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Individual and community level factors influencing modern contraceptive use among women of reproductive age in South Africa: a multilevel analysis

Kutlwano Kimberly Sifora¹, Nicole De Wet-Billings¹, Sasha Frade-Bekker¹ and Million Phiri^{1,2*}

Abstract

Background Contraceptive use is a major global public health priority, contributing to improved maternal and child health, gender equality, and sustainable development. Despite advancements, women with sensory disabilities in low- and middle-income countries continue to face challenges in accessing modern contraceptives, leading to low utilisation. Despite this, no research has examined the influence of sensory disability status on modern contraceptive use among women of reproductive age in South Africa. Thus, this study explored the association between sensory disability status and other individual and community-level factors and modern contraceptive utilisation in South Africa.

Methods Data were drawn from the 2016 South Africa Demographic and Health Survey (SADHS). A sample of 7,040 sexually active women aged 15–49 years was used in the analysis. A two-level multilevel binary logistic regression model was used to examine the association between sensory disability status and other individual and community-level factors and modern contraceptive use.

Results The prevalence of modern contraception among sexually active women in South Africa was 57.32% [95% CI = 55.59–59.03]. Women with sensory disabilities [aOR = 0.81, CI = 0.67–0.98] were less likely to use contraceptives. Other factors negatively associated with use included desiring five or more children [aOR = 0.67, 95% CI = 0.47–0.97] and living in communities with a high ideal number of children [aOR = 0.75, 95% CI = 0.63–0.90]. Factors positively associated with contraceptive use included mobile phone ownership [aOR = 1.45, 95% CI = 1.15–1.82] and living in communities with high employment [aOR = 1.32, 95% CI = 1.06–1.64].

Conclusion Sensory disability status influenced women's contraceptive behaviour in South Africa. Current family planning interventions should target women with sensory disabilities by prioritising accessible communication methods (e.g., braille, sign language), disability awareness training for healthcare workers, and integration of reproductive health services into disability support programmes.

Keywords Women, Sensory disability, Modern contraception, Multilevel analysis, South Africa

*Correspondence:
Million Phiri
millsphiri@gmail.com

Full list of author information is available at the end of the article



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Introduction

Contraceptive use has been a key public health focus globally, with increasing access to family planning services contributing to fostering gender equality, enhancing maternal and child health, and advancing sustainable development [1, 2]. However, despite progress, millions of women, particularly in low- and middle-income countries, still experience barriers to accessing modern contraceptives [3]. This results in low utilisation, leaving an estimated 218 million women with unmet contraceptive needs [4, 5]. This low utilisation stems from factors such as lack of access to contraceptive services, lack of knowledge, cultural or religious opposition, and concerns about side effects [6–10]. Addressing this gap requires attention to ensure that all women, especially those living in developing countries have equitable access to reproductive health services.

People with disabilities often face significant challenges in accessing reproductive health services, including contraception. These challenges may include physical barriers, such as inaccessible clinics, as well as attitudinal and systemic issues, such as health provider bias, limited provider training, and the assumption that people with disabilities are not sexually active [11–14]. Sensory disability is the impairment of sensory functions like hearing, sight, taste, touch, smell, and spatial awareness [15]. Women with sensory disabilities encounter particularly significant barriers in accessing reproductive health services, including contraceptive methods [16]. This is largely due to communication barriers, a lack of accessible information, and inadequate healthcare provider training to address their specific needs [17–20]. While global initiatives have focused on increasing access for the general population of women of reproductive ages, women with sensory disabilities are often left behind [21]. In 2022, the prevalence of disability among people aged 5 or older in South Africa was 6.0%, with women (7.0%) being more affected than men (4.9%) [22]. Additionally, 6,386,536 (11.6%) of individuals aged 5 years and older reported using visual aids and 631,914 (1.1%) used hearing aids. While these figures are not disaggregated by sex, they highlight the significant presence of sensory disability within the population [22]. Despite evidence that women with sensory disabilities encounter difficulties accessing reproductive health care services, there is no research that examines the influence of sensory disability status on modern contraceptive use among women of reproductive age in South Africa [23–26]. Examining both sensory disability status and sociodemographic factors is essential when studying modern contraceptive use, as individuals with disabilities often face unique barriers to accessing reproductive health services, including communication challenges and stigma. Sociodemographic factors such as age, education, income, marital status, and location

significantly influence access to information, healthcare services, and individual choices [27–30].

This study is framed on the theoretical understanding of the Social Model of Disability, which shifts focus from individual impairments to societal barriers that limit access to services for people with disabilities [31]. This model defines disability not as a medical condition but as a result of social exclusion, inaccessible systems, and structural inequalities that disadvantage individuals with impairments [31–33]. This study views modern contraceptive use as both a personal health behaviour and an outcome shaped by interactions between women with sensory disabilities and their environments. Barriers like inaccessible health facilities, communication issues, and social stigma can hinder access to family planning services for these women [11, 14, 18, 23]. For example, women with sensory disabilities living in communities which lack accessible health information (e.g., braille or sign language) may be less likely to use contraceptives than those in communities prioritising inclusive health services.

The findings of this study are critical for understanding the utilisation of contraceptives by women with sensory disabilities. This knowledge will help fill significant gaps in existing literature. It can inform the development of more inclusive policies and programmes that better address the reproductive health needs of women with sensory disabilities. The study's findings could contribute to reducing the unmet contraceptive needs among women with sensory disabilities, improving their overall health outcomes, and promoting gender equality and reproductive rights.

To improve the planning and design of family planning interventions that cater to women with sensory disabilities in the country, it is important to understand their usage of contraceptives. Therefore, this research offers insights into understanding how sensory disability status and other sociodemographic factors influence modern contraception uptake among sexually active women in South Africa. To achieve this, we used data from the most recent SADHS to examine factors at individual and contextual level. It is important to understand community-level characteristics that influence contraceptive use decision behaviour, because people from the same group or community are more likely to share common traits than people from different communities. To understand the influence of contextual variables, multilevel analysis models were applied in this study.

Methods and data

Data source

This study utilised the latest standardised data from the Demographic Health Survey (DHS) conducted in South Africa in 2016. The DHS is a national survey conducted

in over 90 countries to collect crucial health indicators among individuals aged 15–49 [34]. Data for this research were sourced from the recode files for women and households, which are publicly accessible upon request. The women recode file contains information on maternal health, sexuality, and reproductive health [35]. The SADHS included a specific questionnaire for women aged 15–49. The questionnaire covered various topics such as demographic details (like age, education, and media exposure), knowledge and use of contraceptives, as well as marriage and sexual activity [36]. The questionnaires were prepared in English and then translated into South Africa's 10 other official languages for comprehensive data collection [36]. The DHS employs a two-stage sampling process: primary survey units are first selected, followed by the random selection of households from clusters. For this analysis, a sample of 7,040 sexually active women (women with and those without sensory disabilities formed the analysis) aged 15–49 years who had complete cases on all the variables of interest were included in the study. The intention of this study was to assess whether the sensory disability status of women, which is being measured as (1 = women without sensory disability and 2 = women with sensory disability), influences modern contraceptive use among women of reproductive age in South Africa. Furthermore, the study aimed at examining whether there is a difference in utilisation of modern contraceptive use among these two groups. The selection criteria for the analytical sample size are described in Fig. 1.

Study measurements

Outcome variable

The outcome variable for this study is current modern contraceptive use. All sexually active women in the DHS were asked the question, “Are you currently using any contraceptive method to prevent a pregnancy?”. The variable in the DHS was classified using four response categories: (i) using a modern method, (ii) using the traditional method (iii) non-user – intends to use later (iv) does not intend to use. The description of the specific contraceptive methods has been described elsewhere [37]. This analysis excluded women who were not sexually active or pregnant or declared infecund at the time of the survey. A binary outcome was then created from the initial variable, with the classification “0” representing not using modern contraception and “1” representing women using any modern contraception method.

Independent variables

The independent variables analysed in this study were selected based on their relevance in influencing maternal health care utilisation as reported in previous studies [38–41]. The main independent variable for the study

is sensory disability status derived from two variables: “difficulty hearing” and “difficulty seeing.” Each of these variables originally comprised five response options. For “difficulty hearing,” the choices included no difficulty hearing (1), some difficulty (2), a lot of difficulty (3), cannot hear at all (4), and don't know (8). Similarly, for “difficulty seeing,” the response options were no difficulty seeing (1), some difficulty (2), a lot of difficulty (3), cannot see at all (4), and don't know (8). To simplify the analysis, these ten responses were consolidated into two categories. The first category, labelled “No Sensory Disability” (coded as 1), was formed by combining responses indicating no difficulty hearing, no difficulty seeing, and those who responded with “don't know.” The second category, labelled “Have Sensory Disability” (coded as 2), was created by grouping responses of some difficulty, a lot of difficulty, and cannot hear or see at all for each respective variable. This was done due to insufficient cases in other categories. Women with disabilities continue to face barriers to accessing and using maternal health and related reproductive health services. Based on existing literature [42–46], the other explanatory variables selected for analysis include; the age of a woman, education level, wealth status, residence, employment status, living children, marital status, visited health facility in the last 12 months before the survey, exposure to family planning messages, woman's decision-making autonomy, ownership of mobile phone, and ideal number of children. These variables were categorised at individual or community levels.

Individual-level factors

Individual-level factors included age categorised as (15–24, 25–34 and 35–49); education level (none, primary, secondary and tertiary); marital status (never married, married, formally married); wealth status (poor, middle, rich); employment status (working, not working); living children (zero, one, two – three, four or more); ideal number of children (zero, one – two, three – four, five or more). Other individual variables included woman's decision-making autonomy (yes/no); ownership of mobile phone (yes/no); visited health facility in the last 12 months before the survey (yes/no); exposure to mass-media FP messages (no, yes); and sensory disability status (yes/no).

Community-level factors

The aggregation of sociodemographic characteristics, access and behaviour-related factors from the individual level to the community level was done to study variables at the community level. These variables were chosen based on their significance in previous studies [47, 48]. The primary sampling unit (i.e., cluster) of the SADHS survey was defined as a community. The proportion of women in the cluster was determined by their place

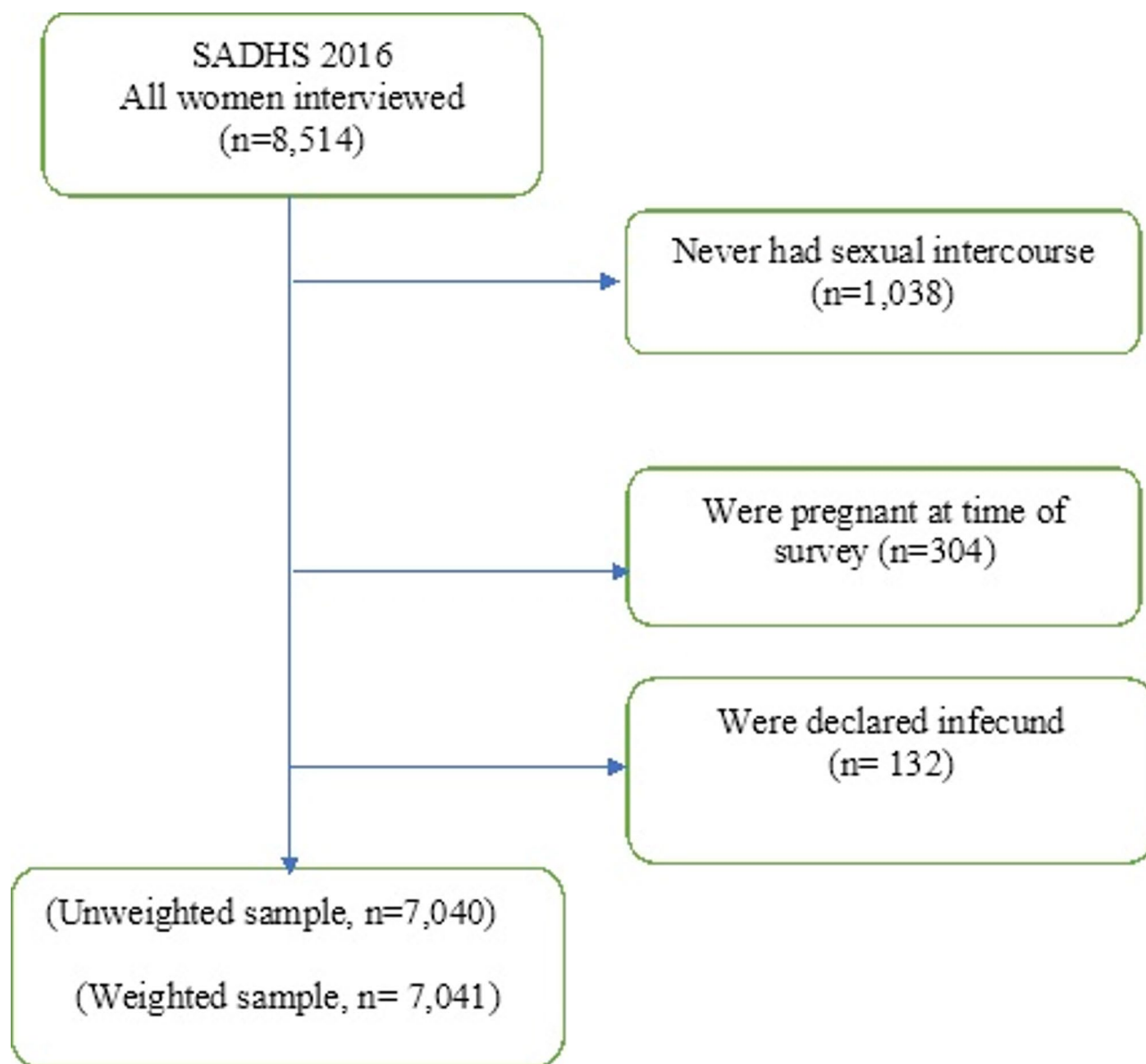


Fig. 1 Description of sample size derivation

of residence, community wealth, women's education, employment status, ideal number of children, women's decision-making autonomy and access to FP messages. Percentiles were categorised into three levels for simple interpretation (low, moderate, and high). Community-level variables were categorised as place of residence (rural, urban); community wealth (low, moderate, high); community education (low, moderate, high); community employment status (low, moderate, high); community ideal number of children (low, moderate, high); community woman autonomy (low, moderate, high); and community access to FP messages (low, moderate, high).

Statistical analysis

Statistical analysis was done at three levels: descriptive, bivariate and multi-level logistic regression. Stata version 17 software was used to perform all statistical analyses. At the descriptive level, proportional distributions of outcome indicators were determined. At the bivariate level, we used cross-tabulations and chi-square tests to examine the associations between modern contraception use and specific independent variables.

A two-level multi-level binary logistic regression model was applied to the DHS dataset to examine the effects of several individual and community-level factors on modern contraceptive use in South Africa. The DHS's definition of post-stratification weights and survey design were

Table 1 Percent distribution of background characteristics of sexually active women (15–49 years), 2016 DHS, South Africa

Background characteristics	DHS 2016 (N = 7,041)	
	Number	Percent
Age		
15–24	1769	25.1
25–34	2551	36.2
35–49	2720	38.6
Residence		
Urban	4750	67.5
Rural	2291	32.5
Educational level		
None	150	2.1
Primary	633	9.0
Secondary	5361	76.1
Higher	897	12.7
Marital status		
Never married	3803	54.0
Married	2789	39.6
Formally married	449	6.4
Wealth status		
Poor	2797	39.7
Middle	1523	21.6
Rich	2720	38.6
Employment status		
Not working	4322	61.4
Working	2719	38.6
Living children		
Zero	1274	18.1
One	2014	28.6
Two – Three	3002	42.6
Four or more	750	10.7
Visited health facility in the last 12 months		
No	2123	30.2
Yes	4917	69.8
Woman's decision-making autonomy		
No	4610	65.5
Yes	2431	34.5
Ideal number of children		
Zero	448	6.4
One – Two	3179	45.2
Three – Four	2883	41.0
Five or more	530	7.5
Sensory disability status		
No sensory disability	6267	89.0
Have sensory disability	773	11.0
Ownership of mobile phone		
No	473	6.7
Yes	6568	93.3
Exposure to FP Messages		
No	3155	44.8
Yes	3886	55.2

taken into account in the analysis. The “melogit” command was used in Stata software to perform a two-level multilevel analysis where the cluster was taken as a second-level unit. The DHS cluster or the primary sampling unit (PSU) was taken to represent a community in the analysis [49, 50]. As a result, members of the same group are more likely to exhibit similar behaviours [51], such as contraceptive use. Other studies have also used multilevel modelling to evaluate how much variance in the outcome variable (which in this case is modern contraceptive use), is explained by factors at each analysis level [52]. Results were presented using adjusted odds ratios (aOR) and their related 95% CI. Four logistic models with many levels were estimated. The outcome variable was the only variable in Model 0. Individual-level factors were included in Model 1, community-level variables were solely included in Model 2, and both individual and community-level variables were included in Model 3.

All significantly associated factors from the bivariate analyses were included in the multilevel analysis. Also, all covariates were included in the multilevel analyses regardless of their significance levels at bivariate analysis. To explain the heterogeneity in the probabilities of modern contraceptive use, the Proportional Change in Variance (PCV) was computed for each model compared to the empty model [49, 51, 52]. The PCV provided information on the share of variance at each level. The goodness of fit of the models was evaluated using the log-likelihood and a model with a lower log-likelihood was considered to be a better fit for the data. To assess multicollinearity among independent factors, the variance inflation factor (VIFs) was used. There were no concerns with multicollinearity in any of the variables (all VIF < 5) (Supplementary Table 1).

Ethics

The data analysed in this study is available in the public domain at (<https://dhsprogram.com/>) Permission to the data was obtained from the DHS program. All data used did not contain any identifying information. The original South Africa DHS 2016 Biomarker and survey protocols were approved by the South African Medical Research Council (SAMRC) Ethics Committee and the ICF Institutional Review Board.

Results

Description of sample characteristics

The findings regarding the background characteristics of the study sample are summarised in Table 1. More than one-third (36.2%, n = 2551) of the study sample were within 25–34 years, while one-fourth were within 15–24 years old (25.1%, n = 1769). Slightly more than two-thirds (67.5%, n = 4750) of the sampled women were living in urban areas. Most (76.1%, n = 5361) of the study

respondents in the sample had secondary school education, while 12% ($n=12.7$) had attained tertiary-level education. The majority (54.0%, $n=3803$) of the respondents were never married and about a third (39.6%, $n=2789$) were married or living with a partner. About 39% ($n=2720$) and 40% ($n=2797$) of them were from rich and poor households, respectively. The study sample was also made up of most (61.4%, $n=4322$) women who were not in employment. The largest proportion (42.6%, $n=3002$) of the sampled women had two to three children at the time of the survey. A majority (69.8%, $n=4917$) visited a health facility within the past 12 months before the survey. Most women (65.5%, $n=4610$) had no decision-making autonomy. Regarding the ideal number of children, 45% ($n=3179$) wanted one or two children, and 41% ($n=2883$) wanted three or four children. The majority of women did not have a sensory disability (89.0%, $n=6267$), and most owned a mobile phone (93.3%, $n=6568$). Over half (55.2%, $n=3886$) were exposed to mass-media family planning messages.

Prevalence of modern contraceptive use among sexually active women

Table 2 shows the distribution of results of modern contraceptive use across distinct individual and household level factors. With regards to the individual-level factors, the highest prevalence of modern contraceptive use was found among women aged 25–34 (63.4%), married women (58.9%), those who owned a mobile phone (57.8%), women with two to three children (62.2%), those with secondary and higher levels of education (57.9% and 62.0%, respectively), those who visited a health facility (62.6%), desired one – two children (60.7%) and three – four children (56.5%) and women who had decision-making power at household level (59.6%). Furthermore, women who had no sensory disability had higher rates (58.1%) of modern contraceptive use. The chi-square test of independence results revealed that apart from residence, wealth status, employment status, and exposure to media FP messages, all the independent correlates were statistically associated with modern contraceptive usage among women.

Determinants of modern contraceptive use among sexually active women

The study found statistically significant associations between individual and community-level factors and modern contraceptive use. Specifically, formally married women had lower odds of using modern contraception [$aOR=0.67$, 95% $CI=0.49–0.90$], compared with those who were never married. Women with higher education [$aOR=1.96$, 95% $CI=1.22–3.15$] were more likely to use modern contraceptives compared to those with no education. Women with 1 child [$aOR=1.79$,

95% $CI=1.43–2.25$] or 2–3 children [$aOR=3.26$, 95% $CI=2.55–4.17$] or 4+ children [$aOR=3.96$, 95% $CI=2.87–5.45$] had a higher likelihood of using modern contraceptives compared to those with no child. Women who desired five or more children were less likely to use contraceptives than those who wanted no children at all [$aOR=0.67$, $CI=0.47–0.97$]. Women who owned a mobile phone [$aOR=1.45$, $CI=1.15–1.82$] or had visited a health facility [$aOR=1.81$, $CI=1.58–2.08$] had higher odds of using modern contraceptive methods. On the other hand, women aged 25–34 years [$aOR=0.63$, $CI=0.52–0.77$], and 35–49 years [$aOR=0.29$, $CI=0.23–0.38$] or those with sensory disabilities [$aOR=0.81$, $CI=0.67–0.98$] were less likely to use modern contraceptive methods (Table 3).

Community-level determinants of modern contraceptive use among sexually active women

Regarding the influence of the community-level factors on modern contraceptive use, women from communities that had high employment [$aOR=1.32$, 95% $CI=1.06–1.64$] were more likely to use modern contraception. However, women living in communities where the ideal number of children was high [$aOR=0.75$, 95% $CI=0.63–0.90$] were less likely to use modern contraceptive methods. Although not statistically significant, women residing in communities with a high proportion of women who had decision-making autonomy [$aOR=1.03$, 95% $CI=0.85–1.25$] or communities with high access to FP messages [$aOR=1.06$, 95% $CI=0.86–1.30$] were more likely to use modern contraceptives. Conversely, communities with a high percentage of women residing in rural areas [$aOR=0.97$, 95% $CI=0.81–1.16$] were less likely to use modern contraceptives.

Table 3 also presents adjusted random effects for modelling modern contraceptive utilisation using a two-level multilevel analysis. The effects of individual and community variables on modern contraceptive use were determined using four models. In the null model, the clustering of the primary sampling units (PSUs) accounted for substantial variations in the odds of using modern contraceptives ($\sigma^2=0.26$, 95% $CI=0.18–0.36$). Model 0 showed that 7.3% of the total variation in the use of modern contraceptives was attributed to the variance within clusters ($ICC=0.073$). The within-cluster variance showed a decrease from 7.3 to 7.1% from Model 0 to Model 1 (individual-level factors only). From Model I, the ICC further reduced to 5.0% in Model II (model with community-level factors only) and increased to 6.6% in the full model (Model III), where all the individual correlates and community-level factors were considered. This indicates that differences within the clustering of the communities (primary sampling units) accounted for the modern contraceptive use variations among sexually

Table 2 Percent distribution of modern contraceptive use among sexually active women (15–49 years) by background characteristics, 2016 DHS, South Africa

Background characteristics	DHS 2016 (N= 7,041)		p-value
	Using modern contraception N (%)	Not using modern contraception N (%)	
Age			0.000***
15–24	1100 (62.2)	669 (37.8)	
25–34	1618 (63.4)	933 (36.6)	
35–49	1317 (48.4)	1403 (51.6)	
Residence			0.818^{ns}
Urban	2729 (57.5)	2021 (42.6)	
Rural	1307 (57.1)	984 (43.0)	
Educational level			0.000***
None	59 (39.2)	91 (60.8)	
Primary	316 (50.0)	317 (50.1)	
Secondary	3104 (57.9)	2256 (42.1)	
Higher	556 (62.0)	341 (38.0)	
Marital status			0.000***
Never married	2189 (57.6)	1614 (42.4)	
Married	1642 (58.9)	1146 (41.1)	
Formally married	205 (45.5)	245 (54.5)	
Wealth status			0.594^{ns}
Poor	1606 (57.4)	1191 (42.6)	
Middle	894 (58.7)	630 (41.3)	
Rich	1536 (56.5)	1184 (43.5)	
Employment status			0.493^{ns}
Not working	2495 (57.7)	1827 (42.3)	
Working	1541 (56.7)	1178 (43.3)	
Living children			0.000***
Zero	604 (47.4)	671 (52.7)	
One	1162 (57.7)	852 (42.3)	
Two – Three	1867 (62.2)	1135 (37.8)	
Four or more	402 (53.7)	347 (46.3)	
Visited health facility in the last 12 months			0.000***
No	959 (45.1)	1165 (54.9)	
Yes	3077 (62.6)	1840 (37.4)	
Woman decision-making autonomy			0.026*
No	2586 (56.1)	2023 (43.9)	
Yes	1449 (59.6)	982 (40.4)	
Ideal number of children			0.000***
Zero	236 (52.7)	212 (47.3)	
One – Two	1931 (60.7)	1249 (39.3)	
Three – Four	1630 (56.5)	1253 (43.5)	
Five or more	239 (45.1)	291 (54.9)	
Sensory disability status			0.002**
No	3639 (58.1)	2629 (41.9)	
Yes	397 (51.3)	377 (48.7)	
Ownership of mobile phone			0.006*
No	240 (50.7)	233 (49.3)	
Yes	3796 (57.8)	2772 (42.2)	
Exposure to FP Messages			0.101^{ns}
No	1761 (55.8)	1394 (44.2)	
Yes	2275 (58.5)	1611 (41.5)	
Total	4036 (57.3)	3005 (42.7)	

*** $p < 0.001$; ** = $p < 0.01$; * = $p < 0.05$; ns = non-significant

Table 3 Multilevel parameter estimates and odds of modern contraceptive use among sexually active women aged (15–49), SADHS 2016

Variables	Model 0	Model I	Model II	Model III
		aOR (95%CI)	aOR (95%CI)	aOR (95%CI)
Individual factors				
Age				
15–24		1		1
25–34		0.63*** [0.52, 0.76]		0.63*** [0.52, 0.77]
35–49		0.29*** [0.23, 0.37]		0.29*** [0.23, 0.38]
Education level				
None		1		1
Primary		1.16 [0.71, 1.90]		1.15 [0.70, 1.89]
Secondary		1.42 [0.93, 2.17]		1.43 [0.94, 2.18]
Higher		1.94** [1.20, 3.11]		1.96* [1.22, 3.15]
Marital Status				
Never Married		1		1
Married		0.84 [0.62, 1.13]		0.83 [0.61, 1.12]
Formally married		0.68* [0.50, 0.92]		0.67* [0.49, 0.90]
Wealth Status				
Poor		1		1
Middle		1.01 [0.84, 1.21]		1.00 [0.82, 1.21]
Rich		0.94 [0.79, 1.12]		0.92 [0.73, 1.16]
Employment status				
Not working		1		1
Working		1.05 [0.90, 1.21]		0.99 [0.85, 1.16]
Living children				
Zero		1		1
One		1.80*** [1.43, 2.25]		1.79*** [1.43, 2.25]
Two – Three		3.26*** [2.55, 4.16]		3.26*** [2.55, 4.17]
Four or more		3.90*** [2.84, 5.36]		3.96*** [2.87, 5.45]
Visited health facility in the last 12 months				
No		1		1
Yes		1.81*** [1.58, 2.08]		1.81*** [1.58, 2.08]
Woman decision-making autonomy				
No		1		1
Yes		1.32 [0.98, 1.79]		1.32 [0.97, 1.79]
Ideal number of children				
Zero		1		1
One – Two		1.25 [0.95, 1.63]		1.25 [0.96, 1.63]
Three – Four		0.98 [0.75, 1.29]		1.02 [0.78, 1.34]
Five or more		0.62* [0.43, 0.90]		0.67* [0.47, 0.97]
Sensory disability status				
No		1		1
Yes		0.82* [0.68, 0.99]		0.81* [0.67, 0.98]
Ownership of mobile phone				
No		1		1
Yes		1.44** [1.14, 1.81]		1.45** [1.15, 1.82]
Exposure to FP messages				
No		1		1
Yes		0.36 [0.21, 0.64]		1.02 [0.87, 1.19]
Community-level variables				
Residence				
Urban			1	1
Rural			1.01 [0.86, 1.19]	0.97 [0.81, 1.16]
Community education				

Table 3 (continued)

Variables	Model 0	Model I	Model II	Model III
		aOR (95%CI)	aOR (95%CI)	aOR (95%CI)
Low			1	1
Moderate			1.16 [0.95, 1.42]	1.09 [0.84, 1.42]
High			0.88 [0.77, 1.01]	0.90 [0.77, 1.07]
Community wealth status				
Low			1	1
Moderate			0.85 [0.70, 1.03]	0.90 [0.71, 1.12]
High			0.78* [0.64, 0.95]	0.87 [0.67, 1.13]
Community employment				
Low			1	1
Moderate			1.18* [1.03, 1.36]	1.12 [0.95, 1.32]
High			1.35*** [1.14, 1.59]	1.32* [1.06, 1.64]
Community access to FP messages				
Low			1	1
Moderate			0.98 [0.84, 1.14]	1.01 [0.84, 1.21]
High			1.06 [0.90, 1.25]	1.06 [0.86, 1.30]
Community ideal number of children				
Low			1	1
Moderate			0.95 [0.81, 1.10]	0.95 [0.79, 1.13]
High			0.77** [0.65, 0.90]	0.75** [0.63, 0.90]
Community woman decision-making autonomy				
Low			1	1
Moderate			0.97 [0.84, 1.13]	1.00 [0.84, 1.18]
High			1.06 [0.91, 1.22]	1.03 [0.85, 1.25]
Random effects				
PSU Variance (95% CI)	0.26 [0.18–0.36]	0.25 [0.17–0.37]	0.17 [0.12–0.26]	0.23 [0.16–0.34]
ICC (%)	7.3	7.1	5.0	6.6
PVC (%)	Ref	3.8	34.6	11.5
MOR	1.62	1.61	1.49	1.58
Wald chi-square	Ref	328.85***	38.57***	375.48***
Model fitness				
Log-likelihood	-4739.4	-4445.8	-4773.8	-4434.7
AIC	9482.7	8937.7	9577.7	8941.5
BIC	9496.5	9095.4	9680.6	9188.4
N	7,040	7,040	7,040	7,040

**** $p < 0.001$; ** = $p < 0.01$; * = $p < 0.05$; 1 = Reference Category; Model 0 contains no explanatory variables; Model I includes individual-level factors only; Model II includes community-level factors only; Model III includes both individual-level and community-level factors aOR adjusted odds ratio, CI confidence interval, ICC intraclass correlation coefficient, PVC Proportional variance change, AIC Akaike information criterion, BIC Bayesian Information Criterion"

active women in South Africa. Additionally, 11.5% of the variance in the odds of modern contraceptive use across communities was explained by both individual and community-level factors, as indicated by the PCV. Furthermore, the median odds ratio (MOR) reduced from 1.61 (Model I) to 1.58 (Model III), signifying that significant differences exist within communities in using modern contraceptives. This suggested that the full model still had some unexplained community variability. Model III was the model of best fit since it had the lowest log-likelihood value (Log-likelihood = -4434.7).

Discussion

The current study sought to determine the influence of individual and community-level factors on modern contraception to better understand the contraceptive use of sexually active women in South Africa. The low use of modern contraceptives among SSA women of reproductive age continues to be an issue that requires an urgent shift in health policy and programmatic actions [46, 53, 54]. Literature shows that contraceptive use levels and trends vary between countries in SSA. While modern contraceptive use has risen in some countries, other countries have seen a stagnation, and some have even experienced a decline [53–57]. Disparities in contraceptive use among women were observed among different

socio-economic, demographic strata and contextual factors.

Our study revealed that the modern contraceptive prevalence rate among sexually active women in 2016 was 57.3%. In comparison to neighbouring countries in the southern region, such as Eswatini (44.2%) [39], Zambia (45.0%) [9, 58] and Malawi (45.6%) [38], the contraceptive prevalence in South Africa was slightly higher in this study. This could be attributed to comprehensive family planning programmes and policies [59, 60], free access to contraceptives [4], and sex education in schools [61].

In this study, women with sensory disabilities were less likely to use modern contraceptives compared to their counterparts without sensory disabilities. This suggests that women with sensory disabilities, such as those with hearing or vision impairments, may face significant challenges in accessing information about modern contraceptive methods. These findings align with a study conducted in Cameroon [62], which reported that women with disabilities were more likely than their non-disabled counterparts to have never utilised any sexual and reproductive health (SRH) services, highlighting the additional challenges they face in accessing essential healthcare. This finding highlights a disparity in sexual and reproductive health services, indicating that women with sensory disabilities may not be receiving adequate care or information, which could contribute to broader health inequities.

Our study also found that sexually active women who visited the health facility in the 12 months before the survey were more likely to use modern contraceptives compared to their counterparts. This is similar to studies conducted in Ethiopia and Zambia [63, 64]. This is because, during visits to health facilities, women are more likely to receive information and counselling about modern contraceptive methods. Health facilities often have posters, pamphlets, and other educational materials that provide information on modern contraceptives. There is therefore a need for public health strategies to emphasise the importance of routine healthcare visits for women, particularly in reproductive health services.

In this study, there were differences in the proportions of women using modern contraceptives by the ideal number of children. Sexually active women with higher ideal number of children were less likely to use modern contraceptives compared to those with low ideal number of children. This suggests that fertility desire impacts on contraceptive use of women of childbearing in South Africa. The finding supports the conclusions of earlier studies conducted in Tanzania and Eswatini [39, 65] which reported the ideal number of children as a predictor of contraception use. This suggests women with higher fertility desires may intentionally avoid modern

contraceptives because they want more children. Health providers might need to offer more tailored counselling on contraception, emphasising that fertility desires can change over time. For instance, women who currently wish for more children may want to consider contraceptive options that allow for future pregnancies but provide control in the interim (e.g., short-acting methods).

Our study also found that sexually active women who owned a mobile phone were more likely to use modern contraceptives than their counterparts. This is because mobile phones provide women with access to information about reproductive health and contraceptive options. This result highlights the potential of mobile phones as a powerful tool for disseminating information about contraceptives and reproductive health. Public health programmes can leverage mobile technology to reach women directly with educational content, reminders, and counselling services, increasing awareness and informed decision-making.

The effects of community characteristics on contraceptive use among women of reproductive age have been well-documented in other sub-Saharan African countries and elsewhere [43, 66–71]. Findings from this current analysis revealed that women who belonged to communities with a high ideal number of children were less likely to utilise modern contraceptives compared with their defined counterparts. The data explicitly shows a correlation between high fertility desire and reduced modern contraceptive use at the community level. Other studies conducted in other SSA countries have produced similar findings [72–75]. Studies by Obasanjo and others conducted in Nigeria in 2021 showed that community fertility norms can be influenced by the education level of women and religious norms [70]. The explanation for this finding is that women who have a high fertility desire would want to achieve their reproductive goal by avoiding contraception use. Further, women who have a high fertility desire are expected to have a negative attitude towards contraceptive use and are therefore rarely likely to access contraceptives [43, 46, 76, 77]. This finding suggests that understanding the fertility context at the community level is crucial for informing policymakers and program designers in developing effective programmes that promote the utilisation of modern contraceptives.

This study found that women from communities with a high proportion of employed females were more likely to use modern contraceptives. This finding has been confirmed by a previous study [40]. Encouraging female employment can have a positive impact on contraceptive use and reproductive health. Policies that support women's participation in the workforce, such as access to education, childcare, and equal pay, may indirectly lead to increased contraceptive use and better family planning outcomes.

Differences in terms of how different community factors influence modern contraceptive use among sexually active women were observed, thus suggesting the need for community-targeted interventions to address the problem of low use of modern contraceptives in South Africa. The study further shows that there were community factors that either not observed or not measured, which affected contraceptive use behaviour. Therefore, the results suggest that there are community-level factors not accounted for in this analysis, which may be associated with modern contraceptive use behaviour in South Africa. These factors may include, but are not restricted to, socio-cultural differences between communities (that may ultimately influence women's contraceptive behaviour, community family planning outreach, and family planning mobilisation efforts). Therefore, there is a need to strengthen community health structures that promote family planning programmes through community profiling, and community engagement approaches involving key stakeholders like religious institutions, traditional leaders, civic leaders, and community leaders.

While the study offers valuable insights to inform the enhancement of existing sexual and reproductive health policies and programs aimed at improving contraceptive behaviour among sexually active women in South Africa, developing interventions to address the low contraceptive uptake may require a deeper understanding of the factors driving the transition in contraceptive use in the country. Thus, there is a need to conduct a detailed decomposition analysis to delineate factors explaining contraceptive use changes in South Africa. Doing so will inform the appropriate targeting of interventions aimed at scaling up the uptake of modern contraception use.

Strengths and limitations

This study had several limitations. Firstly, the SADHS data were gathered using a cross-sectional study design, which does not allow for the assessment of causal relationships between individual and community factors and the outcomes of interest. Second, since women are usually asked to report an event that happened in the past, there is therefore a possibility of recall bias. Third, the community factors measured in this study serve as proxies based on data collected by the DHS and may not accurately represent the real experiences of the communities.

Although DHS data cannot establish causal relationships, it utilises a nationally representative sample, enabling the generalisation of study findings to the entire country. This demonstrates its strength in assessing country-level outcomes that are crucial for policy implications. Since our analysis was done on a representative sample of sexually active women aged 15–49, the findings can be generalised to the broad category of women of reproductive age in South Africa. In addition, the rigour

of the DHS methodology ensures the reliability of the data and its outcomes. The results are also comparable across countries where the DHS is conducted. As such, this study contributes significantly to the body of knowledge to understand the community factors influencing teenage pregnancy in South Africa. Due to the limited availability of longitudinal data in many African countries to track changes in health indicators over time, the DHS data presents a valuable opportunity for measuring repeated measures.

Conclusion

The study has shown that women with sensory disabilities are disadvantaged in terms of utilisation of modern contraceptives in South Africa. Furthermore, educational level, visiting health facility in the last 12 months, decision-making autonomy and ownership of mobile phone were identified as individual-level factors that influenced modern contraceptive use among sexually active women. At the community level, employment status and ideal number of children were significantly associated with modern contraceptive utilisation. Therefore, the Government of South Africa through policymakers and programme implementers at the Ministry of Health in collaboration with stakeholders implementing FP interventions should integrate community FP programmes that address the maternal health needs of women with sensory disabilities. Community context such as employment opportunities and fertility desire among women should be taken into account when designing SRH interventions. Furthermore, there is a need to promote family planning education through mass media such as mobile phones. These interventions should aim at enhancing access to and uptake of contraception as an important public health strategy in addressing the agenda related to the sexual and reproductive health rights of women.

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Author contributions

KKS developed the concept for this study. KKS and MP extracted DHS data, wrote the introduction, methods and discussion section, and performed data analysis. MP wrote the conclusion. NDB and SFB supervised, performed editorial checks and reviewed the manuscript for intellectual content. All authors read and approved the final version of the manuscript.

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Data availability

The study used secondary data obtained from Demographic and Health Survey program available at <https://dhsprogram.com/Data/>.

Declarations

Ethics approval and consent to participate

In this study, secondary data sources were used. Permission to use DHS datasets was given by the DHS programme. The DHS data contain no personal identification for survey respondents. The South African Medical Research Council (SAMRC) Ethics Committee and the ICF Institutional Review Board approved the 2016 DHS Biomarker and survey protocols for South Africa. Therefore, all techniques used for gathering data were compliant with applicable guidelines and ethical standards. All participants who were enrolled in the DHS and older than 18 years had to give their informed consent during enumeration, according to DHS regulations. Furthermore, before the legal minors were asked for their consent, the parents or guardians of every participant between the ages of 15 and 17 provided informed consent.

Competing interests

The authors declare no competing interests.

Author details

¹Demography and Population Studies Programme, Schools of Public Health and Social Sciences, University of the Witwatersrand, Johannesburg, South Africa

²Department of Demography, Population Sciences and Monitoring and Evaluation, School of Humanities and Social Sciences, University of Zambia, Lusaka, Zambia

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