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Factors associated with choice of home birth as place of delivery among women of reproductive age in South Africa

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Monica E. Akokuwebe* and Erhabor S. Idemudia

North-West University Faculty of Humanities, North West University, Mafikeng 2735, South Africa

*For Correspondence: Email: me.akokuwebenwupostdoctoral2021@gmail.com; Phone: +27671014444

Abstract

A growing prevalence of home births has been reported, yet factors predicting this prevalence have not been adequately investigated in South Africa. Using the 2016 South Africa Demographic and Health Survey dataset, this study aimed to examine the factors associated with the choice of birth at home as the place of delivery among women of reproductive age in South Africa. A total of 2862 women (aged 15–49 years) who gave birth within five years preceding the survey were included in the analysis. Both univariate and multivariable regression analyses were used to determine the predictors for the choice of home birth. The prevalence of births in health facilities and home childbirths were 96.0% and 4.0%, with the majority in non-urban areas, and in Limpopo, KwaZulu-Natal and Eastern Cape Provinces ($\geq 11.4\%$). After adjusting for confounders, the factors associated with the choice of place of delivery were: primary education [AOR = 1.97; $p < 0.001$], secondary/higher education [AOR = 3.51; $p > 0.05$]; cohabitation [AOR = 1.88; $p < 0.01$]; and parity 4–6 [COR = 2.59; $p < 0.001$], parity 7+ [AOR = 5.41; $p < 0.001$]. Predictors for choice of home birth as a place of delivery included increased educational attainment, cohabitation, higher parity and non-urban place of residence. Innovative strategies reinforcing policies or behaviours aimed at women of reproductive age with the aforementioned demographic indicators are needed to increase the use of healthcare facilities for childbirth, thereby reducing maternal and neonatal mortality, especially in non-urban provinces of South Africa. (*Afr J Reprod Health* 2023; 27 [1]: 22-40).

Keywords: Factors, home birth, delivery, prevalence, women, South Africa

Résumé

Une prévalence croissante des naissances à domicile a été signalée, mais les facteurs prédisant cette prévalence n'ont pas été suffisamment étudiés en Afrique du Sud. À l'aide de l'ensemble de données de l'enquête démographique et de santé de 2016 en Afrique du Sud, cette étude visait à examiner les facteurs associés au choix de l'accouchement à domicile comme lieu d'accouchement chez les femmes en âge de procréer en Afrique du Sud. Un total de 2862 femmes (âgées de 15 à 49 ans) qui ont accouché dans les cinq ans précédant l'enquête ont été incluses dans l'analyse. Des analyses de régression univariées et multivariées ont été utilisées pour déterminer les prédicteurs du choix de l'accouchement à domicile. La prévalence des naissances dans les établissements de santé et des accouchements à domicile était de 96,0 % et de 4,0 %, la majorité dans les zones non urbaines et dans les provinces du Limpopo, du KwaZulu-Natal et du Cap oriental ($\geq 11,4\%$). Après ajustement des facteurs de confusion, les facteurs associés au choix du lieu d'accouchement étaient : l'enseignement primaire [AOR = 1,97 ; $p < 0,001$], enseignement secondaire/supérieur [AOR = 3,51 ; $p > 0,05$]; cohabitation [AOR = 1,88 ; $p < 0,01$]; et parité 4–6 [COR = 2,59 ; $p < 0,001$], parité 7+ [AOR = 5,41 ; $p < 0,001$]. Les prédicteurs du choix de l'accouchement à domicile comme lieu d'accouchement comprenaient un niveau d'instruction plus élevé, la cohabitation, une parité plus élevée et un lieu de résidence non urbain. Des stratégies innovantes renforçant les politiques ou les comportements destinés aux femmes en âge de procréer avec les indicateurs démographiques susmentionnés sont nécessaires pour accroître l'utilisation des établissements de santé pour l'accouchement, réduisant ainsi la mortalité maternelle et néonatale, en particulier dans les provinces non urbaines d'Afrique du Sud. (*Afr J Reprod Health* 2023; 27 [1]: 22-40).

Mots-clés: Facteurs, accouchement à domicile, accouchement, prévalence, femmes, Afrique du Sud

Introduction

Maternal deaths continue to be a public health concern globally, and in 2015, maternal death was the second top cause of death among women of

childbearing age. About 94% of these deaths occurred in low- and middle-income nations, of which African countries accounted for 65%^{1,2}. However, there is a huge discrepancies of maternal mortality ratios between high-income (16 per

100,000 live births) and low- and middle-income nations (240 per 100,000 live births), and more than half (56%) of these maternal deaths occur in sub-Saharan Africa^{3,4}. Yet, most of these deaths are avoidable if women receive adequate antenatal and intrapartum care by trained birth attendants^{5,6}. Skilled birth attendants are trained medical experts. They follow the procedure by which a woman who is delivering is provided with adequate care during labour, delivery, and the early postpartum period by a qualified health care provider^{2,6}. Several studies have reported that there are direct causes of maternal death which have contributed up to 80% of all maternal deaths. These include severe bleeding, usually after childbirth (postpartum hemorrhage), high blood pressure during pregnancy and the postpartum period (pre-eclampsia and eclampsia), and infection, usually after childbirth or complications of abortion^{6,7}.

In South Africa, maternal health has continued to be a major concern, and the mortality ratio has still remained high in 2021 (100 deaths/100,000 live births), although the South African government has made much effort to increase access to maternal healthcare services by introducing the waiver of delivery fees across all provinces^{8,9}. Similarly, this was followed by the launching of the national health insurance scheme (NHIS) in 2005, which allows all pregnant women under the scheme to have free access to maternal healthcare services, including antenatal care, delivery services, and postnatal and neonatal care¹⁰. As a result, this agenda saw a decrease in home births from 45% in 2007 to 20% in 2017, while a decline from a peak of 189 deaths per 100,000 live births in 2009 to 135 deaths per 100,000 live births was observed in 2016^{11,12}. This major success of recorded reduction of maternal death was attributed to the early introduction of the Human Immunodeficiency Virus (HIV) anti-viral treatment programme in pregnancy and beyond. This government programme contributed majorly to the main cause of the decline of maternal and neonatal mortality during the past few years in South Africa¹³. Despite South Africa's progress in reducing maternal mortality since 1998, much remains to be done to achieve the sustainable development goal (SDG) of 70/100,000 by 2030. In South Africa, hypertensive disease of pregnancy, hemorrhage, and non-pregnancy related infections, including HIV, are the leading clinical causes of

maternal mortality^{12,13}. The 2021 South Africa maternal, perinatal, and neonatal health policy documents (SAMPNHP) have reported and identified that significant systemic drivers are the major contributors to maternal mortality in South Africa, which consist of the length of time it takes to arrive at a facility where a birth attendant has the right skills to attend to emergency cases¹⁴. This has been cited in several studies to illustrate the urgency and the need to optimize referral pathways within the structural healthcare system concerning the levels of maternal health care¹⁵⁻¹⁷.

It is, therefore, important to understand the factors associated with home delivery among women of reproductive age, and providing useful information for interventions aimed at reducing maternal mortality is key. Studies have shown that women traditionally prefer to deliver at home because it is cheaper^{18,19}, and easier, as women who deliver at home receive social support from their extended families and do not have to pay so much for the delivery medical services^{20,21}. Other studies indicated that the lack of economic or financial resources, transportation, and delivery of supplies, and a dearth of referral and coordination between traditional birth attendants at the community level and facilities can inhibit women from using facility-based services²²⁻²⁴. Few studies have reported other risks associated with home births which include neglect of colostrum provision and breastfeeding practices, disregard of immunizations and dietary supplementation for mother and child, and lack of postnatal care check-ups for the child and mother²⁵⁻²⁸. However, socio-cultural factors have been indicated as one contributing factor to maternal preference regarding place of birth^{29,30}. For instance, a socio-cultural tradition in some of the tribal cultures within Africa involves a married woman who, when becoming pregnant for the first time, has to go back to her parent's home to give birth, so the decision about the place of delivery is decided by her mother or her spouse's mother³¹⁻³³. Also, mistreatment of women in health facilities during childbirth has been associated with the number of home births in Africa^{31,33}. The prevalence of mistreatment during facility-based delivery have been documented in several studies and this has become a conspicuous issues that sometimes prevents women from obtaining skilled birth services, as this fact has been observed in Kenya (20%)³⁴, Tanzania (28.2%)³⁵, Ethiopia

(78%)³⁶, Ghana³³ and Nigeria (almost universal such that all of the women reported at least one kind of mistreatment during childbirth)⁴.

Thus, the World Health Organization (WHO) has categorized barriers encouraging home birth among women into social and logistical factors. The social factors include the social norms about place of delivery, the role of socio-economic status (SES) and the influence of spouse and other family relatives in the selection of a place of delivery³⁷. Also, the logistical factors include distance to the facility, rural residence, lack of health insurance cover and other economic factors³⁷. In South Africa, such aforementioned challenges still persist, and are mainly predominant in non-urban regions, where home births are higher compared to urban regions. In spite of advanced health facilities in South Africa, few studies have shown why women still choose home birth over delivery in health facilities^{12,38}. To the best of our knowledge, no study has looked at the dynamics that influence home births among women of reproductive age, using the 2016 South Africa Demographic Survey. Hence, we examined the predictors of home births among South African women aged 15–49 years, as this study seeks to fill this gap in literature. This study's findings will help to interpret the present implications of home births in urban and non-urban settings, which will aid in providing practical health educational interventions and sensitization approaches that are targeted at reducing home births in these settings. This will further go a long way to help in the reduction of obstetric risks of impediments, particularly policies at the grassroots.

Methods

Study setting

The study setting is the Republic of South Africa, one of the countries in Southern Africa, bounded by Namibia, Botswana and Zimbabwe, to the north and west, to the east and north east by Mozambique and Eswatini (former Swaziland), and surrounding the enclaved country of Lesotho^{39,40}. The country has a multi-ethnic society covering a wide diversity of cultures, languages, and religions. The up-to-date population estimate of South Africa is 60,142,978⁴¹, and as at the time of carrying out the 2016 Demographic Health Survey, the country was

administratively divided into nine provinces: Northern Cape, Western Cape, Eastern Cape, North West, Free State, Gauteng, Mpumalanga, Limpopo, and KwaZulu-Natal. The country is urbanized, with about 66.7% of its population living in urban areas and 33.3% in non-urban areas⁴²⁻⁴⁴. In terms of population groups, the dominant groups in the country are Black Africans (80.7%), followed by Coloured (8.8%), White (7.9%) and Asian (2.6%). By official languages, South Africa has 11 official languages which are English, isiZulu, isiXhosa, Afrikaans, Sepedi, Setswana, Sesotho, Xitsonga, SiSwati (Swazi), Tshivenda and IsiNdebele, with other languages with special status including the Khoi languages, Nama, San languages, South African sign language, German, Greek, Gujarati, Hindi, Portuguese, Telugu, Tami, Urdu, Arabic, Hebrew and Sanskrit⁴¹. In terms of religion, a majority of South Africans are Christians (78.0%), followed by those who practice no religion (10.9%), traditional faiths (4.4%), Islam (1.6%), Hinduism (1.0%), others (2.7%) and undetermined (1.4%)⁴⁵⁻⁴⁷. During the 20th century, the black majority sought to claim more rights from the governing white minority, playing a great role in the country's current history and politics, as the white minority imposed apartheid in 1948, institutionalizing prior racial segregation; Black South Africans and the other non-white racial groups were liberated from the apartheid system in 1994⁴¹. The country has upper-middle power in the Commonwealth of Nations and the G-20, ranking 114th on the Human Development Index, yet crime, poverty, and inequality still persist, with about a quarter of the population unemployed and living on less than US \$ 1.25 a day⁴¹.

Study design and data source

This study is a cross-sectional analysis of a dataset from the 2016 South Africa Demographic and Health Survey³⁸. The 2016 SADHS is the third in a series of national sample surveys conducted in South Africa to measure the prevalence and estimates of health and behaviour indicators for adults aged 15 and older. The information collected through the SADHS 2016 was intended to assist policy makers and programme managers in evaluating and designing programmes and strategies for improving the health of the country's population. The survey was undertaken by the

National Department of Health (NDoH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC), and ICF. The core of the 2016 SADHS was to provide up-to-date estimates of basic demographic and health indicators. Five model questionnaires based on the demographic health survey programme standard were used for the 2016 SADHS: the household, the individual woman's, the individual man's, the caregiver's and the biomarker questionnaires. Each of these questionnaires gathered data from households and women, and the woman's questionnaire was used to collect information from all eligible women aged 15-49 years³⁸. The information collected includes background characteristics; birth history and childhood mortality; fertility preferences; knowledge and use of family planning methods; breastfeeding and infant feeding practices; nutrition; antenatal, delivery and postnatal care; vaccinations and childhood illnesses; marriage and sexual activity; women's work and husband's background characteristics; adult mortality, including maternal mortality; domestic violence, malaria, and other health issues³⁸.

Study population

This study employed the use of files containing the women's responses, and the stratified two-stage sampling approach was utilized with same questions posed to all women recruited for the survey. First, this study utilized the sampling process that involves the selection of clusters (i.e. enumeration areas [EAs]), followed by the use of systematic household sampling within the selected EAs, with a probability proportional to size sampling of primary sampling units (PSUs)³⁸. The second step involved the selection of households from the predefined clusters. A total of 15,292 households were selected for the sample, of which 13,288 were occupied, and out of 13,288 occupied households, 11,083 households were successfully interviewed, yielding a response rate of 83%. In the interviewed households, 9,878 eligible women aged 15-49 years were identified for individual interviews; interviews were completed with 8,514 women, yielding a response rate of 86%. These were stratified into urban areas (4,805), with a response rate of 82.0%, and non-urban areas (3,709), with response rate of 92.3%³⁸. As a result

of consistent lower response rates found in the urban areas, unweighted data of 5,463 women were sampled. For the purpose of this study, only those women in the urban and non-urban regions that had given birth in the 5 years preceding the survey, and who had completed cases on all the variables considered for the study were used (N = 2,862 women were weighted). The individual recodes (FR337) file was used, and the final sample size for this analysis resulted in 2,862 women. We then dropped unnecessary variables for this study from the data file. Thus, details of the methodology employed by the South Africa Demographic Health Survey can be found in the final report³⁸.

Study variables in the study

Outcome variable

The outcome variable for this study is 'Place of delivery' and was obtained from the question, "Where did you give birth to [NAME]?" In the 2016 SADHS, responses to this question were home, other home, government hospital, government health centre/clinic, government health post/Community-based Health Planning and Services (CHPS), other public, private hospital/clinic, maternity homes, and other. These responses were dichotomised into health facility delivery = 0 and home delivery = 1, where respondent's home and other home were grouped as 'home birth' and all the other categories were classified as 'facility birth'^{4,18}. Home delivery referred to deliveries that occurred in respondent's home or another home. On the other hand, deliveries that occurred at a government hospital, government health centre/clinic, government health post/CHPS, other public, private hospital/clinic, maternity homes, and other health facilities were grouped as "health facility delivery".

Explanatory variables

The study considered seventeen explanatory variables. These are age, woman's education, wealth status, marital status, occupation, racial group, sex of household head, parity, ante-natal care (ANC) visits, partner's education, partner's occupation, healthcare decision, financial decision, intimate partner violence (IPV), covered by NHIS, and Province. These variables were not determined a priori; instead, they were determined based on the

Table 1: Summary of the measurement of the study explanatory variable names

S/No	Variable name	Categorization of explanatory variable
1	Age	1 = 15-24, 2 = 25-34, 3 = 35+ years
2	Place of residence	1 = Urban, 2 = Non-urban
3	Woman's education	1 = No education, 2 = Primary, 3 = Secondary/Higher
4	Wealth status	1 = Poor, 2 = Middle, 3 = Rich
5	Marital status	1 = Never married, 2 = Married, 3 = Cohabitation, 4 = Widowed, 5 = Divorced/Separated
6	Occupation	1 = Not working, 2 = Working
7	Racial group	1 = Black African, 2 = White, 3 = Coloured, 4 = Indian/Asian
8	Sex of Household Head	1 = Male, 2 = Female
9	Parity	1 = 1-3 births, 2 = 4-6 births, 3 = 7+ births
10	ANC visits	1 = No ANC visits, 2 = 1-3 ANC visits, 3 = 4+ ANC visits
11	Partner's education	1 = None, 2 = Primary, 3 = Secondary/Higher
12	Partner's occupation	1 = Skilled/Professional, 2 = Unskilled/Unprofessional
13	Healthcare decision	1 = Partner alone, 2 = Woman alone, 3 = Joint decision
14	Financial decision	1 = Partner alone, 2 = Woman alone, 3 = Joint decision
15	IPV	1 = No, 2 = Yes (The IPV comprises combining violence variables such as 'ever experienced any 'domestic', 'emotional', 'physical' or 'sexual violence'. IPV was coded '2' if a respondent reported yes having experienced one or more forms of violence mentioned above), otherwise coded as '1')
16	Covered by NHIS	1 = No, 2 = Yes
17	Provinces	1 = Western Cape, 2 = Eastern Cape, 3 = Northern Cape, 4 = Free State, 5 = KwaZulu-Natal, 6 = North West, 7 = Gauteng, 8 = Mpumalanga, 9 = Limpopo

Source: Author's compilation

closeness with the outcome variable, hypothetical possibility^{7,48} and applicability^{21,49}, and practical implication^{3,50} with place of delivery. The explanatory variables used in this study were measured as follows in Table 1.

Data analysis

Data processing, management and analysis were carried out using statistical software Stata version 21.0, and univariate, bivariate and multivariate statistical analyses were carried out. The univariate analysis was employed to show the sample percentage of women with home births together with socio-demographic factors, as well as the prevalence of home delivery. Bivariate analysis (Pearson Chi-square, χ^2) was carried out to show the associations between home delivery and demographic factors with their levels of significance (p-values). Multivariate analysis (binary logistic regression) was further carried out to determine the significant predictors of choice of place of delivery. Importantly, only the variables that indicated statistical significance in the bivariate analysis were used for the regression analysis. The findings in the regression analysis were presented as crude odds ratio (COR) and adjusted odds ratio (AOR), with statistical significance of $p < 0.05$ signifying level of precision. Also, sample weights

were used and the survey command (svy) was utilized to accommodate the structure of the survey sampling design.

Results

Socio-demographic characteristics of the women under study

Table 2 presents findings on the weighted sample of all women of reproductive age and those who had home delivery. Out of the 8,325 women, only 2,862 reported that they have had a home delivery. Therefore, the sample size for this study analysis was 2,862. The mean age of the women with home births was 30.0 (\pm SD 15.0) years. The majority of the women who had a home delivery are among the age cohorts of 35+ years (66.1%), with 81.9% of them having secondary/higher educational status, and the majority of them residing in urban areas. A greater proportion of women were never married (44.5%), and 51.1% of women were not working (Table 2).

Distribution of the prevalence of place of delivery

Figure 1 presents findings on the prevalence of place of delivery among women of reproductive age. The prevalence of health facility and home

Table 2: Background characteristics amongst women of reproductive age in South Africa (N = 8,325)

Characteristics	Proportion of women who had home delivery (15-49), n = 2,862	
	Frequency (n)	Percentage (%)
Mean age	Mean \pm SD: 30.0 \pm 15.0	
Age (years)		
15-24	130	4.5
25-34	840	29.4
35+	1892	66.1
Place of residence		
Urban	1,644	57.4
Non-urban	1,218	42.6
Woman education		
No education	116	4.1
Primary	401	14.0
Secondary/Higher	2345	81.9
Wealth status		
Poor	1190	41.6
Middle	676	23.6
Rich	996	34.8
Marital status		
Never married	1,273	44.5
Married	860	30.1
Cohabiting	371	13.0
Widowed	152	5.3
Divorced/Separated	206	7.2
Occupation		
Not Working	1,463	51.1
Working	1,399	48.9
Racial group		
Black African	2,469	86.3
White	78	2.7
Coloured	290	10.1
Indian/Asian	25	0.9
Sex of Household Head		
Male	1,158	40.5
Female	1,704	59.5
Parity (no. of births)		
1-3 births	3,345	81.9
4-6 births	472	16.5
7+ births	45	1.6
ANC Visits		
No ANC visits	5	6.4
1-3 visits	20	25.6
4+ visits	53	68.0
Partner's education		
None	104	8.7
Primary	225	18.8
Secondary/higher	866	72.5
Partner's occupation		
Skilled/professional	783	86.7
Unskilled/unprofessional	120	13.3
Healthcare decision		
Partner alone	475	38.7
Woman alone	687	56.0
Joint decision	65	5.3
Financial decision		
Partner alone	192	34.4
Woman alone	342	61.2
Joint decision	25	4.5
IPV		
No	1,293	79.2

Yes	340	20.8
Covered by NHIS		
No	1,222	86.2
Yes	195	13.8
Province		
Western Cape	241	8.4
Eastern Cape	363	12.7
Northern Cape	240	8.4
Free State	308	10.8
KwaZulu-Natal	442	15.4
North West	299	10.5
Gauteng	297	10.4
Mpumalanga	320	11.2
Limpopo	352	12.3

Source: SADHS, 2016.

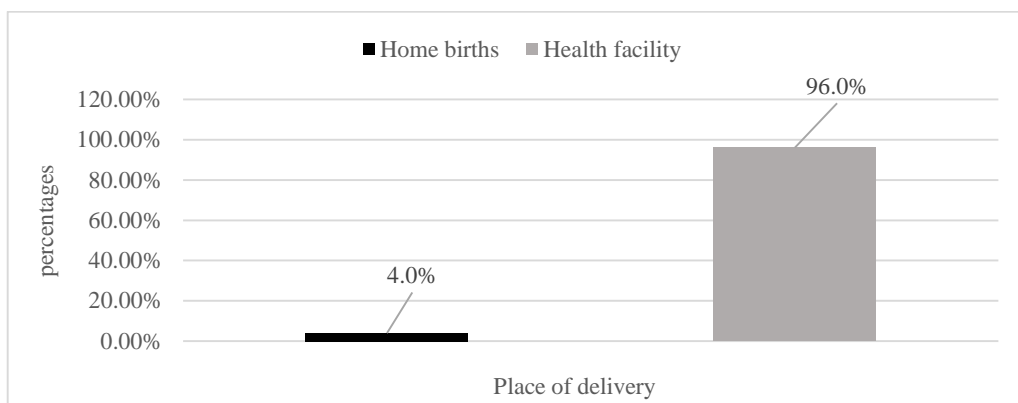


Figure 1: Prevalence of place of delivery among women 15–49 years in South Africa



Figure 2: Prevalence of home delivery among women aged 15–49 years by Province in South Africa

Table 3: Bivariate Results of women who had home delivery by place of residence

<i>Variables</i>	<i>Urban, n (%)</i> <i>n = 1,644</i>	<i>Chi-square</i> <i>(χ^2)</i>	<i>Non-urban, n (%)</i> <i>n = 1,218</i>	<i>Chi-square</i> <i>(χ^2)</i>	<i>Total, n (%)</i> <i>n = 2,862</i>	<i>Chi-square</i> <i>(χ^2)</i>
<i>Age (years)</i>		4.8*		5.4*		6.3*
15-24	72 (4.4)		58 (4.8)		130 (4.5)	
25-34	458 (27.9)		382 (31.4)		840 (29.4)	
35+	1,114 (67.8)		778 (63.9)		1,892 (66.1)	
<i>Woman's education</i>		52.9*		5.3*		45.8*
No education	51 (3.1)		65 (5.3)		116 (4.1)	
Primary	172 (10.5)		229 (18.8)		401 (14.0)	
Secondary/Higher	1,421 (86.4)		924 (75.9)		2,345 (81.9)	
<i>Wealth index</i>		845.6*		8.3*		548.6*
Poor	354 (21.5)		836 (68.6)		1190 (41.6)	
Middle	379 (23.1)		297 (24.4)		676 (23.6)	
Rich	911 (55.4)		85 (7.0)		996 (34.8)	
<i>Marital status</i>		11.3*		8.5*		21.1*
Never married	696 (42.3)		577 (47.4)		1,273 (44.5)	
Married	532 (32.4)		328 (26.9)		860 (30.1)	
Cohabiting	215 (13.1)		156 (12.8)		371 (13.0)	
Widowed	84 (5.1)		68 (5.6)		152 (5.3)	
Divorced/Separated	117 (7.1)		89 (7.3)		206 (7.2)	
<i>Employed</i>		17.4*		7.2*		23.3*
No	785 (47.8)		678 (55.7)		1,463 (51.1)	
Yes	859 (52.3)		540 (44.3)		1,399 (48.9)	
<i>Racial group</i>		230.9*		20.2*		320.9*
Black African	1,281 (77.9)		1,188 (97.5)		2,469 (86.3)	
Coloured	65 (4.0)		13 (1.1)		78 (2.7)	
White	273 (16.6)		17 (1.4)		290 (10.1)	
Indian/Asian	25 (1.5)		0 (0.0)		25 (0.9)	
<i>Sex of household head</i>		15.2		12.8		18.4
Male	716 (43.6)		442 (36.3)		1,158 (40.5)	
Female	928 (56.5)		776 (63.7)		1,704 (59.5)	
<i>Parity</i>		66.5*		46.2*		77.1*
One to Three	1,423 (86.6)		922 (75.7)		2,345 (81.9)	
Four to Six	212 (12.9)		260 (21.4)		472 (16.5)	
Seven or More births	9 (0.6)		36 (3.0)		45 (1.6)	
<i>ANC visits</i>		0.5		0.8*		1.8
No ANC visits	1 (3.7)		4 (7.8)		5 (6.4)	
1-3 visits	7 (25.9)		13 (25.5)		20 (25.6)	
4+ visits	19 (70.4)		34 (66.7)		53 (68.0)	
<i>Partner education</i>		61.9		21.5*		46.5
None	43 (5.9)		61 (13.0)		104 (8.7)	
Primary	97 (13.4)		128 (27.2)		225 (18.8)	
Secondary and higher	584 (80.7)		282 (59.9)		866 (72.5)	
<i>Partner occupation</i>		0.5		0.8		0.9
Skilled/Professional	496 (86.1)		287 (87.8)		783 (86.7)	
Unskilled/Not Professional	80 (13.9)		40 (12.2)		120 (13.3)	
<i>Healthcare decision</i>		15.7		34.2*		20.4
Partner alone	276 (37.2)		199 (41.1)		475 (38.7)	

Woman alone	445 (59.9)		242 (50.0)		687 (56.0)
Joint decision	22 (3.0)		43 (8.9)		65 (5.3)
<i>Financial decision</i>		8.8		4.2*	6.8
Partner alone	111 (30.5)		81 (41.5)		192 (34.4)
Woman alone	239 (65.7)		103 (52.8)		342 (61.2)
Joint decision	14 (3.9)		11 (5.6)		25 (4.5)
<i>IPV</i>		1.8		1.3	2.0
No	756 (79.5)		537 (78.7)		1,293 (79.2)
Yes	195 (20.5)		145 (21.3)		340 (20.8)
<i>Covered by NHIS</i>		38.8*		24.8*	78.2*
No	649 (81.2)		573 (92.7)		1,222 (86.2)
Yes	150 (18.8)		45 (7.3)		195 (13.8)
<i>Province</i>		748.3		318.8	248.3
Western Cape	232 (14.1)		9 (0.7)		241 (8.4)
Eastern Cape	193 (11.7)		170 (14.0)		363 (12.7)
Northern Cape	169 (10.3)		71 (5.8)		240 (8.4)
Free State	271 (16.5)		37 (3.0)		308 (10.8)
KwaZulu-Natal	200 (12.2)		242 (19.9)		442 (15.4)
North West	140 (8.5)		159 (13.1)		299 (10.5)
Gauteng	264 (16.1)		33 (2.7)		297 (10.4)
Mpumalanga	119 (7.2)		201 (16.5)		320 (11.2)
Limpopo	56 (3.4)		296 (24.3)		352 (12.3)
<i>Media sources</i>					
<i>Newspaper/Magazine</i>		75.5*		23.7*	32.6*
Exposed	645 (56.1)		504 (43.9)		1149 (40.1)
Not exposed	573 (33.4)		1140 (66.6)		1713 (59.9)
<i>Radio</i>		32.4*		35.0*	24.2*
Exposed	441 (53.8)		379 (46.2)		820 (28.7)
Not exposed	777 (38.1)		1265 (61.9)		2042 (71.3)
<i>Television</i>		41.9*		62.8*	34.6*
Exposed	342 (63.1)		200 (36.9)		542 (18.9)
Not exposed	876 (37.8)		1444 (62.2)		2320 (81.1)

Source: SADHS, 2016; * $p < 0.05$

delivery was 96.0% and 4.0% respectively, in South Africa (Figure 1).

Distribution of the prevalence of home delivery among women by province

Figure 2 showed the prevalence of home delivery among women aged 15–49 years by province across South Africa. The findings of this study showed that home delivery is more prevalent in Limpopo, KwaZulu-Natal and Eastern Cape Provinces ($\geq 11.4\%$). Also, North West, Free State and Mpumalanga Provinces have a prevalence of home delivery ranging from 10.4% – 11.4%. Gauteng, the smallest province, has a prevalence of home delivery ranging from 9.4% – 10.4% (Figure 2). Western Cape Province has a prevalence of home delivery between 8.4% and 9.4% while the

largest province, Northern Cape, has the lowest prevalence ($< 8.4\%$) of home delivery among women aged 15–49 years in South Africa (Figure 2).

Bivariate results of women who gave birth at home by place of residence

The bivariate results of home delivery stratified by place of residence showed significant differences in all the explanatory variables in urban areas, with the exception of the variables of sex of household head, ANC visits, partner education, partner occupation, healthcare decision, financial decision, IPV, covered by NHIS, and province (Table 3). In the non-urban areas, only the variables of sex of household head, partner occupation, intimate partner violence (IPV) and province did not exhibit

Table 4: Binary logistic regression of the predictors of choice of place of delivery among women aged 15-49 years in South Africa

Variables	Crude odds ratio (Confidence interval)	Adjusted odds ratio (Confidence interval)
<i>Age (years)*</i>		
15-24	RC	RC
25-34	0.23***(0.19-0.28)	0.23***(0.17-0.31)
35+	0.04*(0.04-0.05)	0.03*(0.25-0.05)
<i>Woman's education*</i>		
No education	RC	RC
Primary	1.42***(0.76-2.67)	1.97***(1.30-3.00)
Secondary and Higher	2.00 (1.09-3.62)	3.51 (2.38-5.19)
<i>Wealth Index*</i>		
Poor	RC	RC
Middle	0.91***(0.73-1.14)	0.85***(0.74-0.97)
Rich	1.03***(0.82-1.30)	0.70***(0.62-0.79)
<i>Marital Status</i>		
Never married	RC	RC
Married	1.04 (0.83-1.30)	0.56 (0.49-0.64)
Cohabiting	1.11* (0.85-1.46)	1.88** (0.75-1.04)
Widowed	0.41 (0.22-0.79)	0.16 (0.11-0.24)
Divorced/Separated	1.05 (0.70-1.59)	0.37 (0.28-0.48)
<i>Employed*</i>		
No	RC	RC
Yes	0.76***(0.63-0.92)	0.76***(0.63-0.92)
<i>Racial group</i>		
Black African	RC	RC
Coloured	0.91**(0.47-1.77)	0.47*** (0.32-0.71)
White	0.03 (0.74-1.42)	0.77 (0.64-0.93)
Indian/Asian	0.86 (0.28-2.68)	0.59 (0.31-1.14)
<i>Parity*</i>		
One to Three	RC	RC
Four to Six	2.59***(1.97-3.41)	0.69***(0.59-0.80)
Seven or More births	5.41***(2.87-10.20)	0.74***(0.47-1.17)
<i>Covered by NHIS*</i>		
No	RC	RC
Yes	0.22**(0.90-1.65)	0.71***(0.56-0.89)

Source: SADHS, 2016; * $p < 0.05$

significant differences with regard to home delivery. In addition, all the explanatory variables in the total population, with the exception of the variables of sex of household head, ANC visits, partner education, partner occupation, healthcare decision, financial decision, IPV, and province showed significant increase of home delivery (Table 3).

Also, table 3 showed the association between media sources of home delivery and place of residence. A majority of two-thirds of women residing in urban areas were exposed to

newspaper/magazine (56.1%), radio (53.8%) and television (63.1%) media sources. Other findings from this study also showed that women's utilization of home delivery services was significantly influenced by non-exposure to media sources. Non-urban women who were not exposed to media sources i.e. newspapers (OR = 2.39, 95% CI: [0.34, 3.46]), radio (OR = 1.53, 95% CI: [1.60, 2.62]) or television (OR = 3.36, 95% CI: [1.29, 3.43]) were more likely to engage in home delivery than urban women who are exposed to media sources.

Binary logistic regression on the factors associated with the choice of place of delivery

In the multivariable logistic regression analysis, age, education level, wealth index, marital status, employed, racial groups, parity and health insurance remained independent predictors that influenced the choice of place of delivery (Table 4). Being a woman aged between 25–34 years (COR 0.23, 95% CI: 0.19–0.28; AOR 0.23, 95% CI: 0.17–0.31) significantly decreased the odds of predicting the choice of place of delivery compared to women aged 15–24 years. Women with primary education significantly increased the odds to influence their choice of place of delivery (COR 1.42, 95% CI: 0.76–2.67; AOR 1.97, 95% CI: 1.30–3.00) compared to women with no education. Women in the rich wealth index have higher odds to predict their choice of place of delivery compared to women in the poor wealth index. Employed women have lower odds of predicting their choice of place of delivery (COR 0.76, 95% CI: 0.63–0.92; AOR 0.50, 95% CI: 0.45–0.56) than their unemployed counterparts in both models. Women with 4–6 and 7+ children had higher odds to influence their choice of place of delivery compared to women with fewer than four children. Women with NHIS cover had lower odds to influence their choice of place of delivery compared to those with no NHIS cover (Table 4).

Discussion

In sub-Saharan Africa, home delivery practices are one of the risk factors for maternal morbidity and death. This study investigated the prevalence and factors associated with choice of home delivery among women of reproductive age in South Africa. This study's findings showed an overall prevalence of 4% of home delivery and 96% of health facility deliveries among women aged 15–49 years in South Africa. The 2016 SADHS and Statistics South Africa–2030 NDP reported a similar finding in the national survey conducted by Statistics SA and Demographic Health Survey collaborators in partnership with the National Department of Health and the South African Medical Research Council in South Africa^{38,51}. Thus, the prevalence of home delivery is acceptably low (4%) in South Africa,

which is very much lower than the median average prevalence¹ (50.7%) of home delivery in African regions, and also remains ahead of the target of less than 10% home deliveries as stipulated by the 2030 Agenda Sustainable Development Goal 3^{30,32}. However, the implication of the above-mentioned findings on the overall low prevalence rate of home delivery in South Africa gives an impression of “no cause for alarm”, yet policy stakeholders have to take into consideration the factors that still play out in motivating women in opting for home delivery^{47,52}. Health needs of women are prioritized by the South African government, considering the fact that choice of place of delivery can be determined by the quality of maternal healthcare women received from a health facility. Women who decide on home delivery may be at risk of obstetric complications, even though the South African government has made a large investment in promoting the use of health facilities, as it is one of the practical and effective approaches that will lead to the decline of maternal deaths^{10,12}.

Studies carried out in the Southern African Development community (SADC) and East African community (EAC), such as in Mozambique (98%)⁵³, Malawi (96%)⁵⁴, Rwanda (92%)⁵⁵, Burundi (92%)⁵⁶, Zambia (85%)¹⁸, the Comoros (75%)⁵⁷, Zimbabwe (69%)⁵⁸ and Uganda (66%)⁴⁸ have reported a decreased probability of women choosing home delivery. In Rwanda, the prevalence of home delivery was estimated to be about 7%, and has been tagged to have the lowest proportion of home deliveries in the East Africa region^{55,59}. This success story of lower prevalence in Rwanda, to an extent, might be associated with government investing in healthcare, access to maternal healthcare services, and recruiting CHWs to reach out to women, especially in grassroots' communities^{59–60}. The weighted prevalence of home delivery was 23.8% among women in East African countries; while it was highest among Ethiopian women (72.5%)³⁶, Kenyan women (53%)⁶³, and Tanzanian women (33.5%)²¹ it was lowest among Mozambican women (2.8%)⁵³. The finding from the above weighted prevalence was in line with the national survey conducted on home delivery in India⁶¹ but lower than in studies conducted in Nigeria^{24,62}. However, a greater prevalence of home deliveries were reported in the West African region

– Ghana (7.9%)⁵⁰, Nigeria (59%)²⁴, Cameroon (33.8%)²³, Chad (78%), and Niger (70%)² – and the Southwest Africa region – Namibia (40%)². Also, another study conducted in Kenya indicated a likelihood of 2.24 times higher than for women with home deliveries in Ethiopia⁶³⁻⁶⁴. This finding can be interpreted that countries with a lower prevalence of home delivery were found to have greater utilization of health facilities during and after delivery^{24,32}.

Age of women and place of residence have a role to play in home delivery, and this study findings showed that home delivery significantly increased among older women (35+) and non-urban residence. This association is similar to the result of the previous study of the 2016 SADHS, showing women with higher-order births are much more likely to be delivered at home³⁸. Most reported home birth deliveries differ slightly by place of residence, as home deliveries are nearly three times more likely to be practiced by women in non-urban residences compared to urban women. This finding is comparable to previous studies, which have reported the same findings among women in high- and low-income nations with home delivery¹⁻². Despite the fact that many efforts have been made to improve the accessibility and use of health facilities in non-urban areas, low usage of health delivery facilities still persists in South Africa³⁸. Removal of financial barriers, increasing the number of health facilities and skilled human resources within the healthcare system are among the strategies that can promote a higher usage of maternal health services. Still, one wonders why pregnant women choose to deliver at home where there is a low possibility of being assisted by skilled birth attendants^{10,32}. Conversely, regarding racial groups, Coloured, White and Indian/Asian women were less likely to have a home delivery as compared with Black African women. Principles linking racial groups, pregnancy, birth preparedness and complication readiness plan (BP and CR) indicated that Black African women faced a lack of or reduced level of psychosocial support and relationship stability^{12,16}. This strategy of BP and CR can aid in promoting the timely use of skilled maternal and neonatal care, especially during the actual childbirth, based on the theory that, preparing for childbirth and being ready for complications reduce the delay in obtaining care¹². In South Africa, home delivery varied widely, with a

racially-mixed population from diverse backgrounds of values and beliefs, spirituality, social customs, social autonomy and traditional practices^{14,16}.

Women residing in Limpopo, KwaZulu-Natal and Eastern Cape provinces were more likely to have a home delivery, while the Northern Cape Province has the lowest prevalence of home delivery. A similar finding was reported for Eastern Cape Province³⁸, and a provincial difference in fertility patterns have been anticipated in KwaZulu-Natal, North West, Limpopo and Gauteng provinces¹⁴. Consistent with previous studies⁶⁵⁻⁶⁹, our findings suggested that women who were not exposed to media had a 73% higher chance of home delivery compared with women with exposure to media. Media promotion of health facility delivery and the dangers of home delivery may influence mothers to develop a positive attitude towards delivering in a health facility. Another finding from this study showed that the majority of the women residing in non-urban areas were not exposed to media. This finding is consistent with previous studies conducted in Indonesia, Ethiopia, India, and Pakistan⁶⁵⁻⁶⁹. Prior to delivery, women need appropriate and adequate information on delivery in health facilities through the media. Thus, information from media sources can aid women in understanding the health hazards associated with home delivery through visual appealing, audio messages, and written reports⁷⁰⁻⁷³.

In South Africa, media campaigns have been utilized to improve access to skilled birth attendants, especially where deliveries are conducted, and the establishment of maternity waiting homes were instituted, where necessary¹⁷. This result was in line with the individual studies conducted in Bangladesh and other South Asian countries⁷¹⁻⁷⁴. In Bangladesh, the TV drama series Ujan Ganger Naiya covered delivery health-related issues such as disseminating the significance of regular antenatal visits, birth preparedness, delivery by skilled birth attendants, and essential newborn care, by entertaining audiences with stories set in rural villages⁷³. Similarly, an educational media campaign on safe motherhood initiated by the United Nations Population Fund (UNFPA) focused on information concerning labour pain symptoms, and where and who will be best in delivering a baby were disseminated through media in South Asian countries⁷²⁻⁷⁴. Also, another TV programme such as

Ujan Ganger Naiya was shown to promote social action by generating a spirit of connectedness and reciprocity, not only to women of reproductive age but within families and local communities in South Asian countries⁷²⁻⁷³. Perhaps this could explain the positive impact of exposure to media has on women's attitude and perception towards place of delivery^{71,75}. Also, in patriarchal societies, women do not have the autonomy to make health decisions for themselves, as such decision-making comes from their spouses, of authority and control from the mother-in-law^{58,76}. Spouses' mothers have compelled their sons' wives to undergo home delivery as part of the demands of traditional rituals; hence, this has prevented women from making the right decision about place of delivery. Media campaigns can sensitize women on the advantages of the place of delivery, especially if confronted with obstetrical problems⁷⁷⁻⁷⁹.

Among the selected co-variables, age of respondents, woman's education, wealth index, marital status, whether employed, racial group, parity and whether covered by NHIS were significantly associated with urban and non-urban women who had a home delivery. This study's findings revealed that a majority of non-urban women were more likely to have home births than urban women. This is evident, as inequalities and numerous barriers to health care still persist in non-urban areas, as these limitations have barred non-urban women from accessing and obtaining the adequate and appropriate health care they needed. Women with increasing educational accomplishments had higher odds to influence the choice of place of delivery than those with no education. A possible explanation could be that advancement in education level may perhaps increase women's exposure to adequate and appropriate health information and knowledge as well as an increased income. Conversely, studies based on population surveys in Tanzania⁷⁶, Ghana³³, Nigeria⁸⁰, Zimbabwe⁵⁸, and Ethiopia⁸¹ have reported related findings that women's education plays a vital role in their decision-making power and financial affluence that impact their inclinations for place of delivery, as educated women are more likely to be responsive of the importance of consistent antenatal check-ups and increased ANC visits. However, results from a study conducted by Rahman et al.⁷² was in contrast with this study's findings, as non-educated women

had a higher level of delivery in a facility than educated women, possible due to various incentives offered to this group of women by various non-governmental organizations (NGOs) and similar institutions in countries such as in Bangladesh, Pakistan and Nepal⁷².

Women who are wealthier are more likely to make an appropriate choice of place of delivery than their poor counterparts^{21,24}. This finding has also been presented in other studies¹⁻². This finding proves the continual inability of poor women to have access to optimum maternal healthcare as they cannot afford it, and this invariably determines the number of times that they might be able to attend ANC for any pregnancy. The results from the bivariate and multivariate analyses of this study showed that wealth index was significantly associated with the home birth as choice of place of delivery among women in rich wealth index. However, several studies have proven that in recent times wealthier women are now opting for home birth owing to factors related to birthing environment preferences, intrinsic motivations, and/or avoidance of conventional medicine^{82,83} as well as comfortability and safety in a familiar environment, with trusted professionals and close 'significant others' (family, friends etc.)^{2,83}. On the other hand, the financial status of the poor could be the cause of the disparity in the choice of place of delivery, as poor women might have financial challenges in meeting the demands of health facilities. In addition, few studies have associated women with poor wealth index as a predictor for home delivery, and several studies have consistently shown that high cost is an important constraint to service utilization, particularly for poor women^{1,79}. Employed women were more likely to influence their preference for place of delivery than unemployed women. Other studies have additionally implicated employed women as having higher odds of influencing their choice of place of delivery⁵⁹⁻⁶⁰. Generally, racial disparity associated with choice of place of delivery could be attributable to the inequitable differences in accessing health services, media and information, place of residence, economic status, social and cultural attributes, and most importantly, the living conditions with unequal variations of infrastructural facilities, as seen in South Africa^{12,16}. Thus, the reliability of this finding is certain by its consistency with previous studies conducted in

countries such as in the United Kingdom⁸⁴, in remote Thai-Myanmar border areas⁸⁵ and in other African countries such as Nigeria⁸⁶ and Ghana⁸⁷.

Presently unmarried (cohabitating) women were more likely to have a home delivery as compared to married women. This is similar to studies conducted in Nigeria, which found that unmarried women have autonomy to take a decision regarding their birth preparedness and place of delivery^{24,86}. Similar findings have been reported in prior studies done in Western, Eastern, and Southern African countries such as Zimbabwe⁵⁸, Lesotho⁸⁸, Rwanda⁵⁹, Zambia¹⁸, Nigeria²⁴, and Ghana⁵⁰. Another possible explanation could be that cohabiting or divorced/separated women have fewer economic resources that will cover for health delivery visits where they may have health information on the danger signs of obstetric complications associated with childbirth and the place of delivery. Overwhelming findings from a few studies have shown that women in cohabitation unions are faced with low social acceptance of an unmarried status in that there is still stigmatism surrounding illegitimate births in many African countries. Thus, unmarried women may be intrinsically different from married women, and who may be less empowered, self-isolated, or lack motivation to access the health service^{14,19}. These factors might increase the odds of home delivery among women who are in a cohabitation union. The other most significant factors associated with home delivery in this study's findings was women with higher parity (number of children). The likelihood of home delivery was increased by 26% and 54% of women with higher parity to influence their choice of place of delivery. This finding was in line with previous studies conducted in Ethiopia³⁶ and in Nigeria⁸⁰. Other studies have documented uneventful childbirths that have occurred with choice of place of delivery, and this could explain the reasons for mothers' lowered risk perceptions of childbirth at home³²⁻³⁶. This finding could be equated as women with higher parity do make their choice of place of delivery owing to their personal history of uneventful childbirths and low risk of obstetric complications^{80,87}. Women who had a national health insurance scheme (NHIS) were less likely to opt for the influence of their choice of place of delivery, compared to their counterparts with no NHIS cover. Thus, studies have reported that NHIS is gaining ground in developing

countries and is effective in removing barriers that will increase utilization of maternal health facilities in order to reduce maternal deaths^{57,59}. The NHIS implemented in South Africa is one of the most motivated healthcare financing reforms that has been established to make available a large financial protection scheme towards attaining universal health coverage^{8,12}.

Over the recent years, the South African government has made many efforts to improve access to maternal healthcare services. A waiver of delivery fees on delivery care was introduced, followed by the introduction of the National Health Insurance Scheme (NHIS) and significant progress has been made in the improvement of maternal health and the reduction of maternal mortality in the last two decades. The NHIS allows all pregnant women under the scheme to have free access to maternal healthcare services, including antenatal care, delivery services, postnatal care, and neonatal care^{12,14}. These maternal health programmes and interventions saw an increased utilization of health facility deliveries from 86.0% in 1998⁸⁹ to 96.0% in 2016³⁸, and home deliveries decreased from 14% in 1998⁸⁹ to 4% in 2016³⁸. However, this study's findings showed the rural-urban differentials in terms of home delivery, with the prevalence of home delivery in non-urban areas being 57.4%, as compared to 42.6% in urban areas in this study's finding³⁸. Despite the seemingly low prevalence of home delivery and access to health facilities and the waiver of delivery fees^{14,19}, it is expected that women would not deliberate on the choice of having a home delivery, yet they did. What is, therefore, unclear is why women still deliver at home in the midst of the provision and easy access to the usage of a health facility for free in South Africa. It is therefore, important to understand the factors associated with the choice of place of delivery among women in South Africa, and provide interventions aimed at reducing the risk for opting for home delivery.

Strengths and limitation

The strength of the study lies in the relatively large sample size that gave the study the statistical power to run rigorous analyses. The sampling employed also makes the data collected nationally representative and, for that matter, findings from such a study can also be generalizable to similar

populations in South Africa or in other African countries. However, some potential limitations inherent within the study are captured. First, the use of the DHS large dataset for analysis: by nature of being a cross-sectional survey, the study cannot establish causal relationship between variables, but only association; hence more research is needed to confirm and explore this topic. Second, there is perhaps the possibility of social desirability inherent with self-reporting, and recall bias, from the respondents. Third, this study was limited by its exclusive use of quantitative methods, which work to determine the predicting factors associated with home birth among women of reproductive age in South Africa. As such, a corresponding study using a qualitative methodology for a more narrative overview of the findings might be useful to explore the research question in greater depth. Other limitations could be errors associated with data extraction, and curation and coding of procedures in charts and tables⁹⁰⁻⁹³; however, coding and data extraction did not go through much substantial change.

Ethical approval and consent to participate

Ethical review and approval for procedures and questionnaires for standard DHS surveys are provided by the ICF Institutional Review Board (IRB). Country-specific DHS survey protocols are reviewed by the ICF IRB and typically by an IRB in the host country. Also, all human subjects gave their informed consent for inclusion before they participated in the study. Procedures and questionnaires for standard DHS surveys have been reviewed and approved by the ICF International Institutional Review Board (IRB). We obtained approval to use the 2016 SADHS from the DHS repository (<https://dhsprogram.com/data/available-datasets.cfm>). The study was conducted in accordance with the Declaration of Helsinki, as well as with the relevant ethical guidelines and regulations. The protocol was approved by the Ethics Committee of the host country of the DHS Programme/ICF (Project identification code: 2016 SADHS).

Conclusion and recommendations

Over the years, the South African government has made great efforts to offer free maternal health

services, by targeting women of reproductive age (15-49 years) in the country. However, a significant number of women still give birth at home. This study has shown that women's educational status, wealth index, parity, place of residence, employment status, access to media communication, ANC visits, and whether the respondent is covered by NHIS all have significant influence on women's use of home birth services. Based on the data and findings, the authors provide the following three recommendations. First, education and awareness programmes should be designed to emphasize the importance of delivering at health facilities and the risks associated with delivering at home or outside of institutional health facilities. Second, innovative interventions targeting women with the specific indicators listed above are needed to increase the use of health facilities for childbirth and hence reduce maternal and neonatal mortalities in South Africa. Third, there is the need for government and non-governmental organizations to integrate the cost of birth services into the free maternal health care policy by encouraging more ANC visits, economic empowerment of women, encouraging girl child education, strengthening the NHIS to cover some of the hidden costs, and education in general on the need to deliver at health facilities, especially among those who are traditionalist since they might hold certain cultural values and beliefs. Fourth, maternal health services at all levels of health facilities, including dispensaries and health centers, should be improved and be friendly to users. This will motivate women, particularly those of low socioeconomic status, to utilize health facilities for delivery. Thus, findings from this study may be useful in informing policy-makers and public health experts in the area so as to improve maternal health outcomes by improving the utilization of health facilities by women during labour and delivery.

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Authors' contributions

MEA conceptualized the study, developed the design section and drafted the first manuscript, data extraction, data analysis, drafted the final manuscript and led the process of critical revision of the manuscript. MEA and ESI read and approved the final manuscript. The authors read and consented for the manuscript to be submitted for peer review.

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Availability of data and materials

All the data for this study are openly available at <https://dhsprogram.com/data/available-datasets.cfm>.

Consent for publication

Not applicable

Competing interests

The authors declare no conflicts of interest.

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