Cyclopedic Medical Dictionary, 1997:1654).

Stillbirth: A stillborn infant is a viable foetus born dead (De Kock & Van der Walt, 2004:24-4). The South African Births and Deaths Registration Act (51 of 1992) considers and infant stillborn if it has completed 26 weeks gestation and shows no signs of life at birth (South Africa, 1992).

Team midwifery: Team midwifery is a midwifery practice model in which the care of a woman is shared within a specific group of midwives (Morgan *et al.*, 1998:78).

Transient tachypnoea of the new-born (TTN): This condition is also known as wet lung syndrome. It occurs when there is a delay in the absorption of lung fluid after birth, causing decreased gas exchange and therefore increased respiratory rate in the infant. It occurs more frequently in babies born via caesarean, because they do not go through the same mechanical pressure as those who go through normal birth (De Kock & Van der Walt, 2004:31-15).

Vaginal birth after caesarean (VBAC): A patient who had a previous caesarean section and has a vaginal birth in a subsequent pregnancy is said to have a vaginal birth after caesarean (Taber's Cyclopedic Medical Dictionary, 1997:2055).

Viability: A foetus is considered viable if it has reached a gestation in which extra-uterine life is considered possible or if the foetus shows definite signs of survival after birth. In many countries 24 weeks gestation is the considered viable gestational age (Sandall *et al.*, 2013:4). However as a stillbirth in South Africa is registered after 26 weeks of gestation, 26 weeks can be considered the legal viable gestational age.

Water birth: A birth is considered a waterbirth if the second stage occurrs while the patient is still immersed in water. In other words the infant is born under water and brought to the surface after birth (Cluett & Burns, 2009).

CHAPTER 1: OVERVIEW OF THE RESEARCH

1.1 Introduction

Maternity care is the care of women during pregnancy and childbirth, continuing into the post-partum period (World Health Organisation [WHO], 2013; Wiegers, 2006:163). During the twentieth century maternity care became increasingly medicalised (Freeman *et al.*, 2006:98). Globally, there is concern about the rate at which unnecessary interventions are used in pregnancy and childbirth, leading to escalating costs and more risk to mothers and their new-born infants (Renfrew *et al.*, 2014:1). South Africa is one of the countries in which obstetric management of pregnancy and an over dependence on technology has become standard practice (Tiran, 1999:130; Du Plessis, 2005:25).

In the past thirty years there has been an increasing realisation of the need for more holistic care. The development and birth of a child is critical in the life of a family and the support and care a woman receives has a profound impact on the outcome (Page, 2001:S82). The prominent 1993 "Changing Childbirth" report in the United Kingdom (UK) highlighted the fact that women should have continuity of care and be more actively involved in decisions about their own care (Tiran, 1999:127). This brought about a maternity care reform that is still applicable today. Countries such as Canada and Australia have also recognised the principles of continuity of care and a woman's right to choice and control of her own birth experience (Benoit *et al.*, 2010:476).

Greater access to quality midwifery services is the focus of global efforts to give pregnant women and new-born infants better, more humanised care (United Nations Populations Fund [UNFPA], 2011:iii). The need for more sensitive, personalised care is one of the reasons why midwifery is being restored in numerous countries around the world (Page, 2001:S84). The latest evidence points to one-to-one midwife-led care as a safe and less intervention-driven option for healthy pregnant women and their infants (Sandall *et al.*, 2013:2; Renfrew *et al.*, 2014:5). In South Africa it is mainly midwives in private practice who are able to provide continuity of care. The aim of this research study is to assess the quality of private midwife-led care in Gauteng.

1.2 Background

The South African health system faces major challenges. Epidemics such as acquired immune deficiency syndrome (AIDS) and tuberculosis are overshadowing other aspects of health care. The Health Systems Trust (HST) reports that there are also great financial, infrastructural and human resource concerns in the health care system (HST, 2011:31). There are also problems in

maternity care. Although this is not the only indicator of quality of care, the maternal mortality ratio in 2008 was estimated to be 310 deaths per 100 000 live births (Bradshaw & Dorrington, 2012:38). This is very high compared with similar resourced countries such as Brazil in which the mortality rate was 69 per 100 000 women (World Bank, 2014).

Maternity care in South Africa is fragmented. In the public sector that serves most of the population, antenatal care and postnatal care are provided at primary health care clinics whereas births primarily take place in community health centres, district hospitals and regional provincial hospitals. In community health centres and hospitals, women are attended to by whoever is on duty at the time of admission and care is followed up by a series of midwives or nurses. There is thus very limited continuity of care. Women using the public health service do not have a choice of where to birth or how to birth. They are at the mercy of the staff of the community health centres or hospitals which serves their area or district. Continuity, choice and control by the woman herself, the core principles of quality maternity care according to Hundley *et al.* (1997:1273), are limited in the public health system.

In contrast to public health care, there is the private health sector in South Africa. Citizens of moderate to high income groups prioritise having medical insurance through medical aid schemes. In fact, all permanently employed people in South Africa are required to have medical insurance. Their objectives are to have access to private hospitals and private practising health care professionals. In private hospitals, maternity care is predominantly obstetrician-led. Care is provided by the nurses who are on duty at the time the woman is admitted, while the birth itself is usually attended by an obstetrician. This is the case for both low and high risk pregnant women.

FedHealth, a South African medical insurance company, reports that over a three year period 76% of their pregnant clients gave birth via caesarean section (FedHealth, 2012). Similarly, HST (2014:81) records a caesarean section rate of 73.9% in the private sector during 2013 and 2014. This is reflective of the high intervention rate in private hospitals throughout the country.

There is an on-going debate on the reasons for the high caesarean section rate in South Africa. An obstetrician interviewed by Bateman (2004:801) states that women should be fully aware of the advantages as well as the risks. Bateman (2004:802) further speculates that the high caesarean rate in South Africa is influenced by the fact that private obstetricians do not have evidence-based protocols in place. They consider the risks of normal birth, but do not fully recognise the risks of unnecessary caesarean sections. In contrast, Rothberg and McLeod (2005:258) are of the opinion that caesarean section, like plastic surgery, is a matter of personal choice. According to them women should have to right to choose. However, in order to choose, women should be able to take an informed decision. Women should be informed of the risks

and benefits of the different modes of birth. Caesarean section clinical guideline of the UK based National Institute for Health and Care Excellence (NICE, 2011:4) aim to provide evidence-based information about caesarean sections to ensure consistent, quality of care when it comes to choosing caesarean section. James *et al.* (2012:408) state that a large percentage of women in South Africa fail to attend midwife-led antenatal education courses and are thus uninformed and more vulnerable to be persuaded into unnecessary caesarean sections.

Thirty years ago, the WHO recommended 10 to 15% as an acceptable caesarean section rate (WHO, 1985:436). Ye *et al.* (2014:237) studied the current validity of this recommendation by assessing the association between caesarean section and mortality rates in 19 countries. They concluded that medically speaking, caesarean rates of higher than 10 to 15% could hardly be justified in these populations. The newest World Health Organisation statement was adjusted accordingly (WHO, 2015:1) stating that when medically justified, a caesarean section can effectively prevent maternal and perinatal mortality and morbidity, but that at population level, caesarean section rates higher than 10% are not associated with reductions in maternal and infant mortality rates. They also report that long term physical and psychological outcomes and the effect of a caesarean rate above 30% are still unclear.

In contrast to the medical model, advocates of the midwife-led model believe that pregnancy and birth are normal life events. It differs from the medical model of care in terms of philosophy; relationship between women and care providers; interventions used during labour; birth settings and objectives of care (Hatem *et al.*, 2008:3). Well-trained midwives as the specialists in uncomplicated maternity care, are meant to be at the forefront of primary maternity services (Page, 2001: S83). They are most effective when they function within an integrated health system. When risk factors are evident, complications arise or interventions such as caesarean section are necessary, midwives need to be able to refer women to obstetricians for a higher level of care (Renfrew *et al.*, 2014:13).

Private midwife-led care is available in South Africa, predominantly in metropolitan areas (Du Plessis, 2005:25; Mother Instinct, 2012). Private midwives offer a caseload (one-to-one) or team approach from early pregnancy until the postnatal period. The private midwives in Gauteng have formed an alliance, the Private Practicing Midwives' Alliance (PPMA). Meetings take place to develop protocols; discuss case studies and talk about challenges. Private midwives provide care at their own consulting rooms, women's homes, some private hospitals or facilities focussing specifically on midwife-led care. One such midwife-led facility in Johannesburg, Gauteng, is a freestanding birth centre hosting at least 20 independent midwives (Genesis Clinic, 2012).

Private midwifery care is well suited for a woman who wishes to give birth naturally in a more home-like environment (Hatem *et al.*, 2008:3). Du Plessis (2005:23) explored the experiences of 47 women who received private midwife-led care in Gauteng. Through naïve sketches and unstructured interviews these women reported having had "hugely positive" birth experiences. They felt safe, uninhibited and in control of their births, because they were treated like individuals (Du Plessis, 2005:33).

International research on the outcomes, cost effectiveness and patient satisfaction with midwife-led care, reports that it is a safe option, trending towards lower intervention rates, more cost-effectiveness as well as higher patient satisfaction (Renfrew *et al.*, 2014:10). In the latest update of the Cochrane review, Sandall *et al.* (2013:2) compared the outcomes of midwife-led births with other models of care for childbearing women and their infants. Thirteen trials involving 16 242 women were included. The trials were conducted in Australia, Canada, Ireland, New Zealand and the United Kingdom and women who participated were all randomly assigned to midwife-led or other models of maternity care. The midwife-led groups were less likely to experience regional analgesia, episiotomy, instrumental birth or medicated pain relief. The midwife-led women had a longer mean length of labour and while there was no difference between groups in terms of caesarean birth, the women attended to by midwives were more likely to experience spontaneous vaginal birth without instrument assistance. A known midwife also more often attended to them at birth (Sandall *et al.*, 2013:12).

The authors of the Cochrane review concluded that women without substantial medical or obstetric complications should be offered midwife-led continuity of care. They also concluded that policy makers who wish to improve, humanise and normalise birth should consider how the financing of maternity care could be reviewed to support this model of continuity of care (Sandall *et al.*, 2013:18). Trials have not yet been conducted in resource constrained countries. With South Africa falling into this category, a study on the outcomes of private midwives in the province of Gauteng would be the first step in exploring midwife-led care as a safe and viable option in this specific area.

1.3   Problem statement

Continuity, choice and control are globally recognised as important factors for quality care during pregnancy and childbirth. Women should have the right to be cared for by their health care provider of choice. They should also have access to different options, including natural birth and midwife-led care. Although private midwife-led care is available in South Africa, particularly in Gauteng, the obstetrician-led model of care is still dominant and the intervention rate in pregnancy and childbirth is high.

The latest international research evidence on the safety, cost effectiveness and patient satisfaction with midwife-led care (as indicators of quality care) show midwife-led care to be a viable alternative to obstetrician-led care for low risk pregnant women. There is currently no evidence on the outcomes of births attended by private midwives in the Gauteng area.

The problem leads to the following questions:

(1)	What are the outcomes of births attended by private midwives in Gauteng in 2012 and 2013?

(2)	How do the outcomes of births attended by midwives in Gauteng compare with some of the most relevant outcomes in the latest Cochrane review on midwife-led care (Sandall *et al.*, 2013:2)?

## 1.4	Objectives of the study

The objectives are as follows:

(1)	To explore and describe the outcomes of births attended by private midwives in Gauteng in 2012 and 2013; and

(2)	to compare these outcomes with some of the most relevant outcomes in the latest Cochrane review on midwife-led care (Sandall *et al.*, 2013:2).

## 1.5	Paradigmatic perspective

The research paradigm is a set of assumptions about the nature of reality, how different entities interact within this reality, and how to go about studying them. A researcher works from the most appropriate set of assumptions which will form an encompassing framework for the entire research project (Brink *et al.*, 2012:24). To describe the paradigmatic perspective researchers need to state their meta-theoretical, theoretical and methodological assumptions.

### 1.5.1	Meta-theoretical assumptions

The researcher believes that human beings – and pregnant women in particular, are unique in their social circumstances, health status and needs. They have their own challenges and wishes about their pregnancies, the birth of their babies and adaptation to the postnatal period. The researcher is a Christian and believes that all human beings should be treated with respect regardless of race, religion or social standing. Human beings fare better in an environment where they are cared for in a holistic manner.

Through informal observation the researcher has noticed that women's choices about the care they seek during pregnancy and their birth options are influenced by a society that is convenience- and technology-driven. The broader society in which this research took place is urbanised, time-conscious and consumer-driven.

Midwives have to be competent, qualified and professional, but also compassionate. They have to advocate for the rights of the women, unborn babies and infants under their care so that these women can make informed decisions about their care. The first priority of midwifery is the physical wellbeing of a woman and her infant and thus a healthy outcome for both. The second priority is for the woman and her partner to feel supported emotionally and to have the opportunity to ask questions and make decisions that would best suit their unique needs.

1.5.2 Theoretical assumptions

The midwifery model of care focuses on the normalcy of pregnancy and birth. It is based on a different philosophy and focus from other models of maternity care. Midwifery and obstetrics complement each other. Midwives use knowledge and skills which originate from the same sources as their obstetric counterparts, but emotional support and relationship-building are just as prominent as physical care. Due to respect for the intricacy of the process of labour and birth, midwives try to avoid interference and interventions. The aim is for women to be the central focus of prenatal care and to receive hands-on support during labour and birth (Rooks, 1999:370).

The International Confederation of Midwives (ICM) very aptly describes the key concepts that define the unique role of midwives. They state that midwives and women are partners. Their aims are to promote self-care and the health of mothers, infants, and families. Midwives respect human dignity and women's rights. They are advocates for women so that their voices may be heard. Midwives work with cultural sensitivity, helping women to overcome those cultural practices that are harmful to them and their infants. The focus is on promoting health and preventing disease, viewing pregnancy as a normal life event (ICM, 2014).

An integrative literature review by Nicholls and Webb (2006:414) define a "good midwife" as a skilful, knowledgeable, compassionate, caring person who sees women as individuals and involves them and their partners in decision-making. Woman-centred care under the wing of an experienced midwife with the backup support of an obstetrician is thus the goal of midwife-led care.

1.5.3   Methodological assumptions

Quantitative research is usually associated with the positivist paradigm, but for this study the researcher used a pragmatic approach. The pragmatic approach advocates for the integrated use of different methodologies to answer one's research questions (Morgan, 2007:72). In pragmatism the methodology is guided by the research questions and not vice versa (Polit & Beck, 2008:310). Weaver and Olson (2006:466) see it as an effective approach to nursing inquiry since it is more about finding out what works in practice than formulating abstract ideas. The researcher chose pragmatism because the focus of the study - to critically analyse outcomes - fits well within this research paradigm.

1.6   Research design

A retrospective cohort design was chosen for this study. This type of design is a sub-category of outcomes research, which plays an important role in strengthening the scientific basis of nursing (Burns & Grove, 2009:288). The outcomes of births attended by independent midwives in Gauteng are evaluated to add to the existing body of knowledge on midwife-led care. The study design, methods and procedures are discussed in Chapter 3.

1.7   Dissertation outline

The dissertation outline is as follows:

Chapter 1: Overview of the research

Chapter 2: Literature study of midwife-led care

Chapter 3: Research design and methodology

Chapter 4: Results of the retrospective cohort study

Chapter 5: Discussion of results

Chapter 6: Conclusions, limitations and recommendations

1.8   Summary

Existing literature on midwife-led care shows that globally this model leads to safe, cost effective and personalised care. Private midwife-led care in South Africa is available and the researcher could not find any formal research that has been done to compare it with that in the rest of the world. This research project explores the outcomes of care by independent midwives in Gauteng by means of a retrospective cohort study.

CHAPTER 2:   LITERATURE STUDY OF MIDWIFE-LED CARE

2.1   Introduction

Caring for women and their infants during pregnancy, birth and the postnatal period should go beyond physical care to include emotional support and education (Renfrew *et al.*, 2014:4). Maternity care is an important factor in the health of any population and small improvements can have positive long-term effects (Renfrew *et al.*, 2014:1). Globally the most prominent role players in direct maternity care are midwives, general practitioners and obstetricians (Heatley & Kruske, 2011:54). The responsibility for, cooperation among and prominence of each of these professions in carrying out the maternity care cycle differ among countries. In some countries traditional birth attendants also play a part in the care of women during labour and birth (Wiegers *et al.*, 2010:190).

Since the last quarter of the 20th century, deviations from standard hospital-based maternity care have been developing in reaction to the perceived "medicalisation" of childbirth (Waldenström & Turnbull, 1998:1160). The 1993 "Changing Childbirth" report in the United Kingdom highlighted the fact that women should have continuity of care and be more actively involved in decisions about their own care (Tiran, 1999:127). Women want to be informed and educated by health care workers with knowledge and interpersonal skills (Renfrew *et al.*, 2014:4). This gives them the power to exert choice and control. Midwives have been noted to be at the forefront of women-centred care and are advocates for the three Cs of maternity care: continuity, choice and control.

In this literature study the definition of a midwife, the history of midwifery, the global standing of midwives, different models of midwifery care, and alternative settings for birth are explored. The role midwives play in the three Cs and the latest research on the standards of midwife-led care are discussed. This creates a backdrop for the exploration of midwifery in the unique South African context.

2.2   Literature search strategy

In the initial phase of the literature search the main key words used were "midwifery-led", "midwife-led care" and "midwifery". The search was limited to English and Afrikaans literature. Sources dating back further than the year 2000 were only included if very relevant or historically significant (e.g. sources related to the "Changing Childbirth" report). The search was mainly done on the Google Scholar, Science Direct and the Cochrane databases. "Related articles" cited through an automated function were also screened. Articles quoted in the text or bibliography of already obtained articles, were also searched. In this way the researcher

obtained more primary sources. Articles were grouped under: articles and other literature about characteristics of midwives; articles about midwifery in different countries; articles about women's experiences of midwife-led care; articles about quality and outcomes of midwife-led care; and reviews or meta-reviews of studies on midwife-led care. Relevant statement documents from important stakeholders such as the ICM, HST, World Bank, WHO, and country midwifery organisation websites were also included.

A further search was done through Science Direct and the Cochrane database to search for studies specifically about midwife-led care in the South African context. Where applicable, the researcher searched for specific information such as the maternal death ratio and statistics of the caesarean section rate in the private sector in South Africa. Articles and other literature about the history of midwifery were accessed to create a summary of the origins and development of midwifery as a profession. The literature study was completed over a ten month period (January – October 2014).

2.3   Overview of midwife-led care

In this section an overview is provided about midwifery and models of midwifery and maternity care.

2.3.1   The midwife

The general description of a midwife is someone who is well trained in attending to the needs of women and new-borns in pregnancy, birth and the first six weeks thereafter. The ICM defines a midwife as someone educated and trained in specific proficiencies and who has the necessary licensure or registration according to legislation in her country of practice (ICM, 2011:10). Midwives work at different settings: women's homes, the community, antenatal clinics, hospitals and maternity centres. They have different pathways of training in different countries (UNFPA, 2011:1).

The ICM very aptly describes the key concepts that define the unique role of midwives. They state that midwives and women are partners. Their aims are to promote self-care and the health of mothers, infants, and families. Midwives respect human dignity and women's rights. They are advocates for women so that their voices may be heard. Midwives work with cultural sensitivity, helping women to overcome those cultural practices that are harmful to them and their babies. The focus is on promoting health and preventing disease, viewing pregnancy as a normal life event (ICM, 2014).

2.3.2 Origins of midwifery as a profession

Midwifery is an ancient vocation of which mention has been made since biblical times. Two Bible phrases regarding midwives are found in the Old Testament. Genesis 35:17 reads: "After a very hard delivery, the midwife finally exclaimed, 'don't be afraid - you have another son!'" and Exodus 1:20: "So God was good to the midwives, and the Israelites continued to multiply, growing more and more powerful. And because the midwives feared God, he gave them families of their own" (Bible, 2007). There is mention of midwives in ancient Greek and Egyptian texts. In the English language the word midwife had its origin between the years 1250 and 1300 and literally means "accompanying" or "with" women (Dictionary.com, 2014). The ancient Jews used the term "wise woman" which still applies in France today as the term "sage-femme" (Sullivan, 2013). Midwifery traditionally has a strong spiritual and even mystical component (Fleming, 1998:45).

Before the 1700s men were rarely involved in childbirth. Women were attended to by other women – some specifically known to take the role of midwives with wisdom merely from having given birth themselves. In some rural or tribal communities, labouring women are still cared for by traditional birth attendants.

In the western world, the seventeenth and eighteenth century brought about the first successful caesarean sections, the use of the obstetric forceps, and a dramatic increase in the number of hospitals in European cities. Along with these developments physicians began formally studying the mechanism of labour. They became prominent in acting as man-midwives or accouchers (Low, 2009:1132). It was during this era that the former high regard for the knowledge and skills of midwives started declining. Science and medicine gained control over childbirth in the developed world (Fleming, 1998:45). Training for midwives also became more scientifically orientated and in many countries it would eventually be considered a subcategory of nursing science (Sherrat, 2011).

2.3.3 Overview of the global standing of midwifery

When and how midwifery evolved and how much it has gained professional status differ from country to country. The Netherlands is well known for its midwife-led model of primary maternity care. Midwives practise mainly outside of hospitals in the community. Newly pregnant women are assigned to a midwife, general practitioner or obstetrician according to specific risk criteria. A Dutch woman can find information and the contact details of a midwife in her area by accessing a designated website. This was initiated by the country's professional midwifery organisation Koninklijke Nederlandse Organisatie van Verloskundigen or KNOV (De Verloskundige, 2014). Statistics show that between 1999 and 2012 approximately 34% of Dutch

women gave birth with a midwife or general practitioner as their primary caregiver (Stichting Perinatale Registratie Nederland [PRN], 2013:33). During the same time period 74.5% of Dutch women had spontaneous vaginal births. Martijn *et al.* (2013) report that 18% of these births took place at women's own homes.

The United Kingdom had a very medically orientated maternity care system, but the Expert Maternity Group found care to be fragmented and impersonal (United Kingdom, Department of Health, 1993). Since 1994 there has been a shift towards community midwifery with shared or personal caseload models of care. The main objectives are continuity, choice, control and women-centred care (Morgan *et al.*, 1998:77). In Scotland there is a range of maternity care settings and different models of care (Harris *et al.*, 2011:302). Maternity care is prasticed in stand-alone midwifery units; community units alongside non-obstetric health care facilities; midwife-units alongside maternity units; consultant-led units with no neonatal intensive care; and full consultant-led units with neonatal intensive care. Harris *et al.* (2011:301) found in there qualitative study conducted in rural Scotland that rural midwives feel that their skills are undermined by their urban counterparts and that there is a need for development of professional understanding between Scottish midwives in different locations.

In 1990 midwifery in New Zealand became autonomous from nursing as a profession in its own right. Direct entry midwifery was also recognised from then onwards. Registration with the Midwifery Council of New Zealand allows a midwife to practise independently or be employed in a hospital setting. Midwives who practise independently offer a high level of continuity of care and collaborate with their medical counterparts where needed. Self-employed, independent midwives work alone, in partnerships or in practices where they take full responsibility for the women under their care. They are referred to as the "Lead Maternity Carers" for these women (New Zealand College of Midwives Inc., 2014). The latest published maternity statistics for New Zealand are those for 2011. In that particular year spontaneous vaginal delivery occurred in 66% of all births and 3.3% of women gave birth at home. Midwives were registered as the lead maternity carers for 78% of all maternity cases (New Zealand Ministry of Health, 2014).

Australia has a highly medicalised maternity care system stemming from its colonial heritage (Benoit *et al.*, 2010). Maternity care is mal-distributed and culturally inappropriate to women in rural areas. In the 1920s to 1970s the medical profession almost held a monopoly over maternity care in Anglo-Australian societies. In the 1960s to 1970s there was a growing recognition in Australia that the emotional, social and spiritual component should not be overlooked and that birth is a natural biological process (Benoit *et al.*, 2010:476). The case was made for different approaches to childbirth and the 1970s brought vocal opposition from professional groups such as nurses and midwives. Women wanted to become "reflexive consumers" rather than "passive recipients". Medicare was instated in 1984 with a fixed subsidy

for public health services and procedures. However, independent midwives are not eligible for reimbursement from Medicare (Benoit *et al.*, 2010:278). Nowadays, across Australia, there are different models of maternity care and midwives feature in different roles (Homer *et al.*, 2009:674). There is a parallel private health sector and more than a third of women attend care by a private obstetrician in a private hospital. Maternity care is mostly controlled by obstetricians except in rural areas where it is run by nurses and midwives.

In Canada maternity care followed a similar historical trend to that in Australia, but midwives turned out to be more prominent role players. Medicare was instated in 1972 and the 1970s were dedicated to cost control initiatives. Midwives became the primary maternity care providers in the 1990s. Current midwifery training requires a four year baccalaureate programme and each Canadian province has its own regulatory board. There are still territories in which midwifery is unregulated (Canadian Association of Midwives [CAM], 2014). Certified midwives are salaried practitioners in Quebec. In Ontario and British Columbia they are paid per client course of care and home births are permitted. Care is women-centred, conducted by groups of two to eight midwives and characterised by a high level of continuity (Benoit *et al.*, 2010).

Each of the 50 states of the USA has its own legislation and control over midwifery practice. In the United States there are three types of midwives in terms of training and registration: certified nurse-midwives, certified midwives and certified professional midwives (American College of Nurse-Midwives, 2011). Certified nurse-midwives (CNM) and certified midwives (CM) are regulated by the American College of Nurse-Midwives (ACNM). Since 2010 CNMs have been required to hold a graduate degree to enter into midwifery practice. This usually entails a master's degree in midwifery after a bachelor's degree in nursing. Certified nurse-midwives are legally allowed to practise in all 50 states, and mostly work in hospital settings. Certified midwifery is a newer, direct entry pathway into midwifery education and is not recognised in all states. These midwives also mainly work in hospital settings. The latest available statistics report that CNM and CMs attended 7.9% of US births (ACNM, 2014). Certified professional midwives (CPM) are registered by the North American Registry of Midwives (NARM) after completing a written examination. NARM offers registration to direct entry midwives (DEM) who are trained through a variety of sources such as apprenticeship, self-study, midwifery schools or colleges. These midwives focus on out-of-hospital births and can legally practise in 26 states (NARM, 2014).

In Japan midwives have the right to practise autonomously, but do not always have the freedom to do so (Page, 2001:S85). A large proportion of births take place in hospitals and physician-run clinics, with on-shift midwives monitoring the labour process and physicians conducting the births. Around 2% of births take place in midwife-led birth houses or women's own homes (Limura & McNab, 2009).

China has one of the highest rates of unnecessary caesarean sections in the world (Renfrew *et al.*, 2014:11). Up to the recent past, Chinese midwives had a very low standing and were disregarded even on ministerial level. This could have been influenced by the country's "one-child policy" which controlled population growth (Feng *et al.,* 2012:30). Cheung *et al.* (2009:745) attempted to address the low standing of midwifery by proposing the implementation of a "midwife-led normal birth unit". The proposal was welcomed by Chinese midwives. The implementation of the midwife-led unit succeeded in reducing the caesarean section rates as well as overall intervention rates (Cheung *et al.*, 2011:583). Since then more birth units have been opened and efforts are being made to promote the status of midwifery in the country (Renfrew *et al.*, 2014:11). The situation in developed countries is not directly applicable in developing countries like South Africa.

Throughout the developing world quality maternity care is a major concern. WHO (2005:62) reported that 529 000 women died annually during or after childbirth in the previous years – mostly in developing countries and often through avoidable factors. On a more positive note the estimated maternal mortality dropped to 287 000 in 2010 (WHO, 2012:22). In the latest "State of the World's Midwifery" report by UNFPA (2014:iv) it is stated that 73 of the world's low income countries account for 92% of the global maternal and infant mortality rate, but have only 42% of the maternity care work force. Expanding these countries' midwifery work forces has been recognised as central to improving outcomes. Low income countries have been advised to focus on midwifery education, regulation and national policies on midwife-led care. It has been estimated that midwives are able to deliver 87% of the essential services women and new-born infants need (UNFPA, 2014:iv).

2.3.4 Characteristics of midwife-led versus other models of care

In the midwife-led model of care there is a general belief that pregnancy and birth are normal life events. It differs from other models of care in terms of philosophy; relationship between women and care providers; interventions used during labour; birth settings; and objectives of care (Hatem *et al.*, 2008:3). A phenomenological study by Hunter (2008:411) states the philosophy that often sets the midwife-led model of care apart: "the midwife understood the unique midwife-client relationship where women had a right to participate in their own birth with shared decision-making". Midwives tend to support a woman's preferences: to be recognised as an individual, to have a relationship of mutual trust and to be supported and guided on one's own terms (Berg *et al.*, 1996:11).

Midwifery and medical obstetrics should not be seen as mutually exclusive, but rather as complementary. Even though there may be a difference in philosophy, focus and purpose there is overlap between these two professions. Obstetricians are experts in pathology and

complications whereas midwives focus on the normal physiology of labour and birth (Rooks, 1999:370). An interdisciplinary team approach is essential in offering safe, quality care (Renfrew *et al.*, 2014:12). South African midwives are obliged to advise every patient to see a medical practitioner at least once during pregnancy and they should refer women to a higher level of care when needed (SANC, 1990). The 2013 SANC "Regulations Regarding the Scope of Practice of Nurses and Midwives" paragraph 14.3 states "The clinical practice of a midwife is to provide care and management, as an independent practitioner, of all aspects that influence the course of pregnancy, labour and puerperium and the newborn baby". Subsection (o) require a practitioner to "appropriately refer a healthcare user; to other members of the multidisciplinary health team" (SANC, 2013:15).

2.3.5   Models of midwifery care and settings for birth

Depending on how maternity care is organised in their country, midwives are either employed as clinic or hospital labour ward staff or they work independently. Labour ward midwives usually meet their clients when they admit them for labour and hand them over to postnatal staff after the birth. In some countries labour ward midwives take full responsibility for monitoring labour and conducting normal births. They only notify physicians or obstetricians when complications arise or interventions are necessary. They are governed by standing orders and hospital protocols. Midwives in the South African public sector function in this way. In private obstetrician-led facilities midwives have some control over patient care, but mostly follow the orders and preferences of obstetricians.

Independent or private midwives practise midwife-led care and take full responsibility for their own women throughout pregnancy and birth. They offer caseload (one-to-one) care in which a woman is assigned to a specific midwife or midwifery team where a group of midwives share the care of their women (Huber & Sandall, 2009:614). Midwife-led care refers to antenatal, intra-partum and postnatal care conducted primarily by a trained midwife. Independent midwives tend to practise in more home-like settings. Free standing birth centres, "ambient rooms" and "Snoezelen" rooms are some examples of more home-like birth settings as opposed to medical-like labour wards (Hodnett *et al.*, 2010:3). Some independent midwives and community midwives attend to home births at women's own homes.

Independent midwives are more inclined to offer birth settings where natural pain relief options such as immersion in water for labour and birth are available. Cluett and Burns (2009:2) conducted a Cochrane review to examine the evidence on immersion in water in labour and birth. Twelve trials involving 3243 women were included. Although most of the studies had limitations in validity and reliability, there was evidence of less epidural or spinal anaesthesia in women who were immersed in water at some point during the first stage of labour. Their labours

were also shorter. Outcomes could not be reported conclusively, but no evidence of increased risk to the neonate of women labouring or birthing in water could be found. Cluett and Burns (2009) suggest larger collaborative trials to examine the issue of water birth further.

2.3.6   Cooperation in maternity care

The World Health Report recommends "care that is close to women – and safe" (WHO, 2005:69). This means keeping birth close to home and within the woman's culture, but with the presence of a skilled professional who can anticipate the need for intervention or mobilise transfer to a higher level of care (WHO, 2005:69). Page (2001:S83) sees midwives as the only specialists of uncomplicated maternity care who need to be at the forefront of primary maternity services. Secondary and tertiary maternity services should be reserved for women who really need them.

Midwives cannot function in isolation - a good backup system with hospital infrastructure and obstetrics specialists is essential. Women-centred, holistic care cannot be optimally carried out if the focus is only on the interactions between doctors and midwives. There should be good collaboration among all parties involved in a woman's care (Heatley & Kruske, 2011:54). After extensive evidence synthesis Renfrew *et al.* (2014:13) conclude that well trained, regulated midwives use resources effectively and improve outcomes as long as they are integrated into a health system in which teamwork, good referral systems and sufficient resources are in place.

2.4   The three Cs of maternity care: Continuity, choice and control

2.4.1   Continuity of care

Maternity care entails more than just the physical aspect. Psychological support, information and education are also imperative (Wiegers, 2006:163). Continuity of maternity care is care received from the same health care provider throughout pregnancy, birth and the six week period afterwards. Continuity of care, with midwives as important role players, has been one of the endeavours aimed at increasing women's satisfaction with care. In midwife-led care, continuity is provided from early pregnancy until the postnatal period by a specific midwife or small group of midwives (Waldenström & Turnbull, 1998:1160). In medical-led care, family physicians or obstetricians are the primary caregivers (Hatem *et al.*, 2008:2). Women who choose medical-led care are monitored by hospital-employed midwives during labour. These midwives work shifts and contact the patient's physician or obstetrician near the time of birth. Continuity in this model is thus interrupted.

One-to-one midwifery care with a high level of continuity has been shown to reduce unnecessary interventions during childbirth. The same midwife takes care of the patient during

pregnancy, labour, birth and the postnatal period. A study by Page *et al.* (1999:243) found less need for epidural anaesthesia and less use of episiotomy with the one-to-one model of care. Another benefit of having fewer health care workers involved in the same woman's care is the reduced risk of gaps in communication and contradictory advice (Morgan *et al.*, 1998:78). It is said that continuity of care not only benefits the clients, but also increases the job satisfaction of their caregivers. Midwives with their own caseloads regain autonomy over their practice and are able to build trusting partnerships with their clients (Sandall, 1995:206).

The postnatal period is an aspect of maternity care that is often overlooked. Wiegers (2006:169) is of the opinion that women cannot adjust to motherhood within a two-day hospital stay. Continuity of care during the postnatal period, for example in the form of home visits, has been proven beneficial to clients as well as to the health care system. Breastfeeding support could ensure longer continuation of breastfeeding and the early detection of problems could prevent major complications. The World Health Report (WHO, 2005:73) states the alarming fact that more than half of maternal deaths occur more than 24 hours after birth has taken place.

2.4.2 Choice and control

Maternity care should be centred on the woman and focused on her needs and wishes (DOH [UK], 1993:11). Allowing choice means actively listening to the pregnant woman, objectively explaining all the care options, and giving her the freedom to choose within reason. In a meta-synthesis of qualitative studies conducted by Renfrew *et al.* (2014:4), women reported that they wished to be educated and learn for themselves. They wanted their health care professionals to be not only skilled and knowledgeable, but also have good interpersonal skills and cultural competence. A health care provider should not try to influence a woman out of personal belief or for personal convenience. Information should come from evidence and experience based points of view. A Turkish study by Turan *et al.* (2006:2203) theorises that failure to involve women in decision making can be a barrier to adopting evidence based practice (EBP).

Having the opportunity to choose and being supported in one's choices leads to a greater degree of autonomy and self-determination in pregnant women and new mothers (Mander & Melender, 2009:638). In a study by Morgan *et al.* (1998:82), women rated involvement in decision making and feeling in control even higher than the need for personal continuity of carer. Allowing choice does not stop once the choice has been made. An understanding, non-judgemental health care provider is essential if the choice is to become a reality. Mander and Melender (2009:638) argue that women's control during pregnancy and childbirth is often merely rhetoric. For this rhetoric to become reality one needs to probe into women's perceptions of their current care and listen to how they wish it could be (Kabakian-Khasholian *et al.*, 2000:104). Swedish women described positive birth experiences as having been supported by

their midwives, but on their own terms. They appreciated it when there were trust, openness and mutual respect. They wanted to feel guided, but not aggressively or overwhelmingly (Berg *et al.*, 1996:13).

As previously stated choice and control cannot be exerted without information. Women use various sources of informal research to find out about their care options. The internet is a widely used source, although women have reported that they do not always find it trustworthy. The overload of information in the media can be overwhelming (Mander & Melender, 2009:643). Women also get informal information from friends and family. It can be problematic to hear horror stories about others' bad experiences or second hand information out of context. Some countries have a standardised way of informing women about their options. In Scotland, for example, women are supposed to receive the "Health Education Board (HEBS) Pregnancy Book" in early pregnancy (Hundley *et al.*, 2002:128). There are cases in which women rely solely on the knowledge of their health care providers. James *et al.* (2012:404) confirmed this in a group of South African women. Only a small percentage of them attended quality antenatal education courses by experienced and well-informed midwives and were dependant on the advice of their obstetricians.

2.4.3   Barriers to continuity, choice and control

Choice and control in maternity care is a controversial subject. Due to different models of training, obstetricians and midwives differ in their approach to caring for healthy pregnant women. Midwives, for example, work from the standpoint that the rising caesarean section and intervention rate instils fear in women about normal birth and takes away their control. Midwives see birth as inherently "normal". Some obstetricians believe the opposite and have stated that the choice of caesarean section is made by women after discussing the pros and cons with their care providers (McIntyre *et al.*, 2011:4). This discussion is not necessarily based on evidence. There is a lack of substantive evidence of women's own perceptions and reality of choice (Jomeen, 2006:e192).

Choice in maternity care is not as straightforward as it is idealistically assumed to be. Women as both clients and consumers have an idea about the type of experience they would like to have. In reality the outcome is often uncontrollable or uncertain. Health care providers have developed their own opinions of what they deem safe practice to be and this influences the mind sets of women. The medical model of care perceives childbirth as normal only in retrospect. Midwives who are used to working within the scientific model sometimes agree with the view of natural childbirth as being "alternative" (Henley-Einion, 2009:174).

Narratives from women in a qualitative study by Jomeen (2006:e197) conducted in the UK reveal that some general practitioners, who are often the first port of call in early pregnancy, were quite vocal about their opinions. Rather than objectively explaining, they verbalise their negativity towards certain options such as home birth and birth centres. Though this cannot be generalised, it is an example of how health care providers influence women's decision-making. Defensive rather that expectant management has become the norm and needs to be challenged before shared decision making can be implemented (Freeman *et al.*, 2006:98). Women who ask a lot of questions are sometimes stereotyped as "difficult" or "neurotic" (McCourt, 2006:1308).

Midwives' perceptions of their ability to give women control differ among the settings in which they are working. An appreciative inquiry in 14 sites in England found some midwives took pride in their ability to offer women choice and control. Others stated that resource constraints limited the possibilities they could offer their clients (Lavender & Chapple, 2004:331). They also reported that they were sometimes undermined by their obstetric or other medical counterparts. Mutual respect and effective communication among all maternity care providers would make women feel safer and enhance the quality of their care (Hunter *et al.*, 2008:133). Positive interactions between doctors and midwives are imperative for woman-centred, holistic care.

Women need to have trusting and open relationships with their caregivers to be able to release their internal control and exert control over their environment. For midwives to build these kinds of relationships and give autonomy to their clients, they need a certain degree of autonomy themselves. In theory, empowering midwives indirectly empowers the women under their care (Mander & Melender, 2009:638). Midwives in medically dominated obstetric hospitals in Auckland, New Zealand, describe their practices as being intervention driven due to hospital policies. They experience medical dominance and hospital policy as barriers to choice and control (Freeman *et al.*, 2006:97). Irish midwives feel the same way. They find it difficult to facilitate natural birth when the culture and the hierarchy in their units are patriarchal. Obstetricians have the final say over all practices and some of their midwifery colleagues are compliant rather than supportive (Keating & Fleming, 2009:525).

Choice and control in labour and birth may be influenced by social factors such as age and level of education. Supine position is the standard for labour and birth in most hospital settings, although women may prefer to mobilise during labour and birth in alternative positions such as squatting or kneeling. A Dutch study of 665 women in midwife-led care found that women 36 years and older with higher levels of education were less inclined to use supine positions during the second stage of labour, whereas the majority of the rest of the women gave birth in a supine position. Homebirth was associated with more freedom to choose birthing positions (De Jonge *et al.*, 2009: 446). Social and cultural norms may also limit women's choice and control. Turan *et*

al. (2006:2199) observed obstetric practices in Istanbul, Turkey, and found for example that women were not allowed to have a known support person present at the time of birth.

Economic and racial inequalities in some countries negatively impact choice and control. In Brazil and South Africa women in lower socio-economic circumstances who belong to previously disadvantaged racial groups have limited resources available to them. Women from rural areas have to travel far to attend antenatal clinics and are less likely to have skilled attendance at birth. Women of moderate to high income groups have access to maternity services similar to those in the most developed countries (Burgard, 2004:1142).

2.5 Summary of current research on the standards of midwife-led care

2.5.1 Quality of care: studies on the outcomes of midwife-led care

In developed countries the safety of care by independent, autonomous midwives is often questioned. One-to-one midwifery care was instated in England after the 1994 "Changing Childbirth" reform. To evaluate its success a prospective study (Page *et al.*, 1999) was done to compare one-to-one midwife-led care (728 women) and conventional care (675 women). The outcomes of interest were achievement of continuity of care; intervention use during labour; length of labour; maternal and neonatal morbidity; and breastfeeding rates. The study found a high level of continuity of care in the midwife-led group with less use of interventions and no higher safety risk for women and their infants. Caesarean section, assisted birth and breastfeeding rates were similar for both groups (Page *et al.*, 1999:243). Lack of randomisation owing to the geographical basis of this study limits inferences which could be drawn (Page *et al.*, 1999:246).

A retrospective study of 20 midwifery practices and a thousand patient records adds to the body of evidence of the safety of midwife-led care for low-risk women in the Netherlands, but reports on the importance of risk screening (Martijn *et al.*, 2011:1). A multi-method study was done consisting of prospective incident reporting by the midwives and retrospective content analysis of patient records. Questionnaires on safety culture were also completed. A safety assessment instrument was developed, reviewed by a panel of experts, and used to conduct the content analysis part of the study. The instrument included demographic variables, patient history, information about antenatal care visits and the occurrence of safety incidents. Two independent reviewers examined 50 patient records and obtained 75% agreement. Thereafter, the panel of experts discussed and evaluated the results. The prospective incident reporting was done by actively practising midwives using a standardised form (Martijn *et al.*, 2011:2). The study found that in the 20 midwifery practices there was a relatively low (2.5%) probability per patient of a safety incident occurring. Underestimating risk arising from patient history and certain lifestyle

factors such as increased body mass index (BMI) were factors which contributed to safety incidents.

A Cochrane review by Hatem *et al.* (2008:2) comparing midwife-led to other models of care also responds to the question of safety in midwife-led care. Eleven trials including 12 276 women were included. In all these trials women were randomly allocated to midwife-led and other models of care, adding to the validity of the findings. Women considered low and mixed risk of complications were included. The review reported it to be safe for women without specific medical or obstetric concerns, thus "low risk" pregnant women, to follow the midwife-led route of care. Less use of interventions such as regional analgesia during labour (risk ratio [RR] 0.81, 95% confidence interval [CI] 0.73 to 0.91), episiotomy (RR 0.82, 95% CI 0.77 to 0.88), and instrumental delivery (RR 0.86, 95% CI 0.78 to 0.96) was found in the midwife-led group (Hatem *et al.*, 2008:2). A better chance to be cared for by a known midwife during labour, and enhanced feelings of control were also benefits of midwife-led care. Adverse events did not number more than with any other model of care.

Hodnett *et al.* (2010:3) reviewed the evidence on alternative birth settings. Nine randomised or quasi-randomised trials involving 10 684 women were included in the study sample. To qualify for inclusion these studies had to compare alternative birth settings to conventional labour wards for the care of low risk pregnant women. Primary outcomes for the mother included spontaneous vaginal birth (eight trials; n = 10,218; RR 1.04, 95% CI 1.02 to 1.06); maternal death or serious morbidity (four trials, n = 6334; RR 1.11, 95%CI 0.23 to 5.36); no analgesia during labour and birth (five trials, n = 7842; RR 1.17, 95% CI 1.01 to 1.35); augmentation of labour with artificial oxytocics (seven trials, n = 10,020; RR 0.78, 95% CI 0.66 to 0.91); and very positive views of intrapartum care (two trials, n = 1207; RR 1.96, 95% CI 1.78 to 2.15). Primary outcomes for the infant reviewed by Hodnett *et al.* (2010:3) included mortality and serious morbidity (conditions threatening life or predicting long term disability). Secondary maternal outcomes examined were instrumental vaginal birth; caesarean delivery (eight trials, n = 10,239; RR 0.89, 95% CI 0.78 to 1.01); PPH (five trials, n = 9601; RR 0.98, 95% CI 0.85 to 1.14); epidural analgesia (seven trials, n = 9820; RR 0.82, 95% CI 0.75 to 0.89); and episiotomy (seven trials, n = 9944; RR 0.83, 95% CI 0.77 to 0.90). For the infant secondary risks included admission to neonatal intensive care units (NICU); 5 minute Apgar score less than or equal to 7 (six trials, n = 6554; RR 0.98, 95% CI 0.69 to 1.40); and breastfeeding continuation at six to eight weeks (Hodnett *et al.*, 2010:4). No apparent risk, less intervention, greater maternal satisfaction and longer continuation with breastfeeding were reported. It is not clear whether or not these outcomes were influenced by different models of care in the various settings.

Rana *et al.* (2003:330) advocate for the birth centre model to be considered even in underdeveloped countries. They conducted a comparative study in which low risk pregnant

women in Nepal were assigned to birth at a birthing centre run by independent midwives (550 women) or a consultant-led maternity unit (438 women). It was decided that randomisation would be unethical. Procedures, complications and access to postnatal services were evaluated by interviews and record reviews (Rana *et al.,* 2003:230). In this study, Nepal's first freestanding birth centre staffed by midwives had the same safety outcomes as the hospital labour ward. Outcomes in terms of duration of labour, complications, Apgar scores, and admission to NICU were similar between groups. The birth unit was found to have had less use of oxytocin to augment labour (RR 0.26, 95% CI 0.20 to 0.33), better postnatal follow up, and more use of family planning. Artificial rupture of membranes occurred more frequently in the birth centre group (RR 1.26, 95% CI 1.10 to 1.44) and episiotomy was performed less frequently (RR 0.64, 95% CI 0.57 to 0.72). Due to the fact that there was no randomisation, findings could be confounded by possible systematic differences between the two groups (Rana *et al.*, 2003:335).

Sutcliffe *et al.* (2012:6) did a systematic review of reviews or "meta-review" comparing midwife-led with other models of care. Three reviews met the inclusion criteria and the minimum quality threshold as assessed with a quality assessment tool (Sutcliffe *et al.*, 2012:5). The review by Hatem *et al.* (2008:2) as described above was one of the reviews included in this meta-review. No evidence of a difference in foetal loss or physiological neonatal outcomes between midwife-led and "other" (usually physician-led groups) could be found. Similarly there was no evidence of risk to the physical health of women receiving midwife-led care. They found spontaneous vaginal birth to be significantly more likely and intervention use to be less likely in the midwife-led group.

The latest evidence synthesis of continuous midwife-led versus other models of care was done in a 2013 Cochrane review (Sandall *et al.*, 2013:1). Thirteen studies involving 16 242 women were included. Primary outcomes regarding birth and the immediate postpartum period were regional analgesia (epidural/ spinal); caesarean birth; instrumental vaginal birth (forceps/ vacuum); spontaneous vaginal birth (as defined by trial authors); and intact perineum. Primary neonatal outcomes were: preterm birth (fewer than 37 weeks); and overall foetal loss or neonatal death (foetal loss was assessed by gestation using 24 weeks as the cut-off for viability in many countries). Secondary outcomes included antenatal hospitalisation; antepartum haemorrhage; induction of labour; amniotomy; augmentation/artificial oxytocin during labour; no intrapartum analgesia/ anaesthesia; opiate analgesia; attendance at birth by known midwife; and episiotomy (Sandall *et al.*, 2013:4).

Studies for the review (Sandall *et al.,* 2013:4) were considered if there was random or in some cases not completely random allocation of pregnant women to either midwife-led (where a midwife is the lead clinician and only consults with a physician when necessary) or other models of care (physician/ obstetrician as the lead clinician). Thirteen trials qualified for inclusion and

took place in the public health systems in Australia, Canada, Ireland, New Zealand and the UK. There were variations in models of care, risk status of participating women and practice settings. In eight of the studies women were classified as low risk and "low and high" or mixed risk in five studies. In two trials women were excluded if they had significant medical problems; previous classical caesarean or two previous caesareans; or needed admission to maternal and foetal units. In some of the included trials, women with high risk of complications were still followed up by the midwife-led groups, but had individual care plans (Sandall *et al.* 2013:27). Physician consultation differed among the midwife-led groups from the different trials. In most trials women had at least one or two visits with an obstetrician, but in some instances obstetricians were only consulted if need be.

Outcomes did not differ significantly between low risk and mixed groups reviewed by Sandall *et al.* (2013:16). No mention was made of cases where there was complete handover, in other words an obstetrician became the lead clinician in complicated cases (e.g. induction of labour). The caesarean section rate and frequency of induction of labour were reported for the midwife-led groups, thus women who had caesarean sections or inductions were still considered midwife-led women, since they had been categorised as such from the beginning (intention to treat). No differentiation was made between planned and unplanned caesareans. Overall results of the review showed that women in the midwife-led groups underwent fewer interventions specifically regional or intra-partum analgesia (average RR 0.83, 95% CI 0.76 to 0.90), episiotomy (average RR 0.84, 95% CI 0.76 to 0.92), and instrument birth (average RR 0.88, 95% CI 0.81 to 0.96). They were more likely to have spontaneous vaginal births without instrument assistance (average RR 1.05, 95% CI 1.03 to 1.08); and be attended by a known midwife in labour (average RR 7.83, 95% CI 4.15 to 14.80). They did, however, have longer mean lengths of labour. The percentage of women undergoing caesarean births (average RR 0.93, 95% CI 0.84 to 1.02) was the same for both groups (Sandall *et al.*, 2013:1).

2.5.2 Women's perceptions of receiving midwife-led care

According to the summary of evidence regarding effective care in pregnancy and birth by Enkin and colleagues (2000:22), women expressed their satisfaction with continuity of care by a team of midwives, more so than with care from general practitioners, obstetricians or a variety of midwives. They felt more at liberty to raise and discuss their concerns and felt more prepared for childbirth. In surveys on midwife-led antenatal care, women verbalised their appreciation for having someone to listen to them and the freedom to ask questions (Dowswell *et al.*, 2001:98). A randomised controlled trial in Grampian, Scotland, compared women's satisfaction with birth experiences in a consultant-led labour ward with a midwife-led unit. Satisfaction in the midwife-led unit was slightly higher although not significantly so. The women in the midwife-led group did report more freedom of movement and more control in deciding on pain relief options

(Hundley *et al.*, 1997:1273). In another study, satisfaction with birth experiences in two towns, one in Belgium and another in the Netherlands, was quantified and compared. In both settings women who had planned and succeeded in home births were the most satisfied with their birth experiences (Christiaens & Bracke, 2009:e11). In the Gauteng-based study by Du Plessis (2005:23), one of the major themes that emerged was the therapeutic relationship between the women and their midwives. They felt that they bonded with their midwives, because they were treated like individuals. The safety, security and sense of control they experienced led to hugely positive birth experiences. These women did, however, report that they underestimated the intensity of the pain they would experience during labour, but that the guidance of their midwives helped them to manage it (Du Plessis, 2005:32).

The 2013 Cochrane review which examined outcomes of and satisfaction with midwife-led care compared with other models found a lack of consistency in the way satisfaction was measured. It was therefore reported narratively. The majority of studies found higher satisfaction in women who had continuous midwife-led care versus other models of care (Sandall *et al.*, 2013:2).

2.6   Midwifery in the South African context

The South African health care system is unique in the sense that it may be compared to the developed as well as the developing world. As previously described there is a public health care system and in contrast to that a private health care system.

Midwives feature in varying roles and settings in South Africa. Most registered midwives are hospital-based and permanently employed by public health care facilities or private hospitals. Hospital midwives in public health care facilities are primarily responsible for normal births and refer to obstetric registrars and consultants when complications arise. Midwife obstetric units (MOUs) are community based centres where midwives practise with a higher level of independence. Women have to be transferred to referral hospitals when the need for a higher level of care arises. Level one (district) hospitals deal with non-critical cases. Doctors on call are usually relatively inexperienced or busy completing their community service, and are not specialised in obstetrics. These facilities can usually manage normal births, induction of labour, uncomplicated caesarean sections, and basic pregnancy ultrasound scans. Tertiary level provincial hospitals manage high risk and complicated obstetric cases. These facilities are associated with academic institutions and the registrars on call are specialising in obstetrics (DOH, 2002:11).

Citizens of moderate to high income groups have medical insurance through medical aid schemes and make use of the private health sector namely, private hospitals and private practising health care professionals. In private hospitals, maternity care is predominantly

obstetrician-led. Care is provided by the nurses who are on duty at the time the woman is admitted, while the birth itself is usually attended to by an obstetrician. This is the case for both low and high risk women. The intervention rate is high in private maternity care. In 2013 and 2014 it was estimated that the caesarean section rate was 73.9% (HST, 2014:81)

James *et al.* (2012:404) interviewed 100 women who had given birth at private hospitals in the Nelson Mandela Metropolitan area to explore factors that influenced their decisions on how to give birth. They found that the women were highly educated, but failed to attend proper antenatal education courses and were therefore easily influenced into deciding to have caesarean sections. Half of these women desired to have normal deliveries, but only 22% of them managed to do so in the end. Although some caesareans were obviously justified, informed choice was lacking. Those women who chose to have elective caesarean sections could not offer evidence-based reasons. Their motivations were mostly fear-driven and they were unaware of basic things such as pain relief methods during labour. A lawyer interviewed by Bateman (2004:801) reported that women are sometimes subjected to "emotional blackmail". They are scared into thinking their infants will be damaged by labour and normal birth. James *et al.* (2012:408) are of the opinion that midwives' expertise in antenatal education and care during labour is underused in the private sector and that better cooperation between midwives and obstetricians could influence the high caesarean section rate.

Private midwife-led care is an option for South African women who prefer a more natural approach to pregnancy and birth. The Society of Private Nursing Practitioners of South Africa (2008:19) stated that they support a woman's right to select the most appropriate birth option for her, and to be supported and cared for by a qualified midwife whose primary objective is the health and safety of the mother and infant. Guidelines were established specifically for midwives who conduct home births, but these guidelines are also a good overview of the guidelines for South African private midwives in general (Society of Private Nursing Practitioners of South Africa, 2008:19). These guidelines propose that women who follow midwife-led care should be seen by a medical practitioner at least twice during pregnancy and this medical practitioner should be available if complications arise during pregnancy or childbirth. It also states that there should always be a second practitioner present during a birth, which could be a midwife, a nurse or a trained doula.

South African private midwives practise independently, similar to their Dutch, New Zealand and Canadian counterparts and use community based settings similar to those described in international studies. They are not reimbursed by government funding, however, and their clients pay privately. Some medical insurance companies do reimburse their clients to a certain extent for midwife-led care. Private midwives provide care at their own consulting rooms, women's homes, and some private hospitals or facilities focussing specifically on midwife-led

care. They have to hold current registration with SANC according to the Nursing Act (33 of 2005) and are obliged to follow the "regulations relating to the conditions under which registered midwives and enrolled midwives may carry on their profession" as set out by SANC (1990). The risk profile of women attending midwife-led care in South Africa is assumed to be mainly low risk, but will be assessed in this study.

Access to private midwife-led care can be found in most provinces, although the largest concentration of private midwives works in cities such as Johannesburg and Cape Town (Mother Instinct, 2012). Johannesburg has more than one midwife-led facility or birth centre, which hosts more than 20 private midwives. Gauteng private midwives are organised in a forum, the PPMA in which they discuss standards, challenges and case studies.

2.7   Conclusion

Midwives have a unique approach to pregnancy and childbirth. Evidence suggests that the midwife-led model of care involves more emotional support and allows more input from the women and their families. Research on midwife-led versus other models of care shows it to be as safe as and less intervention-driven than other models of care, although collaboration and a referral system to higher levels of care are imperative for when complications arise (Renfrew *et al.*, 2014:13). In South Africa there is little evidence on the outcomes, models of care, birth settings, medical backup systems and demographic details of women attending private midwife-led care throughout the country. In the process of adding new evidence to the topic, the next chapter describes the methodology of the retrospective cohort study to explore the outcomes of private midwives in Gauteng.

CHAPTER 3:   RESEARCH DESIGN AND METHODOLOGY

3.1   Introduction

The aim of this chapter is to describe how the research design and methodology were employed in each step of the study. The processes of sampling, data collection and data capturing as well as data analysis are described. Finally validity and reliability and the ethical issues that were considered are discussed.

3.2   Research design

As may be deduced from the title of the study, the researcher is interested in the outcomes of births attended by private midwives in Gauteng. The focus of outcomes research in nursing science is ultimately to evaluate the results of patient care (Burns & Grove, 2009:281). The researcher does not alter or influence any variables, but collects data as an objective observer. The study can therefore be classified as non-experimental quantitative research (Brink *et al.*, 2012:102). Considering the objectives, the study population and the time available for data collection the researcher chose a retrospective cohort design. Data from a cohort of women who underwent the same event (birth attended by a private midwife) was collected and analysed *ex post facto* or retrospectively.

The objectives were to explore and describe the outcomes of these births and compare them with the latest Cochrane review on midwife-led care (Sandall *et al.*, 2013:2).

3.3   Methods and procedures

3.3.1   Sampling

The two different units of analysis in the study were:

- the birth incident of every woman who gave birth in Gauteng in 2012 and 2013 with a private midwife as primary caregiver and

- each separate private midwifery practice.

The sources of information were each midwifery practice's birth register in which a summary of a birth is entered after it has occurred. The birth register of every Gauteng private midwife who could be reached and was willing to allow access to her records was included in the study sample. Some midwives work alone while others work together in practices.

To estimate a representative sample size, the researcher conducted an informal birth census via email. The response rate was poor – in fact, only two practices involving six midwives responded. These six midwives conducted an average of 57 births per midwife in 2013. There were more or less 25 actively practising private midwives in Gauteng in 2012 and 2013. A rough estimate of the total number of births would thus be 2850. Although some sources say a 10% sample should be sufficient, the researcher decided to aim for a sample size of at least 50% of the number of births or midwives (Botma *et al.*, 2010:130). The aim was thus to include at least 1500 births or 13 midwives. The heterogeneity among the different midwifery practices and the small population influenced this decision.

The sampling method can most aptly be described as network sampling. The practices whose data were used had characteristics and expertise particular to the study (Burns & Grove, 2009:356). The PPMA allows membership to all midwives in Gauteng who conduct births independently. Most private practising midwives have joined this forum. In fact, it is compulsory for midwives who want to have birthing rights at one of the main birth centres to belong to this alliance. Each PPMA member received a list of the contact details of all individual members or practices. Every midwife on this list was contacted via email and informed about the purpose of the study and what participation would entail.

The researcher informed possible participants about the research at four of the monthly scheduled meetings of the PPMA early in 2014. Informed consent forms were handed out to everyone present at these meetings [Annexure A]. Midwives were requested to sign informed consent to participate in a short interview to provide background information and allow access to their birth registers. The midwives who showed interest or had already signed consent forms were contacted telephonically and appointments were made to meet them at venues convenient for them. In the group practices only the lead midwife or practice owner was consulted, although each midwife in the practice had to sign informed consent.

The sample consisted of 1724 births attended by 14 midwives working in eight midwifery practices. Each midwifery practice was also a separate primary unit of analysis. The practices were coded as follows:

- Practice A: 5 midwives (A1; A2; A3; A4 and A5).
- Practice B: 1 midwife (B1)
- Practice C: 1 midwife (C1)
- Practice D: 2 midwives in 2012 and 1 midwife in 2013 (D1 and D2)
- Practice E: 1 midwife (E1)
- Practice F: 1 midwife (F1)
- Practice G: 2 midwives (G1 and G2)

- Practice H: 1 midwife (H1)

The researcher continued to contact and recruit midwives until the desired sample size was reached, but at the end of the sampling process all members on the PPMA list had been contacted either telephonically, via email or by being approached in person at meetings. Eleven midwives did not participate, mostly for logistical reasons. One was out of the country at the time of data collection and the rest reported that their records were not summarised in a birth register and it would be too time-consuming to access all the patients' files for the specified information needed by the researcher. The researcher is not aware of any Gauteng midwife who is in private practice and is not a PPMA member.

3.3.1.1 Inclusion criteria

The records of midwives in private practice in Gauteng during 2012 and 2013 were eligible for inclusion. According to law midwives are only allowed to practise if they are registered with the South African Nursing Council (SANC). Only registered midwives who held annual licences to practise when the births took place were included in the study.

3.3.1.2 Exclusion criteria

The records of midwifery practices with fewer than ten births per year were excluded as this could affect the anonymity of the midwives and women under their care.

3.3.2 Data collection

The first step in the process of data collection comprised of a short interview with the lead midwife of each midwifery practice. The researcher asked about the number of midwives in the practice, the demographics and risk status of pregnant women taken on by the practice, locations for births and backup system, and the qualification and years of experience of each midwife in the practice. The rationale behind collecting this information was that data analysis would be done for each practice separately and then in combination.

The second step was to copy the birth register or birth record book of each practice. The birth registers were not removed from the midwives' practices. The names and addresses of all patients as recorded in the birth register were covered before copies were made with the camera of a smartphone. The pictures were uploaded to a password protected computer, printed and put into a folder. Because the names and addresses were covered no patient was identifiable in the printed copies of the birth registers. Women were coded by using the year; the practice code and the chronological number of the patient for the particular practice for the year.

Patient anonymity thus commenced at the data collection phase and continued throughout the study.

The main areas of interest were:

- The women' demographic details including risk factors and

- The outcomes of the birth including interventions that were needed.

Demographic details included were age; gravidity and parity; weight of the infant; and known risk factors (previous caesarean section, medical conditions and advanced maternal age). Outcomes of interest were type of birth (spontaneous vaginal delivery, caesarean section or instrument assisted birth); the location where the birth took place and whether or not this was the planned location for the birth; the perineum after birth (intact, episiotomy, 1st/2nd degree tear or complicated tear); interventions (induction of labour, augmentation of labour, and artificial rupture of membranes); maternal complications (postpartum haemorrhage, retained placenta, or admission to high care unit in hospital); and neonatal complications (preterm birth, 5 minute Apgar below 7, admission to neonatal intensive care, still birth or early neonatal death).

3.3.3   Data capturing

An audit form was compiled in the proposal development phase [Annexure B] based on the systematic review of Sandall *et al.* (2013:1) as the outcomes of births attended by the Gauteng midwives would ultimately be compared with the outcomes from the systematic review. An Excel spread sheet for data capturing was then designed with the assistance of a consultant from the Statistical Consultation Service of the North-West University, Potchefstroom Campus [Annexure C].

The researcher did the data capturing by doing an audit of the birth register of each midwifery practice on a separate spread sheet. During this phase the names of all the midwives were coded ensuring that only the researcher would know the identities of participating midwives. Each midwife was aware of her own code, but they were all met privately and did not know one another's codes. After all the data had been captured it was combined into one spread sheet and sent for data analysis by the Statistical Consultation Service. Data collection and data capturing took approximately two months to complete.

3.3.4   Data analysis

Statistical Consultation Service provided guidance throughout the process and conducted the data analysis. Two different statistical techniques were used for the two different units of

analysis. Where the records of the individual birth were the unit of analysis, SPSS version 22 was used to analyse the computerised data (SPSS Inc., 2013). Hierarchical linear modelling was used as each midwifery practices was analysed as a separate unit of analysis with unique characteristics. Hierarchical linear models report averages and entail multilevel analysis to exclude type I error (Hancock & Mueller, 2010:123). The software used to conduct analysis for the hierarchical linear models was the SAS System for Windows Release 9.3 TS Level 1M0 (SAS Institute Inc., 2011).

A summary of the data is displayed in the form of descriptive statistics (Botma *et al.*, 2010:148). The descriptive statistics are shown as means and percentages where applicable. Cross tabulations as well as chi-square tests were used where applicable to determine associations between practices and measured variables. Results from calculations from SAS (SAS Institute Inc., 2011) are reported as frequencies or means with 95% confidence limits and standard errors as percent or mean. SAS SURVEYFREQ was used to calculate the 95% confidence limits.

When comparing a variable across different groups one would expect p-values and/or 95% confidence limits to be reported. Statistical significance can be indicated by the p-value or related 95% confidence limits. In large study samples one would always expect small p-values which would not necessarily be useful in practice (Ellis & Steyn, 2003:51). In medical publications 95% confidence limits are now preferable over p-values. Confidence limits can be used when the value of the parameter is not preconceived (such as in hypothesis testing). The estimation is inferred from sample data and can be used in a single or multiple populations (Burns & Grove, 2009:455). For the purpose of this study 95% confidence limits were calculated and used to compare outcomes. The 95% confidence limits bind the confidence interval (CI), which is reported with a lower and higher number. As per advice from the Statistical Consultative Services, differences between the outcomes of the Gauteng group and the midwife-led group from the Sandall *et al.* (2013) study were considered significant if the results from Sandall *et al.* (2013) fell outside the calculated 95% CI of the Gauteng sample.

The background information of each midwifery practice was reported narratively to create the context in which the births took place. This information was captured in notes during the interviews with the midwives from each practice. Ultimately the results were discussed in comparison with the results of the systematic review by Sandall *et al.* (2013:2).

3.4   Validity and reliability

Measures to promote validity commenced at the problem identification stage by clearly defining the research problem, population and variables. Meticulous planning and adherence to detail in

every step of the study added to the trustworthiness and validity of the study findings (Burns & Grove, 2009:34).

A retrospective cohort design was chosen after considering the research paradigm, time frame, academic level and ethical considerations of the study. A pragmatic approach proposes that the method should be guided by the objectives and not vice versa. The use of a retrospective design instead of a prospective design allowed access to a greater study sample in a shorter time frame, adding to the validity of the study findings. The study design was thus feasible given realistic time, financial and academic level constraints (Burns & Grove, 2009:226).

An adequate sample is one of the most important factors in assessing the feasibility and validity of a study (Botma *et al.*, 2010:129). The midwives in the sample had various levels of qualification, years of practice and practice models. The sample was thus heterogeneous, contributing to the validity of the findings. Participation was voluntary, however, which could have created bias. Although one cannot make any assumptions, it might be that midwives who chose not to participate did so because of them not having very positive practice outcomes in general and feared being exposed. With regard to sample size, the researcher aimed for at least 13 midwives, while 14 eventually participated and 1500 births but ended up with 1724, which is a larger sample than anticipated.

The researcher chose to use the midwives' birth registers only and not to access patients' files. There were some missing data and possible underreporting of findings for which there were not specifically designated columns in the registers (e.g. increased body mass index and artificial rupture of membranes). The rationale behind not accessing patients' files was that the birth registers contained most of the information the researcher was interested in. Gaining access to the patients' files would have limited added advantage. Missing data is reported in chapter four in which the results of the study findings are described.

Precise data collection and data analysis were imperative therefore the researcher developed an audit form to serve as a guide for data collection [Annexure B]. The audit form was based on the variables in the systematic review by Sandall *et al.* (2013). Data collection was done by capturing the information into an Excel spread sheet directly from the midwives' birth registers [Annexure C]. The spread sheet was developed from the birth audit form which included all the variables the researcher identified as important to assess the outcomes of each birth and which correlated with the variables from the Sandall *et al.* (2013) review..

The researcher did all the data collection and data capturing in person. Data capturing by a single individual could lead to errors and missing data (Botma *et al.,* 2010:176). However, data were therefore, checked and re-checked. Outliers were double checked after data analysis.

Spot checks were also done before results were reported. Data collection, capturing, analysis and reporting were done in consultation with the Statistical Consultation Service of the North-West University.

3.5 Ethical considerations

The research proposal for this study was approved by the Human Research Ethics Committee (HREC) of the North-West University Potchefstroom campus (Nr NWU-00011-14-A1) [Annexure D].

Throughout the research process the researcher took care to adhere continually to the principles of beneficence and non-malevolence. The topic and the study design were chosen with careful consideration of the risks and benefits of conducting the study. Ethical aspects were considered, commencing at the proposal development phase and continuing throughout the processes of sampling, data collection, data capturing and data analysis.

Data collection was commenced only after ethical clearance had been confirmed. The participating midwives were recruited in an ethical manner with no coercion or intimidation of any kind. The midwives who made their records available did so voluntarily. They were informed of the aims and benefits of the study as well as the risks and signed informed consent before collection was initiated. The informed consent document [Annexure A] gave an overview of the study and made the midwives aware of the risks and benefits for them and their patients. The main perceived benefit would be more insight into private midwifery practice in Gauteng.

The risk of inconvenience was addressed by visiting the midwives at locations convenient to them, limiting consuming their time. No meeting with any midwife took longer than an hour. The midwives were informed that they had the right to withdraw from the study at any time. This was in respect of their right to autonomy and self-determination.

Measures were taken to ensure confidentiality and anonymity. The researcher took note of the "Promotion of Access to Information Act" and could not find anything against the use of anonymous information for research purposes when the person is not identifiable (South Africa, 2000). The birth registers were copied after the names and addresses of women had been covered. Interviews were conducted in private limiting the risk of loss of anonymity. Midwives, their patients, and the hospitals or birth centres involved, remained anonymous through the use of numerical codes instead of names. No midwife or patient was identifiable in the captured data and only the codes appeared on the spread sheets. Only the researcher knew all the practice and midwife codes and the code lists were locked away separate from the data. Participating midwives knew their own codes, but not one another's codes. The researcher personally

conducted all data collection. The records of midwives with very few patients (fewer than 10) were excluded as this could jeopardise anonymity. The midwives' qualifications and years of practice were discussed together and not per practice. Discussing it separately could have hampered anonymity. Outcomes of births were reported statistically, making identification of any single patient highly improbable. Data were reported in the form of descriptive statistics, further ensuring patient anonymity.

Electronic data were kept on a password protected computer to which no-one but the researcher had access. The statistician had access to the completed Excel audit document in which patient codes, but no names, appeared. Paper documents such as the copied birth registers and spread sheets would be kept under lock and key at the research entity for five years following the completion of the research project. Electronic records would be transferred to a compact disc and stored with the other records.

The findings of the study will be disseminated to the scientific community via publication and presentation at conferences. As promised in the informed consent document, feedback would be given to the midwives regarding the findings of the study.

The researcher made reference to all sources used, thereby refraining from plagiarism. All ethical considerations mentioned above were based on those outlined by Pera and Van Tonder (2005:46-55).

3.6   Conclusion

A retrospective cohort design was employed to explore the outcomes of births attended by private midwives in Gauteng in 2012 and 2013. The aim of this chapter was to describe the processes of sampling, data collection, analysis, measures to ensure validity and reliability as well as ethical considerations. In chapter 4 the results of data analysis will be reported and displayed.

CHAPTER 4:   RESULTS OF THE RETROSPECTIVE COHORT STUDY

4.1   Introduction

In this chapter the researcher will report on the results of the retrospective data captured from the study sample. The two different units of analysis were 1724 births attended by 14 midwives in Gauteng during 2012 and 2013 and the eight separate midwifery practices. Because of three twin births, there was a total of 1727 infants. All the midwives conducted midwife-led care as autonomous professionals. Data analysis aimed to explore specific variables regarding the women's demographic details, risk factors, as well as variables regarding the outcomes of their births.

4.2   Background information about each midwifery practice

Background information about every private midwifery practice whose birth register was used in the study sample is reported narratively. The information was recorded in notes during interviews with the lead midwives of each practice. Each practice has different referral criteria and patient demographics. All these practices would, however, refer women to a medical practitioner or hospital if they develop serious complications such as preterm labour or have medical conditions outside of the midwife's scope of practice. Some of the midwives work more closely with their backup obstetricians and will conduct co-managed care for women with specific risk factors. Although a risk factor, most practices accept women who request to attempt vaginal birth after caesarean section or VBAC. VBAC is managed in consultation with a backup obstetrician and PPMA protocols require these women to give birth at a hospital or birth centre with access to an operating theatre.

4.2.1   Practice A

In 2012 and 2013, when the births audited in the study took place, Practice A had four full time practising midwives and one midwife occasionally taking on births through the practice. This practice conducted births at an active birth unit on the premises of a maternity hospital, births at a "birth house", and occasional home births. They managed mainly low risk women, although women with risk factors such as epilepsy and asthma were considered if they were stable and had been cleared by their physicians. Practice A did accept women with previous caesarean sections to attempt trial of labour and VBAC. If a patient had been under their care for the duration of pregnancy and an elective caesarean section became necessary (e.g. in case of breech presentation) they offered midwife accompaniment to theatre. During 2012 and 2013 the backup system consisted of mainly two private obstetricians for women with a medical aid fund and a nearby public hospital for women without a medical aid and women who could not afford

private hospital rates. In this practice it was standard for two midwives to be present at every birth: the primary midwife and the backup midwife. Each woman had her own primary midwife throughout the pregnancy and birth, thus Practice A offered a caseload or one-to-one approach.

4.2.2 Practice B

Practice B consisted of one midwife who took on her own caseload. She conducted most of the births at a free-standing birth centre as well as at an active birth unit at a hospital. Home births were only done occasionally. Women who wished to make use of a doula could have one present at the birth. She used the birth centre staff for support and other private midwives for assistance at home births. Specific private obstetricians (woman's choice) acted as her medical backup and she occasionally used the public hospital system for non-medical aid women. She accepted VBAC women on occasion and mainly focused on low risk pregnancy. She continued the care of moderate risk women, e.g. pregnancy induced hypertension when induction of labour had been prescribed by the backup obstetrician. Midwife B induced women who had reached 42 weeks pregnancy duration with a script from, and thus in cooperation with the backup obstetrician.

4.2.3 Practice C

Midwife C also practised on her own. Her patients made use of a doula if they chose to do so and had the choice of giving birth at a free-standing birth centre, one of two active birth units at hospitals, or at their own homes. The women used the private obstetrician of their choice for backup if the obstetrician was willing to act as such. She rarely relied on the public system for backup. Midwife C conducted VBACs and accepted clients with mild pregnancy induced hypertension, auto-immune disease, controlled epilepsy, asthma or diabetes in consultation with their backup obstetricians.

4.2.4 Practice D

Practice D consisted of two midwives in 2012 and one midwife in 2013. A third midwife helped with antenatal clinics or when one of the midwives was on leave. Practice D conducted most of the births at a freestanding birth centre. Home births or births at other hospitals active birth units were only done at special request. Practice D accepted VBACs and otherwise low risk women. Occasional moderate risk women (e.g. mild pregnancy induced hypertension) were considered individually and if the backup obstetrician agreed. Induction of labour was performed according to the criteria of the practice and in consultation with the backup obstetrician. Practice D made use of specific backup obstetricians depending on the patient's choice.

4.2.5 Practice E

Practice E consisted of a single midwife who employed the help of a doula. She conducted home births; birth centre births, and births at an active birth unit on hospital premises. She referred her patients to specific backup obstetricians. VBACs were done at hospital. Midwife E took no women with risk factors and chose not to perform induction of labour. She accompanied women to theatre for elective caesarean sections on request.

4.2.6 Practice F

Midwife F also practised on her own. The birth centre staff helped her with births done there. She used a support midwife if she had been busy and was very tired. Midwife F worked at a free-standing birth centre, an active birth unit at a hospital, and occasionally conducted home births. She took on women who wish to attempt VBAC, otherwise mainly low risk women. She performed induction of labour if advised by an obstetrician. She used specific obstetricians as backup for her clients.

4.2.7 Practice G

Practice G consisted of two midwives. They preferred home births, but also conducted births at a free-standing birth centre, and an active birth unit at a hospital. They used specific obstetricians for backup and on rare occasions used the facilities at a public hospital. Practice G preferred not to conduct VBAC and referred women with risk factors to obstetricians, with some exceptions such as controlled asthma. They performed induction of labour under doctors' orders. Team midwifery was practised, in other words women could be cared for by either of them during labour and most women met them both during pregnancy.

4.2.8 Practice H

Practice H consisted of a midwife taking her own caseload and used various support midwives, especially at home births. In 2012 and 2013 she conducted births at a free-standing birth centre, two active birth units at different hospitals, and at women's own homes. She used specific obstetricians as backup. Midwife H accepted VBAC women. She took on only low risk women with some exceptions at the specific obstetrician's discretion. She had for example taken on a patient with gestational diabetes, but referred her back to the obstetrician.

4.3 Midwives qualifications

All 14 midwives who participated in the study were trained by institutions which were approved by SANC at the time they qualified. All of the midwives held current registration with the South African Nursing Council when the births took place.

- **Table 4-1:   Midwives' qualifications**

Qualifications	Basic Midwifery qualification (n=14)				Specialisation	
	Four-year university degree in nursing and midwifery	Four year diploma nursing and midwifery	Three year nursing diploma with additional year of midwifery training	Nursing and midwifery diploma with bridging course to obtain degree	Advanced midwifery and neonatal nursing diploma	Advanced midwifery and neonatal nursing Masters' degree
Number of midwives with each qualification	4	2	3	5	2	1

All 14 midwives' basic qualifications are presented in table 4-1. The number of midwives with further specialisation is presented on the right side of the table.

4.4 Results of data collection

The analysed data is presented in tabular form. A discussion of all results will follow in chapter 5.

4.4.1 Number of births conducted per practice

- **Table 4-2:   Number of births conducted per practice for 2012 and 2013**

Practice code	Number of births conducted (2012 and 2013)
Practice A	416 (5 midwives)
Practice B	71 (1 midwife)
Practice C	145 (1 midwife)
Practice D	240 (2 midwives)
Practice E	113 (1 midwife)
Practice F	199 (1 midwife)
Practice G	497 (2 midwives)
Practice H	43 (1 midwife)
Total number of births	**n = 1724 (14 midwives)**

The number of births attended to by each of the eight midwifery practices is summarised in table 4-2.

4.4.2   Biographical information

Biographical information obtained from the birth registers for the purpose of the study included the woman's age, gravidity, parity, obstetric risk factors and gestation. Infant gestational age at time of birth was also reported under biographical information and aspects of the weight, for example the percentage of babies with low birth weight, were presented.

4.4.2.1   Age

- **Table 4-3:   Minimum, maximum and mean age of women cared for per practice**

Practice	Number of women	Missing data	Minimum age	Maximum age	Mean age	Standard deviation
A	416	0	17	43	29.8	4.9
B	69	2	20	42	29.6	4.3
C	145	0	19	47	31.8	5.0
D	238	2	19	45	31.7	4.7
E	112	1	22	42	32.8	4.4
F	197	2	20	44	29.7	4.2
G	497	0	17	45	29.0	5.2
H	43	0	22	41	30.7	4.8
Combined	**1717**	**7**	**17**	**47**	**30.2**	

Table 4-3 reports the minimum, maximum and mean age of all women cared for per practice as well as the combined minimum, maximum and mean ages. The total number of women as indicated under combined (1717) differs from the total number of births (1724) because the ages of seven women were not indicated in the birth registers.

4.4.2.2 Gravidity and parity of women per practice

- **Table 4-4:   Primigravida, multipara and grand multipara per practice**

Practice	Not stated	Primigravida	Primipara	Multipara	Grand multipara
A Number (% within A)	0 (0.0%)	196/416 (47.2%)	15/416 (3.6%)	203/416 (48.8%)	2/416 (0.5%)
B Number (% within B)	0 (0.0%)	55/71 (77.5%)	1/71 (1.4%)	15/71 (21.1%)	0 (0.0%)
C Number (% within C)	0 (0.0%)	60/145 (41.1%)	18/145 (12.4%)	66/145 (45.2%)	1/145 (0.7%)
D Number (% within D)	5/240 (2.1%)	78/240 (32.5%)	11/240 (4.6%)	146/240 (61.2%)	0 (0.0%)
E Number (% within E)	0 (0.0%)	52/113 (46.0%)	11/113 (9.7%)	50/113 (44.2%)	0 (0.0%)
F Number (% within F)	0 (0.0%)	92/199 (46.2%)	11/199 (5.5%)	96/199 (48.2%)	0 (0.0%)
G Number (% within G)	0 (0.0%)	199/497 (40.0%)	17/497 (3.4%)	268/497 (43.9%)	13/497 (2.6%)
H Number (% within H)	0 (0.0%)	19/43 (44.2%)	5/43 (11.6%)	19/43 (44.2%)	0 (0.0%)
Total number (% of total)	**5/1724 (0.3%)**	**751/1724 (43.6%)**	**89/1724 (5.2%)**	**865/1724 (50.1%)**	**16/1724 (0.9%)**

Table 4-4 shows the number and percentage of women in each practice who were primigravidae, primiparae, multigravidae and multiparae. It also presents the total number of women in each category.

4.4.2.3 Pregnancy duration at the time of birth

The pregnancy duration at the time of birth was reported for 1720 out of 1724 women in the study sample. The data for the other four women were not stated in the birth registers

- **Table 4-5:** **Minimum, maximum and mean pregnancy duration in completed weeks per practice**

Practice	Number of women	Missing data	Minimum	Maximum	Mean	Std. Deviation
A	416	0	30	42	39.5	1.3
B	70	1	37	42	39.7	1.1
C	145	0	34	41	39.2	1.2
D	239	1	32	41	39.3	1.4
E	113	0	36	42	39.3	1.2
F	198	1	33	42	39.2	1.2
G	496	1	35	42	39.4	1.3
H	43	0	37	42	39.2	1.2
Combined	**1720**	**4**	**30**	**42**	**39.4**	

Table 4-5 presents the minimum, maximum and mean pregnancy duration of women for each practice. The combined minimum, maximum and mean pregnancy duration is also shown.

- **Table 4-6:** **Percentage of pregnancies within different pregnancy duration categories**

Pregnancy duration	Frequency	Percent	Standard Error of Percent	95% Confidence interval (CI) for Percent	
Before 37 weeks	33	1.9%	0.3	1.3	2.6
37 – 40 weeks	1392	80.9%	1.0	79.1	82.8
After 40 weeks	295	17.2%	0.9	15.4	18.9
Total	**1720**	**100.00%**			
Frequency of missing information = 4 pregnancies					

Table 4-6 shows the number, percentage and 95% CI for percent of pregnancies ending before 37 weeks; between 37 and 40 weeks; and after 40 weeks gestation.

4.4.2.4 Infant birth weight

In the study sample, 1727 infants were born to 1724 women (three twin births). The infant birth weight was reported in 1716 cases, but the weights of 11 infants were not reported. The mean infant weight was 3.3kg (0.01 standard error of mean; 3.29 to 3.34 95% CI for mean).

- **Table 4-7:   Mean infant weight per practice**

Practice	Mean infant weight at birth in kilogram
A	3.4
B	3.4
C	3.4
D	3.4
E	3.4
F	3.2
G	3.3
H	3.4
Combined mean infant weight	**3.3**

Table 4-7 presents the mean infant weight per practice as well as the combined mean infant weight.

- **Table 4-8:   Infant birth weight categories**

Infant weight	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Below 2.5kg	50	2.9%	0.4	2.1	3.7
Normal weight: (2.5-4kg)	1538	89.6%	0.7	88.2	91.1
Weight above 4kg	122	7.5%	0.6	6.2	8.7
Total	**1716**	**100.00%**			
Frequency of missing information = 11 infants					

In table 4-8 the number, percentage and 95% CI for percent of infants below 2.5kg; between 2.5 and 4kg; and above 4kg are shown.

4.4.3 Risk factors

- **Table 4-9:   Percentage of reported risk factors per practice**

Practice	Number of women with risk factors as fraction of total women per practice
A Number (% within practice)	93/416 (22.4%)
B Number (% within practice)	14/71 (19.7%)
C Number (% within practice)	65/145 (44.8%)
D Number (% within practice)	86/240 (35.8%)
E Number (% within practice)	46/113 (40.7%)
F Number (% within practice)	47/199 (23.6%)
G Number (% within practice)	96/497 (19.3%)
H Number (% within practice)	12/43 (27.9%)
Total number (% of total)	**459/1724 (26.6%)**

In table 4-9 the number and percentage of women in each practice with reported risk factors are presented alongside the total number of women.

- **Table 4-10:   Number and percentage of women with known risk factors**

Risk factors identified	Frequency	Percent	Standard Error of Percent	95% CI for percent	
No	1265	73.4	1.1	71.3	75.5
Yes	459	26.6	1.1	24.5	28.7
Total	**1724**	**100.00%**			

Table 4-10 show the total number and percentage of women reported to have had pre-existing or pregnancy related risk factors. Specific risk factors are reported separately in the tables below.

4.4.3.1 Previous caesarean section

- **Table 4-11: Previous caesarean reported per practice**

Practice	Number of women who had a previous caesarean sections as fraction of total women per practice
A Number (% within practice)	36/416 (8.7%)
B Number (% within practice)	4/71 (5.6%)
C Number (% within practice)	7/145 (4.8%)
D Number (% within practice)	26/240 (10.8%)
E Number (% within practice)	5/113 (4.4%)
F Number (% within practice)	25/199 (12.6%)
G Number (% within practice)	5/497 (1.0%)
H Number (% within practice)	3/43 (7.0%)
Total number (% of total)	**111/1724 (6.4%)**

In table 4-11 the number and percentage of women in each practice who had had previous caesarean sections are displayed.

4.4.3.2 Increased body mass index

Only Practices A, B and C reported instances of increased body mass index. The total number of women identified was 7 (0.4% of the sample). Other practices did not report this risk factor. Increased BMI was thus underreported in the study sample.

4.4.3.3 Pre-existing or pregnancy related medical conditions

- **Table 4-12:   Medical conditions reported per practice**

Practice code	No medical conditions	Pregnancy induced hypertension	Pre-eclampsia	HELLP syndrome	Mild anaemia	Epilepsy	Pituitary tumor	Previous pulmonary embolism	Reiters Syndrome	Shogans Syndrome - Auto Immune Disorder
A	414/416 99.5%	1 0.2%	0 0.0%	0 0.0%	0 0.0%	1/416 0.2%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
B	70/71 98.6%	1/71 1.4%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
C	132/145 91%	0 0.0%	0 0.0%	1/145 0.7%	3/145 2.1%	1/145 0.7%	0 0.0%	1/145 0.7%	1/145 0.7%	1/145 0.7%
D	235/240 97.1%	4/240 1.7%	0 0.0%	0 0.0%	0 0.0%	1/240 0.4%	1/240 0.4%	0 0.0%	0 0.0%	0 0.0%
E	113/113 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
F	199/199 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
G	488/497 98.2%	7/497 1.4%	2/497 0.4%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
H	42/43 97.7%	0 0.0%	1/43 2.3%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
	1693/1724 98.0%	**13/1724 0.8%**	**3/1724 0.2%**	**1/1724 0.1%**	**3/1724 0.2%**	**3/1724 0.2%**	**1/1724 0.1%**	**1/1724 0.1%**	**1/1724 0.1%**	**1/1724 0.1%**

Table 4-12 shows the number and percentage of women with different medical conditions in each of the eight practices. Medical conditions were not pre-specified or categorised on the audit forms. Midwives narratively reported specific medical conditions. These were entered in words on the spread sheet, grouped together and quantified to explore the types and occurrence of different medical conditions. The number of women with no reported medical conditions is shown in the second column to the left, followed by a column for each of the reported medical conditions and the number of women suffering from these conditions. Some women had more than one medical condition.

4.4.3.4 Advanced maternal age

- **Table 4-13:** **Cases of advanced maternal age per practice**

Practice	Number of women of advanced age as fraction of total women per practice
A Number (% within practice)	54/416 (13.0%)
B Number (% within practice)	9/71 (12.7%)
C Number (% within practice)	40/145 (27.6%)
D Number (% within practice)	59/240 (24.6%)
E Number (% within practice)	40/113 (35.4%)
F Number (% within practice)	21/199 (10.6%)
G Number (% within practice)	71/497 (14.3%)
H Number (% within practice)	9/43 (20.9%)
Total (% of total)	**303/1724 (17.6%)**

Table 4-13 shows the number and percentage of women categorised as advanced maternal age per practice.

4.4.3.4 Grand multipara

- **Table 4-14:** **Grand multiparity per practice**

Practice	Number of grand multiparous women as fraction of total women per practice
A Number (% within practice)	3/416 (0.7%)
B Number (% within practice)	0/71 (0.0%)
C Number (% within practice)	1/145 (0.7%)
D Number (% within practice)	0/240 (0.0%)
E Number (% within practice)	0/113 (0.0%)
F Number (% within practice)	0/199 (0.0%)
G Number (% within practice)	13/497 (2.6%)
H Number (% within practice)	0/43 (0.0%)
Total number (% of total)	**17/1724 (1.0%)**

Table 4-14 shows the number and percentage of grand multiparous women per practice. The total number and percentage of grand multiparous women are also shown.

4.4.3.5 Other

Numerous risk factors were identified under the heading "other". Fifty six women (3.2%) were identified as having had "other" risk factors. Specific risk factors classified under the heading "other" were explored. Poor obstetric history and positive group B streptococcus were the most significant as both were reported in 13 cases (0.8% of the study sample). Previous preterm birth; abnormality in the foetus; bicornuate uterus; previous retained placenta; breech presentation; drug use during pregnancy; previous intra-uterine foetal demise; pregnancy by means of in vitro fertilisation; placenta praevia; previous myomectomy and previous postnatal depression were rare and were only identified in one or two cases each (0.1% each). Previous postpartum haemorrhage was identified in four cases (0.4%). Twin pregnancy could also be considered a risk factor and was present in three cases (0.2%).

4.4.4 Type of birth

For the purpose of this study, type of birth was divided into three sections: spontaneous vaginal births (without instrument assistance); instrument birth; and caesarean section. The type of birth for three women is missing.

- **Table 4-15:   Type of birth per practice**

Practice	Spontaneous vaginal delivery	Assisted/ instrument delivery	Caesarean section	Type of birth not stated
A Number (% within practice)	313/416 (75.2%)	34/416 (8.2%)	68/416 (16.3%)	1/416 (0.2%)
B Number (% within practice)	40/71 (56.3%)	5/71 (7.0%)	25/71 (35.2%)	1/71 (0.2%)
C Number (% within practice)	119/145 (82.1%)	1/145 (0.7%)	25/145 (17.2%)	0 (0.0%)
D Number (% within practice)	172/240 (71.7%)	17/240 (7.1%)	50/240 (20.8%)	1/240 (0.2%)
E Number (% within practice)	64/113 (56.6%)	3/113 (2.7%)	46/113 (40.7%)	0 (0.0%)
F Number (% within practice)	146/199 (73.4%)	7/199 (3.5%)	46/199 (23.1%)	0 (0.0%)
G Number (% within practice)	412/497 (82.9%)	24/497 (4.8%)	61/497 (12.3%)	0 (0.0%)
H Number (% within practice)	30/43 (69.8%)	2/43 (4.7%)	11/43 (25.6%)	0 (0.0%)
Total number (% of total)	**1296/1724 (75.2%)**	**93/1724 (5.4%)**	**332/1724 (19.3%)**	**3/1724 (0.2%)**

Table 4-15 shows the number of spontaneous vaginal births, instrument births and caesarean sections per practice as well as the total number in which each type of birth occurred.

- **Table 4-16: Number and percentage of spontaneous vaginal deliveries**

Spontaneous vaginal delivery	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	1296	75.2	1.04	73.1	77.2
No	428	24.8	1.04	22.8	26.9
Total	**1724**	**100.00%**			

Table 4-16 shows the frequency of the occurrence of spontaneous vaginal birth as well as the percentage, standard error of percent and 95% CI for percent.

- **Table 4-17: Number and percentage of caesarean sections**

Caesarean section	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	332	19.3	1.0	17.4	21.1
No	1392	80.7	1.0	78.9	82.6
Total	**1724**	**100.00%**			

Table 4-17 shows the frequency of occurrence of caesarean birth as well as the percentage, standard error of percent and 95% CI for percent.

- **Table 4-18: Number and percentage of instrument assisted births**

Instrument assisted birth	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	93	5.4	0.5	4.3	6.5
No	1631	94.6	0.5	93.5	95.7
Total	**1724**	**100.00%**			

Tables 4-18 examines the frequency of occurrence of instrument assisted birth as well as the percentage, standard error of percent and 95% CI for percent.
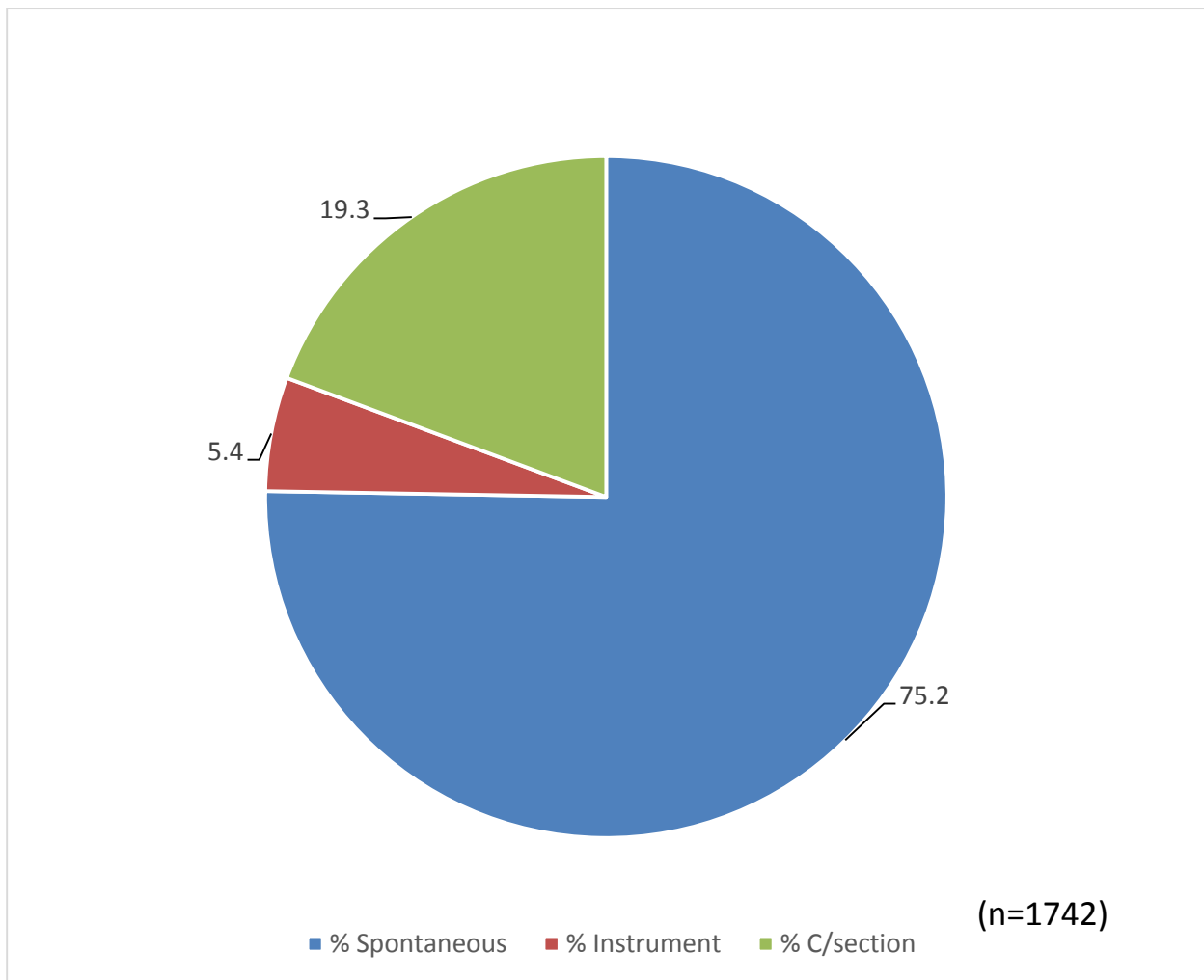
Figure 4-1:   Type of birth for entire study sample

Figure 4-1 presents the percentage at which each type of birth occurred in the study sample.

4.4.4.1 Caesarean section: planned or unplanned

For the purpose of this study a planned caesarean section (c/section) is a scheduled caesarean in which the mutual choice was made by the patient, midwife and obstetrician before there were signs of labour. An unplanned caesarean is one in which the patient planned to have a vaginal birth and something occurred during pregnancy (e.g. preterm rupture of membranes) or labour to necessitate an immediate caesarean section.

- **Table 4-19:   Percentage of planned and unplanned caesarean sections per practice**

Practice	Planned c/sections	Unplanned c/section	Total c/sections
A Number (% within practice)	15/416 (3.6%)	53/416 (12.7%)	68/416 (16.3%)
B Number (% within practice)	3/71 (4.2%)	22/71 (31.0%)	25/71 (35.2%)
C Number (% within practice)	6/145 (4.1%)	19/145 (13.1%)	25/145 (17.2%)
D Number (% within practice)	15/240 (6.3%)	35/240 (14.4%)	50/240 (20.8%)
E Number (% within practice)	12/113 (10.6%)	34/113 (30.1%)	46/113 (40.7%)
F Number (% within practice)	6/199 (3.0%)	40/199 (20.1%)	46/199 (23.1%)
G Number (% within practice)	4/497 (0.8%)	57/497 (11.5%)	61/497 (12.3%)
H Number (% within practice)	2/43 (4.7%)	9/43 (20.9%)	11/43 (25.6%)
Total number (% of total)	**63/1724 (3.7%)**	**269/1724 (15.6%)**	**332/1724 (19.3%)**

In table 4-19 the total number of caesarean sections is divided into planned and unplanned caesareans.

- **Table 4-20:   Total number and percentage of planned and unplanned caesarean sections**

Planned caesarean section	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	63	19.0	2.2	14.7	23.2
No	269	81.0	2.2	76.8	85.3
Total	**332**	**100.00%**			

Table 4-20 shows the frequency, percentage, standard error of percent and 95% CI for percent of planned and unplanned caesareans in the study sample.

4.4.4.2 Water birth

- **Table 4-21: Percentage of water births per practice**

Practice code	Number of water births as fraction of spontaneous vaginal births per practice
A Number (% within practice)	162/313 (51.8%)
B Number (% within practice)	26/40 (65.0%)
C Number (% within practice)	108/199 (90.8%)
D Number (% within practice)	117/172 (68.0%)
E Number (% within practice)	20/64 (31.3%)
F Number (% within practice)	48/146 (32.9%)
G Number (% within practice)	167/411 (40.6%)
H Number (% within practice)	13/30 (43.3%)
Total number (% of total)	**661/1295 (51.0%)**

Table 4-21 shows the number and percentage of spontaneous vaginal births that occurred under water.

- **Table 4-22: Frequency of the occurrence of water birth**

Water birth	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	661	51.0	1.4	48.3	53.7
No	635	49.0	1.4	46.3	51.7
Total	**1296**	**100.00%**			

Table 4-22 reports the frequency and percentage of water births as well as the standard error of percent and 95% CI for percent.

4.4.5   Location of birth

- **Table 4-23:   Location of birth per practice**

Practice	Home birth	Birth house	Active birth unit	Birth centre	Hospital	Location not stated
A Number (% within practice)	46/416 (11.1%)	95/416 (22.8%)	198/416 (47.6%)	0 (0.0%)	74/416 (17.8%)	3/416 (0.7%)
B Number (% within practice)	2/71 (2.8%)	0 (0.0%)	0 (0.0%)	68/71 (95.8%)	0 (0.0%)	1/71 (1.4%
C Number (% within practice)	23/145 (15.9%)	0 (0.0%)	23/145 (15.9%)	98/145 (67.6%)	0 (0.0%)	1/145 (0.7%)
D Number (% within practice)	6/240 (2.5%)	0 (0.0%)	29/240 (12.1%)	200/240 (83.3%)	3/240 (1.3%)	2/240 (0.8%)
E Number (% within practice)	26/113 (23.0%)	0 (0.0%)	18/113 (15.9%)	49/113 (43.4%)	19/113 (16.8%)	1/113 (0.8%)
F Number (% within practice)	8/199 (4.0%)	0 (0.0%)	32/199 (16.1%)	156/199 (78.4%)	3/199 (1.5%)	0 (0.0%)
G Number (% within practice)	121/497 (24.3%)	1/497 (0.2%)	83/497 (16.7%)	285/497 (57.3%)	3/497 (0.6%)	4/497 (0.8%)
H Number (% within practice)	4/43 (9.3%)	0 (0.0%)	37/43 (86.0%)	0 (0.0%)	1/43 (2.3%)	1/43 (2.3)
Total number (% of total)	**236/1724 (13.7%)**	**96/1724 (5.6%)**	**420/1724 (24.4%)**	**856/1724 (49.7%)**	**103/1724 (6.0%)**	**13/1724 (0.8%)**

Table 4-23 shows the number of births that occurred in every practice at each of the locations.

- **Table 4-24:   Frequency of births that occurred at the planned location**

Planned location of birth used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	1611	55.4	0.6	92.4	94.7
No	110	6.4	0.6	5.2	7.5
Total	**1722**	**100.00%**			
Frequency missing information = 2 births					

Table 4-24 presents the frequency, percentage, standard error of percent and 95% CI for percent of births which occurred at the planned locations.

- **Table 4-25:   Frequency of home births**

Home birth	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	236	13.7	0.8	12.1	15.3
No	1488	86.3	0.8	84.7	87.9
Total	**1724**	**100.00%**			

Table 4-25 presents the frequency, percentage, standard error of percent and 95% CI for percent of home births for the entire study sample.

- **Table 4-26:   Frequency of birth house births**

Birth house	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	96	5.6	0.6	4.5	6.7
No	1628	94.4	0.6	93.3	95.5
Total	**1624**	**100.00%**			

Table 4- 26 presents the frequency, percentage, standard error of percent and 95% CI for percent of birth house births for the entire study sample.

- **Table 4-27:   Frequency of active birth unit births**

Active birth unit	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	420	24.4	1.0	22.3	26.4
No	1304	75.6	1.0	73.6	77.7
Total	**1724**	**100.00%**			

Table 4-27 presents the frequency, percentage, standard error of percent and 95% CI for percent of active birth unit births for the entire study sample.

• **Table 4-28:** **Frequency of birth centre births**

Birth centre	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	856	49.7	1.2	47.3	52.0
No	868	50.3	1.2	47.3	52.0
Total	**1724**	**100.00%**			

Table 4-28 presents the frequency, percentage, standard error of percent and 95% CI for percent of birth centre births for the entire study sample.

• **Table 4-29:** **Frequency of hospital births**

Hospital	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	103	6.0	0.6	4.9	7.1
No	1621	94.0	0.6	92.9	95.1
Total	**1724**	**100.00%**			

Table 4-29 presents the frequency, percentage, standard error of percent and 95% CI for percent of hospital births for the entire study sample.
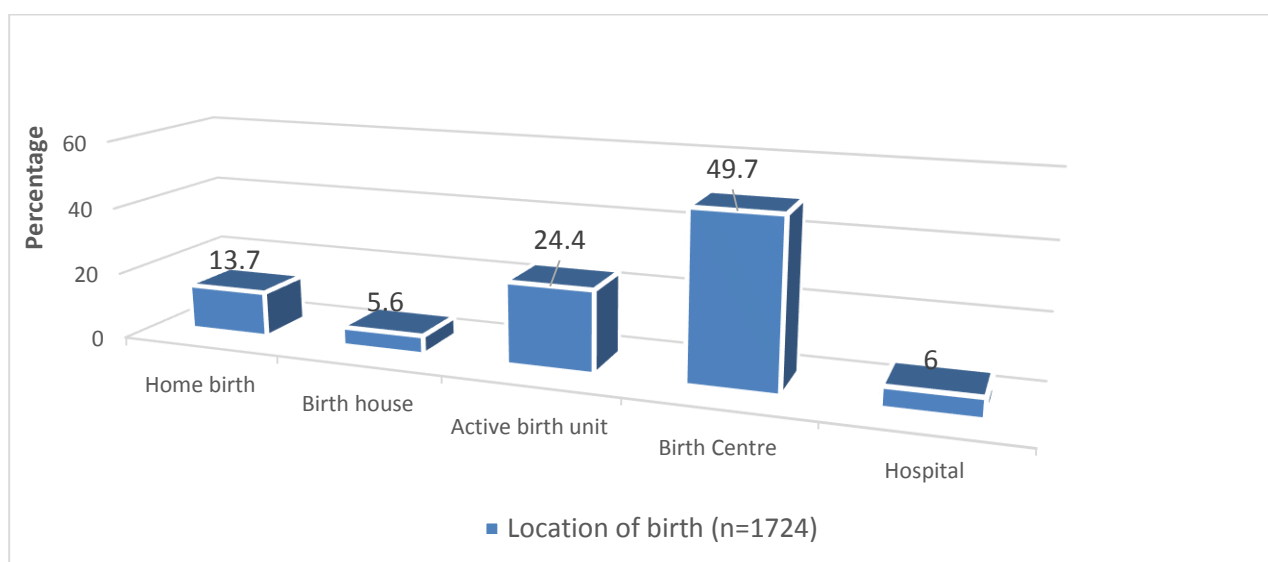
Figure 4-2: **Location of birth for entire study sample**

Figure 4-2 is a schematic representation of the percentages at which births occurred at each of the different venues.

4.4.6 Interventions used during labour and birth

- **Table 4-30:   Induction, augmentation and AROM per practice**

Practice	Type of intervention used as fraction of all women who were in labour per practice			
	Induction of labour	Augmentation of labour	Artificial rupture of membranes (AROM)	
			Not stated	Yes
A Number (% within practice)	28/401 (7.0%)	41/401 (10.2%)	0 (0.0%)	142401 (35.4%)
B Number (% within practice)	11/69 (15.9%)	7/69 (10.1%)	66/69 (95.7%)	0 (0.0%)
C Number (% within practice)	8/137 (5.8%)	2137 (1.5%)	0 (0.0%)	48/137 (35.0%)
D Number (% within practice)	40/223 (17.9%)	54/223 (24.2%)	187/223 (83.9%)	2/223 (0.9%)
E Number (% within practice)	0 (0.0%)	0 (0.0%)	90/101 (89.1%)	0 (0.0%)
F Number (% within practice)	20/195 (10.3%)	16/195 (8.2%)	188/195 (96.4%)	0 (0.0%)
G Number (% within practice)	48/493 (9.7%)	37/493 (7.5%)	461/493 (93.5%)	1/493 (0.2%)
H Number (% within practice)	4/40 (10.0%)	0 (0.0%)	40/40 (100.0%)	0 (0.0%)
Total number (% of total)	**159/1659 (9.6%)**	**157/1659 (9.5%)**	**1032/1659 (62.2%)**	**193/1659 (11.6%)**

For the purpose of this study, interventions in labour and birth include induction of labour, augmentation of labour, and artificial rupture of membranes (AROM). Table 4-30 shows the number of cases in which each specific intervention occurred. All women who were in labour, whether or not they eventually had caesarean sections, could have had interventions and were thus included. Only those with planned caesarean sections were excluded. The total number of women who could have had interventions is shown in the last column on the left.

- **Table 4-31:** **Frequency of interventions used during labour**

Interventions used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	458	27.6	1.1	25.5	29.8
No	1201	72.4	1.1	70.2	74.5
Total	1659	100.00%			

Table 4-31 shows the frequency, percentage, standard error of percent and 95% CI for percent of interventions used during labour in 1659 women (all women who were in labour are included, regardless of eventual type of birth). Some women had more than one intervention during labour.

- **Table 4-32:** **Frequency of induction of labour**

Induction of labour	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	159	9.6	0.7	8.2	11.0
No	1500	90.4	0.7	89.0	91.8
Total	**1659**	**100.00%**			

Table 4-32 reports the frequency, percentage, standard error of percent and 95% CI for percent at which induction of labour was performed in the study sample.

- **Table 4-33:** **Frequency of augmentation of labour**

Augmentation of labour	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	157	9.5	0.7	8.1	10.9
No	1502	90.5	0.7	89.1	91.9
Total	**1659**	**100.00%**			

Table 4-33 reports the frequency, percentage, standard error of percent and 95% CI for percent at which augmentation of labour was performed in the study sample.

4.4.7 Medication used for intra-partum analgesia

- **Table 4-34:** **Types and percentage of intra-partum analgesia used**

Practice	Number of women who received intra-partum analgesia as fraction of women who were in labour per practice			
	Pethidine	**Atarax**	**Entonox Gas**	**Epidural**
A Number (% within practice)	32/401 (8.0%)	55/401 (13.7%)	13/401 (3.2%)	5/401 (1.2%)
B Number (% within practice)	11/69 (15.9%)	14/69 (20.3%)	8/69 (11.6%)	1/69 (1.4%)
C Number (% within practice)	22/137 (16.1%)	45/137 (32.8%)	12/137 (8.8%)	2/137 (1.5%)
D Number (% within practice)	38/223 (17.0%)	32/223 (14.3%)	82/223 (36.8%)	5/223 (2.2%)
E Number (% within practice)	0/101 (0.0%)	0/101 (0.0%)	0/101 (0.0%)	0/101 (0.0%)
F Number (% within practice)	56/195 (28.7%)	68/195 (34.9%)	18/195 (9.2%)	5/195 (2.6%)
G Number (% within practice)	66/493 (13.4%)	69/493 (14.0%)	2/493 (0.4%)	9/493 (1.8%)
H Number (% within practice)	2/40 (5.0%)	4/40 (10.0%)	1/40 (2.5%)	5/40 (12.5%)
Total number (% of total)	**227/1659 (13.7%)**	**287/1659 (17.3%)**	**136/1659 (8.2%)**	**32/1659 (1.9%)**

Medication for intra-partum analgesia includes any form of pharmaceutical pain relief administered to a woman during the process of labour. Women from the sample who were never in labour were excluded from the total and marked "not applicable", as they were not eligible for labour analgesia. The types of medications used in labour by private midwives in Gauteng were Pethidine (an opiate), Atarax, Entonox Gas and Epidural anaesthesia. Table 4-34 shows the number and percentage of women within each practice who made use of pharmaceutical pain relief during labour. The last column on the right shows the total number of women who were eligible for pain relief during labour but the numbers indicated are not the sum of the other columns since some women did not use any pharmaceutical pain relief while others used more than one type of medication.

- **Table 4-35:   Frequency of medication use during labour**

Medication used during labour	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	413	24.9	1.1	22.9	27.0
No	1243	75.1	1.1	73.0	77.1
Total	**1656**	**100.00%**			
Frequency missing information = 3 births					

Table 4-35 presents the frequency, percentage, standard error of percent and 95% CI for percent of patient who used and did not use pharmaceutical pain relief during labour.

- **Table 4-36:   Frequency of the use of Pethidine during labour**

Pethidine used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	227	13.7	0.8	12.1	15.4
No	1428	86.3	0.8	84.6	87.9
Total	**1655**	**100.00%**			
Frequency missing information = 4 births					

Table 4-36 shows the frequency, percentage, standard error of percent and 95% CI for percent of women who used the opiate Pethidine.

- **Table 4-37:   Frequency of the use of Atarax during labour**

Atarax used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	287	17.3	0.9	15.5	19.2
No	1368	82.7	0.9	80.8	84.5
Total	**1655**	**100.00%**			
Frequency missing information = 4 births					

Table 4-37 shows the frequency, percentage, standard error of percent and 95% CI for percent of women who used Atarax during labour.

- **Table 4-38:   Frequency of the use of Entonox during labour**

Entonox used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	136	8.2	0.7	6.9	9.5
No	1521	91.8	0.7	90.5	93.1
Total	**1657**	**100.00%**			
Frequency missing information = 2 births					

Table 4-38 presents the frequency, percentage, standard error of percent and 95% CI for percent for the use of Entonox during labour.

- **Table 4-39:   Frequency of the use of epidural anaesthesia during labour**

Epidural anaesthesia used	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	32	1.9	0.3	1.3	2.6
No	1625	98.1	0.3	97.4	98.7
Total	**1657**	**100.00%**			
Frequency missing information = 2 births					

Table 4-39 shows the frequency, percentage, standard error of percent and 95% CI for percent of the use of epidural anaesthesia during labour.

4.4.8   Outcomes of births

The researcher explored specific pre-identified labour and birth outcomes. These were the condition of the perineum after vaginal birth (spontaneous vaginal delivery or instrument birth); maternal complications and neonatal complications (for the entire sample).

4.4.8.1   Condition of the perineum after birth

After a spontaneous vaginal birth a woman is examined to assess the extent of perineal or vaginal trauma and the need for surgical repair. Intact perineum refers to minimal or no tearing of the perineal tissues, thus not requiring suturing after birth. For the purpose of this study all cases described as "intact", "skin snick – no suturing required" or "minimal laceration – no suturing required" were classified as "intact". An episiotomy is an enlargement of the vaginal outlet by making a mediolateral incision into the perineal tissues. A perineal laceration or tear is spontaneous tearing in the posterior aspect of the vaginal opening. A 1st degree tear involves

only mucosal tissue and skin; a 2nd degree tear extends through the perineal muscles; a 3rd degree tear involves the anal sphincter and a 4th degree tear involves the anterior rectal wall (De Kock & Van der Walt, 2004:14-13). Both 3rd and 4th degree tears need to be repaired in theatre and are referred to as complicated tear requiring transfer to theatre for the purpose of this study.

- **Table 4-40:   Condition of perineum after birth (excluding caesareans)**

Practice	Condition of perineum after birth				Condition of the perineum not reported
	Intact	Episiotomy	1st or 2nd degree tear	Complicated tear needing transfer to theatre	
A Number (% within practice)	139/348 (39.9%)	11/348 (3.2%)	197/348 (56.6%)	1/348 (0.3%)	0 (0.0%)
B Number (% within practice)	14/46 (30.4%)	4/46 (8.7%)	21/46 (45.7%)	3/46 (6.7%)	4/46 (8.7%)
C Number (% within practice)	60/120 (50.0%)	6/120 (5.0%)	50/120 (42.5%)	4/120 (3.3%)	0 (0.0%)
D Number (% within practice)	118/190 (62.1%)	11/190 (5.8%)	55/190 (28.9%)	3/190 (1.6%)	3/190 (1.6%)
E Number (% within practice)	48/66 (72.7%)	2/66 (3.0%)	14/66 (21.2%)	1/66 (1.5%)	1/66 (1.5%)
F Number (% within practice)	84/153 (54.9%)	19/153 (12.4%)	46/153 (30.1%)	3/153 (2.0%)	1/153 (0.7%)
G Number (% within practice)	266/437 (60.9%)	19/437 (4.3%)	140/437 (32.0%)	12/437 (2.7%)	0 (0.0%)
H Number (% within practice)	14/32 43.8%)	4/32 (12.5%)	12/32 (37.5%)	2/32 (6.3%)	1/32 (3.1%)
Total number (% of total)	**743/1392 (53.4%)**	**76/1392 (5.5%)**	**535/1392 (38.4%)**	**29/1392 (2.1%)**	**9/1932 (0.6%)**

In Table 4-40 condition of the perineum after birth is reported for all women in each practice who had spontaneous vaginal births or instrument assisted births.

- **Table 4-41:** **Condition of the perineum for entire study sample (excluding caesareans)**

Condition of the perineum	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Episiotomy	76	5.5	0.6	4.3	6.7
Intact	743	53.4	1.3	50.8	56.0
Tear	564	40.5	1.3	37.9	43.1
Not stated	9	0.6	0.2	0.2	1.1
Total	**1392**	**100.00%**			

In Table 4-41 frequency and percentage of episiotomies, intact perineums, and tears are reported for all women in the study sample who had spontaneous vaginal births or instrument assisted births.

4.4.8.2 Maternal complications

- **Table 4-42:** **Maternal complications per practice**

Practice	Maternal complications as fraction of total births			No complications
	Post-partum haemorrhage	Retained placenta and transfer to theatre	Maternal high care transfer	
A Number (% within practice)	30/416 (7.2%)	5/416 (1.2%)	4/416 (1.0%)	379/416 (91.1%)
B Number (% within practice)	4/71 (5.6%)	1/71 (1.4%)	0 (0.0%)	67/71 (94.4%)
C Number (% within practice)	17/145 (11.7%)	0 (0.0%)	1/145 (0.7%)	125/145 (86.2%)
D Number (% within practice)	30/240 (12.5%)	4/240 (1.7%)	2/240 (0.8%)	206/240 (85.8%)
E Number (% within practice)	7/113 (6.2%)	1/113 (0.9%)	0 (0.0%)	106/113 (93.8%)
F Number (% within practice)	14/199 (7.0%)	2/199 (1.0%)	0 (0.0%)	184/199 (92.5%)
G Number (% within practice)	33/497 (6.6%)	4/497 (0.8%)	1/497 (0.2%)	461/497 (92.8%)

Practice	Maternal complications as fraction of total births			No complications
	Post-partum haemorrhage	Retained placenta and transfer to theatre	Maternal high care transfer	
H Number (% within practice)	1/43 (2.3%)	0 (0.0%)	0 (0.0%)	42/43 (97.7%)
Total number (% of total)	**136/1724 (7.9%)**	**17/1724 (1.0%)**	**8/1724 (0.5%)**	**1570/1724 (91.1%)**

Table 4-42 displays the number and percentage of maternal complications per practice. Note that the sum of women with no complications and those with each of the specific complications may exceed the total number of women, because some women had more than one complication.

- **Table 4-43:   Frequency of the occurrence of maternal complications**

Maternal complications	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	152	8.8	0.7	7.5	10.2
No	1570	91.2	0.7	89.8	92.5
Total	**1722**	**100.00%**			
Frequency of missing information = 2 births					

In table 4-43 displays the frequency, percentage, standard error of percent and 95% CI for percent of maternal complications after birth. There were 152 women with one or more reported complications; 1570 with no complications; and two cases in which complications were not reported.

- **Table 4-44:   Frequency of the occurrence of postpartum haemorrhage in the study sample**

Postpartum haemorrhage	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	136	7.9	0.7	6.6	9.2
No	1586	92.1	0.7	90.8	93.4
Total	**1722**	**100.00%**			
Frequency of missing information = 2 women					

Table 4-44 shows the frequency, percentage, standard error of percent and 95% CI for percent of the occurrence of postpartum haemorrhage for all women in the study sample. Only three of the PPH cases warranted admission to a high care unit or for blood transfusion (0.2% of the total sample).

4.4.8.3 Neonatal complications

- **Table 4-45:   Percentage of neonatal complications per practice**

Practice	Neonatal complications as fraction of total cases					
	5 minute Apgar equal to or below 7/10	Shoulder dystocia	Preterm birth < 37 weeks (missing=4)	Admission to NICU	Stillbirth	Early neonatal death
A Number (% within practice)	32/416 (7.7%)	1/416 (0.2%)	4/416 (1.0%)	18/416 (4.3%)	0 (0.0%)	0 (0.0%)
B Number (% within practice)	2/71 (2.8%)	2/71 (2.8%)	0 (0.0%)	3/71 (4.2%)	0 (0.0%)	0 (0.0%)
C Number (% within practice)	0 (0.0%)	1/145 (0.7%)	3/144 (2.1%)	12/145 (8.3%)	0 (0.0%)	0 (0.0%)
D Number (% within practice)	5/240 (2.1%)	2/240 (0.8%)	9/239 (2.9%)	15/240 (6.3%)	0 (0.0%)	0 (0.0%)
E Number (% within practice)	3/113 (2.7%)	1/113 (0.9%)	2/113 (1.8%)	4/113 (3.5%)	1/113 (0.9%)	1/113 (0.9%)
F Number (% within practice)	1/199 (0.5%)	0 (0.0%)	4/199 (2.0%)	10/199 (5.0%)	2/199 (1.0%)	0 (0.0%)
G Number (% within practice)	8/497 (1.6%)	2/497 (0.4%)	11/496 (2.2%)	11/497 (2.2%)	1/497 (0.2%)	0 (0.0%)
H Number (% within practice)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1/43 (2.3%)	0 (0.0%)	0 (0.0%)
Total number (% of total)	51/1724 (3.0%)	9/1724 (0.5%)	33/1720 (1.9%)	74/1724 (4.3%)	4/1724 (0.2%)	1/1724 (0.1%)

Table 4-45 displays the number and percentage of neonatal complications per practice. Note that the sum of the women with each of the specific complications does not add up to the total number of women, because there were cases with more than one complication and others with no neonatal complications. Neonatal complications were calculated per midwifery case and not per infant. A set of twins was born preterm, which was reported as one case of preterm birth. In another case one of the twins was admitted to NICU and was reported for the specific case. The third set of twins had no neonatal complications.

Shoulder dystocia is a birth complication with the potential for morbidity in both the mother and the neonate. Owing to its potential for a poor neonatal outcome the researcher decided to include it under neonatal complications. This variable affects the overall frequency of neonatal complications, but has no effect on the calculation of each individual complication.

- **Table 4-46: Frequency of the occurrence of neonatal complications in the study sample**

Neonatal complications	Frequency	Percent	Standard Error of Percent	95% C for Percent	
Yes	138	8.0	0.7	6.7	9.3
No	1584	91.9	0.7	90.6	93.2
Total	**1722**	**100.00%**			
Frequency of missing information = 2 birth					

Table 4-46 presents the frequency, percentage, standard error of percent and 95% CI for percent of the occurrence of neonatal complications in the study sample.

- **Table 4-47: Frequency of the occurrence of Apgar score equal to or below 7 at 5 minutes**

Apgar equal to or below 7	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	51	3.0	0.4	2.2	3.8
No	1671	97.0	0.4	96.2	97.8
Total	**1722**	**100.00%**			
Frequency missing information = 2 infants					

Table 4-47 displays the frequency, percentage, standard error of percent and 95% CI for percent of Apgar scores of 7 or below at 5 minutes.

- **Table 4-48: Frequency of the occurrence of shoulder dystocia**

Shoulder dystocia	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	9	0.5	0.2	0.2	0.9
No	1713	99.5	0.2	99.1	99.8
Total	**1722**	**100.00%**			
Frequency missing information = 2 births					

Table 4-48 shows the frequency, percentage, standard error of percent and 95% CI for percent of the occurrence of shoulder dystocia in the study sample.

- **Table 4-49:** **Frequency of the occurrence of preterm birth before 37 weeks**

Infant born before 37 weeks	Frequency	Percent	Standard Error of Percent	95% CI for Percent	
Yes	33	1.9	0.3	1.3	2.6
No	1687	98.1	0.3	97.4	98.75
Total	**1720**	**100.00%**			
Frequency missing information = 4 infants					

Table 4-49 show the frequency, percentage, standard error of percent and 95% CI for percent of preterm birth in the study sample.

- **Table 4-50:** **Frequency of infant admission to NICU**

Admission to NICU	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	74	4.3	0.5	3.3	5.3
No	1648	95.7	0.5	94.7	96.7
Total	**1722**	**100.00%**			
Frequency missing information = 2 infants					

Table 4-50 presents the frequency, percentage, standard error of percent and 95% CI for percent of NICU admission in the study sample.

- **Table 4-51:** **Overall foetal loss**

Foetal loss	Frequency	Percent	Standard Error of Percent	95% CI for percent	
Yes	5	0.3	0.1	0.04	0.5
No	1717	99.7	0.1	99.5	100.0
Total	**1722**	**100.00%**			
Frequency missing information = 2 infants					

Table 4-51 presents the frequency of overall foetal loss. Overall foetal loss is the total number of intra-uterine deaths and early neonatal deaths combined.

4.5 Comparison with the systematic review by Sandall *et al*. (2013)

The differences between the outcomes of the Gauteng group and the midwife-led group from the Sandall *et al*. (2013) study were considered significant if the results from Sandall *et al*. (2013) fell outside the calculated 95% CI of the Gauteng sample.

- **Table 4-52:   Outcomes of midwife-led group in the review by Sandall *et al*. (2013) versus Gauteng midwife-led sample**

Outcomes	Gauteng private midwives	Sandall *et al*. (2013)	Difference
Regional analgesia (epidural/spinal)	32/1657 (1.9%) [95% CI for percent 1.3;2.6]	1864/8816 (21.1%)	Epidural analgesia percentage **significantly lower** in Gauteng sample
Caesarean birth	332/1724 (19.3%) [95% CI for percent 17.4;21.1]	1098/8816 (12.5%)	Caesarean section percentage **significantly higher** in Gauteng sample
Instrument vaginal birth (forceps/vacuum)	93/1724 (5.4%) [95% CI for percent 4.3;6.5]	1004/8735 (11.5%)	Instrument birth percentage **significantly lower** in Gauteng sample
Spontaneous vaginal birth	1296/1724 (75.2%) [95% CI for percent 73.1;77.2]	5998/8330 (72%)	Spontaneous vaginal birth percentage **significantly higher** in Gauteng sample
Intact perineum	743/1392 (53.4%) [95% CI for percent 50.8;56.0]	2069/6587 (31.4%)	Intact perineum percentage **significantly higher** in Gauteng sample
Preterm birth (< 37 weeks)	33/1720 (1.9%) [95% CI for percent 1.3;2.6]	321/6589 (4.9%)	Preterm birth percentage **significantly lower** in Gauteng sample
Overall foetal loss and neonatal death	5/1722 (0.3%) [95% CI for percent 0.04;0.5]	243/8760 (2.8%)	Foetal loss and neonatal death percentage **significantly lower** in Gauteng sample
Induction of labour	159/1659 (9.6%) [95% CI for percent 8.2;11.0]	1642/8735 (18.6%)	Induction of labour percentage **significantly lower** in Gauteng sample
Amniotomy	Underreported: not stated in 62.4% of the sample	582/1898 (30.7%)	Finding **inconclusive** due to underreporting
Augmentation/ artificial oxytocin in labour	157/1659 (9.5%) [95% CI for percent 8.1;10.9]	1793/7585 23.6%	Augmentation of labour percentage **significantly lower** in Gauteng sample

Outcomes	Gauteng private midwives	Sandall *et al.* (2013)	Difference
No intra-partum analgesia/anaesthesia	1243/1656 (75.1%) [95% CI for percent 73.0;77.1]	843/5228 (16.1%)	Percentage of no use of intra-partum analgesia **significantly higher** in Gauteng sample
Opiate analgesia	227/1655 (13.7%) [95% CI for percent 12.1;15.4]	2200/6815 (32.3%)	Percentage of opiate use during labour **significantly lower** in Gauteng sample
Episiotomy	76/1392 (5.5%) 95% CI for percent 4.3;6.7]	1681/8816 (19.1%)	Episiotomy percentage **significantly lower** in Gauteng sample
Perineal laceration requiring suturing	1st or 2nd degree tear 535/1392 (38.4%) Complicated tear 29/1392 (2.1%) **Total: 40.5%** [95% CI for percent 37.9;43.1]	3173/7534 (42.1%)	**Combined results** (1st/2nd degree tears and complicated tears): **difference not significant**
Post-partum haemorrhage	136/1722 (7.9%) [95% CI for percent 6.6;9.2]	440/7072 (6.2%)	Post-partum haemorrhage percentage **significantly higher** in Gauteng sample
Low birth weight (<2.5kg)	50/1716 (2.9%) [95% CI for percent 2.1;3.7]	298/5726 (5.2%)	Low birth weight percentage **significantly lower** in Gauteng sample
5-minute Apgar score below or equal to 7	51/1722 (3.0%) [95% CI for percent 2.2;3.8]	117/5686 (2.1%)	Low Apgar score percentage **significantly higher** in Gauteng sample
Admission to neonatal intensive care unit	74/1722 (4.3%) [95% CI for percent 3.3;5.3]	585/8760 (6.7%)	Admission to neonatal intensive care percentage **significantly lower** in Gauteng sample
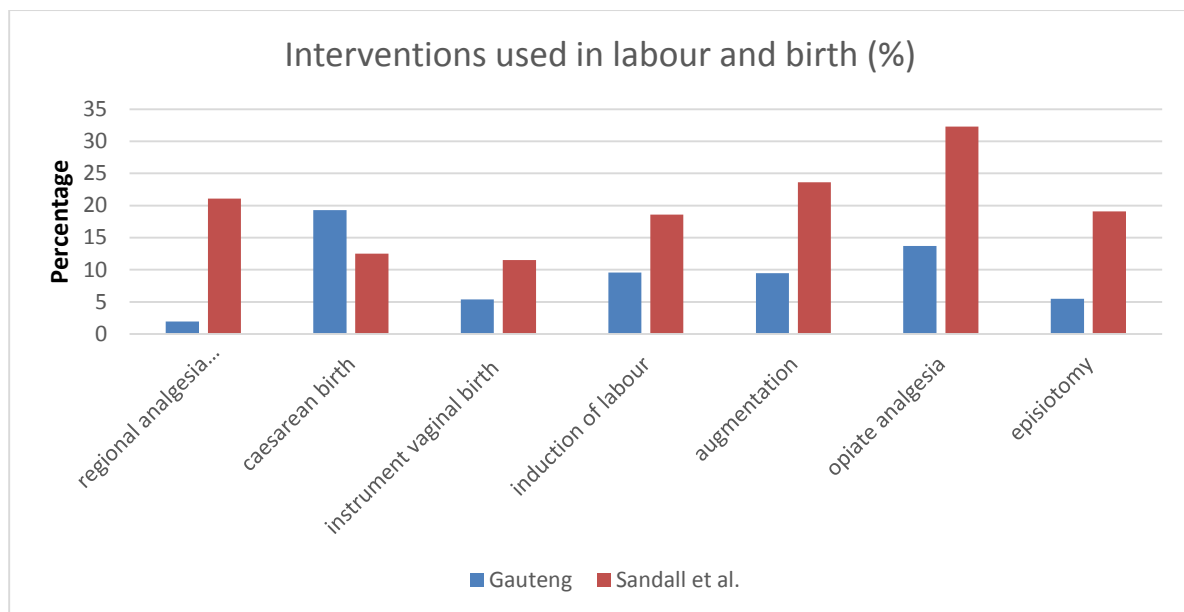
Figure 4-3: **Schematic comparison of interventions used during labour and birth – Gauteng sample versus Sandall *et al*. (2013) midwife-led sample**
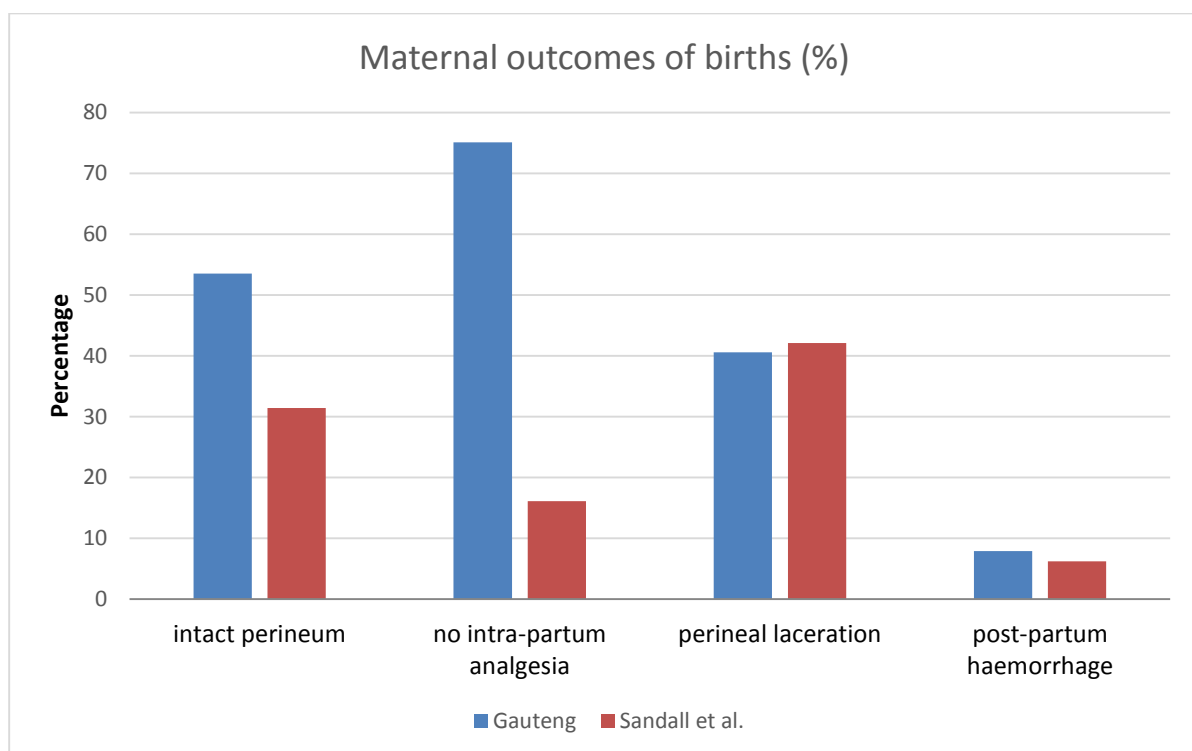
Figure 4-4: **Schematic comparison of outcomes of births – Gauteng sample versus Sandall *et al*. (2013) midwife-led sample**
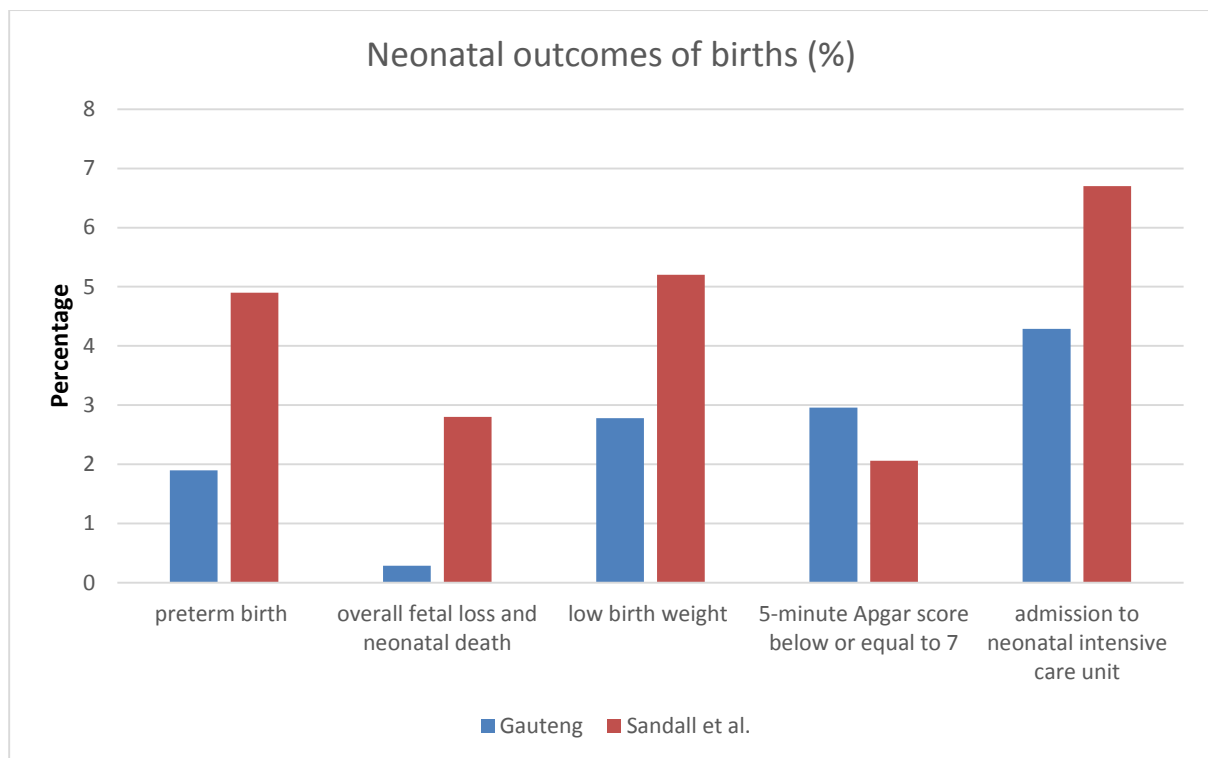
Figure 4-5: **Schematic comparison of neonatal outcomes of births – Gauteng sample versus Sandall _et al_. (2013) midwife-led sample**

4.6 Conclusion

In this chapter the results of quantitative analyses of 1724 births conducted by eight midwifery practices in Gauteng were displayed in the form of descriptive statistics. Results were also compared with specific outcomes from the systematic review by Sandall _et al._ (2013). The next chapter is dedicated to discussing the findings.

CHAPTER 5:   DISCUSSION OF RESEARCH FINDINGS

5.1   Introduction

In this chapter the results of the retrospective cohort study will be discussed. The words 'woman' and 'patient' are used interchangeably where appropriate in the discussion of findings.

5.2   Midwives qualifications and years of practice

Nine midwives reported having nursing and midwifery degrees and five having nursing and midwifery diplomas. Three midwives had obtained further specialisation in advanced midwifery of which one completed a masters' degree. Midwifery experience was not quantified or reported in the results chapter, but during the interviews midwives were asked about their year of practice. Overall midwifery experience ranged from seven years to more than 50 years. Most of the midwives initially worked in public hospitals, then private hospital labour wards and finally went into private practice. Some worked as staff in birth centres before going into private practice. Years of private midwifery practice range from two to 25 years.

5.3   Number of births conducted per practice

The eight practices involved in the study varied in terms of the number of births they conducted and the number of midwives during 2012 and 2013 (see: Table 4-2). The practices which consisted of one midwife conducted 71 (B), 145 (C), 113 (E), 199 (F), and 43 (H) births over two years. Practice A consisted of five midwives who conducted 416 births while in practice D two midwives conducted 240 births. The practice which conducted the most births was practice G, in which two midwives conducted 497 births.

5.4   Patient biographical information

5.4.1   Age

The age of 1717 of the 1724 women was reported. The mean age for these women was 30.2 years when they gave birth (standard error of mean 0.1; with 95% CI for mean of 30.0 to 30.4). The youngest women were 17 years old and the oldest was 47 years. The women in Practice E had the highest mean age of 32.8 years. Practice G's patients had the youngest mean age of 29.0 years.

5.4.2 Gravidity and parity of women per practice

Reporting gravidity and parity includes giving information about gravidity (G), parity (P), miscarriages (M), ectopic pregnancies (E), and previous termination of pregnancy (TOP). Gravidity and parity were reported for 1719 women (see: Table 4-4). Practice D had five cases of missing data regarding gravidity and parity. Practice B had the highest percentage of women who were giving birth for the first time (78.9%). In contrast to that Practice D had 37% primiparous and 61.2% multiparous women. All the other practice had between 40 and 50% primiparous and multiparous women.

5.4.3 Pregnancy duration at the time of birth

The minimum pregnancy duration (in completed weeks) was 30 weeks and the maximum 42 weeks. The combined mean pregnancy duration for the 1720 women who were reported was 39.4 weeks (standard error of mean: 0.03; with 95% CI for mean of 39.3 to 39.4). The women of Practice B had the highest mean pregnancy duration (39.7 weeks). This could be explained by the fact that the midwife from this practice performed induction of labour at 42 weeks, whereas other practices stated that they induced women between 41 and 42 weeks. Women from all the practices had a mean pregnancy duration of 39.2 to 39.5 weeks (see: Table 4-5).

Women who prefer midwife-led care usually start visiting the midwife for antenatal care from 16 weeks gestation at the earliest after confirming their pregnancy earlier at their general practitioner or obstetrician. Early pregnancy losses (miscarriage or neonatal death before 24 weeks gestation) are usually not recorded in midwives' birth registers even if these women intended to have midwife-led care therefore, this study does not explore pregnancy loss before 24 weeks. In the studies included in the review by Sandall *et al.* (2013) with which the results of the Gauteng sample were compared, women were randomised to midwife-led versus other models of care at no later than 24 weeks and foetal loss or neonatal death before 24 weeks was reported.

The cause of spontaneous preterm birth before 37 weeks gestation is seldom known. Maternal infections such as amniotic fluid infection and lifestyle factors such as smoking, poor nutrition and alcohol use are associated with an increased risk of preterm labour (De Kock & Van der Walt, 2004:26-9). In cases such as severe pre-eclampsia when continuing the pregnancy would endanger the woman's life preterm delivery is sometimes indicated. Other than financial and emotional implications preterm birth itself holds no physical risk to the mother (Verklan & Walden, 2010:28). For the infant prematurity is a major concern. Preterm infants may have multisystem immaturity, needing respiratory and other support. They are also more susceptible

to infection and are unable to regulate their own body temperature (Verklan & Walden, 2010:106).

Preterm birth occurred in 1.9% (standard error of percent: 0.3; 95% CI for percent 1.3 to 2.6) of the study sample. The earliest instance of preterm labour was recorded at 30 weeks gestation. When interpreting the results one should be aware that not all cases of preterm labour were necessarily recorded. This could be ascribed to the fact that some of these cases might have been referred to higher levels of care. If the birth was not conducted by the midwife the birth was not necessarily recorded in the midwife's birth register. In their review of randomised controlled trials Sandall *et al.* (2013:2) found that preterm birth occurred less frequently in women allocated to midwife-led care than with other models of care.

Birth between 37 and 40 weeks is considered term pregnancy. After 40 weeks an infant is considered post term. Anecdotally in the private sector in South Africa labour is often induced or infants are delivered via caesarean before or just after 40 weeks because of the perceived risks of pregnancy beyond the 'due date'. The World Health Organization states that induction of labour before 41 weeks should only be done if medically indicated (WHO, 2011:5). In the study sample 80.9% (standard error of percent: 1.0; 95% CI for percent 79.1 to 82.8) of infants were born between 37 and 40 weeks and 17.2% (standard error of percent: 0.9; 95% CI for percent 15.4 to 18.9) after 40 weeks (see: Table 4-6). No cases of birth beyond 42 weeks were reported.

5.4.4   Infant birth weight

The birth weight (in kilograms) was recorded for 1716 infants, including the weights of three sets of twins. Birth weight was not recorded in 11 cases. The mean weight for all infants was 3.3kg (standard error of mean: 0.01; 95% CI for mean 3.29 to 3.34). Practice F's infants had the lowest mean weight (3.2kg). The infants of Practice G had a mean weight of 3.3kg while all the other practices had mean infant weights of 3.4kg. Table 4-7 shows the mean infant weight at birth per practice and table 4-8 shows the number and percentage of infants within the different weight categories.

A birth weight of below 2.5kg is considered "low birth weight" and was observed in 2.9% (standard error of mean: 0.4; 95% CI for mean 2.1 to 3.7) of the sample. The majority of infants (89.6%) weighed within the normal weight range of 2.5 to 3.99kg (standard error of mean: 0.7; 95% CI for mean 88.2 to 91.1). A birth weight of 4kg and above is defined as "macrosomia" and is associated with risks such as postpartum haemorrhage, shoulder dystocia and trauma to the infant at birth (Irion & Boulvain, 1998:2). In the recorded sample 128 infants or 7.5% (standard error of mean: 0.6; 95% CI for mean 6.2 to 8.7) weighed 4kg or more (see Table 4-8).

5.5   Patient risk factors identified

Midwife-led care is indicated for low risk pregnant women. In the study sample there were, however, women who had risk factors. Previous caesarean section, advanced maternal age (35 years and older), increased body mass index and pre-existing or pregnancy induced medical conditions are considered risk factors. The percentage of women with or without risk factors differed among the practices: 459 (26.6%) women were reported to have had risk factors (1.1 standard error of percent; with 95% CI for percent 24.5 to 28.7).

Table 4-9 shows the number and percentage of women with known risk factors in each practice. Practice C had the highest percentage of women with risk factors (44.8%). Practice G reported the lowest percentage of women with risk factors (19.3%). The fact that practice G preferred not to take on women with previous caesarean section may have contributed to this finding.

5.5.1   Previous caesarean section

Previous caesarean section is considered a risk factor owing to the possibility of rupture of the uterine scar. Accepting women for trial of labour after caesarean section (TOLAC) to attempt VBAC depended on the policy of each practice. Most private midwifery practices support women who choose to attempt VBAC. There is a growing demand for VBAC as a result of the high primary caesarean section rate in the private sector in South Africa. Practices D and F had 10.8% and 12.6% women with previous caesarean respectively whereas practice G had only 1% (see: table 4-11). As previously stated this practice prefers not to take on women for TOLAC or VBAC. Practice G prefers home births and previous caesarean section is a contra-indication for home birth.

5.5.2   Increased body mass index

Although considered a risk factor in obstetrics, increased body mass index is difficult to identify in pregnancy. The midwives' birth registers did not have a designated column for the patient's weight or body mass index would be indicated. Only Practices A, B and C reported instances of increased body mass index. The total number of women identified was seven (0.4% of the sample). This finding may be invalid because of possible underreporting. There was also no indication of the criteria for making the diagnosis and it might have been a subjective observation.

In a prospective cohort study done by Martin *et al.* (2015:1), in which 1030 pregnant women with a BMI of 25 or more were recruited, it was found that these women were more at risk of developing gestational diabetes. Women with an increased BMI are also more likely to give birth

to infants with high birth weights. Lifestyle interventions may affect high birth weight, therefore it is important to take note of increased BMI.

5.5.3 Pre-existing or pregnancy related medical conditions

In the study sample 98% of the women had no pre-existing or pregnancy induced medical conditions (see: table 4-12). The practices that had women with manageable pre-existing conditions such as controlled epilepsy and auto-immune diseases reported that they cared for them in consultation with physicians and backup obstetricians. Mild anaemia was stated by Practice C only. There is a possibility that this may have been underreported. Mild anaemia was also not operationally defined by the midwives who reported these cases.

Bick *et al.* (2014:428) state that more and more women with pre-existing medical conditions are getting pregnant and are at increased risk of poor pregnancy outcomes. Their systematic review focuses on evaluating evidence of multidisciplinary team models in managing the care of women with pre-existing diabetes or cardiac disease. They believe that multidisciplinary team models are advocated for these women, but that more studies on the care of complex pregnancies are needed. Although no women in the Gauteng midwife-led sample were reported to have had pre-existing diabetes or cardiac disease, a parallel can be drawn when considering women with any pre-existing conditions in pregnancy. The practices that did accept women with medical conditions (2% of the sample) stated that they had the support of their backup obstetricians and physicians therefore there was some level of a team approach. There was no information, however, in the birth registers on how often these women saw their obstetricians and whether or not the obstetricians were aware of or involved in the normal births if or when they took place. More information may have been available in patient files, but access to their files was beyond the focus of the study.

5.5.4 Advanced maternal age

Women 35 years and older are classified as "advanced maternal age". Advanced age is considered a risk factor for hypertensive disorders and diabetes in pregnancy although this risk is more significant in women 40 years and older. There is also an increased risk for miscarriage, ectopic pregnancy and stillbirth in older women (Mills & Lavender, 2011:107). The percentage of women 35 years and older ranged between 10.6% in Practice F and 35.4% in Practice E. The combined percentage of women considered advanced maternal age was 17.6% (see: Table 4-13).

5.5.5   Grand multiparity

The majority of grand multiparous women in the study sample (13 out of 17) were cared for by Practice G. Five of the practices had no grand multiparous patients. Grand multipara accounted for 1% of the total sample (see: Table 4-14).

Grand multipartity used to be associated with increased morbidity and mortality, but there is contradicting literature on the topic. Shechter *et al.* (2010:1211) in a population based study, report that there is an increased risk in obstetric outcomes, especially in "great grand multiparity" (more than 10 previous births). Simonsen *et al.* (2005) argue that maternal age may have accounted for formerly associated risks such as gestational diabetes and hypertension and that younger grand multiparas had less risk than older grand multiparas. In the Gauteng study sample Practice G had the highest percentage of grand multiparity, but the lowest mean patient age. In terms of outcomes they had only one reported case of postpartum haemorrhage in a grand multiparous patient and no high care admissions.

5.5.6   Other

Numerous risk factors were identified under the heading "other". Poor obstetric history and positive group B streptococcus were the most significant as both were reported in 13 cases (0.8% of the study sample). Previous preterm birth; abnormality in the foetus; bicornuate uterus; previous retained placenta; previous post-partum haemorrhage; breech presentation; drug use during pregnancy; previous intra-uterine foetal demise; pregnancy by means of in vitro fertilisation; placenta praevia; previous myomectomy and previous postnatal depression were each only identified in one or two cases each. Twin pregnancy could also be considered a risk factor and was present in three cases.

5.6   Type of birth

Spontaneous vaginal delivery occurred in 75.2% of the study sample (1.0 standard error of percent; with 95% CI for percent 73.1 to 77.2). Two spontaneous vaginal deliveries were twin births and one was a breech vaginal birth. Instrument assisted birth by vacuum accounted for 5.4% of the births (standard error of percent 0.5; with 95% CI for percent 4.3 to 6.5). No reports were made of forceps assisted birth. The overall caesarean section rate was 19.3% (standard error of percent 1.0; with 95% CI for percent of 17.4 to 21.1). Practice G had a significantly higher percentage of successful spontaneous vaginal births (82.9%) and a lower caesarean rate (12.3%).

5.6.1 Caesarean section: planned or unplanned

Private midwives focus on natural birth, but most practices continue support even if women choose or need caesarean section. Often these women are accompanied to theatre by their midwives and were still entered into the birth registers. Tables 4-19 and 4-20 show the number and percentage of planned and unplanned caesareans in each practice. Of the 332 caesarean sections, 269 (81.0%) were unplanned (2.2 standard error of percent; with 95% CI for percent of 76.8 to 85.3) and 63 (19.0%) were planned (2.2 standard error of percent; with 95% CI for percent of 14.7 to 23.2). Practice G had only four (0.8%) planned caesarean sections. This could have contributed to their low overall caesarean rate. Practice E had the highest overall caesarean section rate, but the fact that they had 10.6% planned caesarean sections could have contributed to this finding.

If women had planned caesarean sections for various reasons and their midwives continued support by accompanying them to theatre, or if they had inductions of labour managed by their midwives, they were still entered in the birth registers and thus included in the study sample. The researcher made the decision to include these cases based on the fact that Sandall *et al.* (2013) included low and mixed risk women who were randomised to midwife-led versus other models of care from the beginning (Intention to treat). They were grouped under midwife-led or "other" until they had given birth regardless of outcomes. Even though some women in the Gauteng sample had planned caesareans or inductions of labour they had been midwives' patients throughout their pregnancies and their midwives had been present at their births. Care of these women had become shared care and not necessarily complete handover. Some cases warranted complete handover but were not entered in the birth registers and were thus not be included.

5.6.2 Indication for caesarean section

The NICE (2011:12) guidelines advise planned caesarean sections for women with placenta praevia, persistent breech presentation, twin pregnancy (if the first twin is not cephalic), and on maternal request if the woman has been counselled properly on the risks of caesarean versus normal birth. Failure to progress in labour and cephalo-pelvic disproportion (CPD) are stated as two of the possible reasons for unplanned caesarean sections (NICE, 2011:17).

In the Gauteng sample there were various indications for caesarean section. One or more indication was stated for each patient who had a caesarean section. The options on the audit forms were previous caesarean section; breech presentation; medical conditions; failure to progress in labour; CPD/macrosomia (big baby); foetal distress; and other. Whether or not these women were attempting trial of labour this time around, previous caesarean section was stated

as an indication for 43 (13%) caesareans. Twenty two caesareans were conducted because of breech presentation (6.6%). Failure to progress and CPD were the most common reasons, occurring in 99 (29.8%) and 83 (25%) cases respectively. Foetal distress necessitated 59 (17.8%) caesareans.

Indications reported under "other" were: rupture of membranes at 34 weeks; pre-labour rupture of membranes; prolonged rupture of membranes; abruptio placenta; antepartum haemorrhage; compound presentation; cord presentation; cord prolapse; decreased foetal movements, non-reactive non-stress test; deep transverse arrest; failed induction of labour; failed ventouse (vacuum assisted birth); baby not descending; meconium-stained liquor; cord around baby's neck x2; imminent uterine rupture; intra-uterine growth restriction; malpresentation; occipito-posterior position; placenta praevia; post-dates; previous myomectomy; previous polypectomy; previous stillbirth; reduced amniotic fluid index; transverse position; and twin pregnancy. Most of the indications described under 'other' occurred in one or two instances. Prolonged-, pre-labour, preterm- or spontaneous rupture of membranes was reported 25 (7.5%) times. In six cases (1.8%) caesarean sections were planned without medical indications and classified as to patient's choice or emotional reasons.

5.6.3   Water birth

All the midwives in the study sample practised water birth (see: Table 4-21 and Table 4-22). Of the women who had spontaneous vaginal births 661 or 51% did so under water (1.4 standard error of percent; with 95% CI for percent of 48.3 to 53.7). Practice C had the highest percentage of water births (90.8%). Practice E had the lowest percentage of spontaneous vaginal births under water (31.3%).

5.7   Location of birth

Each midwifery practice made use of a variety of locations for the births. The majority of women in the sample gave birth at the venues they had planned (see: Table 4-24). A total of 1611 out of 1724 women (93.6%) gave birth at their preferred venues (0.6 standard error of percent; with 95% CI for percent 92.4 to 94.7). Reasons for using a different venue for the birth included ante-partum haemorrhage necessitating hospital birth; birth before arrival (in the car); the birth centre being full; transfer from home or a birth house for caesarean section or assisted delivery; prolonged pre-labour rupture of membranes; preterm birth in another country; and unplanned home birth.

The overall home birth rate was 13.7% (0.8 standard error of percent; with 95% CI for percent of 12.1 to 15.3). Practice A was the only practice which did a significant number of births at a birth house (96 women; 5.6%; 0.6 standard error of percent; with 95% CI for percent of 4.5 to 6.7).

Nearly half of the women in the total sample gave birth at a midwife-led freestanding birth centre (856 women; 49.7%; 1.20 standard error of percent; with 95% CI for percent of 47.3 to 52.0). Various active birth units on hospital grounds were the venues for 420 (24.4%) of the births in the sample (1.0 standard error of percent; with 95% CI for percent of 22.3 to 26.4). Only 103 (6.0%) women gave birth at a regular hospital (0.6 standard error of percent; with 95% CI for percent of 4.9 to 7.1).

5.8   Interventions used during labour and birth

Induction of labour, augmentation of labour, and AROM were explored as interventions during labour and birth (see: Table 4-30). One or more interventions were used in 458 out of 1659 women (27.6%; 1.1 standard error of percent; with 95% CI for percent of 25.5 to 29.8) who were in labour at some point, whether they eventually had spontaneous vaginal births or caesarean sections (see: Table 4-31).

5.8.1   Induction of labour

In the study sample, inductions were done with medication (oxytocin or prostaglandins) or mechanically (rupture of membranes or balloon catheter in the cervix). Induction of labour was performed in 159 of 1659 women (9.6%; 0.7 standard error of percent; with 95% CI of percent of 8.2 to 11.0). Practice E had no inductions of labour whereas 15.9% of Practice B and 17.9% of Practice D's women were induced. Since practice E had a higher percentage of caesarean sections (40.7%) than Practice B and Practice D (35.2% and 20.8%) one could argue that induction of labour instead of planned caesarean section may have reduced the overall percentage of caesarean sections.

5.8.2   Augmentation of labour

Augmentation of labour was performed in 157 out of 1659 women (9.5%; 0.7 standard error of percent; with 95% CI for percent of 8.1 to 10.9). Practices E and H did no augmentations of labour, whilst Practice D had the highest percentage of augmentation of labour (24.2%). One could again argue that augmentation of labour may have reduced the unplanned caesarean section rate, since practice E and H had higher caesarean rates (40.7% and 25.6%) than practice D (20.8%). Contrary to this, however, Practices A, C and G had lower augmentation rates (10.2%, 1.5% and 7.5%) as well as lower caesarean rates (16.3%, 16.6% and 12.3%) than Practice D.

5.8.3 Artificial rupture of membranes

AROM was only reported consistently in the birth registers of Practices A and C (see: Table 4-30). The results are therefore only conclusive for these two practices. AROM was not reported in 1032 out of 1659 cases (62.2%), but was performed in 193 (11.6%) of the cases in which it was reported.

5.9 Use of pharmaceutical pain relief during labour

Whether or not medication was used was reported for 1655 out of the 1659 women who were in labour. One or more type of medication was given to 413 (24.9%; 1.1 standard error of percent; 95% CI for percent 22.9 to 27.0) women during the process (see Table: 4-35). This means that 1243 women (75.1%; 1.1 standard error of percent; 95% CI for percent 73.0 to 77.1) did not make use of any pharmaceutical pain relief during labour.

5.9.1 Meperidine (Pethidine)

Meperidine (Pethidine) is a commonly used intramuscular opiate for labour analgesia. The main risks associated with opiates are that they freely cross the placental barrier and are poorly metabolised by the foetus. Respiratory depression, poor Apgar scoring and delayed suckling can occur as a result (El-Wahab & Robinson, 2014:99). Pethidine was used by 227 out of 1655 women (13.7%; 0.8 standard error of percent; 95% CI for percent 12.1 to 15.4). The percentage of women who were given Pethidine during labour differed vastly among practices. Practice E made no use of Pethidine whereas 28.7% of the women in Practice F received Pethidine.

5.9.2 Hydroxyzine (Atarax)

Hydroxyzine (Atarax) is not an analgesic, but is used during labour for its anxiolytic properties. It potentiates the action of Pethidine; therefore, these two drugs are often administered in combination. Atarax was used more frequently than Pethidine in the study sample. It was reported that 287 women (17.3%; 0.9 standard error of percent; 95% CI for percent 15.5 to 19.2) were given Atarax during labour. The use of Atarax also differed significantly among practices. The women from Practice E did not use Atarax, whilst 34.9% of the women of Practice F received Atarax.

5.9.3 Nitrous oxide (Entonox Gas)

Entonox gas or nitrous oxide is self-administered through inhalation via a negative pressure mask. It is considered the safest pharmaceutical pain relief method for labour (El-Wahab & Robinson, 2014:97). It can be used at any time during the process of labour with no limits to

duration of use. Advantages are that the onset is rapid, metabolism minimal, and its effect on the cardio-respiratory system limited. Uterine contractions, foetal wellbeing and breastfeeding have also been proven unaffected by Entonox inhalation. Women report side effects such as nausea, drowsiness and paraesthesia. The effectiveness of its use depends on the timing of inhalation in relation to uterine contractions and efficacy has not been found as very high (El-Wahab & Robinson, 2014:97). Whether or not Entonox was used was reported for 1657 women who were in labour. Of these women 287 (17.3%; 0.9 standard error of percent; 95% CI for percent 15.5 to 19.2) used Entonox. The use of Entonox also depended on the practice caring for the women. It varied from 0% in practice E to 36.8% in practice D.

5.9.4 Epidural anaesthesia

Epidural anaesthesia provides total pain relief, but has several reported risks: more need for assisted vaginal birth; maternal hypotension; motor-blockade; maternal fever; urinary retention; prolonged second stage of labour; need for augmentation through administration of oxytocin; and an increased risk of caesarean section caused by foetal distress (Anim-Somuah *et al.*, 2011). Epidural analgesia can only be initiated by an anaesthesiologist and cannot be done in a home birth setting. An epidural is usually not the analgesia of choice for women who have specifically planned natural birth with a midwife. Epidural anaesthesia was not widely used in the study sample (see: Table 4-39). Thirty-two out of 1657 women (1.9%; 0.3 standard error of percent; 95% CI for percent 1.3 to 2.6) had epidurals. The use of epidural anaesthesia ranged from 0% to 2.6% in all practices, except practice H in which a 12.5% epidural rate was found.

5.10 Outcomes of births

5.10.1 Condition of the perineum after birth

The condition of the perineum after birth is classified as intact; episiotomy; 1st or 2nd degree tear; or complicated tear needing transfer to theatre. The condition of the perineum was reported by the midwives in their birth registers. Classification was based on each midwife's own observation. Intact perineum or cases where there were small 'skin snicks' not requiring suturing were counted together. Intact perineum was reported in 743 out of 1392 spontaneous vaginal births and instrument births. This means that 53.4% of women were intact after giving birth (1.3 standard error of percent; with 95% CI for percent of 50.8 to 56.0). Episiotomy was performed in 76 (5.5%) cases (0.6 standard error of percent; with 95% CI for percent of 4.3 to 6.7). First or second degree tears occurred in 536 (38.4%) cases (1.3 standard error of percent; with 95% CI for percent of 36.0 to 41.1). Transfer to theatre for repair of complicated tears was necessary in 29 (2.1%) cases (0.4 standard error of percent; with 95% CI for percent of 1.3 to 2.8).

5.10.2 Maternal complications

Maternal complications were reported for the entire sample irrespective of the type of birth (see: Table 4-42). Post-partum haemorrhage, retained placenta, and maternal admission to high care units could have occurred separately or in combination – as one could have led to the other (e.g. PPH leading to admission to high care unit). One or more maternal complications were reported in 152 (8.8%) cases (0.7 standard error percent; with 95% CI for percent of 7.5 to 10.2).

The main causes of PPH are failure of the uterus to contract (atonic uterus); retained placenta or retained fragment of placenta; vaginal lacerations; cervical tears; perineal tears; ruptured uterus and bleeding associated with caesarean section. For the purpose of this study post-partum haemorrhage is operationally defined as more than 500ml blood-loss after vaginal birth and more than 1000ml after caesarean section. The accuracy with which this was measured within each practice is not known. It could have been measured physically or estimated by observation. Of the total sample 136 (7.9%) women were reported to have had post-partum haemorrhage. Only three of these cases were severe enough for admission to a high care unit or for blood transfusion (0.2% of the total sample). There were 16 (0.9%) cases of retained placenta needing transfer to theatre for evacuation of the uterus.

Eight women were admitted to high care units after having given birth (0.5% of the sample). Reasons were post-partum haemorrhage (3 cases or 0.2%); post-partum infection (2 cases or 0.1%) and "other" including breakdown of wound; paralytic ileus; septicaemia & necrotizing fasciitis; secondary post-partum haemorrhage at 6 weeks; and deep venous thrombosis (DVT). Some of the reasons for admission to high care, such as wound breakdown, DVT and necrotising fasciitis, were complications following caesarean sections and were not directly related to midwife-care.

5.10.3 Neonatal complications

Neonatal complications are any problems regarding the infant around the time of birth. Specific complications were identified and explored (see: table 4-46). Neonatal complications of one or more categories were reported in 138 (8.0%) cases (0.7 standard error of percent; with 95% CI for percent of 6.7 to 9.3). Some of these complications were fleeting and others required admission to neonatal intensive care.

The complications which were specifically reported were 5 minute Apgar equal to or below 7/10; shoulder dystocia; preterm birth < 37 weeks; admission to NICU; stillbirth; and early neonatal death. Outcomes for the three sets of twins were combined and reported together. When one of the twins had a complication it was reported under the patient code or case. Table 4-23 depicts

the number and percentage of infants who presented with the defined categories of complications.

Determining an Apgar score out of 10 is based on specific criteria, but is often done through subjective observation. The Apgar score is an important indicator of infant well-being at birth, but not always an indicator of long-term outcome. Of the sample 51 infants (3%; standard error of percent: 0.4; 95% CI for percent 2.2 to 3.8) were reported to have had Apgar scores of less than seven out of ten at 5 minutes after birth. Practice A had the highest number of infants with 5 minute Apgar scores less or equal to seven (7.7%). They had only a 4.3% neonatal admission rate suggesting that the infants with low Apgar scores either recovered very well or that midwives were overly strict when determining Apgar scores. Practice C reported that none of its infants had low Apgar scores at 5 minutes. The practice's neonatal admission rate was 8.3%.

Shoulder dystocia is diagnosed when an infant's head is born and there is difficulty in delivering the shoulders. It usually occurs in larger infants weighing more than 3.5kg (DOH, 2007:27). Shoulder dystocia is an obstetric emergency and can lead to numerous complications in the infant as well as the mother. Brachial nerve injuries, humerus or clavicle fractures, asphyxia and neonatal death can occur in severe cases (Verklan & Walden, 2010:33). Shoulder dystocia was a rare occurrence in the study sample. Nine out of 1724 (0.5%; standard error of percent: 0.2; 95% CI for percent 0.2 to 0.9) infants were reported to have had shoulder dystocia. No practice had more than two instances of shoulder dystocia. The infants in the sample who were said to have had shoulder dystocia weighed between 3.5kg and 4.4kg which is consistent with the literature on the topic. In hindsight, shoulder dystocia is neither a maternal nor neonatal complication as such, but has the potential for complications in both.

As reported earlier, birth before 37 weeks gestation is considered preterm birth. Out of 1720 cases in which it was reported, 33 (1.9%; standard error of percent: 0.3; 95% CI for percent 1.3 to 2.6) infants were born before 37 weeks. Admission to neonatal intensive care (NICU) occurred in 74 (4.3%; standard error of percent: 0.5; 95% CI for percent 3.3 to 3.5) infants. There were birth related and non-birth related indications for admission to NICU. Ten infants were admitted for prematurity (0.6%); six were diagnosed with some degree of asphyxia (0.3%); eight infants were reported to have had respiratory distress (0.5%); and six infants (0.3%) had severe enough jaundice to warrant admission.

Other reasons for neonatal admission were described as ABO (blood group) incompatibility; antibiotics (mother group B streptococcus positive); congenital heart defect; bladder extrophy; cephalohematoma; cerebral oedema; cleft lip and palate; complications due to abruptio placenta; gastroenteritis from mother (3 days after birth); hypoglycaemia; low Apgar scores;

metabolic acidosis; observation over-night; plethora; sub-aponeurotic haemorrhage; twin 2 - transient tachypnoea of the new-born (TTN); and vomiting.

Four cases of stillbirth were reported (0.2%). It was not stated in any of these cases whether intra-uterine death occurred before or during labour. One early neonatal death (0.1%) was reported and it was known before birth that this infant had an abnormality incompatible with life. Overall foetal loss or neonatal death thus occurred in 5 cases (0.3%; standard error of percent: 0.1; 95% CI for percent 0.04 to 0.5).

5.11 Comparison with the systematic review by Sandall *et al.* (2013)

As discussed earlier (2.5.1), Sandall *et al.* (2013) recently conducted a systematic review on studies comparing the outcomes of midwife-led versus other models of care. The outcomes of 13 trials including 16 242 women in total were reported. For each outcome or intervention, relevant studies were assessed before inclusion. Some of the most important outcomes and interventions evaluated by Sandall *et al.* (2013) were also evaluated in this study. The researcher compared the outcomes of the Gauteng private midwives with the outcomes of the midwife-led group in the systematic review (see: Table 4-23). Some outcomes evaluated by Sandall *et al.* (2013) were not addressed in this study and were thus excluded from the discussion of outcomes.

5.11.1 Outcome: Regional analgesia (epidural/ spinal)

Women who birthed with private midwives in Gauteng had a significantly lower epidural rate (1.9%; standard error of percent: 0.3; 95% CI for percent 1.3 to 2.6) when compared with 21.1% in the midwife-led groups reviewed by Sandall *et al.* (2013:53). Although not explored by this study, factors such as the use of natural pain relief methods, the unavailability of epidural analgesia at home births, or women's personal preferences might have affected this outcome. Women in the Gauteng sample self-selected midwife-led care, whereas the women in the Sandall *et al.* (2013) review were mostly randomised to midwife-led care. Women who seek midwife-led care are usually those who prefer a more natural approach to childbirth and are not inclined to request epidural analgesia.

5.11.2 Outcome: Caesarean birth

The Gauteng sample of women had a significantly higher overall caesarean section rate. Caesarean sections occurred in 19.3% of women (1.0 standard error of percent; with 95% CI for percent of 17.4 to 21.12) compared with the 12.5% in the midwife-led group from Sandall *et al.* (2013:54). The caesarean rate differed among practices. Practice G had a caesarean section rate similar to that of the review, whereas all other practices had a higher caesarean rate. The

context of the study should be taken into account. The private health sector in South Africa has a caesarean rate of approximately 73% and in the public sector the rate is 18% (HST, 2014). The World Health Organization recommends a caesarean section rate of 10 to 15% (WHO, 1985:436). Because this recommendation was made almost 20 years ago Ye *et al.* (2014:237) re-examined the current validity thereof. They selected 19 countries in North and West Europe, North America, Australia, New Zealand, and Japan, and evaluated the association between caesarean section rate and mortality. They found that a population based caesarean section rate of higher than 10% had no significant impact on maternal, neonatal or infant outcome.

Bateman (2004:802) interviewed numerous specialists and advisors for medical aid schemes regarding the caesarean rate in South Africa. There is an awareness of the caesarean section rate being too high, but opinions are varied. Some specialists are pro-caesarean owing to the possibility of injury to the pelvic floor and urinary incontinence. They also state that emergency caesarean is more risky than planned caesarean. Although morbidity and mortality have been proven higher with caesarean section and risks include postpartum haemorrhage, hysterectomy and amniotic fluid embolism, private obstetricians at a panel discussion stated that none of them had lost a patient because of a caesarean section (Bateman, 2004:802). Rothberg and McLeod (2005:258) argue that South African women in the private sector have freedom of choice. Controlling the caesarean section rate or developing a more midwife-led maternity care system would, according to them, encroach on women's rights to choose their desired level of care and method of birth. They are of the opinion that only certain populations of women choose midwife-led care and options such as home birth. In discussion on the caesarean rate in the public sector they propose that when considering factors such as HIV, antenatal infection rates and resource constraints, one could argue that the caesarean section rate might even be too low. This is a complex issue which should be explored further with intensive inquiry.

In the Gauteng sample differentiation was made between planned and unplanned caesareans. Midwives continued to support women with planned caesareans and reported them as midwife patients. Sandall *et al.* (2013) report the overall caesarean section rate for included studies, but do not elaborate on indications for caesarean or whether or not women could choose caesarean sections.

5.11.3 Outcome: Instrument vaginal birth (forceps/ vacuum)

The women in the Gauteng sample had a significantly lower percentage of assisted births namely 5.4% (0.5 standard error of percent; with 95% CI for percent of 4.3 to 6.5) than the 11.5% in the midwife-led samples in Sandall *et al.* (2013:55). The women included in the review of Sandall *et al.* (2013) had a higher instrumental birth rate but a lower caesarean section rate. The decision between instrumental vaginal birth and caesarean section is usually based on the

specific circumstances and after weighing risks and benefits for a specific woman. Ekéus *et al.* (2014:36) found an association between vacuum assisted delivery and the risk for intracranial haemorrhage in the neonate. Other risks include trauma to the infant's scalp and a higher likelihood of perineal trauma to the woman. However, the risks of caesarean section are also considerate.

5.11.4 Outcome: Spontaneous vaginal birth

Spontaneous vaginal birth refers to all births which occur naturally without instrument assistance. Spontaneous vaginal birth accounted for 72% of births in the Sandall *et al.* (2013:56) review. The percentage of spontaneous vaginal births was significantly higher in the Gauteng sample. Spontaneous vaginal birth occurred in 1296 cases (75.2%; 1.0 standard error of percent; with 95% CI for percent of 73.1 to 77.2). The higher percentage of spontaneous vaginal births even with a higher percentage of caesarean sections is explained by the lower percentage of instrument assisted births in the Gauteng sample.

5.11.5 Outcome: Intact perineum

Intact perineum refers to no suturing to the perineum required after a vaginal birth, either spontaneous or by vacuum assistance. In the Gauteng sample 743 of 1392 (53.4%) women who had vaginal births were reported to have intact perineums (1.3 standard error of percent; with 95% CI for percent of 50.8 to 56.0). This is a significantly higher percentage than that in the 31.4% in the Sandall *et al.* (2013:57) review. Even though the percentage of perineal tears requiring suturing was similar in both groups, a higher percentage of women in the Sandall *et al.* (2013) review had episiotomies, explaining the higher percentage of intact perineums in the Gauteng sample.

5.11.6 Outcome: Preterm birth (< 37 weeks)

When an infant is born after 24 weeks, but before 37 weeks it is considered preterm birth. In the Gauteng sample, 33 out of the 1720 of women (1.9%; standard error of percent: 0.3; with 95% CI for percent of 1.3 to 2.6) were reported to have given birth before 37 weeks gestation. This is significantly lower than the 4.9% of the midwife-led sample in Sandall *et al.* (2013:58). As previously mentioned, however, the units of analysis in the Gauteng sample were midwife-attended births entered in the birth registers only. The Sandall *et al.* (2013) review included all women randomly assigned to midwife-led care from no later than 24 weeks gestation and reported on all these cases. In the Gauteng sample, there may have been a few women completely handed over to higher levels of care as a result of preterm labour and, therefore, not entered into midwives' birth registers.

5.11.7 Outcome: Overall foetal loss and neonatal death

Overall foetal loss and neonatal death include intra-uterine foetal demise, stillbirth and early neonatal death after 24 weeks gestation (Twenty four weeks gestation was used instead of 26 weeks (viable age in South Africa) to enable comparison with the Sandall *et al.* study). In the Gauteng sample five out of 1722 (0.3%) perinatal infant deaths were reported (0.1 standard error of percent; with 95% CI for percent of 0.04 to 0.5). This is significantly lower than the 2.8% reported in the midwife-led samples reviewed by Sandall *et al.* (2013:59).

5.11.8 Outcome: Induction of labour

Induction of labour was reported to have been performed in 9.6% of the Gauteng sample (0.7 standard error of percent; with 95% CI for percent of 8.2 to 11.0). This is significantly lower than the 18.6% of the midwife-led group in the Sandall *et al.* (2013:62) review. Recommendations from the World Health Organization (2011:12) state that induction of labour especially before 41 weeks gestation should only be conducted when there are clear medical indications. The evidence for induction of labour after 41 weeks is also weak. The benefits should outweigh the risks, which are uterine overstimulation, uterine rupture and foetal distress.

5.11.9 Outcome: Amniotomy

The outcome "artificial rupture of membranes" was underreported in the Gauteng sample and therefore no accurate conclusion can be made on this finding. The practices which did report AROM indicated 35.4% (Practice A) and 35% (Practice C) compared with 30.7% in the Sandall *et al.* (2013:63) review.

5.11.10 Outcome: Augmentation/ artificial oxytocin in labour

In the sample of Gauteng women labour was augmented with the use of artificial oxytocin in 157 out of 1659 births (9.5%; 0.7 standard error of percent; with 95% CI for percent of 8.0 to 10.9). This percentage is significantly lower than the 23.6% in the Sandall *et al.* (2013:64) review. As with induction of labour, the latest recommendations from the World Health Organization (2014:4) advise that augmentation of labour should be used carefully and only when medically indicated.

5.11.11 Outcome: No intra-partum analgesia/ anaesthesia

It was reported that 1243 (75.1%) out of 1659 labouring women (1.1 standard error of percent; with 95% CI for percent of 73.0 to 77.2) in the Gauteng sample did not make use of medication for pain relief. Natural methods of pain relief such as reflexology, immersion in water during labour and massage were noted, but not quantified. A remarkable difference is, therefore,

evident between the Gauteng sample and the midwife-led sample in Sandall *et al.* (2013:65) in which 16.1% of women did not use medical pain relief.

5.11.12 Outcome: Opiate analgesia

Pethidine is the only opiate that was used in the Gauteng sample of labouring women. These women were significantly less likely to use opiates in labour (227/1655; 13.7%; 0.9 standard error of percent; with 95% CI for percent of 12.1 to 15.4) than the women in the midwife-led group in the Sandall *et al.* review (2013:66) of which 32.3% used opiates. Opiates have not been proven to be very efficient and are risky for the mother and the infant (El-Wahab & Robinson, 2014:99). Less use of opiates is thus preferable.

5.11.13 Outcome: Attendance at birth by known midwife

Studies reviewed by Sandall *et al.* (2013:67) show that 1808 out of 2610 women were attended by a "known midwife". This outcome was not explored statistically for the Gauteng women, but since most of their midwives practice alone and the group practices offered one-to-one or team care it is safe to assume that the majority of the study sample was attended by a known midwife in labour.

5.11.14 Outcome: Episiotomy

Episiotomy was performed in 76 (5.5%) of 1392 women who had spontaneous vaginal or instrument assisted births in the Gauteng sample (0.6 standard error of percent; with 95% CI for percent of 4.3 to 6.7). This percentage is significantly lower than the 19.1% performed by the midwives of the studies in the review (Sandall *et al.* 2013:68). Carroli and Mignini (2009:2) reviewed the evidence on routine episiotomy versus restrictive use of episiotomy. They concluded that it is beneficial to restrict the use of episiotomy since posterior perineal trauma, suturing and complications occur less frequently when routine episiotomy is not practised.

5.11.15 Outcome: Perineal laceration requiring suturing

In the Gauteng sample, perineal tears were classified as 1st or 2nd degree tear (535/1392; 38.4%; 1.3 standard error of percent; with 95% CI for percent of 36.0 to 41.1) and complicated tears requiring transfer to theatre for repair (29/1392; 2.1%; 0.4 standard error of percent; with 95% CI for percent of 1.3 to 2.8). When these two aspects were combined the results showed that 564 women out of 1392 (40.5%) had perineal lacerations requiring suturing (1.3 standard error of percent; with 95% CI for percent of 37.9 to 43.1). This percentage is lower than the 42.1% of the midwife-led women in the review by Sandall *et al.* (2013:69), although the difference is not significant.

5.11.16 Outcome: Postpartum haemorrhage

Blood loss of more than 500ml after vaginal birth or more than 1000ml after caesarean section was reported in 136 (7.9%) out of 1722 women (0.7 standard error of percent; with 95% CI for percent of 6.6 to 9.2). Compared with the midwife-led patient sample in Sandall *et al.* (2013:71) in which 6.2% of women had post-partum haemorrhage, the percentage of women with post-partum haemorrhage in the Gauteng sample was significantly higher. However, only three of the Gauteng midwives' cases were severe enough to require admission to high care units. This may indicate that measurement of blood loss was either not objective or that post-partum haemorrhage was promptly managed.

5.11.17 Outcome: Low birth weight (<2.5kg)

In the Gauteng sample, 50 out of 1716 infants (2.9%) were reported to have weighed less than 2.5kg at birth (0.4 standard error of percent; with 95% CI for percent of 2.1 to 3.7). This is a significantly lower percentage than the 5.2% in the Sandall *et al.* (2013:74) review.

5.11.18 Outcome: 5-minute Apgar score below or equal to 7

Fifty-one out of 1722 with reported Apgar scores had equal to or lower than 7 at 5 minutes (3.0%; 0.4 standard error of percent; with 95% CI for percent of 2.2 to 3.8). In the midwife-led group in Sandall *et al.* (2013:75) low Apgar scores occurred in 2.1% of cases. Low Apgar scores thus occurred significantly more in the Gauteng sample. Apgar scores equal to or lower that 7 at 5 minutes occurred in 116 of 5168 (2.2%) cases in the category "other models of care" in Sandall *et al.* (2013:63). The difference between the Gauteng group and this group is not significant.

5.11.19 Outcome: Admission to neonatal intensive care unit

Seventy-four (4.3%) out of 1722 (0.5 standard error of percent; with 95% CI for percent of 3.3 to 5.3) infants were admitted to neonatal high care or intensive care shortly after birth or within the first few weeks of life. This percentage is significantly lower than the 6.7% neonatal admissions in the midwife-led group in Sandall *et al.* (2013:77).

5.12 Summary

In this chapter the results of the retrospective cohort study as presented in chapter 4 were discussed, comparing the results with those in the relevant literature on each topic. Specific outcomes were compared to the outcomes of the women allocated to midwife-led care in the review by Sandall *et al.* (2013).

CHAPTER 6: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 Introduction

In this chapter study conclusions and limitations are discussed. The researcher will also make recommendations for practice, education and further research.

6.2 Conclusions of the study

The outcomes of and interventions used in 1724 births conducted by 14 private midwives in eight practices were explored by means of a retrospective cohort study. The practices all focused on low risk pregnancies, although some practices continued care of women with manageable risk factors in cooperation with the specific backup obstetricians. Risk factors were reported in 26.6% of women in the sample. Previous caesarean section, grand multiparity and advanced maternal age were the most significant risk factors. Pre-existing and pregnancy induced medical conditions existed in only 2% of the cases.

The women in the sample gave birth at a mean age of 30.2 years and a mean gestation of 39.4 weeks. The mean birth weight for their babies was 3.3kg, 89.8% being within a normal weight range of 2.5 to 4kg. Successful spontaneous vaginal birth occurred in 75.2%, instrument birth in 5.4% and caesarean section in 19.3% of the births. Differentiation was made between planned and unplanned caesareans sections. Most practices continued care of women who had planned or pre-booked caesareans and the midwives accompanied them to theatre. These cases were still entered into their birth registers. Results showed that 3.7% caesareans were planned and 15.5% were unplanned or "emergency" caesareans. Overall most caesareans were as a result of obstetric indications such as breech presentation, foetal distress and cephalopelvic disproportion. Six caesareans occurred out of patient choice or for emotional reasons.

The number of interventions and maternal and neonatal outcomes of the study sample were compared with those of the midwife-led group in the review by Sandall *et al.* (2013). However, the review by Sandall *et al.* (2013) included only trials in which there was some form of randomisation. These women were randomly allocated to either have midwife-led care or physician-led care. Women in the Gauteng sample chose midwife-led care. This should be taken into consideration when the study findings are interpreted. Du Plessis (2005:28) suggests that women seek private midwife-led care for various reasons, with one of the reasons being that they are weary of the high intervention rate in the private hospital settings.

Gauteng women had a significantly higher percentage of caesarean sections, but a significantly lower percentage of instrument assisted births and also a significantly higher percentage of spontaneous vaginal births. Induction and augmentation of labour occurred significantly less frequently in the Gauteng sample. Gauteng women made significantly less use of pharmaceutical pain relief during labour. This included the use of opiates, Entonox gas and epidural anaesthesia. With the exception of a higher caesarean section rate one may conclude that interventions during labour and childbirth were used significantly less frequently in the Gauteng sample.

Maternal and neonatal complications were also explored. Gauteng women were significantly less likely to have had episiotomies and significantly more likely to have intact perineums. The percentage of perineal tears requiring suturing was similar in both groups. Postpartum haemorrhage occurred significantly more frequently in the Gauteng group; however, only three out of 136 cases were severe enough for admission to high care units or to require blood transfusion. There were no maternal deaths reported in either the Gauteng or the Sandall *et al.* (2013) samples of women. With the maternal mortality ratio estimated at 310 deaths per 100 000 live births in South Africa this is a reassuring finding (Bradshaw & Dorrington, 2012:38).

Pertaining to the neonatal outcomes, significantly lower percentages of preterm labour before 37 weeks and low birth weight below 2.5kg occurred in the Gauteng sample when compared with the Sandall *et al.* (2013) sample. The occurrence of low Apgar scoring was significantly more frequent in the Gauteng sample, but admission to neonatal intensive care occurred significantly less frequently than in the Sandall *et al.* (2013) sample. When the outcome: "overall foetal loss or neonatal death" was explored, a significantly lower percentage was found in the Gauteng sample.

After a study of the literature about midwife-led versus other models of care, it became clear that continuity of care, choice and control are important factors in outcomes of as well as satisfaction with care. In the present study there were planned and elective caesareans, vaginal births after caesarean, home births and water births which point to the likelihood that these women had a high level of choice regarding their births. Women who choose obstetrician-led care do not usually have access to all these options. Women's sense of control during their pregnancies and birth experiences cannot be commented on in the interpretation of results, since this aspect of the three C's would better be explored through qualitative data collection. All the midwifery practices reported during interviews that it was highly likely that their patients were cared for by a known midwife during labour, since most practices offer one-to-one or caseload patient care. This indicates that there was a high level of continuity of care. Women's satisfaction with their care and other emotionally prominent factors in the literature on midwife-led care were not explored in this study.

The review by Sandall *et al.* (2013) concludes that midwife-led care should be offered to low risk pregnant women and their infants. With the exception of a 1.6% higher percentage of postpartum haemorrhage, a higher caesarean section rate (which should be taken in context), and a 0.9% higher percentage of Apgar scores of 7 or lower at 5 minutes Gauteng private-midwife-led care was found to be less intervention driven with less medication use in labour and no more significant risks to the mothers and infants.

6.3 Study limitations

The following limitations of the current study were identified.

(i)   The use of a retrospective cohort design may be seen as a study limitation. The researcher exerted no control over the study environment or extraneous variables (Burns & Grove, 2009: 226). Variables were explored and discussed as they occurred in their natural environment.

(ii)   For optimal comparison with the systematic review of Sandall *et al.* (2013) a prospective case controlled study with randomisation to midwife-led or other care would have been ideal. The fact that women in the Gauteng study self-selected to be cared for by a midwife need to be taken into consideration when interpreting findings.

(iii)   Midwives volunteered to participate. All midwives meeting the inclusion criteria were approached, but participation was voluntary. This could have led to biased results. No conclusions can be made about the number or outcomes of births conducted by midwives who did not allow access to their records.

(iv)   Certain factors were underreported in some of the birth registers. Factors such as increased BMI could have had an impact on outcomes.

(v)   There were grey areas in considering the midwife or the obstetrician as lead clinician. Referral was not always clear since some midwives transferred care to obstetricians when risks or planned caesarean section become necessary while others stayed involved, e.g. induction of labour or accompaniment to caesarean.

(vi)   The possible inaccuracy of Apgar scoring and measurement of post-partum haemorrhage are study limitations. These were some of the main outcomes assessed and over- or underreporting of these variables could have had a large impact on the frequency assessed.

6.4 Recommendations

The following recommendations are made for practice, education and research:

6.4.1 Recommendations for practice

(i)   The birth registers in the study sample were very neatly kept and fairly complete, however, there were some missing data and some aspects were underreported. The midwives will be made aware of this. Excellent record keeping and practice statistics are not only indicators of high standards in practice, but also serve as evidence in cases in which outcomes are questioned.

(ii) Results will be disseminated into practice. Firstly Gauteng midwives will receive feedback regarding the overall results of the study. Awareness of their outcomes will allow them to continually improve on all aspects of their care. Secondly an article will be prepared for publishing in a scientific journal to make the results available to the profession and the public.

(iii) It is advisable to arrange a discussion or debriefing session on the topic of postpartum haemorrhage with the Gauteng midwives. Standards of practice on accurate measurement of blood loss, prevention and prompt treatment of postpartum haemorrhage will improve outcomes. Using case studies as examples could be a good way of approaching the issue.

(iv) An update on the importance of accurate Apgar scoring should be arranged for the Gauteng midwives. After informal feedback some practices have already made efforts to improve on Apgar score accuracy.

(v)   Pilot projects on government sponsored or partially sponsored independent midwife-led care should be considered as this could help to relieve the burden on the public health system and offer more choice to women without medical aid.

(vi)   Private midwife-led care should be expanded for women who are committed to natural birth in an out of hospital environment.

(vii) Intervention rates and the use of medication during labour differ vastly among practices. The midwives should be aware of their own statistics and be open to share them with prospective women. This way a pregnant woman would be able to make an informed choice to select a midwife who fits in well with her needs and wishes for her pregnancy and birth.

6.4.2   Recommendations for education

(i)   Furthering their education and staying up-to-date with emergency procedures are imperative for private midwives to maintain a high level of care. Important topics identified by this study are estimation and management of PPH as well as Apgar scoring and neonatal resuscitation.

6.4.3   Recommendations for research

(i)   Prospective studies over a long period of time, including a larger sample of women, are needed to confirm the findings of this study and explore the correlation between certain aspects of care and outcomes. Comparison of the findings with those of an obstetrician-led sample would improve the validity of the findings.

(ii)   Similar studies in other South African settings would also be valuable.

(iii)   Cost analysis comparing the overall expense of midwife-led with other models of care is needed to assess the cost effectiveness of midwife-led care in Gauteng.

(iv)   Qualitative or mixed-method studies could shed more light on the emotional aspects of midwife-led care. Maternal satisfaction with care, emotional support, breastfeeding success and the financial factor is prominent in the literature on midwife-led care and should also be explored in the Gauteng context.

(v)   The challenges faced by private midwives in Gauteng were informally observed during interviews with the midwives and were identified as an important topic for further research.

(vi)   Exploring women's motivations for choosing private midwife-led care in Gauteng would also be a valuable research project.

6.5   Conclusion

Midwifery is a global profession with standards and regulations, but the extent to which it is practised is unique in each country. Numerous international studies and reviews report independent midwife-led care to be a safe option for low risk pregnant women. Qualitative and mixed-method studies show higher levels of satisfaction in women who have had midwife-led care compared with that in other models of care.

This study on the outcomes of births attended by private midwives in Gauteng adds new knowledge to the topic of midwife-led care in the South African context. It shows that private

midwife-led care in Gauteng compares well with the rest of the world, especially since the private health system is in South Africa is generally intervention-driven.

The need for further research on midwife-led care has become apparent. Proposed studies include cost-analysis of midwife-led versus other models of care, prospective case control studies to compare midwife-led with other models of care in the South African context as well as mixed-method studies to explore women's views and wishes.

REFERENCES

American College of Nurse-Midwives (ACNM). 2014. Essential facts about midwives. http://www.midwife.org/Essential-Facts-about-Midwives Date of access: 24 Aug. 2014.

American College of Nurse–Midwives (ACNM) 2011 Comparison of certified nurse-midwives, certified midwives and certified professional midwives. http://www.midwife.org/acnm/files/ cclibraryfiles/filename/000000001031/cnm cm cpm comparison chart march 2011.pdf Date of access: 24 Aug. 2014.

Acts *see* South Africa.

Anim-Somuah, M., Smyth, R.M.D. & Jones, L. 2011. Epidural versus non-epidural or no analgesia in labour. (Protocol) Cochrane Database of Systematic Reviews 2011, Issue 12. Art. No.: CD000331. DOI: 10.1002/14651858.CD000331.pub3.

Balaskas, J. 1982. Active Birth Manifesto. http://activebirthcentre.com/about/active-birth-manifesto/ Date of access: 8 March 2015.

Bateman, C. 2004. Rendering unto Caesar. *South African medical journal,* 94(10):800-802.

Benoit, C., Zadoroznyj, M., Hallgrimsdottir, H., Treloar, A. & Taylor, K. 2010. Medical dominance and neoliberalisation in maternal care provision: The evidence from Canada and Australia. *Social science & medicine,* 71:475-481.

Berg, M., Lundgren, I., Hermansson, E. & Wahlberg, V. 1996. Women's experience of the encounter with the midwife during childbirth. *Midwifery,* 12:11-15.

Bick, D., Beake, S., Chappell, L., Ismail, K.M., McCance, D.R., Green, J.S.A. & Taylor, C. 2014. Management of pregnant and postnatal women with pre-existing diabetes or cardiac disease using multi-disciplinary team models of care: a systematic review. *BMC pregnancy and childbirth*, 14:428-441.

Bible. 2007. New Living Translation. Carol Stream, IL: Tyndale.

Board of Healthcare Funders (BHF)). 2004. Better benefit design. BHF Info-line, 2. https://www.bhfglobal.com/files/bhf/files/Volume_two.pdf Date of access: 10 Oct. 2014.

Botma, Y., Greeff, M., Mulaudzi, F.M. & Wright, S.C.D. 2010. Research in health sciences. Cape Town: Heinemann.

Bradshaw, D. & Dorrington, R.E. 2012. Maternal mortality ratio: trends in vital registration data. *South African Journal of Obstetrics and Gynaecology,* 18(2):38-42.

Brink, H., Van der Walt, C. & Van Rensburg, G. 2012. Fundamentals of research methodology for healthcare professionals. 3rd ed. Lansdowne: Juta & Co.

Burgard, S. 2004. Race and pregnancy-related care in Brazil and South Africa. *Social science & medicine*, 59:1127-1146.

Burns, N. & Grove, S.K. 2009. The practice of nursing research: appraisal, synthesis, and generation of evidence. 6th ed. St. Louis: Elsevier Saunders.

Canadian Association of Midwives (CAM). 2014. Midwifery Practice. http://www. canadianmidwives.org Date of access: 24 Aug. 2014.

Carroli, G. & Mignini, L. 2009. Episiotomy for vaginal birth. Cochrane Database of Systematic Reviews 2009, Issue 1. Art. No.:CD000081. DOI: 10.1002/14651858.CD000081.pub2.

Cheung, N.F., Mander, R., Wang, X., Fu, W. & Zhu, J. 2009. Chinese midwives' views on a proposed midwife-led normal birth unit. *Midwifery,* 25(6):744-755.

Cheung, N.F., Mander, R., Wang, X., Fu, W., Zhou, H., & Zhang, L. 2011. Clinical outcomes of the first midwife-led normal birth unit in China: a retrospective cohort study. *Midwifery*, 27(5):582-587.

Chiu, T.L., Sadler, L. & Wise, M.R. 2013. Placenta praevia after prior caesarean section: an exploratory case–control study. *Australian and New Zealand Journal of obstetrics and gynaecology*; 53:455-458.

Christiaens, W. & Bracke, P. 2009. Place of birth and satisfaction with childbirth in Belgium and the Netherlands. *Midwifery*, 25:e11-e19.

Cluett, E.R. & Burns, E. 2009. Immersion in water in labour and birth. Cochrane Database of Systematic Reviews, Issue 2. Art.No.: CD000111. DOI: 10.1002/14651858.CD000111.pub3.

De Jonge, A., Rijnders, M.E.B., Van Diem, M.T., Scheepers, P.L.H. & Lagro-Janssen, A.L.M. 2009. Are there inequalities in choice of birthing position? Sociodemographic and labour factors associated with the supine position during the second stage of labour. *Midwifery,* 25:439–448.

De Kock, J. & Van der Walt, C., eds. 2004. Maternal & newborn care: a complete guide for midwives and other health professionals. Lansdowne: Juta & Co. Ltd.

De Verloskundige. 2014. *Over de verloskundige*. http://www.deverloskundige.nl Date of access: 24 August 2014.

Dictionary.com. 2014. http://dictionary.reference.com/browse/midwife Date of access: 30 March 2014.

DOH (Department of Health) *see* South Africa. Department of Health.

DOH [UK] (Department of Health, United Kingdom) *see* United Kingdom. Department of Health.

Dowswell, T., Renfrew, M., Hewison, J. & Gregson, B. 2001. A review of the literature on the midwife and community-based maternity care. *Midwifery*, 17:93-101.

Du Plessis, D. 2005. Women's experiences of a vaginal delivery conducted by a private midwife. *Health SA Gesondheid*, 10(3):23-35.

Ekéus, C., Högberg, U. & Norman, M. 2014. Vacuum assisted birth and risk for cerebral complications in term newborn infants: a population-based cohort study. *BMC pregnancy and childbirth*, 14:36.

Ellis, S.M. & Steyn, H.S. 2003. Practical significance (effect sizes) versus or in combination with statistical significance (p-values). *Management dynamics*, 12(4):51-53.

El-Wahab, N. & Robinson, N. 2014. Analgesia and anaesthesia in labour. *Obstetrics, gynaecology & reproductive medicine*, 24(4):97-102.

Enkin, M., Keirse, M.J.N.C., Neilson, J., Crowther, C., Duley, L., Hodnett, E. & Hofmeyr, J. 2000. A guide to effective care in pregnancy and childbirth. 3rd ed. Oxford: Oxford University Press.

FedHealth. 2012. Press release: 76% of all deliveries via C-Section. http://www.health24.com/ Medical-schemes/General-info/76-of-all-deliveries-via-C-Section-20120721 Date of access: 18 Sept. 2013.

Feng, X.L., Ling, X., Guo, Y. & Ronsmans, C. 2012. Factors influencing rising caesarean sections rates in China between 1988 and 2008. *Bulletin of the World Health Organization*, 90:30-39.

Fleming, V.E.M. 1998. Autonomous or Automatons? An exploration through history of the concept of autonomy in midwifery in Scotland and New Zealand. *Nursing ethics*, 5(1):43-51.

Freeman, L.M., Adair, V., Timperley, H. & West, S.H. 2006. The influence of the birthplace and models of care on midwifery practice for the management of women in labour. *Women and birth*, 19:97-105.

Genesis Clinic. 2012. Private Midwives. http://www.genesisclinic.co.za/private-midwives.html Date of access: 10 July 2012.

Hancock, G.R. & Mueller, R.O. 2010. The reviewer's guide to quantitative methods in the social sciences. New York, NY: Routledge.

Harris, F.M., Van Teijlingen, E., Hundley, V., Farmer, J., Bryers, H., Caldow, J., Ireland, J., Kiger, A. & Tucker, J. 2011. The buck stops here: midwives and maternity care in rural Scotland. *Midwifery*, 27:301-307.

Hatem, M., Sandall, J., Devane, D., Soltani, H. & Gates, S. 2008. Midwife-led versus other models of care for childbearing women (Review). *Cochrane Database of Systematic Reviews* 2008, Issue 4. Art. No.: CD004667. DOI:10.1002/14651858.CD004667.pub2.

Heatley, M. & Kruske, S. 2011. Defining collaboration in Australian maternity care. *Women and birth*, 24:53-57.

Health Systems Trust (HST). 2011. South African health review 2011. http://www.hst.org.za/ publications/south-african-health-review-2011 Date of access: 06 October 2012.

Health Systems Trust (HST). 2014. District Health Barometer 2013/2014. Durban, RSA.

Henley-Einion, A. 2009. The medicalisaton of childbirth. (*In*: Squire, C., ed. The social context of birth. 2nd ed. Milton Keynes: Radcliffe Publishing. p. 173–185).

Hodnett, E.D., Downe, S., Walsh, D. & Weston, J. 2010. Alternative versus conventional institutional settings for birth (interventional review). Cochrane Database of Systematic Reviews 2010, Issue 9. Art. No.: CD000012. DOI: 10.1002/14651858.CD000012.pub3.

Homer, C.S.E., Passant, L., Brodie, P.M., Kildea, S., Leap, N., Pincombe, J. & Thorogood, C. 2009. The role of the midwife in Australia: views of women and midwives. *Midwifery*, 25(6):673-681.

HST *see* Health Systems Trust.

Huber, U.S. & Sandall, J. 2009. A qualitative exploration of the creation of calm in a continuity of carer model of maternity care in London. *Midwifery*, 25:613-621.

Hundley, V., Penney, G., Fitzmaurice, A., Van Teijlingen, E. & Graham, W. 2002. A comparison of data obtained from service providers and service users to assess the quality of maternity care. *Midwifery*, 18:126-135.

Hundley, V.A., Milne, J.M., Glazener, C.M.A. & Mollison, J. 1997. Satisfaction and the three C's: continuity, choice and control. Women's views from a randomised controlled trial of midwife-led care. *British Journal of Obstetrics and Gynaecology*, 104:1273-1280.

Hunter, B., Berg, M., Lundgren, I., Ólafsdóttir, Ó.Á. & Kirkham, M. 2008. Relationships: the hidden threads in the tapestry of maternity care. *Midwifery*, 24:132–137.

Hunter, L.P. 2008. A hermeneutic phenomenological analysis of midwives' ways of knowing during childbirth. *Midwifery*, 24:405–415.

ICM *see* International Confederation of Midwives

International Confederation of Midwives (ICM). 2011. Global Standards for Midwifery Regulation (2011). The Hague, NL.

International Confederation of Midwives (ICM). 2014. ICM international definition of the midwife. http://www.internationalmidwives.org/who-we-are/policy-and-practice/icm-international-definition-of-the-midwife/ Date of access: 6 Oct. 2014.

Irion, O. & Boulvain, M. 1998. Induction of labour for suspected fetal macrosomia. Cochrane Database of Systematic Reviews 1998, Issue 2. Art. No.: CD000938. DOI: 10.1002/14651858.CD000938.

James, S., Wibbelink, M. & Muthige, N. 2012. Delivery method choice in the South African private sector. *British journal of midwifery*, 20(6):404-408.

Jomeen, J. 2006. Choices for maternity care are they still 'an illusion'? : A qualitative exploration of women's experiences in early pregnancy. *Clinical effectiveness in nursing*, 9S2:e191–e200.

Kabakian-Khasholian, T., Campbell, O., Shediac-Rizkallaha, M. & Ghorayeb, F. 2000. Women's experiences of maternity care: Satisfaction or passivity? *Social science & medicine*, 51:103-113.

Keating, A. & Fleming, V.E.M. 2009. Midwives' experiences of facilitating normal birth in an obstetric-led unit: a feminist perspective. *Midwifery*, 25:518–527.

Lavender, T. & Chapple, J. 2004. An exploration of midwives' views of the current system of maternity care in England. *Midwifery*, 20:324–334.

Limura, B. & McNab, I. 2009. Birthing in Japan. *Tokyo Weekender*. http://www.tokyoweek ender.com/2009/10/birthing-in-japan-2/ Date of access: 24 Aug. 2014.

Low, J. 2009. Caesarean Section - past and present. *Journal of obstetrics and gynaecology Canada*, 31(12):1131-1136.

Merriam-Webster Dictionary. 2015. http://www.merriam-webster.com/ Date of access: 30 March 2015.

Mander, R. & Melender, H. 2009. Choice in maternity: rhetoric, reality and resistance. *Midwifery*, 25:637–648.

Martijn, L., Jacobs, A., Amelink-Verburg, M., Wentzel, R., Buitendijk, S. & Wensing, M. 2013. Adverse outcomes in maternity care for women with a low risk profile in the Netherlands: a case series analysis. *BMC pregnancy and childbirth*, 13:219.

Martijn, L.L.M., Jacobs, A.J.E., Maassen, I.M.I., Buitendijk, S.S.E. & Wensing, M.M. 2011. Patient safety in midwifery-led care in the Netherlands. *Midwifery*, doi:10.1016/j.midw. 2011.10.013.

Martin, K.E., Grivell, R.M., Yelland, L.N. & Dodd, J.M. 2015. The influence of maternal BMI and gestational diabetes on pregnancy outcome. *Diabetes research and clinical practice*, doi: 10.1016/j. diabres.2014.12.015.

McCourt, C. 2006. Supporting choice and control? Communication and interaction between midwives and women at the antenatal booking visit. *Social science & medicine*, 62:1307–1318.

McIntyre, M., Francis, K. & Chapman, Y. 2011. The struggle for contested boundaries in the move to collaborative care teams in Australian maternity care. *Midwifery*, doi:10.1016/j.midw. 2011.04.004.

Mills, T.A. & Lavender, T. 2011. Advanced maternal age. *Obstetrics, gynaecology and reproductive medicine*, 21(4): 107-111.

Morgan, D.L. 2007. Paradigms lost and pragmatism regained. *Journal of mixed methods research*, 1(1):48-76.

Morgan, M., Fenwick, N., McKenzie, C. & Wolfe, C.D.A. 1998. Quality of midwifery led care: assessing the effects of different models of continuity for women's satisfaction. *Quality in health care*, 7: 77-82.

Mother Instinct. 2012. *Midwives in Private Practice in South Africa*. http://www. motherinstinct.co.za /#!midwives_in_private_practice/c1so Date of access: 25 Aug. 2014.

National Institute for Health and Clinical Excellence (NICE). 2011. Caesarean section: NICE clinical guideline 132. http://www.nice.org.uk/guidance/cg132/chapter/1-recommendations Date of access: 17 April 2015.

New Zealand College of Midwives Inc. 2014. Midwifery: An Autonomous Profession. http://www.midwife.org. nz/in-new-zealand/autonomy Date of access: 24 Aug. 2014.

New Zealand Ministry of Health. 2014. Maternity Tables 2011. http://www.health.govt.nz/ publication/maternity-tables-2011 Date of access: 24 Aug. 2014.

Nicholls, L. & Webb, C. 2006. What makes a good midwife? An integrative review of methodologically-diverse research. *Journal of Advanced Nursing*, 56(4):414-429.

North American Registry of Midwives (NARM). 2014. Certification: The CPM credential. http://narm.org/certification Date of access: 24 Aug. 2014.

Page, L. 2001. Human resources for maternity care: the present system in Brazil, Japan, North America, Western Europe and New Zealand. *International Journal of Gynecology & Obstetrics*, 75:S81-S88.

Page, L., McCourt, C., Beake, S., Vail, A. & Hewison, J. 1999. Clinical interventions and outcomes of One-to-One midwifery practice. *Journal of Public Health Medicine*, 21(3):243-248.

Pera, S.A. & Van Tonder, S. 2005. Ethics in health care. 2nd ed. Lansdowne: Juta & Co.

Polit, D.F. & Beck, C.T. 2008. Nursing research: generating and assessing evidence for nursing practice. 8th ed. Philadelphia: Lippincott, Williams & Wilkins.

PRN *see* Stichting Perinatale Registratie Nederland

Rana, T.G., Rajopadhyaya, R., Bajracharya, B., Karmacharya, M. & Osrin, D. 2003. Comparison of midwifery-led and consultant-led maternity care for low risk deliveries in Nepal. *Health policy and planning*; 18(3):330–337.

Renfrew, M.J., McFadden, A., Bastos, M.H., Campbell, J., Channon, A.A., Cheung, N.F., Silva, D.R.A.D., Downe, S., Powell-Kennedy, H., Malata, A., McCormick, F., Wick, L. & Declercq, E. 2014. Midwifery and quality care: Findings from a new evidence-informed framework for maternal and newborn care. *The lancet,* 384(9948):1129-1145.

Rooks, J.P. 1999. The midwifery model of care. *Journal of nurse-midwifery*, 44(4):370-374.

Rothberg, A.D. & McLeod, H. 2005. Private-sector caesarean sections in perspective. *South African medical journal,* 95(4):257-260.

SANC *see* South African Nursing Council

Sandall, J. 1995. Choice, continuity and control: changing midwifery, towards a sociological perspective. *Midwifery*, 11:201-209.

Sandall, J., Soltani, H., Gates, S., Shennan, A. & Devane, D. 2013. Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database of Systematic Reviews* 2013, Issue 8. Art. No.: CD004667. DOI: 10.1002/14651858. CD004667.pub3.

SAS Institute Inc. 2011. The SAS System for Windows Release 9.3 TS Level 1M0. Cary, NC, USA: SAS Institute Inc.

Shechter, Y., Levy, A., Wiznitzer, A., Zlotnik, A. & Sheiner, E. 2010. Obstetric complications in grand and great grand multiparous women. *The journal of maternal-fetal and neonatal Medicine*, 23(10): 1211–1217.

Sherrat, D.R. 2011. The State of the World's Midwifery 2011: A history of midwifery. http://www.unfpa.org/sowmy/resources/docs/background_papers/10_SherrattD_History Midwifery.PDF Date of access: 30 October 2014.

Simonsen, S., Lyon, J., Alder, S. & Varner, M. 2005. Effect of grand multiparity on intrapartum and newborn complications in young women. *Obstetrics & Gynecology*, 106(3):454-460.

Singh, G. & Sidhu, K. 2010. Bad obstetric history: a prospective study. *Medical journal armed forces India*, 66(2):117-120.

Society of Private Nursing Practitioners South Africa. 2008. Guidelines for midwife home birth. *Professional nursing today,* 12(3):19-20.

South Africa. 1992. Births and Deaths Registration Act 51 of 1992.

South Africa. 2000. Promotion of access to information Act 2 of 2000.

South Africa. 2005. Nursing Act 33 of 2005.

South Africa. Department of Health (DOH). 2002. Guidelines for maternity care in South Africa: a manual for clinics, community health centres and district hospitals. Pretoria.

South Africa. Department of Health (DOH). 2007. Saving mothers: essential steps in the management of common conditions associated with maternal mortality. Durban.

South African Nursing Council (SANC). 1990. R. 2488: Regulations relating to the conditions under which registered midwives and enrolled midwives may carry on their profession. Pretoria.

South African Nursing Council (SANC). 2013. No. R. 786. Regulations Regarding the Scope of Practice of Nurses and Midwives. Pretoria.

SPSS Inc. 2013. IBM SPSS Statistics Version 22, Release 22.0.0. Copyright© IBM Corporation and its licensors. http://www-01.ibm.com/software/analytics/spss/.

Stichting Perinatale Registratie Nederland (PRN). 2013. Perinatal Registrasie Nederland Grote Lijnen 1999-2012. Utrecht, NL.

Sullivan, N. 2013. A short history of midwifery. http://midwifeinsight.com/articles/a-short-history-of-midwifery/ Date of access: 6 Oct. 2014.

Sutcliffe, K., Caird, J., Kavanagh, J., Rees, R., Oliver, K., Dickson, K., Woodman, J., Barnett-Page, E. & Thomas, J. 2012. Comparing midwife-led and doctor-led maternity care: a systematic review of reviews. *Journal of advanced nursing*, doi:10.1111/j.1365-2648.2012.05998.x.

Taber's cyclopedic medical dictionary. 1997. Philadelphia, PA: F.A. Davis Co.

Tiran, D. 1999. A holistic framework for maternity care. *Complementary therapies in nursing & midwifery*, 5:127-135.

Turan, J.M., Bulutb, A., Nalbantb, H., Ortaylıb, N. & Erbaydarc, T. 2006. Challenges for the adoption of evidence-based maternity care in Turkey. *Social science & medicine*, 62:2196-2204.

UNFPA *see* United Nations Populations Fund

United Kingdom. Department of Health (DOH). 1993. Changing childbirth: the report of the Expert Maternity Group. London: HMSO.

United Nations Populations Fund (UNFPA). 2011. The state of the world's midwifery 2011: delivering health, saving lives. New York, NY.

United Nations Populations Fund (UNFPA). 2014. The state of the world's midwifery 2014: a universal pathway. A woman's right to health. New York, NY.

Verklan, M.T. & Walden, M. 2010. Neonatal intensive care nursing. 4th ed. St. Louis, Missouri: Saunders Elsevier.

Waldenström, U. & Turnbull, D. 1998. A systematic review comparing continuity of midwifery care with standard maternity services. *British Journal of obstetrics and gynaecology*, 105:1160-1170.

Weaver, K. & Olson, J.K. 2006. Understanding paradigms used for nursing research. *Journal of Advanced Nursing*, 53(4):459 – 469.

WHO *see* World Health Organization

Wiegers, A. 2006. Adjusting to motherhood. Maternity care assistance during the postpartum period: How to help new mothers cope. *Journal of neonatal nursing*, 12:163-171.

Wiegers, T.A., Boerma, W.G.W. & de Haan, O. 2010. Maternity care and birth preparedness in rural Kyrgyzstan and Tajikistan. *Sexual & reproductive healthcare*, 1:189–194.

World Bank. 2014. Maternal mortality ratio (modeled estimate, per 100,000 live births). http://data.worldbank.org/indicator/SH.STA.MMRT Date of access: 25 Aug. 2014.

World Health Organisation (WHO). 1985. Appropriate technology for birth. *The Lancet*, 2:436-7.

World Health Organisation (WHO). 2005. World health report. Make every mother and child count. Geneva, World Health Publications.

World Health Organisation (WHO). 2011. WHO recommendations for induction of labour. Geneva, World Health Publications.

World Health Organisation (WHO). 2012. Trends in maternal mortality: 1990 to 2010. WHO, UNICEF, UNFPA and The World Bank estimates. Geneva, World Health Publications.

World Health Organisation (WHO). 2013. Health Topics: maternal health. http://www.who.int/topics/maternal_health/en Date of access: 11 May 2013.

World Health Organisation (WHO). 2014. WHO recommendations for augmentation of labour. Geneva, World Health Publications.

World Health Organisation (WHO). 2015. WHO Statement on caesarean section rates. http://apps.who.int/iris/bitstream/10665/161442/1/WHO_RHR_15.02_eng.pdf Date of access: 17 April 2015.

Ye, J., Betrán, A.P., Vela, M.G., Souza, J.P., Zhang, J. 2014. Searching for the optimal rate of medically necessary cesarean delivery. *Birth,* 41(3):237-244.

ANNEXURE A: INFORMED CONSENT FORM

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS ®

Faculty of Health Science; INSINQ Focus Area

Information leaflet and informed consent: Assistance with a research project - Private midwives practicing in Gauteng

Dear Midwife

I am currently conducting a full dissertation Masters' in Nursing at the North-West University. I would like to invite you to participate in my study by allowing me to audit your patient records for 2012 and 2013. The following information will empower you to make an informed decision about assisting me with the study entitled:

"**Outcomes of births attended by private midwives in Gauteng**"

1. PURPOSE OF THE STUDY
The purpose of this study is to explore and describe the outcomes of births attended by private midwives in Gauteng over a two year period and to compare these outcomes with the latest Cochrane review on midwife-led care. This review proves midwife-led care to have the same, if not better outcomes as other models of care.

2. PROCEDURE
If you agree to assist me in conducting this study, the following will be expected of you:

- Meet me to discuss information regarding the characteristics of your specific midwifery practice e.g. one-to-one or team approach, number of midwives, qualifications and years of practice. Practices, midwives and women will be identified with codes.

- Allow me access to the labour and birth records of all births you as a practice conducted in 2012 and 2013. An audit form including biographical information as well as all the outcomes of interest has been developed and fine-tuned with the help of a statistician. A follow up interview may be required to clarify if there is uncertainty regarding certain aspects of the records.

- Provide a place at your practice to collect the required data from the patient documents.

3. POSSIBLE RISKS AND DISCOMFORTS

The interviews may be time-consuming, although I will make an effort to meet you at your practice. Tracing your patient records for the previous two years may also be time-consuming, although a standard labour and birth record book may proof sufficient for the most part. You may have concerns about yours and your patients' anonymity.

4. CONFIDENTIALITY, PARTICIPATION AND WITHDRAWAL

All interviews and audit forms will be coded and no names will appear. Only my study supervisor and I will have access to any names or identifiably factors. The code list will be kept separately from the completed audit forms. I will not share information with anyone else participating in the study. Your type of practice will be described in the research report, but your patients' birth information will be quantified and reported as statistics.

The completed audit forms will be stored for five years in a lockable cabinet in a room behind a lockable door at INSINQ Focus Area at North West University. Electronic data will be stored in a password protected computer. Cooperation is voluntary and you will have the right to withdraw from the study, even after signing informed consent.

5. BENEFITS

Allowing me access to your birth records will benefit all midwives practicing independently in Gauteng. If the outcomes compare well to the rest of the world it will show midwife-led care to be a safe and viable option for low risk pregnant women in Gauteng. Proof of outcomes of care is often needed in negotiations with medical insurance companies and backup obstetricians and facilities. Knowing the collective outcomes could also create awareness of the standards of midwifery care in Gauteng leading to continued quality improvement and accountability.

6. COSTS

There will be no cost to you as a result of your assistance with this study.

7. COMPENSATION

You will receive no payment for your cooperation with this study.

8. **CONTACT DETAILS**

   You are welcome to ask me any questions before you decide to give consent. You are also welcome to email me at stellax01@gmail.com or contact me telephonically at Tel xxx xxx xxxx.

9. **ETHICAL APPROVAL**

   Please note that the study has been granted ethical clearance from the North-West University Ethics Committee. Information about the ethics can be obtained at Ms Carolien van Zyl of the Ethics Committee at Carolien.vanZyl@nwu.ac.za, Tel xxx xxx xxxx

10. **FEEDBACK OF FINDINGS**

   I will present the findings of the study at a Private Practice Midwives Alliance (PPMA) meeting after completion and will give individual feedback if you wish me to do so.

Yours sincerely,

Christél Jordaan

CONSENT FORM

Please sign the underlying form if you are willing to assist me in the research project:

"**Outcomes of births attended by independent midwives in Gauteng**"

I _____ hereby voluntarily consent to assist the researcher in the above mentioned study. I am not coerced in any way and I understand that I can withdraw at any time. I will allow my patient records to be accessed by the researcher for research purposes. I understand that my name and the names of my patients will remain anonymous to anyone who is not part of the study and that the information will be kept confidential. I am aware of the benefits of this project to myself and my peers. I understand the possible risks and I know that someone will be available if I have any more questions or concerns.

_____   _____

Date   Signature of midwife

_____   _____

Date   Signature of the person obtaining consent

ANNEXURE B: AUDIT FORM OF BIRTHS CONDUCTED BY GAUTENG PRIVATE MIDWIVES

Midwifery practice code: _____ Midwife code: _____ Patient code: _____

Section A: Biographical information

1. Patient age	years
2. Gravidity and parity	G: P: M: E:
3. Gestation at time of birth	weeks
4. Infant birth weight	kg

Section B: Outcomes of interest

1. Risk factors identified

a.) Previous caesarean section	YES	NO
b.) Increased body mass index	YES	NO
c.) Pre-existing medical condition Specify:	YES	NO
d.) Other:	YES	NO

2. Type of birth
2.1 Specify

Normal vaginal birth (vertex)	1
Caesarean birth	2
Breech vaginal birth	3
Assisted vaginal birth	4

2.2 If c/section
    2.2.1 Indication

Previous caesarean section	1
Breech presentation	2
Pre-existing medical condition	3
Failure to progress in labour	4
Cephalo-pelvic disproportion/infant macrosomia	5
Other:	6

    2.2.2 Was this a planned caesarean section?   YES / NO

2.3 If instrumental vaginal birth, specify

Forceps	1
Vacuum extraction done by obstetrician	2
Vacuum extraction done by midwife	3

3. Location of birth
3.1 Specify

Home birth	1
Birth house birth	2
Hospital birth	3
Birth centre birth	4

3.2 Was this the panned location of birth?   YES / NO
3.3 Reason for using alternative location: _____

4. Perineum after birth

Intact	1
Episiotomy	2
1nd or 2nd degree	3
Complicated tear needing transfer to theatre	4

5. Interventions
5.1 Specify

a.) Induction of labour	YES	NO
b.) Augmentation	YES	NO
c.) Amniotomy (artificial rupture of membranes)	YES	NO

5.2 If induction of labour, indication

Post term pregnancy	1
Reduced amniotic fluid	2
Other:	3

6. Intrapartum use of synthetic analgesia

a.) Pethidine	YES	NO
b.) Atarax	YES	NO
c.) Entonox gas	YES	NO
d.) Epidural analgesia	YES	NO

7. Maternal complications
7.1 Specify

a.) Postpartum haemorrhage (>500ml)	YES	NO
b.) Shoulder dystocia	YES	NO
c.) Retained placenta needing transfer to theatre	YES	NO
d.) Maternal admission to high care	YES	NO
e.) Maternal death	YES	NO

7.2 If admission to high care, indication

Postpartum haemorrhage	1
Postpartum infection	2
Other:	3

8. Neonatal outcomes
8.1 Specify

a.) Preterm birth less than 37 weeks	YES	NO
b.) Five minute Apgar score less or equal to 7	YES	NO
c.) Admission to neonatal intensive care	YES	NO
d.) Stillbirth	YES	NO
e.) Early neonatal death	YES	NO

8.2 If admission to neonatal intensive care, indication

Prematurity	1
Respiratory distress	2
Neonatal infection	3
Low Apgar score/suspected asphyxia	4
Other:	5

ANNEXURE C: EXAMPLE OF EXCEL SPREAD SHEET FOR DATA COLLECTION

Midwives codes	Practice code	Midwives codes	Patient code (2013A)	year	Biographical information	1. Patient age	2. Gravida; Para; Miscarriage; Ectopic	3. Gestation at birth (weeks)
	A	A3	2012A01	2012		27	G2 P1	40
	A	A3	2012A02	2012		27	G1 P0	39
	A	A3	2012A03	2012		35	G2 P1	41
	A	A1	2012A04	2012		38	G2 P1	40
	A	A3	2012A05	2012		28	G1 P0	41
	A	A2	2012A06	2012		26	G2 P1	38
	A	A1	2012A07	2012		27	G2 P1	40
	A	A2	2012A08	2012		27	G2 P0 M1	40
	A	A2	2012A09	2012		28	G3 P2	38
	A	A3	2012A10	2012		33	G3 P2	40
	A	A1	2012A11	2012		27	G2 P1	37
	A	A1	2012A12	2012		32	G3 P2	38
	A	A3	2012A13	2012		18	G1 P0	38
	A	A1	2012A14	2012		30	G3 P2	39
	A	A1	2012A15	2012		31	G3 P2	40
	A	A1	2012A16	2012		29	G3 P2	38
	A	A2	2012A17	2012		30	G2 P1	38
	A	A3	2012A18	2012		22	G1 P0	40
	A	A2	2012A19	2012		29	G1 P0	39
	A	A2	2012A20	2012		32	G3 P1 M1	39
	A	A1	2012A21	2012		29	G2 P1	38
	A	A3	2012A22	2012		20	G1 P0	40
	A	A4	2012A23	2012		33	G1 P0	39
	A	A1	2012A24	2012		32	G1 P0	39
	A	A3	2012A25	2012		23	G2 P1(-1)	39
	A	A1	2012A26	2012		32	G5 P4	39
	A	A2	2012A27	2012		26	G2 P0 M1	39
	A	A3	2012A28	2012		26	G2 P1	41
	A	A3	2012A29	2012		24	G1 P0	40
	A	A2	2012A30	2012		25	G1 P0	41
	A	A3	2012A31	2012		28	G1 P0	41
	A	A2	2012A32	2012		22	G1 P0	41
	A	A2	2012A33	2012		27	G1 P0	39
	A	A1	2012A34	2012		31	G1 P0	40

4. Infant weight (kg)	Outcomes of interest	1. Risk factors? Y/N	a. Previous c/section	b. Increased BMI	c. Medical conditions	d. Advanced maternal age (>35)	e. Grande multipara	f. Other (*)
3.55kg		no						
3.61kg		no						
3.1kg		yes				yes		
3.27kg		yes				yes		
3.5kg		no						
2.75kg		yes	yes					
3.52kg		no						
3.1kg		no						
3.64kg		no						
4kg		no						
3.51kg		no						
3.6kg		no						
3.16kg		no						
2.61kg		no						
3.1kg		no						
3.02kg		no						
3.24kg		no						
3kg		no						
3.44kg		no						
3.19kg		no						
3.2kg		no						
2.5kg		no						
2.94kg		no						
3.6kg		no						
3.69kg		no						
3.49kg		no						
3.16kg		no						
3.27kg		no						
3.088kg		no						
3.56kg		no						
3.5kg		no						
not stated		no						
3.4kg		no						
4.58kg		no						

Type of birth (choose option)	a. NVD	→ Water birth Y/N	b. Caesarean section (select indication)	→ Planned C/S? Y/N	i.) Previous C/S	ii.) Breech	iii.) Medical condition	iv.) Failure to progress
	yes	no						
	yes	yes						
	yes	yes						
	yes	yes						
			yes	yes		yes		
	yes	yes						
	yes	yes						
	yes	yes						
	yes	no						
	yes	yes						
	yes	yes						
	yes	yes						
	yes	yes						
	yes	no						
	yes	yes						
	yes	no						
	yes	yes						
	yes	no						
	yes	no						
	yes	no						
	yes	no						
	yes	no						
			yes	yes		yes		
	yes	yes						
	yes	yes						
	yes	yes						
	yes	yes						
			yes	no				yes
	yes	no						
			yes	no				
			yes	no				yes

v.) CPD / macrosomia	vi.) Fetal distress	vii.) Other (*)	c. Instrumental birth (choose option)	i.) Forceps	ii.) Vacuum by Doctor	iii.) Vacuum by midwife	3. Location of birth	→ Panned location Y/N
								yes
								yes
			yes			yes		yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
								yes
			yes		yes			no
								yes
								yes
								yes
								no
								yes
								no
								no
			yes			yes		yes

114

→ Reason if not using planned setting (*)	a. Home birth	b. Birth house	c. Active birth unit at hospital	d. Birth centre	e. Hospital	4. Perineum after birth	a. Intact	b. Episiotomy
	yes							
			yes					
			yes				yes	
			yes					
			yes				yes	
					yes	n/a		
			yes				yes	
			yes					
			yes				yes	
			yes				yes	
			yes				yes	
			yes				yes	
	yes						yes	
			yes				yes	
			yes					
			yes				yes	
	yes						yes	
			yes				yes	
			yes					
	yes							
			yes				yes	
			yes					
			yes					
					yes	n/a		
			yes				yes	
vantouse					yes		yes	
			yes					
			yes				yes	
			yes					
c/section					yes	n/a		
			yes				yes	
					yes	n/a		
c/section					yes	n/a		
			yes					

c. 1st or 2nd degree tear	d. Complicated tear needing transfer to theatre	5. **Interventions**	a. Induction of labour	i.) Post term pregnancy	ii.) Reduced amniotic fluid	iii.) Prolonged/ pre-labour rupture of membranes	iv.) Other (*)	b. Augmentation of labour
yes		yes						
yes		yes						yes
		yes	yes	yes				
yes		no						
		yes						yes
		n/a						
		yes						
yes		yes						
		yes						
		no						
		no						
		yes						
		no						
		yes						
yes		no						
		yes						
		no						
		yes						
yes		no						
yes		yes						
		no						
yes		no						
yes		yes						
		n/a						
		yes						yes
		yes						
yes		no						
		no						
yes		yes						yes
		yes	yes	yes				yes
		yes	yes	yes				yes
		yes	yes	yes				yes
		no						
yes		no						

c. Artificial rupture of membranes (AROM)	6. Intra-partum analgesia	a. Pethdine	b. Aterax	c. Entonox gas	d. Epidural	7. Complications (Y/N)	a. Post-partum haemorrhage (>500ml bloodloss)	b. Retained placenta needing transfer to theatre
yes	no					no		
	yes	yes	yes			no		
	yes		yes			yes	yes	yes
	no					no		
yes	yes	yes	yes			no		
	n/a					no		
yes	no					no		
yes	no					no		
yes	no					no		
	no					no		
	no					no		
yes	no					no		
	no					no		
yes	yes		yes			no		
	no					no		
yes	no					no		
	no					no		
yes	yes	yes	yes			no		
	no					no		
yes	no					no		
	no					no		
	yes	yes	yes			no		
yes	no					no		
	n/a					no		
yes	yes		yes			no		
yes	no					no		
	yes	yes	yes			no		
	no					no		
	yes	yes	yes			no		
yes	yes	yes	yes			no		
yes						yes	yes	
yes	yes	yes	yes			no		
	yes				yes	no		
	no					no		

c. Maternal high care transfer:	i.) PPH (haemorrhage)	ii.) Post-partum infection	iii.) Other (*)	8. **Neonatal complications**	a. 5 minute Apgar equal to or below 7/10	b. Shoulder dystocia	c. Preterm birth < 37 weeks	d. Admission to NICU, reason:
				no				
				no				
yes	yes			no				
				no				
				yes	yes			
				no				
				no				
				no				
				no				
				no				
				no				
				no				
				no				
				yes	yes			
				no				
				no				
				no				
				yes	yes			
				no				
				no				
				no				
				yes	yes			
				no				
				no				
				no				
				no				
				no				
				no				
				no				
				yes	yes			
				no				
				no				
				no				
				no				

ANNEXURE D: ETHICS APPROVAL CERTIFICATE

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: (018) 299-4900
Faks: (018) 299-4910
Web: http://www.nwu.ac.za

Ethics Committee
Tel   +27 18 299 4852
Email Ethics@nwu.ac.za

17 March 2014

ETHICS APPROVAL OF PROJECT

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title:	Outcomes of births attended by private midwives in Gauteng

Project Leader: DR CS Minnie

Ethics number:	N	W	U	-	0	0	0	1	1	-	1	4	-	A	1
		Institution				Project Number					Year			Status	

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Approval date: 2014-03-10   **Expiry date**: 2019-03-09

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-EC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-EC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof Amanda Lourens
(chair NWU Ethics Committee)