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# Outcomes of births attended by private midwives in the Gauteng Province of South Africa: A retrospective cohort study

Christél Jordaan-Schlebusch<sup>a,b</sup>, Catharina Susanna Minnie<sup>a,c,\*</sup>

<sup>a</sup> North-West University, NuMIQ Research Focus Area, South Africa

<sup>b</sup> University of Pretoria, South Africa

<sup>c</sup> University of the Western Cape, South Africa

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## ABSTRACT

Midwives are important role players in providing women-centred care for low-risk pregnant women.

South African women use either public or private health care services during pregnancy and birth. As the public sector is overburdened, women do not receive a high level of continuity of care there. The private sector is mainly obstetrician-led and intervention-driven. Private midwife-led care is available in South Africa, but is limited to the major cities. No evidence could be found about the outcomes of private midwife-led care in South Africa.

The objective reported in this paper was to compare the outcomes of and interventions during births attended by private midwives in Gauteng with the latest Cochrane review on midwife-led care.

A retrospective cohort design was used to audit the birth registers of private midwives in Gauteng, focusing on outcomes and interventions as in the most recent Cochrane review on midwife-led care.

The maternal and neonatal outcomes of Gauteng midwives' patients were reassuring. Compared to women in the Cochrane review, significantly more Gauteng women had an intact perineum (53.4% vs 29%), fewer had interventions such as induction of labour (9.6% vs 19.3%), but more had caesarean sections (19.3% vs 13.3%). Overall foetal loss (0.3% vs 2.7%) and NICU admissions (4.3% vs 7.1%) occurred significantly less frequently in the Gauteng sample.

The study's findings indicated that private midwife-led care in Gauteng compared well with that in the rest of the world in terms of outcomes and intervention rates.

## 1. Introduction

An investigative South African television programme, *Carte Blanche*, recently exposed a South African midwife's alleged negligence in private practice, which led to the disability or death of several newborns under her care. The media exposure raised concerns about the safety of births attended by private midwives in South Africa (Mokoena, 2021). This study explores midwife-led care in Gauteng Province by comparing the outcomes of and interventions used during births conducted by 14 private midwives in Gauteng with the midwife-led births in a Cochrane review of 15 trials involving 17,674 women (Sandall et al., 2016).

During the twentieth century, maternity care became increasingly medicalised (Benyamini et al., 2017; Kennedy et al., 2015). Globally,

there are concerns about unnecessary interventions during pregnancy and childbirth, leading to escalating costs and increased risks to pregnant women and newborn infants (Renfrew et al., 2014). In South Africa, obstetric management of pregnancy is characterised by an over-dependence on technology, especially in the private sector (Wibbelink & James, 2015).

The need for more compassionate, sensitive personalised care is one of the reasons why midwifery is being restored in many countries (International Confederation of Midwives (ICM), 2014). 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., 2016; Renfrew et al., 2014). In South Africa, midwives in private practice are typically the ones who are able to provide one-to-one midwife-led care.

**Abbreviations:** CI, Confidence interval; NICU, Neonatal intensive care unit; PPH, Post-partum haemorrhage; PPMA, Private Practising Midwives' Alliance; SANC, South African Nursing Council; SPSS, Statistical Package for the Social Sciences; WHO, World Health Organization.

\* Corresponding author at: North-West University, NuMIQ Research Focus Area, South Africa.

E-mail addresses: [christel.jordaan@up.ac.za](mailto:christel.jordaan@up.ac.za) (C. Jordaan-Schlebusch), [kminnie@uwc.ac.za](mailto:kminnie@uwc.ac.za) (C. Susanna Minnie).

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Maternity care in South Africa is fragmented. In the public sector, which serves most of the population, prenatal and postnatal care is provided at primary health care (PHC) clinics, but births usually occur in community health centres or district and regional provincial hospitals. In community health centres and hospitals, women are assisted by the midwives who happen to be on duty at the time of childbirth. Different midwives provide follow-up care, resulting in limited continuity of care. Women who use the public health service usually do not have a choice of where or how to give birth (Hofmeyr et al., 2014). This leads to loss of continuity, choice and control by the woman herself, which are the core principles of quality maternity care as initially described by Hundley et al. (1997).

The private health sector in South Africa offers health services to citizens with moderate to high incomes, prioritising those with medical insurance through prepaid medical aid schemes. In private hospitals, maternity care is predominantly obstetrician-led. Care is provided by the nurses on duty when the woman is admitted, while the births of both low- and high-risk women are usually attended by an obstetrician. The caesarean section rate in the private sector is high. Solanki et al. (2020) reported that the average caesarean rate in 2015 was 73.6% in the private sector and 24.1% in the public sector. Similarly, the Health Systems Trust (HST, 2014) recorded a caesarean section rate of 73.9% in the private sector for 2013–2014.

In contrast to the medical model practised in most private hospitals, advocates of the midwife-led model believe that pregnancy and birth are everyday life events. Well-trained midwives as specialists providing maternity care to women at low risk of complications should be at the forefront of primary maternity services (Souter et al., 2019). Midwives refer women to obstetricians for specialised medical care when risk factors are evident, complications arise, or interventions such as caesarean sections are necessary (Renfrew et al., 2014). Midwife-led care is associated with lower intervention rates, enhanced cost-effectiveness, and higher patient satisfaction than other models of care (Renfrew et al., 2014). Midwife-led care provided by midwives in private practice is available in South Africa, although predominantly in metropolitan areas (Du Plessis, 2005).

Sandall et al. (2016) compared the outcomes of midwife-led births with other models of care for childbearing women and their infants in a Cochrane review. The review included 15 trials involving 17,674 women randomly assigned to midwife-led or other models of maternity care. The trials were conducted in four countries, namely Australia, Canada, Ireland and the United Kingdom. The Cochrane review found that midwife-led groups were less likely to receive regional analgesia, episiotomies, or instrumental births. They were more likely to experience spontaneous vaginal births without instrumental assistance and to have a known midwife at the birth. The women who had undergone midwife-led care had a longer mean length of labour, but there was no difference between the two groups regarding caesarean birth rates (Sandall et al., 2016). The authors of the Cochrane review recommended that women without substantial medical or obstetric complications should be offered midwife-led continuity of care (Sandall et al., 2016).

Trials comparing midwife-led care to other models of care have not yet been conducted in resource-constrained countries, including South Africa. Thus, a study on the outcomes of private midwives' patients in the Gauteng Province would be the first step towards exploring midwife-led care. The objective of this study was to compare the outcomes of and interventions during births attended by private midwives in Gauteng with the latest Cochrane review on midwife-led care.

## 2. Material and methods

Outcomes research in the form of a retrospective cohort design was employed in this study (Gray & Grove, 2021). The focus of outcomes research in nursing science is ultimately to evaluate the results of the patient care process (Polit & Beck, 2022). The researcher does not alter or influence variables, but collects data as an objective observer. Data on

births assisted by private midwives were collected after the births had occurred (retrospectively).

### 2.1. Population and sampling

Since the researcher intended to include the entire population, there was no need for sampling. The records of all Gauteng private midwives who met the selection criteria and who were willing to participate in the study were included.

The records of all midwives in private practice in Gauteng during 2012 and 2013 were eligible for inclusion if they were registered with the South African Nursing Council (SANC) and had valid licences to practise as midwives. The records of midwifery practices with fewer than ten births per year were excluded as this could affect the anonymity of the midwives and their clients.

There were 25 actively practising private midwives in Gauteng during 2012 and 2013. The midwives were recruited by contacting all the members of the Private Practising Midwives Alliance (PPMA) of Gauteng, to which the private practising midwives belong.

### 2.2. Data collection

The researcher conducted a 30- to 60-minute interview with the lead midwife of each midwifery practice to obtain background information about the midwives and the practice. Midwives were interviewed at their practices, homes, or other locations they identified as convenient. Lead midwives were asked about the number of midwives who were part of the practice, each midwife's qualifications and years of experience, the general demographics and risk status of pregnant women attended to, and the backup systems of the practice.

The second step was to obtain the relevant information from the birth registers of participating midwifery practices for the period January 2012 to December 2013. A birth register is a standard tool used by all hospitals, clinics and midwives in South Africa for statistical and record-keeping purposes. Patient details and specific information about each birth are entered after the birth. The identifying information of all patients, as recorded in the birth registers, was obscured when photocopies were made. The routinely collected data in the birth registers were captured onto a data extraction sheet that was created using the standard birth register headings and the areas of interest identified in the Sandall et al. (2016) review. Data included information, outcomes and interventions for each birth and were coded by year, practice code and the chronological number of the patient for the year concerned.

The three main areas of interest were based on elements of the systematic review by Sandall et al. (2016), namely the patients' demographic details, outcomes of the births, and interventions applied. The demographic information comprised the mother's age, known risk factors (previous caesarean section, medical conditions, and advanced maternal age) and place of birth. The interventions of interest were induction or augmentation of labour, medical or pharmacological pain relief, instrument-assisted birth, and caesarean section. The outcomes of interest were the type of birth, the condition of the mother's perineum after birth (intact, episiotomy, first- or second-degree tear or complicated tear), maternal complications (postpartum haemorrhage or admission to high-care unit in hospital), and neonatal complications (low birth weight, five-minute Apgar below 7, admission to neonatal intensive care, stillbirth, and early neonatal death).

After the data of each practice had been captured on the data extraction sheets, all the sheets were double-checked for completeness, and subsequently combined for analysis.

### 2.3. Data analysis

Data entered on the data extraction sheet were analysed with the assistance of the Statistical Consultative Services of the university through which the study was conducted, using the SPSS version 22

(SPSS Inc., 2013). Provision was made for missing data where the specific data had not been entered in the birth register.

For this study, 95% confidence limits were calculated and used to compare the frequencies of the outcomes. The 95% confidence limits bind the confidence interval (CI), reported with a lower and higher number. As per advice from the Statistical Consultative Services, differences between the outcomes of this study (henceforth referred to as the 'Gauteng sample') and the midwife-led group from the Sandall et al. (2016) study were considered significant if the results from the Gauteng sample fell outside the calculated 95% CI of the Sandall et al. (2016) sample.

#### 2.4. Ethical considerations

Ethical approval to conduct the study was obtained from the Human Research Ethics Committee of the university through which the study was conducted. Written informed consent was obtained from the lead midwife of each practice. The anonymity of the midwives and their patients was maintained throughout the study. Identifying information, such as names and addresses of all patients as recorded in the birth registers, was obscured before photocopies were made.

### 3. Results

Eight midwifery practices where 14 midwives worked, were included. Through the interviews with lead midwives, the researcher learned that all 14 midwives who had participated in the study had received their training at institutions that SANC approved at the time they qualified. As shown in Table 1, nine midwives reported having nursing and midwifery degrees, and five had nursing and midwifery diplomas. Three midwives had obtained specialised qualifications in advanced midwifery, one of whom had completed a master's degree. Experience in private midwifery practice ranged from two to 25 years.

The 14 private midwives in the eight practices conducted 1 724 births during 2012 and 2013 (Table 2). The overall home birth rate was 13.7%. Four hundred and twenty (24.4%) of the births in the sample took place in birth units situated on hospital grounds. Almost half the women in the total sample gave birth at a midwife-led freestanding birth centre (856 women; 49.7%), and only 103 (6%) gave birth at a hospital.

Some practices reported taking care of women with manageable risk factors in cooperation with specific obstetricians, but most practices focused on low-risk pregnancies. Of the women, 1265 (73.4%) had no risk factors, while risk factors were reported in 26.6% (n = 459) of cases. Previous caesarean sections, grand multiparity and advanced maternal age were the most significant risk factors. Only 2% of the women had pre-existing and pregnancy-induced medical conditions.

**Table 1**  
Midwives' highest applicable qualifications.

	Qualification	Number of midwives per qualification
Basic midwifery qualification	Four-year university degree in nursing and midwifery	4
	Four-year diploma in nursing and midwifery	2
	Three-year nursing diploma with additional year of midwifery training	3
	Nursing and midwifery diploma with bridging course to obtain degree	5
Specialisation (additional to basic qualification)	Advanced midwifery and neonatal nursing diploma	2
	Advanced midwifery and neonatal nursing masters' degree	1

**Table 2**  
Number of births conducted per practice for 2012 and 2013.

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

The sampled women gave birth at a mean age of 30.18 years and a mean gestation period of 39.36 weeks. The mean birth weight of their babies was 3.32 kg, ranging from 1.09 to 4.96 kg, and 89.7% (n = 1538) were within the weight range of 2.5 kg to 4 kg, which is considered appropriate for a full-time infant (Marshall et al., 2016).

#### 3.1. Description of the interventions and outcomes

Interventions that were compared were induction of labour, augmentation of labour, epidural or opioid analgesia (for those women who experienced labour), episiotomy and instrumental vaginal birth (excluding women who had caesarean sections). One or more interventions were applied at some point in 458 out of 1 659 women (27.6%) who were in labour, regardless of whether they eventually had spontaneous vaginal births or caesarean sections. The interventions are presented in Table 3.

Both maternal and neonatal outcomes were explored. A total of 75.2% (n = 1296) of the 1724 births were spontaneous vaginal births. The condition of the perineum after normal or instrument-assisted births and the frequency of postpartum haemorrhage, irrespective of the type of birth, were calculated where reported. Maternal outcomes are shown in Table 4.

Table 5 shows the number and percentage of neonatal complications: overall foetal loss and neonatal death, low birth weight (below 2.5 kg), five-minute Apgar score equal to or below 7, and NICU admission. These neonatal complications were calculated per midwifery case and not per infant. There were three sets of twins. In one case, one of the twins was admitted to NICU and reported for the specific case.

#### 3.2. Comparison of the results of this study with the midwives' results in the systematic review by Sandall et al. (2016)

The outcomes and interventions of the women whose births were

**Table 3**  
Interventions used during labour and birth.

	Frequency	Percentage
Induction of labour (excluding patients who had planned caesareans/ no labour)	159/1 659	9.6
Augmentation of labour (excluding patients who had planned caesareans/ no labour)	157/1 659	9.5
Epidural anaesthesia used (excluding patients who had planned caesareans/ no labour)	32/1 657 (data missing for 2)	1.9
Pethidine/opioid analgesia used (excluding patients who had planned caesareans/ no labour)	227/1 655 (data missing for 4)	13.7
Episiotomy (excluding all caesarean sections)	76/1 392	5.5
Caesarean section	332/1 724	19.3
Instrument-assisted birth	93/1 724	5.4

**Table 4**  
Maternal outcomes.

	Frequency	Percentage
<b>Spontaneous vaginal births</b>	1 296 /1 724	75.2
<b>Condition of the perineum</b>		
Episiotomy	76/1 392	5.5
Intact	743/1 392	53.4
Tear	564/1 392	40.5
Not stated	9/1 392	0.6
Vaginal births/total births	1 392/1 724	80.7
<b>Postpartum haemorrhage</b>	136/1 724	7.9

**Table 5**  
Neonatal outcomes.

	Frequency	Percentage
<b>Foetal loss &amp; neonatal death</b>	5/1 722 (data missing for 2)	0.3
<b>Low infant birth weight</b>		
Below 2.5 kg (low birth weight)	50/1 716 (data missing for 11)	2.9
<b>Apgar score equal to or below 7</b>	51/1 722 (data missing for 2)	3.0
<b>Admission to NICU</b>	74/1 722 (data missing for 2)	4.3

attended by private midwives in Gauteng were compared with those of the midwife-led group in the Cochrane review by Sandall et al. (2016). The Cochrane review reported on the outcomes of 15 trials, including 17,674 women. In the review by Sandall et al., the authors compared the outcomes of midwifery-led versus other models of care. Some of the outcomes evaluated by Sandall et al. (2016) (for example, body mass index, neonatal convulsions and breastfeeding initiation) were not recorded in the birth registers, and, therefore, not included in the study.

Regarding interventions, the following percentages from the Gauteng sample fell outside the 95% confidence interval (CI) percentile of the Sandall et al. (2016) review midwife-led sample and are therefore significant: Induction of labour (9.6% vs 19.3%), augmentation of labour (9.5% vs 23.8%), use of regional analgesia (1.9% vs 22.5%), use of opiate analgesia (13.7% vs 32.3%), episiotomy (5.5% vs 18.8%) and instrumental vaginal birth (5.54% vs 12.3%) were all lower in the Gauteng sample. However, the percentage of caesarean sections was significantly higher in the Gauteng sample (19.3% vs 13.3%).

These comparisons of the interventions applied are presented in Table 6.

The following maternal outcomes for the Gauteng sample fell outside the 95% CI percentile of the Sandall et al. (2016) midwife-led sample and are therefore significant: Both spontaneous vaginal birth (75.2% vs 70.6%) and the percentage of women with an intact perineum (53.4% vs 29%) were significantly higher in the Gauteng sample. Significantly more women in the Gauteng sample had perineal lacerations requiring suturing (40.5% vs 38.3%). The higher occurrence of postpartum haemorrhage in the Gauteng sample (7.9% vs 7.4%) was not statistically significant.

The maternal outcomes are presented in Table 7.

The following neonatal outcomes were significantly lower in the Gauteng sample: Overall foetal loss and neonatal death (0.3% vs 2.7%), low birth weight (2.9% vs 4.9%) and admission to the neonatal intensive unit (4.3% vs 7.1%).

There was a significant difference between the two samples in the percentage of neonates with a five-minute Apgar score below or equal to 7, with a higher rate of low Apgar score in the Gauteng sample (3.0% vs 2.4%).

The neonatal outcomes are presented in Table 8.

#### 4. Discussion

The use of induction and augmentation of labour was significantly lower in the Gauteng sample than in the women included in the

**Table 6**  
Interventions used in the Gauteng midwife-led sample versus the midwife-led group in the review by Sandall et al (2016).

Interventions	Gauteng midwife-led sample	Midwife-led group in the review by Sandall et al. (2016)	Interpretation
Induction of labour (elective caesarean excluded)	159/1 659 (9.6%) [95% CI for percent 8.2; 11.0]	1 850/9 586 (19.3%) [95% CI for percent 18.5; 20.1]	Induction of labour percentage <b>significantly lower</b> in Gauteng sample
Augmentation/ artificial oxytocin in labour (elective caesarean excluded)	157/1 659 (9.5%) [95% CI for percent 8.1; 10.9]	2 008/8 436 (23.8%) [95% CI for percent 22.9; 24.7]	Augmentation of labour percentage <b>significantly lower</b> in Gauteng sample
Regional analgesia (epidural/spinal) (only reported when labour was experienced)	32/1 657 (1.9%) [95% CI for percent 1.3; 2.6]	2 178/9 667 (22.5%) [95% CI for percent 21.7; 23.4]	Epidural analgesia percentage <b>significantly lower</b> in Gauteng sample
Opiate analgesia (only reported when labour was experienced)	227/1 655 (13.7%) [95% CI for percent 12.1; 15.4]	2 200/6 815 (32.3%) [95% CI for percent 31.2; 33.4]	Percentage of opiate use during labour <b>significantly lower</b> in Gauteng sample
Episiotomy (reported only where normal birth)	76/1 392 (5.5%) 95% CI for percent 4.3; 6.7]	1 816/9 667 (18.8%) [95% CI for percent 18.0; 19.6]	Episiotomy percentage <b>significantly lower</b> in Gauteng sample
Instrumental vaginal birth (forceps/ vacuum)	93/1 724 (5.4%) [95% CI for percent 4.3; 6.5]	1 176/9 586 (12.3%) [95% CI for percent 11.6; 12.9]	Instrumental birth percentage <b>significantly lower</b> in Gauteng sample
Caesarean birth	332/1 724 (19.3%) [95% CI for percent 17.4; 21.1]	1 281/9 667 (13.3%) [95% CI for percent 12.6; 13.9]	Caesarean section percentage <b>significantly higher</b> in Gauteng sample

Cochrane review. The WHO (2014, 2018) recommends that labour induction, especially before 41 weeks and augmentation of labour, should be used conservatively and only conducted for medical indications. Seeing that the overall outcomes of the births in the Gauteng group were not worse than for women in the international review, the more conservative management of the Gauteng midwives was justified.

Compared with the international review by Sandall et al. (2016), Gauteng midwives' patients used less analgesia during labour and birth. Significantly fewer women in the Gauteng sample had regional analgesia during birth than the women in the review by Sandall et al. (2016). The unavailability of regional analgesia at home births and women's personal preferences might have affected this outcome.

Women in the Gauteng sample were significantly less likely to use opiates than those in the midwife-led group in the review. The use of opiates during labour carries significant risks for the mother and infant, such as nausea, sedation and respiratory depression. The benefits of using opiates have not been proven to outweigh the accompanying risks (El-Wahab & Robinson, 2014). All Gauteng midwives in the study sample offered access to natural pain relief methods such as immersion in water (Jordaan, 2015). Immersion in water during the second stage of labour is associated with less pain and higher satisfaction with the birth experience (Nikodem et al., 2022).

The use of episiotomy was significantly lower in the Gauteng sample. The Cochrane review of Carroli and Mignini (2009) found that posterior perineal trauma, other complications, and the need to suture occur less frequently when episiotomies are not routinely performed. The South African guidelines for maternity care (South Africa, Department of

**Table 7**

Maternal outcomes in the Gauteng midwife-led sample versus the midwife-led group in the review by Sandall et al. (2016).

Outcome	Gauteng midwife-led sample	Midwife-led group in the review by Sandall et al. (2016)	Interpretation
Spontaneous vaginal birth	1 296/1 724 (75.2%) [95% CI for percent 73.1; 77.2]	6 485/9 181 (70.6%) [95% CI for percent 65.1; 70.0]	Spontaneous vaginal birth percentage <b>significantly higher</b> in Gauteng sample
Intact perineum (reported only where normal birth)	743/1 392 (53.4%) [95% CI for percent 50.8; 56.0]	2 159/7 438 (29%) [95% CI for percent 28.0; 30.1]	Intact perineum percentage <b>significantly higher</b> in Gauteng sample
Perineal laceration requiring suturing (reported only where normal birth)	1st or 2nd-degree tear 535/1 392 (38.4%) Complicated tear 29/1392 (2.1%) <b>Total: 40.5%</b> [95% CI for percent 37.9; 43.1]	3 211/8 385 (38.3%) [95% CI for percent 37.3; 39.3]	<b>Combined results</b> (1st/2nd-degree tears and complicated tears) <b>significantly higher</b> in Gauteng sample
Postpartum haemorrhage	136/1 722 reported (7.9%) [95% CI for percent 6.6; 9.2]	589/7 923 (7.4%) [95% CI for percent 6.9; 8.1]	Postpartum haemorrhage percentage <b>not significantly higher</b> in Gauteng sample

**Table 8**

Neonatal outcomes in the Gauteng midwife-led sample versus the midwife-led group in the review by Sandall et al. (2016).

Outcome	Gauteng midwife-led sample	Midwife-led group in the review by Sandall et al. (2016)	Interpretation
Overall foetal loss and neonatal death	5/1 722 reported (0.3%) [95% CI for percent 0.04; 0.5]	257/9 611 (2.7%) [95% CI for percent 2.4; 3.0]	Foetal loss and neonatal death percentage <b>significantly lower</b> in Gauteng sample
Low birth weight (<2.5 kg)	50/1 716 reported (2.9%) [95% CI for percent 2.1; 3.7]	324/6 577 (4.9%) [95% CI for percent 4.4; 5.5]	Low birth weight percentage <b>significantly lower</b> in Gauteng sample
Admission to neonatal intensive care unit	74/1 722 reported (4.3%) [95% CI for percent 3.3; 5.3]	680/9 611 (7.1%) [95% CI for percent 6.6; 7.6]	Admission to neonatal intensive care percentage <b>significantly lower</b> in Gauteng sample
Five-minute Apgar score below or equal to 7	51/1 722 reported (3.0%) [95% CI for percent 2.2; 3.8]	155/6 537 (2.4%) [95% CI for percent 2.0; 2.7]	Low Apgar score percentage <b>significantly higher</b> in Gauteng sample

Health, 2016) further discourage episiotomy due to the increased risk of vertical transmission of the human immunodeficiency virus (HIV), considering the high prevalence in South Africa.

In contrast to most interventions investigated, the caesarean section

rate was significantly higher for the women in the Gauteng sample than those in the Sandall et al. (2016) review. The private health sector in South Africa had a caesarean section rate of more than 73% in 2015, while the rate in the public sector was about 24% (Solanki et al., 2020). The rate for the women who used private midwives' services was comparably lower than in both public and private maternity sections in South Africa. However, the rate for hospitals includes both high- and low-risk women. Thirty years ago, the World Health organisation recommended 10% to 15% as an acceptable caesarean section rate (WHO, 1985). More recently, Ye et al. (2014) studied the association between caesarean section and mortality rates in 19 countries. They concluded that medically speaking, caesarean section rates exceeding 10% to 15% could hardly be justified. The latest WHO (2015) statement was adjusted accordingly, stating that caesarean sections could prevent maternal and perinatal mortality and morbidity when medically justified. Furthermore, at a population level, caesarean-section rates higher than 10% were not associated with reductions in maternal and infant mortality rates (Betrán et al., 2015). There is an ongoing debate about the high rate of caesarean sections in South Africa, especially in the private sector. An obstetrician interviewed by Bateman (2004) stated that women should be fully aware of the advantages and risks of caesarean sections. Bateman (2004) speculated that the high rate of caesarean sections in South Africa might be influenced by private obstetricians who emphasise the risks of normal births without fully recognising those of unnecessary caesarean sections. Anecdotal evidence blames high indemnity insurance costs. Rothberg and McLeod (2005) maintain that caesarean sections, like plastic surgery, should be a matter of personal choice. This approach necessitates women receiving the relevant information to make an informed decision about the risks and benefits of the different modes of birth.

The instrumental vaginal birth rate that was significantly lower in Gauteng than in the Sandall et al. (2016) review findings must be seen in conjunction with the higher caesarean section rate. Private midwives in Gauteng usually refer women developing risk factors like prolonged labour to an obstetrician at a hospital, where a caesarean section is often performed. Pattinson (2013) notes that a relatively high caesarean section rate with a low assisted delivery rate indicates that some caesarean sections are performed when safe assisted deliveries could have been done, putting the mother at unnecessary risk.

Concerning maternal outcomes, more women in the Gauteng group had perineal tears (first- and second-degree and complicated lacerations), but significantly fewer episiotomies were performed in this group. Significantly more women in the Gauteng sample had an intact perineum (no suturing required) than in the Sandall et al. (2016) sample. Protection of the perineum is of concern for midwives. Carroll et al. (2020) mention that, in the study they conducted in Ireland, experienced midwives reported higher confidence levels in managing a woman's perineum during the second stage of labour after having received additional education on techniques to prevent perineal trauma.

Slightly more women in the Gauteng group were reported to have blood loss of more than 500 ml after vaginal birth or more than 1000 ml after a caesarean section. Still, the percentage of patients with postpartum haemorrhage (PPH) in the Gauteng sample was not statistically significantly higher. Only three of the Gauteng midwives' cases who had significant blood loss (n = 136) were severe enough to require admission to high-care units, and there were no maternal deaths. In South Africa, obstetric haemorrhage was the third most prevalent cause of maternal death between 2014 and 2016 (624 deaths) (Fawcus, 2018). It is, therefore, reassuring that there were no fatalities in the study sample.

Regarding neonatal outcomes overall, foetal loss and neonatal deaths after 24 weeks, low birth weight (<2.5 kg), and neonatal intensive care admissions occurred statistically significantly less frequently in the infants of the Gauteng women. Overall foetal loss and neonatal deaths include intra-uterine foetal demise, stillbirths and early neonatal deaths after 24 weeks gestation. There were five perinatal infant deaths in the Gauteng sample out of 1722 births. The percentage of perinatal infant

deaths was statistically significantly lower than in the midwife-led sample reviewed by Sandall et al. (2016) and less than the perinatal mortality for South Africa. The perinatal mortality rate in public hospitals in South Africa for babies of 1000 g or more was 25.6/1000 births from 2010 to 2011 (2.56%) (Pattinson & Rhoda, 2014) compared to the national perinatal mortality rate in all facilities of 21.0/1000 births in 2016 (2.1%) as reported by STATS SA (2018).

The percentage of babies weighing less than 2.5 kg at birth was lower in the Gauteng sample than in the Sandall et al. (2016) sample. The difference is statistically significant. Interestingly, one of the key findings of Sandall et al. (2016) was that women who received midwife-led continuity of care from early pregnancy were less likely to experience preterm birth, or lose their baby before 24 weeks gestation, and to lose their baby overall, although there were no differences in the risk of losing the baby after 24 weeks.

A higher percentage of infants in the Gauteng sample had Apgar scores equal to or lower than seven at five minutes compared with the percentage of cases in the Sandall et al. review. Low Apgar scores thus occurred significantly more frequently in the Gauteng sample. Although the Apgar score is commonly used, it is not absolutely reliable or valid (Michel & Harris-Haman, 2022). Interestingly, Grünebaum et al. (2015) found that infants born with midwives in out-of-hospital settings in the United States had a significantly higher likelihood of a five-minute Apgar score of ten compared to babies born in a hospital. They attributed the finding to bias in Apgar scoring when the birth attendant conducts the birth and scoring alone. Even though there were more babies with lower Apgar scores in the Gauteng sample, there were significantly fewer neonatal admissions and fewer neonatal deaths.

#### 4.1. Limitations

The retrospective cohort design is a study limitation. For optimal comparison with the systematic review of Sandall et al. (2016), a prospective case-controlled study with randomisation to midwife-led or another type of care would have been ideal.

The unit of analysis in this study differs from those in the Sandall et al. (2016) review, as the review included the records of all births of women who were randomly assigned to midwife-led care from no later than 24 weeks gestation. The units of analysis in the Gauteng sample were midwife-attended births entered in the birth registers of the midwives who volunteered to participate. Women also self-select to make use of a private midwife.

The data were collected for births that occurred during 2012 and 2013; however, the findings are still relevant, as midwives who are members of the PPMA still practise according to the same principles of care.

No conclusions could be reached about the outcomes of births conducted by midwives who did not allow access to their records. Some factors were underreported in some of the birth registers. Factors such as increased body mass index could have impacted the outcomes.

According to the Gauteng midwives' records, referrals to other professionals were not handled consistently. Some of the midwives transferred care to obstetricians when risks became apparent. In contrast, others remained involved during labour induction or accompanied the woman to the theatre if a caesarean section was indicated and still entered these patients in their birth registers.

#### 5. Conclusions

This study on the outcomes of births attended by private midwives in Gauteng shows that private midwife-led care in Gauteng compares well with midwife-led care in other countries. Based on the study's findings, private midwife-led care in Gauteng can be recommended to low-risk pregnant women as a safe care option during pregnancy and childbirth. If pregnant women, obstetricians, and medical aid companies are aware that midwife-led care in Gauteng leads to at least the same (and

better) outcomes than found internationally, more women might be encouraged to use the services of private midwives.

The need for further research on midwife-led care is clear. Proposed studies include cost-analysis of midwife-led versus other models of care, prospective case-control studies to compare midwife-led versus other models of care in the South African context, and qualitative and mixed-method studies to explore women's views and wishes. Studies focusing on the implementation and evaluation of a continuous midwife-led model of care in the public health sector would also be valuable.

Concerning education and training, student midwives should get exposure to midwife-led care as practised by private midwives, as such experience would provide a better idea of the essence of midwifery and provide exposure to an alternative career path.

#### CRedit authorship contribution statement

**Christél Jordaan:** Investigation, Writing – original draft. **Catharina Susanna Minnie:** Conceptualization, Methodology, Writing – review & editing, Supervision.

#### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The first author is a private midwife and a member of the Private Practicing Midwives Alliance (PPMA); a non-financial competing interest – CJ.

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