

RESEARCH

Open Access



Determinants of modern contraceptive utilization among married women in sub-Saharan Africa: multilevel analysis using recent demographic and health survey

Zemenu Tadesse Tesema¹, Getayeneh Antehunegn Tesema¹, Moges Muluneh Boke^{2*} and Temesgen Yihunie Akalu¹

Abstract

Background: Family planning is a low-cost, high-impact public health and development strategy to improve child and maternal health. However, there is a lack of evidence on modern contraceptive use and determinants in sub-Saharan Africa. Hence, this study aimed at determining the pooled prevalence and determinants of modern contraceptive utilization among married women of sub-Saharan Africa.

Methods: Thirty-six sub-Saharan African countries' demographic and health survey (DHS) data were used for pooled analysis. A total weighted sample of 322,525 married women was included. Cross tabulations and summary statistics were done using STATA version 14 software. The pooled prevalence of modern contraceptive utilization with a 95% Confidence Interval (CI) was reported. Multilevel regression analysis was used to identify the determinants of modern contraceptive use among married women. Four models were fitted to select the best-fitted model using the Likelihood Ratio (LLR) and Deviance test. Finally, the model with the highest LLR and the smallest deviance was selected as the best-fitted model.

Results: The pooled estimate of modern contraception use in sub-Saharan African countries was 18.36% [95% CI: 18.24, 18.48], with highest in Lesotho (59.79%) and the lowest in Chad (5.04%). The odds of modern contraception utilization were high among women living in East Africa [AOR = 1.47 (1.40, 1.54)], urban areas [AOR = 1.18 (1.14, 1.24)], and women with primary [AOR = 1.49 (1.44, 1.55)] and secondary and above educational level [AOR = 1.66 (1.58, 1.74)]. Moreover, husbands with primary educational level [AOR = 1.38 (1.33, 1.42)], middle [AOR = 1.17, (1.14, 1.21)], rich wealth status [AOR = 1.29 (1.25, 1.34)], media exposure [AOR = 1.25 (1.22, 1.29)], and postnatal care (PNC) utilization [AOR = 1.25 (1.22, 1.29)] had higher odds of modern contraceptive utilization compared with their counterparts. Furthermore, deliver at health facility [AOR = 1.74 (1.69, 1.79)] and birth order 2–4 [AOR = 1.36 (1.31, 1.41)] had higher odds of modern contraceptive utilization. On the other hand, women living in Central [AOR = 0.23 (0.22, 0.24)], Western regions [AOR = 0.46 (0.40, 0.54)], women who decided with husband [AOR = 0.90 (0.87, 0.93)], and decisions by husband alone [AOR = 0.73 (0.71, 0.75)] decreased the odds of modern contraceptive utilization.

*Correspondence: mogelove75@gmail.com

² Department of Reproductive Health, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia
Full list of author information is available at the end of the article



© The Author(s) 2022. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Conclusion: The uptake of modern contraception in sub-Saharan Africa is low. Modern contraceptive utilization is affected by different factors. More attention needs to be given to rural residents, illiterate women, and communities with low wealth status.

Keywords: Modern contraception, Family planning, Sub-Saharan, Multilevel analysis

Background

Contraception is the way to prevent pregnancy and assists couples and individuals to achieve the reproductive goals that enable them to exercise their reproductive rights, spacing of birth interval, limit the number of children, and reduces maternal and child morbidity and mortality related to complications of unwanted pregnancy [1]. In low and middle-income countries, the burden of maternal mortality ratio (MMR) is projected up to 415 maternal deaths per 100,000 live births, which is sixty times higher than the high-income countries. Sub-Saharan Africa is the leading region in MMR. One woman will die in every 37 women in Sub-Saharan Africa compared to developed countries' 1 in 7800 [2].

In most sub-Saharan countries, the total fertility rate (TFR) is declined. However, in some countries, TFR remains stagnant. Countries like Zimbabwe, Namibia, Liberia, Kenya, Togo, Senegal, Madagascar, and Ghana showed the steepest drop in total fertility. Niger, Nigeria, Mozambique, and other countries remain the same or increased [3]. Improving contraception utilization is essential to accelerate the fertility decrement rate in sub-Saharan countries [4].

Currently globally, 1.1 billion women need family planning, 851 million women use a modern method of contraception, 85 million use a traditional method, and 172 million women have an unmet need for contraception [5]. World reproductive age women (15–49) using contraception increased in the last decades, but the progress was uneven between regions. Contraceptive use in Latin and North America, Asia, and Australia range from 60 to 50%, in contrast, Northern Africa and Western Asia (35.1%), sub-Saharan Africa (34.1%), and Oceania (30.7%) had few numbers of women use contraception [6].

Evidence suggests that modern contraceptive usage among married women in sub-Saharan African countries ranges from 4 to 52% [7–9]. Socio-demographic characteristics like age, residence, education level, religion, level of income, marital status, employment, obstetric history-related variables such as parity, number of living children, number of antenatal visits, prior HIV testing, knowledge of methods, and husband involvement has been reported as determinants of contraceptive utilization [10–14].

Expanding contraception access and ensuring family planning met through using effective contraceptive methods are critical steps toward attaining many of 17

Sustainable Development Goals (SDG) and 169 targets of the 2030 agenda related to universal access to sexual and reproductive healthcare services, gender equality, maternal and child health, nutrition, and women's and girl's empowerment [15].

To improve the coverage of contraception in Sub-Saharan Africa, strengthening healthcare systems with commodity supply, integrating family planning service with other health care services, strengthening commercial outlet, increasing the knowledge of clients, encouraging male involvement, free accessing or reducing the price of contraception methods, and training health care providers on counseling and the technical procedure has been done for last two decades [16, 17]. Despite the effort to enhance the coverage of modern contraception, there is a limitation of representative primary data source that provides prevalence and determinants to contraception use in sub-Saharan Africa. According to a recent report, the data gap is the main challenge to tracking the SDG index in Africa [18]. Therefore, this study seeks to determine the pooled prevalence and determinants of modern contraceptive utilization across sub-Saharan African countries.

Method

Data source

The most recent (from 2006 to 2018) Demographic and Health Surveys (DHS) data were used in the following 36 sub-Saharan African countries (Table 1). These datasets were used to determine the pooled prevalence and determinants of modern contraception use across countries in sub-Saharan Africa. The DHS is a national survey that collects information on basic demographic and health indicators such as family planning service use, mortality, morbidity, and mother and child health and fertility. The information came from the DHS measure program. Men, women, children, birth, and household datasets are included in each country's survey; the IR file was employed for this study. Women's data set was used to extract both dependent and independent variables. A two-stage stratified selection procedure was done to select study participants. The study contained a total weighted sample of 322,525 married women from 36 DHS surveys conducted in sub-Saharan African nations in the five years before the survey.

Table 1 Pooled Demographic and Health Surveys (DHS) data from 36 sub-Saharan countries, 2006–2018

Country	DHS year	Sample size (322,525)
Southern Region of Africa		16,071
Lesotho	2014	3612
Namibia	2013	3120
Swaziland	2006/07	6289
South Africa	2016	3049
Central Region of Africa		55,588
Angola	2015/16	7956
DR Congo	2013/14	12,095
Congo	2011/12	6289
Cameroon	2011	9791
Gabon	2012	4474
Sao Tome & Principe	2008/09	1718
Chad	2014/15	13,262
Eastern region of Africa		119,530
Burundi	2010	9781
Ethiopia	2016	10,223
Kenya	2014	18,549
Comoros	2012	3261
Madagascar	2008/09	12,038
Malawi	2015/16	16,130
Mozambique	2011	9331
Rwanda	2014/15	6981
Tanzania	2015/16	8210
Uganda	2011	11,223
Zambia	2018	7648
Zimbabwe	2013/14	6151
Western Region of Africa		131,334
Burkina-Faso	2010	13,563
Benin	2017	11,168
Cote d'Ivoire	2011	6308
Ghana	2014	5321
Gambia	2013	6791
Guinea	2018	7727
Liberia	2013	5385
Mali	2018	8567
Nigeria	2018	29,089
Niger	2012	9880
Sierra Leone	2010/11	10,902
Senegal	2010/11	10,346
Togo	2013/14	6281

Measurements of variables

Outcome variable

The outcome variable for this study was whether a mother used modern contraceptives or not. The outcome of this study was binary (modern contraceptive

use versus non-modern contraceptive). We coded "1" if women utilized modern contraceptives and "0" otherwise.

Explanatory variables

Based on known facts and literatures the explanatory variables included in this study were Region, residence, age group, literacy level, maternal education, husband education, maternal occupational status, women's autonomy on health care, wealth index, media exposure, accessing health care, PNC utilization, place of delivery and birth order [19–22].

Data management and analysis

We integrated data from 36 nations in Sub-Saharan Africa after extracting variables based on literature. Before conducting the statistical analysis, the data was weighted to keep the representativeness of the survey and to get more reliable estimates. STATA version 14 was used to perform cross-tabulations and summary statistics. Moreover, the pooled prevalence of modern contraceptive utilization with a corresponding 95% confidence interval (CI) was reported.

Statistical modeling

The demographic and health survey data has a hierarchical structure for the factors, which violates the usual logistic regression model's assumption; independence of observations and equal variance. Besides, women within a single cluster are expected to be more similar than other clusters in the country. Hence, using multilevel analysis is recommended to take into account the between cluster variability. To address this objective four separate models were fitted. These include the null model, model I (community-level variables), model II (individual-level variable), and Model III (models that include both individual and community level variables) were fitted. The most parsimonious model was selected using LLR and Deviance test. The highest LLR and the lowest deviance was the best-fitted model. Finally, model III, which included both individual and community level variables, were selected (Table XXX3).

Results

A total of 322,525 married women five years preceding the survey in 36 sub-Saharan African countries were included in this study. Of these, the largest study participants 131,334 (40.72%) were from Western Africa Region and the smallest study participants 16,071 (4.98%) were from the Southern Regions of Africa. The majority of study participants 212,360 (65.84%) were rural residents. The median age of women included in his study was 28.8 (IQR = 7.2) years of which 129,302 (40.09%) of them were aged 25–34. Thirty-seven percent of women

and thirty-nine percent of men had no formal education. More than one-third of women 127,562 (39.55%) were within the poor wealth status (Table 2).

The pooled prevalence of modern contraceptive utilization

The pooled prevalence of modern contraceptive utilization in sub-Saharan Africa countries was 18.36% [95% CI: 18.24, 18.48], with the highest modern contraceptive utilization in the Southern Region of Africa (38.43%) and the low modern contraceptive utilization in Central Regions of Africa (9.46%). The sub-group analysis result evidenced that in the Southern regions of Africa highest modern contraceptive utilization (59.79%) was recorded in Lesotho and the low modern contraceptive utilization (19.99%) was recorded in Swaziland. In the Central Regions of Africa highest modern contraceptive utilization (33.68%) was recorded in Sao Tome and Principe and the low modern contraceptive utilization (5.04%) was recorded in Chad. In Eastern regions of Africa highest modern contraceptive utilization (65.77%) was recorded in Zimbabwe and the low modern contraceptive utilization (11.34%) was from Mozambique. In the Western Regions of Africa, the highest modern contraceptive utilization (22.19%) was from Ghana and the low contraceptive utilization (8%) was from Gambia (Fig. 1).

Determinants of modern contraceptive utilization

Random effect analysis

The results of the random-effects model indicated that there was significant clustering of modern contraceptive utilization across the communities (OR of community-level variance = 0.03, 95% CI = 0.024–0.038). The intra-class correlation (ICC) in the null model indicated that 5.13% of the overall variability of modern contraceptive utilization was attributed to cluster variability.

The median odds ratio (MOR) for modern contraceptive utilization was 1.49 in the null model, which indicates that there was a variation in modern contraceptive utilization between clusters. This means if we randomly select women from different clusters, women at the cluster with higher modern contraceptive utilization had 1.49 times higher odds of modern contraceptive utilization as compared with those women at clusters with lower modern contraceptive use.

The Proportional Change in Variance (PCV) also increases from 80% from model II to 83% in model III (a model with individual and community level variables), which indicates the last model (model III) best explains the variability of modern contraceptive utilization (Table 3).

In the multilevel multivariable logistic regression model; Sub-Sahara Africa region, residence, maternal education, husband education, women health care

decision autonomy, wealth index, media exposure, PNC utilization, place of delivery, and birth order were identified as determinants to modern contraceptive utilization.

Women living in Central, and Western Regions of Africa decreased the odds of modern contraceptive utilization by 77%, and 54% as compared to women living in South Regions of Africa (AOR = 0.23, 95% CI: 0.22, 0.24), and (AOR = 0.46, 95% CI: 0.40, 0.54), respectively. The odds of modern contraceptives were increased by 47% among women living in East Africa as compared to women living in South Africa (AOR = 1.47, 95% CI: 1.40, 1.54). The odds of modern contraceptive utilization among urban women were increased by 18% as compared to rural women (AOR = 1.18, 95% CI: 1.14, 1.24).

The odds of modern contraceptive utilization among women who had primary and secondary and above educational level were 1.49 (AOR = 1.49, 95% CI: 1.44, 1.55) and 1.66 (AOR = 1.66, 95% CI: 1.58, 1.74) times higher as compared to women who had no formal education. The odds of modern contraceptive utilization among women whose husbands had primary and secondary and above educational level were 1.38 (AOR = 1.38, 95% CI: 1.33, 1.42) and 1.38 (AOR = 1.38, 95% CI: 1.36, 1.47) times higher as compared to women whose husband had no formal education. The odds of modern contraceptive utilization among women who can decide health care service with their husband and husband alone were decreased 10% (AOR = 0.90, 95% CI: 0.87, 0.93) and 27% (AOR = 0.73, 95% CI: 0.71, 0.75) as compared to women whose health care utilization decided by herself alone.

Women with middle and rich wealth status were 1.17 (AOR = 1.17, 95% CI: 1.14, 1.21) and 1.29 (AOR = 1.29, 95% CI: 1.25, 1.34) times more likely to utilize contraceptives than poor women. The odds of contraceptive utilization among media-exposed women were 1.25 times higher than women who were not exposed to media (AOR = 1.25, 95% CI: 1.22, 1.29). The odds of modern contraceptive utilization among women who had PNC utilization were 1.62 times more likely than women who had no PNC utilization (AOR = 1.25, 95% CI: 1.22, 1.29). The odds of modern contraceptive utilization among women who deliver at the health facility were 1.62 times more likely than women who deliver at home (AOR = 1.74, 95% CI: 1.69, 1.79). The odds of contraceptive utilization among women whose birth order 2–4 and 5+ were increased by 36% (AOR = 1.36, 95% CI: 1.31, 1.41) and 35% (AOR = 1.35, 95% CI: 1.28, 1.43) as compared to women who had first birth order (Table 3).

Discussion

In this study, the pooled prevalence of modern contraceptives was 18.36% (18.23–18.48%). Socio-demographic factors (residency, maternal education, husband

Table 2 Distribution of modern contraceptive utilization in sub-Saharan Africa region

Variable	Modern contraceptive utilization		Total (%)	X-square value	p-value
	Yes	No			
Africa region					
Southern	6789	9282	16,071 (4.98)	163.79	< 0.001
Central	6728	48,860	55,588 (17.24)		
Eastern	47,646	71,883	119,530 (37.66)		
Western	17,936	11,3397	131,334 (40.72)		
Residence					
Rural	47,359	16,5001	212,360 (65.84)	46.19	< 0.001
Urban	31,742	78,422	110,165 (34.16)		
Age group					
15–24	16,472	62,396	78,868 (24.45)	20.08	< 0.001
25–34	35,393	93,908	129,302 (40.09)		
35–46	27,235	87,119	114,355 (35.46)		
Literacy					
Cannot read and write	23,822	140,763	164,585 (51.03)	103.73	< 0.001
Can read and write	55,279	102,660	157,940 (48.97)		
Maternal education					
No education	15,384	111,585	126,969 (39.37)	103.73	< 0.001
Primary education	33,176	72,974	106,151 (32.91)		
Secondary and above	30,541	58,861	89,405 (27.72)		
Husband education					
No education	13,905	98,391	112,296 (35.95)	70.97	< 0.001
Primary education	26,193	60,678	86,871 (27.81)		
Secondary and above	33,694	79,478	113,173 (36.24)		
Maternal occupation					
Had occupation	60,594	182,407	243,001 (75.34)	152.34	< 0.001
Had no occupation	18,507	61,017	79,524 (24.66)		
Women's health care decision making autonomy					
Women alone	17,865	38,350	56,216 (17.43)	118.50	< 0.001
Women and her husband	33,837	84,186	118,024 (36.59)		
Husbands alone	27,398	120,886	148,284 (45.98)		
Wealth Index					
Poor	23,500	104,061	127,562 (39.55)	124.50	< 0.001
Middle	15,318	48,697	64,015 (19.85)		
Rich	40,282	90,665	130,947 (40.60)		
Media exposed					
Yes	61,967	158,840	220,807 (68.46)	112.47	< 0.001
No	17,134	84,583	101,718 (31.54)		
Accessing health care					
Big problem	40,513	143,803	184,316 (57.15)	38.16	< 0.001
Not big problem	38,588	99,620	138,209 (42.85)		
PNC utilization					
Yes	26,673	57,748	113,799 (57.41)	62.26	< 0.001
No	23,777	90,021	8441 (42.59)		
Place of delivery					
Home	11,266	69,960	75,227 (31.26)	136.58	< 0.001
Institution	49,199	116,214	165,413 (68.74)		

Table 2 (continued)

Variable	Modern contraceptive utilization		Total (%)	X-square value	p-value
	Yes	No			
Birth order					
1	11,661	35,991	47,652 (14.81)	68.29	< 0.001
2–4	41,817	101,145	142,963 (44.43)		
5+	25,440	105,698	131,138 (40.76)		
Children ever born					
0	1,544	21,044	22,588 (7.00)	92.39	< 0.001
1–3	41,890	107,871	149,761 (46.43)		
4+	35,667	114,508	150,175 (46.56)		

education), the person who provides health care decision making, wealth index, media exposure, obstetric history-related factors such as PNC utilization, place of delivery, and birth order were significantly associated with modern contraceptive utilization in Sub-Saharan Africa.

The highest modern contraceptive utilization was found in the southern Africa region (38.43%) and the lowest in the central Africa region (9.46%). This study showed that in the southern Africa region the highest prevalence was noticed in Lesotho (59.79%) and the lowest in Swaziland (19.99%). In the Eastern Africa region, the overall modern contraceptive prevalence was 35.99% with the highest and lowest prevalence was found in Zimbabwe (65.77%) and Mozambique (11.34%), respectively. The overall modern contraceptive in the western Africa region was 13.14%. Of these, the highest prevalence was found in Ghana (22.19%) and the lowest prevalence of modern contraceptives was found in Gambia (8.08%). The highest prevalence in central Africa (19.99% in Congo) was lower than the lowest prevalence in many other countries.

This finding is in line with a recent review performed in the SSA [23]. Besides, the current study is in line with a study from the 2018 World Health Organization (WHO) report that showed that 5.4 children were born from a mother [24]. This indicates the uptake of modern contraceptives in the SSA region is still low. This could be because of repeated conflicts and security issues, the need for a large family, fear of side effects like infertility, religious and cultural restrictions [21], sex preference, spouse consent and support, high level of illiteracy, poverty, and health system barriers in the sub-Saharan Africa region [23]. Even though the possible barriers are perfectly preventable, measures applied to ensure adequate uptake of modern contraceptive in the SSA was very limited [25]. Thus, it is of the essence to all SSA countries to ensure the implementation of adequate sustainable measures to increase the uptake of modern contraception.

As a result, they will guarantee sustainable global development, poverty alleviation, increased life expectancy, empowering of women, promoting of health through the reduction of maternal mortality, morbidity, unsafe abortion, and improve child survival through birth spacing [26, 27].

The finding of the current study result is low than the SDG target (75%) [28]. A rise in the proportion of women of reproductive age who use modern contraception to meet their family planning needs (SDG indicator 3.7.1) will help in achieving other 2030 Agenda goals and targets, such as lowering maternal mortality (SDG 3.1.1) and under-5 child mortality (SDG 3.1.2), increase educational attainment (SDG 4.3.1), and to reduce the number of women and children living in poverty (SDG 1.2.1) [29].

The African region, residency, maternal education, husband education, the person who provides health care decision making, wealth index, media exposure, PNC utilization, place of delivery, and birth order were significantly associated with modern contraceptive utilization in Sub-Saharan Africa.

The odds of having modern contraceptive were low in the central, eastern, and western African region compared with the southern African region. This study is in agreement with a trend analysis carried out in SSA countries between 1990 and 2014 [30]. According to the findings of the former study Southern African region had a faster increase in contraceptive prevalence rate with some countries achieving almost 60% and trends in completed family size is the lowest compared with other African regions. In contrast, the Central Africa region has a steady contraceptive rate and the lowest across the period and had the highest total fertility rate, completed family size, and family size preference. As a result, the progression of modern contraceptive utilization in the central Africa region had a very slow progression increment with many below 20% as of 2014 [31]. The possible reason could be a poor health care system in the central Africa

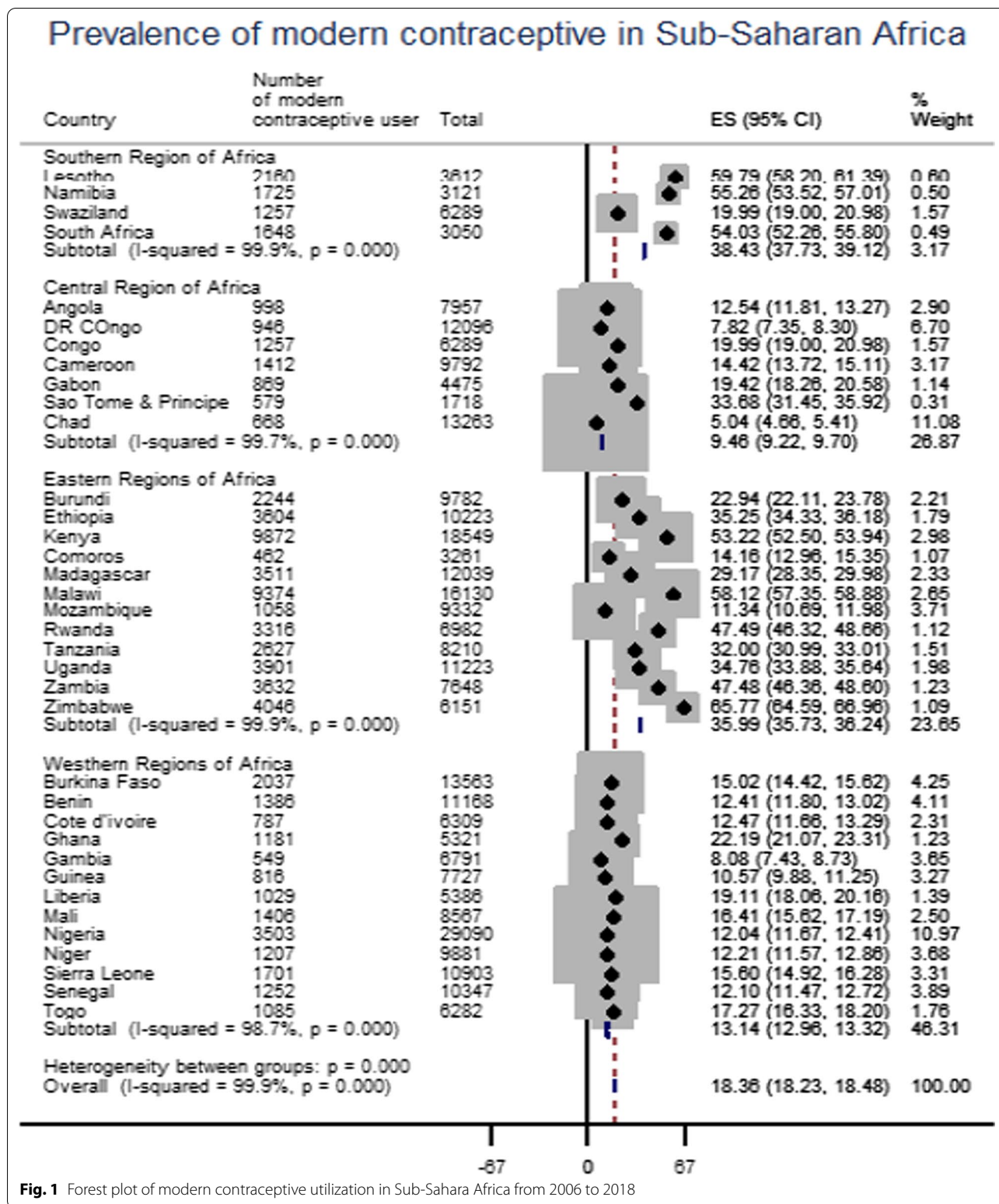


Fig. 1 Forest plot of modern contraceptive utilization in Sub-Sahara Africa from 2006 to 2018

region. For instance, a study from Nigeria, Ghana, and Kenya showed that health care indicators including user-fee, type of health facility, visit by a health care worker, adolescent reproductive health, regular availability of

health care workers, and the number of professionals working on maternal health would highly valuable in the utilization of modern contraceptive use [32].

Table 3 Determinants of modern contraceptive uptake among married women in sub-Saharan Africa

Variable	Null model AOR (95% CI)	Model I AOR (95% CI)	Model II AOR (95% CI)	Model III AOR (95% CI)
Africa Region				
Southern		1		1
Central		0.17 (0.16, 0.17)		0.23 (0.22, 0.24)*
Eastern		1.00 (0.96, 1.03)		1.47 (1.40, 1.54)*
Western		0.23 (0.22, 0.24)		0.46 (0.43, 0.48)*
Residence				
Rural		1		1
Urban		1.77 (1.73, 1.83)		1.18 (1.14, 1.24)*
Age group				
15–24			1	1
25–34			1.06 (1.02, 1.08)	0.99 (0.96, 1.02)
35–46			0.99 (0.95, 1.04)	0.92 (0.88, 1.01)
Maternal education				
No education			1	1
Primary education			1.62 (1.57, 1.68)	1.49 (1.44, 1.55)*
Secondary and above			1.43 (1.36, 1.49)	1.66 (1.58, 1.74)*
Husband education				
No education			1	1
Primary education			1.84 (1.78, 1.90)	1.38 (1.33, 1.42)*
Secondary and above			1.36 (1.31, 1.41)	1.38 (1.33, 1.43)*
Maternal occupation				
Had no occupation			1	1
Had occupation			0.86 (0.84, 0.88)	0.94 (0.91, 1.01)
Women's health care decision making autonomy				
Women alone			1	1
Women and her husband			0.81 (0.78, 0.83)	0.90 (0.87, 0.93)*
Husbands alone			0.50 (0.48, 0.51)	0.73 (0.71, 0.75)*
Wealth Index				
Poor			1	
Middle			1.14 (1.10, 1.17)	1.17 (1.14, 1.21)*
Rich			1.35 (1.31, 1.38)	1.29 (1.25, 1.34)*
Media exposed				
No			1	1
Yes			1.21 (1.18, 1.24)	1.25 (1.22, 1.29)*
Accessing health care				
Big problem			1	1
Not big problem			1.07 (1.04, 1.09)	1.03 (0.98, 1.05)
PNC utilization				
No			1	1
Yes			1.59 (1.56, 1.63)	1.62 (1.58, 1.66)*
Place of delivery				
Home			1	1
Institution			1.90 (1.83, 1.95)	1.74 (1.69, 1.79)*
Birth order				
1			1	1
2–4			1.26 (1.22, 1.31)	1.36 (1.31, 1.41)*
5+			1.20 (1.14, 1.27)	1.35 (1.28, 1.43)*
Community Variance (SE)	0.17 (0.15, 0.20)	0.068 (0.05, 0.08)	0.035 (0.028, 0.044)	0.030 (0.024, 0.038)
ICC%	5.13	2	1.5	1.4

Table 3 (continued)

Variable	Null model AOR (95% CI)	Model I AOR (95% CI)	Model II AOR (95% CI)	Model III AOR (95% CI)
PCV%	1	88.23	80.22	83.05
MOR	1.49 (1.42, 1.53)	1.28 (1.23, 1.30)	1.19 (1.17, 1.22)	1.17 (1.15, 1.19)
LL	-175,175	-158,668	-97,036	-91,641
Deviance	350,350	317,336	194,072	183,282
AIC	350,354	317,349	194,114	183,332
BIC	350,376	317,413	194,329	183,587

1 = reference, * = $p < 0.05$

Living in an urban area was associated with a better modern contraceptive utilization compared with the rural counterparts. The possible reason could be women in rural areas had poor service availability and accessibility and they are far from the health facility [22]. Besides, women in the rural area were more likely uneducated and they are unable to get the method of their choice.

In this study, maternal and husband education increases the uptake of modern contraceptives. This finding is in line with a systematic review and meta-analysis carried out in SSA countries between 2005 and 2015 [19]. Similarly, trend analysis in contraceptive prevalence in SSA showed that women's education was strongly correlated with the high level of contraceptive uptake [30]. This could be due to the fact that education is the power and a precursor to developing women's empowerment through improving their knowledge and attitude [33]. Also, education creates a good job opportunity or employment that could cause child spacing [34] which further improves child survival [35]. However, the former study revealed that the mere presence of female education was not adequate and it is highly recommended emphasizing the presence of voluntarily family planning services was strongly associated with an increase in the prevalence of contraceptive use.

Women's health care decision-making autonomy was significantly affecting the odds of modern contraceptive uptake. Women who decide with their husbands had higher odds of modern contraceptive uptake than women who decide alone. This could be when women are unable to decide by themselves their rights and the ability to choose and use the method was worse. Empowering women would enhance women's decision-making ability and increasing their knowledge level that can further improve modern contraceptive uptake [36]. As a result, the maternal health outcome and child health would be improved in Sub-Saharan Africa.

The odds of having modern contraceptive uptake were higher among women with a higher wealth index. This finding was supported by a cross-sectional study

conducted in sub-Saharan African countries using Kenya and Zimbabwe demographic and health survey data [37]. The possible explanation could be women from middle and high wealth index have better financial resources which are very helpful to get better access to reproductive health services including modern contraceptive uptake [38].

Mass media exposure was associated with higher odds of modern contraceptive uptake. This finding was supported by a systematic review and meta-analysis conducted among 31 sub-Saharan African countries using 47 demographic and health surveys conducted between 2005 and 2015 [39]. The possible reason could be mass media exposure can expose people to information [40, 41] and overcome barriers of illiteracy and improve the knowledge and attitude of women [20].

The current study showed that mothers who had PNS services had higher odds of utilizing modern contraceptives. The possible reason could be during PNC follow-up mothers' have the opportunity to communicate with providers and to receive counseling regarding on initiation of postpartum contraceptive services [42, 43]. Similarly, mothers' who delivered at health institution has higher odds of uptake of modern contraceptive. This is because at the health institution mothers' have the opportunity to get information on when and why they initiate postpartum contraception [44]. Birth orders of two or more had higher odds of modern contraceptive intake than birth order one. This because women's having more children had the intention to have birth spacing than women's having a single child or fewer children.

The strength of the current study was incorporating 36 sub-Saharan Africa countries and the findings can be easily generalized to the SSA at large. However, it is difficult to establish a temporal relationship because of the cross-sectional nature of the study. Moreover, data related to the availability and accessibility of the service was not collected. Lastly, the study will be prone to recall and social desirability bias as most of the health measures in DHS are based on self-report.

The uptake of modern contraceptive utilization has a valuable contribution to the general public and the country at large. As a result, the public will be benefited by maintaining health promotion including reduction of poor maternal outcomes (maternal morbidity, mortality, and abortion) and in poverty mitigation, women empowerment, increased life expectancy, keeping gender equality, and realizing sustainable global development goals. Besides, child survival will be improved through birth spacing and has a great contribution in creating a better future for the coming generations.

Conclusion

This study indicated low modern contraception utilization in sub-Saharan Africa. Women living in the east, central, western region, urban, educational level, wealth status, media exposure, having PNC utilization, delivering at the health facility, and having more birth order, women's decision-making ability were significantly associated with modern contraception utilization. More attention needs to be given to rural residents, illiterate women, and communities with low wealth status. Moreover, postnatal care and health facility delivery activities need to be strengthened.

Abbreviations

AIDS: Acquired Immune Deficiency Syndrome; AOR: Adjusted Odds Ratio; CBD: Community-Based Distribution; CI: Confidence Interval; COR: Crude Odds Ratio; DHS: Demographic and Health Survey; ICC: Intra-Class Correlation; HIV: Human Immune Virus; IQR: Inter Quartile Range; LLR: Likelihood Ratio; MMR: Maternal Mortality Ratio; MOR: Median Odds Ratio; PCV: Proportional Change in Variance; PNC: Postnatal care; SSA: Sub-Saharan Africa; TFR: Total Fertility Rate.

Acknowledgements

We would like to thank the Measure DHS International program for providing the data set.

Author contributions

ZTT conceived of the study, analyze the data, and drafted the manuscript. GAT MMB and TYA performed the statistical analysis and drafted the manuscript. All authors read and approved the final manuscript.

Funding

This study was not funded.

Availability of data and materials

Data is available online on www.measuredhs.com.

Declarations

Ethics approval and consent to participate

Permission to get access to the data was obtained from the measure DHS program online request from <http://www.dhsprogram.com/website> and the data used were publicly available with no personal identifier. Moreover, the study conducted according to the ethical principles and regulations of the country.

Consent for publication

Not applicable.

Competing interests

Authors declare that there is no conflict of interest.

Author details

¹Department of Epidemiology and Biostatistics, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia.

²Department of Reproductive Health, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia.

Received: 19 December 2021 Accepted: 10 May 2022

Published online: 18 May 2022

References

- Bongaarts J, Cleland JC, Townsend J, Bertrand JT, Gupta MD. Family planning programs for the 21st century: rationale and design. 2012.
- Organization WH: Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. 2019.
- Cleland JG, Ndugwa RP, Zulu EM. Family planning in sub-Saharan Africa: progress or stagnation? *Bull World Health Organ*. 2011;89:137–43.
- Bongaarts J. Trends in fertility and fertility preferences in sub-Saharan Africa: the roles of education and family planning programs. *Genus*. 2020;76:1–15.
- Bongaarts J: United Nations Department of Economic and Social Affairs, Population Division World Family Planning 2020: Highlights United Nations Publications, 2020. 46 p. In *Book United Nations Department of Economic and Social Affairs, Population Division World Family Planning 2020: Highlights United Nations Publications, 2020*. 46 p (Editor ed. Aeds.). City: Wiley Online Library; 2020.
- United Nations Department of Economic and Social Affairs, Population Division (2020). World Family Planning 2020 Highlights: Accelerating action to ensure universal access to family planning (ST/ESA/SER.A/450).
- Tsehay CT. Factors associated with modern contraceptive demands satisfied among currently married/in-union women of reproductive age in Ethiopia: a multilevel analysis of the 2016 Demographic and Health Survey. *BMJ Open*. 2022;12: e049341.
- Ahinkorah BO, Budu E, Aboagye RG, Agbaglo E, Arthur-Holmes F, Adu C, Archer AG, Aderoju YBG, Seidu A-A. Factors associated with modern contraceptive use among women with no fertility intention in sub-Saharan Africa: evidence from cross-sectional surveys of 29 countries. *Contracept Reprod Med*. 2021;6:1–13.
- Apanga PA, Kumbeni MT, Ayamga EA, Ulanja MB, Akparibo R. Prevalence and factors associated with modern contraceptive use among women of reproductive age in 20 African countries: a large population-based study. *BMJ Open*. 2020;10: e041103.
- Letamo G, Navaneetham K. Levels, trends and reasons for unmet need for family planning among married women in Botswana: a cross-sectional study. *BMJ Open*. 2015;5: e006603.
- Gueye A, Speizer IS, Corroon M, Okigbo CC. Belief in family planning myths at the individual and community levels and modern contraceptive use in urban Africa. *Int Perspect Sex Reprod Health*. 2015;41:191.
- Belda SS, Haile MT, Melku AT, Tololu AK. Modern contraceptive utilization and associated factors among married pastoralist women in Bale eco-region, Bale Zone, South East Ethiopia. *BMC Health Serv Res*. 2017;17:1–12.
- Eliason S, Awoonor-Williams JK, Eliason C, Novignon J, Novignon J, Aikins M. Determinants of modern family planning use among women of reproductive age in the Nkwanta district of Ghana: a case-control study. *Reprod Health*. 2014;11:1–10.
- Ochako R, Mbondo M, Aloo S, Kaimenyi S, Thompson R, Temmerman M, Kays M. Barriers to modern contraceptive methods uptake among young women in Kenya: a qualitative study. *BMC Public Health*. 2015;15:1–9.
- ECONOMIC UNDF, AFFAIRS. S. Family Planning and the 2030 Agenda for Sustainable Development (data Booklet). UN; 2019.
- Aliyu AA. Family planning services in Africa: The successes and challenges. *Family Planning* 2018, 69.
- Malhotra V, Bhat S. Strategies for family planning going forward-social marketing & expanding contraceptive choices package. *Indian J Med Res*. 2014;140:S6.

18. Africa S. Index and Dashboards Report (2019). Results and analysis of SDG Index Rankings Kigali and New York: SDG Centre for Africa and Sustainable Development Solutions Network Retrieved April 2020, 10.
19. Blackstone SR, Nwaozuru U, Iwelunmor J. Factors Influencing Contraceptive Use in Sub-Saharan Africa: a systematic review. *Int J Community Health Educ.* 2017;37:79–91.
20. Gupta N, Katende C, Bessinger R. Associations of mass media exposure with family planning attitudes and practices in Uganda. *Stud Fam Plann.* 2003;34:19–31.
21. Muanda M, Gahungu Ndongo P, Taub LD, Bertrand JT. Barriers to Modern Contraceptive Use in Kinshasa, DRC. *PLoS One.* 2016;11: e0167560.
22. Shiferaw S, Spigt M, Seme A, Amogne A, Skrøvseth S, Desta S, Radloff S, Tsui A, GeertJan D. Does proximity of women to facilities with better choice of contraceptives affect their contraceptive utilization in rural Ethiopia? *PLoS ONE.* 2017;12: e0187311.
23. Adedze M, Osei-Yeboah R. Underuse of modern contraception in sub-Saharan Africa: are there implications for sustainable development and climate change? A review of the literature. *Eur J Contracept Reprod Health Care.* 2019;24:314–8.
24. WHO. Family planning/contraception. 2018 (published Oct 30, 2018). <http://www.who.int/news-room/fact-sheets/detail/family-planning-contraception>. Accessed 20 Aug 2020.
25. Ngo TD, Nuccio O, Pereira SK, Footman K, Reiss K. Evaluating a LARC expansion program in 14 sub-Saharan African countries: a service delivery model for meeting FP2020 goals. *Matern Child Health J.* 2017;21:1734–43.
26. Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, Innis J. Family planning: the unfinished agenda. *Lancet.* 2006;368:1810–27.
27. Osotimehin B. Family planning as a critical component of sustainable global development. *Glob Health Action* 2015; 8: 29978.v.
28. CEPAL N. Report on the workshop to review progress in the preparation of the proposed indicators for regional monitoring of the Montevideo Consensus on Population and Development. Mexico City, 8–9 June 2016. 2016.
29. Bongaarts J. United Nations Department of Economic and Social Affairs, Population Division World Family Planning 2020: Highlights, United Nations Publications, 2020. 46 p. In Book United Nations Department of Economic and Social Affairs, Population Division World Family Planning 2020: Highlights, United Nations Publications, 2020. 46 p (Editor ed. ^eds.). City: Wiley Online Library; 2020.
30. Bongaarts J, Hardee K. Trends in contraceptive prevalence in Sub-Saharan Africa: the roles of family planning programs and education. *Afr J Reprod Health.* 2019;23:96–105.
31. Odimegwu CO, Akinyemi JO, Banjo OO, Olamijuwon E, Amoo EO. Fertility, family size preference and contraceptive use in Sub-Saharan Africa: 1990–2014. *Afr J Reprod Health.* 2018;22:44–53.
32. Asaolu I, Nuño VL, Ernst K, Taren D, Ehiri J. Healthcare system indicators associated with modern contraceptive use in Ghana, Kenya, and Nigeria: evidence from the Performance Monitoring and Accountability 2020 data. *Reprod Health.* 2019;16:152.
33. Arinze-Onyia SU, Aguwa EN, Nwobodo E. Health education alone and health education plus advance provision of emergency contraceptive pills on knowledge and attitudes among university female students in Enugu, Nigeria. *Niger J Clin Pract.* 2014;17:100–5.
34. Al-Nahedh NN. The effect of sociodemographic variables on child-spacing in rural Saudi Arabia. *Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawassit* 1999;5:136–140.
35. Akter S, Rahman JA, Rahman MM, Abedin S, al-Nahedh NN: the influence of birth spacing on child survival in Bangladesh: a life table approach the effect of sociodemographic variables on child-spacing in rural Saudi Arabia. *World Health Popul.* 2010;12:42–56.
36. Estrada F, Hernández-Girón C, Walker D, Campero L, Hernández-Prado B, Maternowska C. Use of family planning services and its relationship with women's decision-making and support from their partner. *Salud Publica Mex.* 2008;50:472–81.
37. Chikandiwa A, Burgess E, Otworld K, Chimoyi L. Use of contraceptives, high risk births and under-five mortality in Sub Saharan Africa: evidence from Kenyan (2014) and Zimbabwean (2011) demographic health surveys. *BMC Womens Health.* 2018;18:173.
38. Sharma V, Mohan U, Das V, Awasthi S. Socio demographic determinants and knowledge, attitude, practice: survey of family planning. *J Fam Med Prim Care.* 2012;1(1):43–7.
39. Babalola S, Figueroa ME, Krenn S. Association of mass media communication with contraceptive use in Sub-Saharan Africa: a meta-analysis of demographic and health surveys. *J Health Commun.* 2017;22:885–95.
40. Islam MM, Hasan AH. Mass media exposure and its impact on family planning in Bangladesh. *J Biosoc Sci.* 2000;32:513–26.
41. Adamchak DJ, Mbitvo MT. Family planning information sources and media exposure among Zimbabwean men. *Stud Fam Plann.* 1991;22:326–31.
42. Engin-Ustun Y, Ustun Y, Cetin F, Meydanli MM, Kafkasli A, Sezgin B. Effect of postpartum counseling on postpartum contraceptive use. *Arch Gynecol Obstet.* 2007;275(6):429–32.
43. Do M, Hotchkiss D. Relationships between antenatal and postnatal care and post-partum modern contraceptive use: evidence from population surveys in Kenya and Zambia. *BMC Health Serv Res.* 2013;13:6.
44. Darney BG, Sosa-Rubi SG, Servan-Mori E, Rodriguez MI, Walker D, Lozano R. The relationship of age and place of delivery with postpartum contraception prior to discharge in Mexico: a retrospective cohort study. *Contraception.* 2016;93:478–84.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

