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A random effect model for the determinants of modern family planning use among women of reproductive age in Uganda

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Abstract

Despite the fact that most people are aware of contemporary contraceptives, there is still a significant unmet need for family planning. Therefore, this study evaluated the variables linked to Ugandan women of reproductive age using contemporary contraceptives. Data from a cross-sectional 2016 Uganda Demographic and Health Survey was used in this study. The study employed quantitative approach where descriptive statistics were used to summarize the characteristics of the respondents and a random intercept model was run. This study found that women of reproductive age used contemporary contraceptives on average at a rate of 27.3% (95% CI: 26.3, 28.3), women aged 25 to 29 made up the largest percentage of users (AOR = 1.38, 95% CI: 1.10, 1.73), while those aged 15 to 19 made up the smallest percentage of users yet it is the most sexually active age bracket. Very few Ugandan women of reproductive age used contemporary contraceptives on a regular basis. This low rate was attributed to a variety of woman, household, and community factors, including age of the mother, education level (mother and husband), employment status of the mother, ever had a pregnancy terminated, access to television, frequency of internet use, possession of a personal phone, last birth being caesarean, wealth quintile, sex of household head, religion, and region, all of which were significantly associated with the use of modern family planning. Therefore, while pushing the shift to the use of contemporary contraceptives, all these issues must be taken into account.

Keywords: Family Planning, Uganda, Women, Logistic model, Modern Contraceptive.

1. Introduction

The capacity of individuals and couples to anticipate and have the desired number, spacing, and timing of children is known as family planning (FP) (UBOS & ICF, 2017). Family planning may also mean using contraception and other measures to control when you become pregnant if you have a sexual lifestyle (Sundararajan et al., 2019). It is done by reducing unintended infertility and employing contraceptive measures. A woman may consider the ages at which she wishes to have her children when determining how many to have or whether to have none at all. Outside factors that affect FP include a person's marital status, career aspirations, financial condition, and any disabilities that would restrict their ability to conceive and raise children (Babalola & Olubiyi, 2015).

Family planning methods (FPMs) may be conventional or modern. Male and female sterilization, tablets, Depot Implants, and condoms are all current forms of contraception. Modern family practices include the vasectomy, intrauterine devices (IUD), lactation amenorrhea technique (LAM), and morning after pills, and others. Contrarily, traditional approaches include withdrawal, the rhythm method (periodic abstinence), and the folk method. However, the WHO considers both groups to be safe for everyone, but the effectiveness of the traditional approaches is disputed (Andi et al., 2014).

Women who are 15 to 49 years old and of reproductive age engage in family planning. Women who are of childbearing age can be either married or single. Most of them have incomplete or erroneous knowledge of contemporary family planning techniques. Even though they are familiar with some contraceptive names, they have no idea where to buy or how to use them (Sileo, 2014). These women see family planning negatively, and some of them may have been exposed to erroneous or deceptive material. Women's perceptions of the advantages and disadvantages of using current family planning methods have come under scrutiny due to the poor correlation between knowledge, attitude, and acceptance of these methods. It was highlighted that resistance to current treatments was due to concerns that they would lead to infertility, have negative side effects, and be ineffective (Moazzam, 2015).

2. Review of Literature:

The percentage of women who desire to put off having children or delay having them for at least two years but do not use any kind of contraception is known as the

Unmet need for FP. According to DHS data from 2016, married women had a lower unmet requirement than they had in 2011, which was 34%. According to the Uganda Bureau of Statistics (UBOS) and ICF (2017), this shows a rise in the usage of contraceptives, however not in a satisfactory way.

Contraceptive use in has also been researched into and discussed in relation to Uganda. According to Otim (2020), the central area had the greatest rate of contraceptive prevalence at 65%, followed by the eastern region at 57%, the western region at 56%, and the northern region at 45%. In general, this suggests that contraceptive use was still challenging, particularly in the country's north where use didn't even reach 50% of the population. The UDHS (2010/2011) reported a 24% contraceptive prevalence rate as measured by the proportion of presently married women between the ages of 15 and 49 who used any kind of FP. Among married women, 18% adopted contemporary techniques while only 6% employed more conventional ones. Sexually active unmarried women (54%) used contraceptives more frequently than married women (24%), who in turn used them more frequently than all other women (20%).

Injectable were the most popular method among married women, used by 10% of the female population. The next most popular techniques were the rhythm method (3%), followed by tablets (3%). Married women who used male condoms, female sterilization, or withdrawal made up 2% of the population. Male condoms were the most common strategy for sexually active unmarried women (27%), followed by injectable (13%), and the mix of methods was significantly different. Contraception use has generally been seen to rise with age. The most frequently utilized methods among the young women were injectable and male condoms. Women in their 20s and early 30s used injectable more frequently than the pill, whereas older women were sterilized more frequently (Rahayu et al., 2022).

The ICPD Programme of Action recognized an important right for all individuals and couples to choose the number, timing, and spacing of their children while having access to secure standards of sexual and reproductive health as well as the required information and resources to do so. There has been a lot of growth since 1994, but there have also been major obstacles (Nankinga et al., 2019).

3. Research Methodology:

The study design, target population and sampling process, data collection techniques, the accuracy and dependability of the research tools, methods for data analysis, and ethical issues are all covered in this chapter.

3.1 Research design

This study was done using a quantitative approach. The researcher determined whether there was a significant relationship between variables using the Uganda Demographic Health Survey (UDHS) data from 201. Over 20000 homes from all areas of Uganda were included in the study, which represents national representative data. Every five years, UBOS always conducts the UDHS surveys (Uganda Bureau of Statistics).

3.1.1 Study Population

Women between the ages of 15 and 49 who were in reproductive age were targeted. They were selected from the key regions of Uganda. They regions were Kampala, Busoga, Bukedi, Bugisu, Teso, Karamoja, Lango, Acholi, West Nile, Bunyoro, Tooro, Kigezi, and Ankole.

3.1.2 Sampling and Sample Size

A two-stage cluster and stratified sampling were used in the UDHS of 2016. Women and men in sampled households between the ages of 15 and 49 made up the sample. 698 enumeration areas (EAs) were chosen in the first round; 163 of them were urban and 535 were rural. The second stage involves choosing which households to interview from each EA's listing. A random sample of 30 households from each EA, which are geographical areas of 130 households each, were chosen for the survey. Women, ages 15 to 49, who are permanent residents or guests who stayed the night before the poll were included. From the EAs, 20,880 households were chosen as a sample. The details on sampling and data collection procedures are found in UDHS 2016 report (UBOS & ICF, 2017).

3.2 Modelling

Descriptive analysis was used to determine the incidence of modern FP use for binary responses (use of modern contraceptives). A random intercept logistic regression model was still run using ICC and LRT even though the prevalence was higher than 10%. Therefore, the multivariate binary logistic regression model was taken into consideration in this study.

For Binary Response Y , where (x) is the probability of success at x , then $Y \sim \text{Binomial}(n, \pi)$ where $(y = 1$ for “modern FP use”, $y=0$ “otherwise” is non-use of modern family planning). The binary logistic regression model is of the form;

$$\text{logit}(\pi(x)) = \log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \beta x \quad (\text{i})$$

$$\text{And } \pi(x) = \frac{\exp(\alpha + \beta x)}{1 + \exp(\alpha + \beta x)}$$

(ii)

Let π_{ihc} be the response probability of the i^{th} woman in h^{th} household of the c^{th} community having used modern contraceptives (that is, $\pi_{ihc} = P\{y_{ihc} = 1\}$). Then, the random intercept model proposed for this outcome was written as

$$\text{logit}(\pi_{ihc}) = \log\left(\frac{\pi_{ihc}}{1-\pi_{ihc}}\right) = \alpha + X_{ihc}\beta + H_{hc}w + Z_c\varphi + e_{ihc} \quad (\text{iii})$$

Where $\log\left(\frac{\pi_{ihc}}{1-\pi_{ihc}}\right)$ is the logit in which π_{ihc} is the probability of woman “i” in household “h” in community “c” having used modern contraceptives; , X_{ihc} , H_{hc} and Z_c are vectors of woman, household and community level factors, α is a constant, while β , w and φ are vectors of the estimated coefficients (Mwebesa, 2021). From the above equation, e_{ihc} is the woman/individual error term distributed as Bernoulli. The intercept is the average probability of having used modern contraceptives and is assumed to vary randomly across communities.

The intraclass correlation between the probabilities of modern contraceptive use in the same community are presented by variance partition coefficients (VPC). VPC_c is intra-class correlation between women-households in the same communities;

$$VPC_c = \frac{\sigma_c^2}{\sigma_c^2 + \pi^2/3} \quad (\text{iv})$$

Where σ_c^2 is the community level variance, $\pi^2/3$ is the woman or individual and or household level variance?

4. Results & Discussion:

4.1 Results:

The study analyzed the factors that affect how frequently women of reproductive age use contemporary FP in Uganda's rural and urban areas using data from UDHS (2016). The researcher examined the range of current FP practices, the frequency of modern FP practices, and traits associated with the use of modern FP. Utilizing frequencies and percentages, the socio-demographic

features of women were examined at the univariate level. Using the chi-square statistic, the relationship between various women's, household, and community characteristics and FP consumption was examined at the bivariate level. To use the random intercept binary logistic model, multiple analyses were conducted. To see if there were any changes in how modern families were used by the primary sampling units, a null model without covariates was first conducted. Following this, woman level factors were introduced in model 1, then household level variables exclusively in model 2, then community level elements in model 3, and eventually all three levels of factors were introduced in model 4.

Most women were found to be between the ages of 15 and 19 (4,264, or 23%), followed by those between the ages of 20 and 24 (3,822, or 20.7%). The number of women who participated in the study decreased as the age categories increased, with those between 45 and 49 years old making up just 1,207 (6.5%) of the sample. The majority of users of modern FP were between the ages of 25 and 29 (37.4%), followed by those between the ages of 30 and 34 (36.6%), those between the ages of 35 and 39 (36.0%), and only 9.4% were between the ages of 15 and 19 (36.0%). The findings also showed a strong correlation between the women's age and the usage of contemporary contraceptives ($\chi^2 = 1112.65$, $p = 0.000$).

Table 1: Socio-Demographic Characteristics of Reproductive Women in Uganda.

			Modern Contraceptive Use		χ^2	p-value
	Categories	Count (%)	Non-User (%)	User (%)		
Woman Level Factors						
Age in 7 groups	15 – 19	4264 (23.0)	3863 (90.6)	4001 (9.4)	1112.65	0.000
	20 – 24	3822 (20.7)	2741 (71.7)	1081 (28.3)		
	25 – 29	3051 (16.5)	1910 (62.6)	1141 (37.4)		
	30 – 34	2543 (13.7)	1611 (63.4)	932 (36.6)		
	35 – 39	2011 (10.9)	1287 (64.0)	724 (36.0)		
	40 – 44	1608 (8.7)	1066 (66.3)	542 (33.7)		
	45 – 49	1207 (6.5)	978 (81.1)	229 (18.9)		
Education Level	No Education	1781 (9.6)	1414 (79.4)	367 (20.6)	85.57	0.000
	Primary	10630 (57.4)	7808 (73.5)	2822 (26.5)		
	Secondary	4639 (25.1)	3271 (70.5)	1368 (29.5)		
	Higher	1456 (7.9)	963 (66.2)	493 (33.8)		
Working Status	Not Working	4211 (22.8)	3412 (81.0)	799 (19.0)	191.71	0.000
	Working	14264 (77.2)	10017 (70.2)	4247 (29.8)		
Current Marital Status	Never in Union	4783 (25.8)	4272 (89.3)	511 (10.7)	989.52	0.000
	Married	5614 (30.3)	3612 (64.3)	2002 (35.7)		
	Living with a partner	5609 (30.3)	3710 (66.1)	1900 (33.9)		
	Others	2500 (13.5)	1862 (74.5)	638 (25.5)		
Distance to health facility: Getting medical help	Big Problem	6915 (37.4)	5167 (74.7)	1749 (25.3)	22.32	0.000
	Not a big problem	11591 (62.6)	8289 (71.5)	3301 (28.5)		
Ever had pregnancy terminated	No	15160 (81.9)	11137 (73.5)	4023 (26.5)	23.79	0.000
	Yes	3346 (18.1)	2319 (69.3)	1027 (30.7)		
Access to Newspapers	No access	14170 (76.6)	10389 (73.3)	3781 (26.7)	11.26	0.004
	Some access	4336 (23.4)	3066 (70.7)	1269 (29.3)		
Access to Radio	No access	4777 (25.8)	3658 (76.6)	1119 (23.4)	48.23	0.000
	Some access	13729 (74.2)	9798 (71.4)	3931 (28.6)		
Access to television	No access	12475 (67.4)	9278 (74.4)	3197 (25.6)	53.43	0.000
	Some access	6031 (32.6)	4178 (69.3)	1853 (30.7)		
Frequency of Internet use in last month	Never Used	16986 (91.8)	12394 (73.0)	4592 (27.0)	6.90	0.054
	Ever Used	1520 (8.2)	1061 (69.8)	459 (30.2)		
Owns a phone	No	10077 (54.5)	7946 (78.9)	2132 (21.1)	419.88	0.000
	Yes	8429 (45.5)	5510 (65.4)	2918 (34.6)		
Last birth caesarean	No	9377 (92.7)	6064 (64.7)	3312 (35.3)	21.43	0.001
	Yes	740 (7.3)	416 (56.2)	324 (43.8)		
Household Factors						
Wealth Quintile	Lowest	3247 (17.5)	2633 (81.1)	614 (18.9)	177.31	0.000
	Second	3397 (18.4)	2531 (74.5)	866 (25.5)		
	Middle	3460 (18.7)	2486 (71.8)	974 (28.2)		
	Fourth	3683 (19.9)	2541 (69.0)	1142 (31.0)		
	Highest	4720 (25.5)	3265 (69.2)	1455 (30.8)		
Sex of HH head	Male	12266 (66.3)	8628 (70.3)	3638 (29.7)	102.79	0.000
	Female	6240 (33.7)	4828 (77.4)	1412 (22.6)		
Number of HH Members	1-5 members	9179 (49.6)	6600 (71.9)	2579 (28.1)	5.97	0.041
	6 and above members	9327 (50.4)	6856 (73.5)	2471 (26.5)		
Husbands Education	No Education	712 (6.5)	545 (76.5)	167 (23.5)	85.21	0.000
	Primary	5831 (53.4)	3903 (66.9)	1928 (33.1)		

	Secondary or Higher	4370 (40.0)	2660 (60.9)	1710 (39.1)		
Husband's working status	Not Working	387 (3.5)	298 (77.1)	89 (22.9)		
	Working	10776 (96.5)	6986 (64.8)	3790 (35.2)	25.04	0.000
Who decides on Healthcare	Woman Alone	3408 (30.4)	2228 (65.4)	1180 (34.6)		
	Woman and Partner	4851 (43.2)	3088 (63.7)	1763 (36.3)	13.18	0.012
	Others	2962 (26.4)	2004 (67.7)	958 (32.4)		
Religion	Anglican	5774 (31.2)	4081 (70.7)	1693 (29.3)		
	Catholics	7335 (39.6)	5401 (73.6)	1934 (26.4)	17.55	0.007
	Others	5397 (29.2)	3974 (73.6)	1423 (26.4)		
Community Factors						
Type of place of residence	Rural	4943 (26.7)	3437 (69.5)	1506 (30.5)		
	Urban	13563 (73.3)	10020 (73.9)	3543 (26.1)	34.53	0.000
Region	Central	5481 (29.6)	3770 (68.8)	1711 (31.2)		
	Eastern	4879 (26.4)	3558 (72.9)	1321 (27.1)		
	Northern	3546 (19.2)	2819 (79.5)	727 (20.5)	125.98	0.000
	Western	4600 (24.9)	3309 (72.0)	1290 (28.0)		

Source: UDHS Data 2016

Table 1 shows that the majority of women had completed primary school. (10630, or 57.4%), followed by secondary school (4639, or 25.1%), those with no formal education (1781, or 9.6%), and those with the lowest degree of education (1456, or 7.9%). In terms of modern FP usage, those with higher education made up the largest percentage of users (33.8%), secondary education (29.5%), primary education (26.5%), and no education (20.6%) were the next highest levels of education. This demonstrates that modern FP use rose with schooling and that there was a statistically significant correlation ($\chi^2 = 85.57$, $p = 0.000$).

With regard to their employment situation, 14264 (77.2%) of the women reported having some type of employment, while just 4211 (22.8%) reported being unemployed. With a rate of 29.8%, employed women were more likely to use contemporary FP than unemployed women, who made up only 19.0% of the population. Working status and the use of current FP were shown to be significantly correlated ($\chi^2 = 191.71$, $p = 0.000$). Regarding their current marital status, the majority of them were either married (5614) or living with a partner (5609), followed by those who had never been in a partnership (4783) and others (2500 (13.5%). Regarding current FP use, 33.9% of married people used it, followed by those living with partners accounting for 33.9%, others with 25.5% while those never in union only 10.7% were users. The significant association was observed between current marital status and modern FP utilization ($\chi^2 = 989.52$, $p = 0.000$).

The findings also showed that when it came to perceptions of the distance to the nearest medical institution, the majority of the women—11591 (62.6%)—did not see it as a major issue, while just 6915 (37.4%) did. With 28.5% of women using contemporary FP compared to 25.3% of women who

thought distance was a huge issue, the majority of users of modern FP were those who did not think distance was a big issue. There was a significant correlation between the usage of modern FP and the distance to the medical facility ($\chi^2 = 22.32$, $p = 0.000$), implying a significant association. The findings also showed that 3346 women (18.1%) of the study participants had ever had a pregnancy terminated, whereas 15160 women (81.9%) had never had a pregnancy terminated. A larger percentage of women who had ever had a pregnancy terminated used modern FP—30.7% compared to 26.5% of women who had never had a pregnancy ended. There was a statistically significant correlation between the usage of modern FP and a woman's history of preterm birth ($\chi^2 = 23.79$, $p = 0.000$).

Regarding media access, 14170 (76.6%) people had no access to newspapers, and among those who did, 29.3% of people used contemporary FP, which is a highly significant correlation between modern FP use and access to newspapers. ($\chi^2 = 11.26$, $p = 0.004$). Most women claimed to have some radio access (13729, or 74.2%), and these women accounted for the highest percentage of listeners (28.6%, as opposed to 23.4% of those without radio access). Modern FP use was found to be statistically significantly correlated with having access to ($\chi^2 = 48.23$, $p = 0.000$). When it came to television access, the majority of women—12475, or 67.4%—said they didn't have any, whereas the biggest percentage of viewers—30.7%, or 307 out of every 1000 women—said they utilized modern family planning. Access to television and modern FP use were statistically associated with each other ($\chi^2 = 53.43$, $p = 0.000$).

It was also found that the majority of women, or 91.8%, had never used the internet, with 16986 saying they hadn't done so at least once in the previous month. However, internet users had a higher percentage of

modern FP use than non-users, at 30.2% against 27.0%. However, there was no statistically significant link between the frequency of internet use and the use of current FP. ($\chi^2 = 6.90$, $p = 0.054$). The findings also showed that the majority of women (10077, 54.5%) did not own a phone, and that those who did used modern FPM more frequently (34.6% versus 21.1% compared to those who did not). Modern FP usage was found to be significantly associated with owning a phone ($\chi^2 = 419.88$, $p = 0.000$). Women who had given birth most recently through caesarean section accounted for the majority of those who used current FP (43.8%), compared to 35.3% of those who did not, with 9377 (92.7%) of the total number of women having previous births that were not caesareans. Modern FP use was found to be significantly associated with last birth being caesarean sectioned. ($\chi^2 = 21.43$, $p = 0.001$).

In terms of the wealth index, the majority of women, or 4720 (25.5%), were in the top quintile. The fourth quintile had the highest percentage of modern FP users (31.0%), followed by the top quintile's users (30.8%), and the lowest quintile's users (18.9%). The findings showed that there was a statistically significant correlation between wealth quintile and modern FP use ($\chi^2 = 177.31$, $p = 0.000$). The majority of the households, 12266 (66.3%), were headed by men, and among these households, 29.7% of modern FP users were found. The findings showed that there was a statistically significant correlation between household sex and modern FP consumption ($\chi^2 = 102.79$, $p = 0.000$). The majority of women, 9327 (50.4%), resided in households with six or more people. Of these women, 28.1%, or those from families with one to five people, used modern FPM. The findings also showed a strong correlation between the number of infants ever born with current FP use ($\chi^2 = 5.97$, $p = 0.0413$).

Regarding spouse education, 5831 (53.4%) of women were married to men who had only completed their primary education, while 39.1% of women were married to men who had completed their secondary

education or higher. The findings showed a statistically significant correlation between the husband's degree and modern FP use ($\chi^2 = 85.21$, $p = 0.000$). Close to 3790 (35.2%) of women were married to working males, and 35.2% of modern FP users came from households where the spouses were employed. The findings showed a statistically significant correlation ($\chi^2 = 25.04$, $p = 0.000$), between the husband's employment status and modern FP use. In 4851 (43.2%) of the homes, the lady and her spouse make the majority of the healthcare decisions, and 36.3% of users came from the same families. A substantial correlation ($\chi^2 = 13.18$, $p = 0.0125$) between current FP use and health care decision-making.

In terms of religion, 7335 (or 39.6%) of the women identified as practicing the Catholic faith, whilst 29.3% of the women who identified as practicing the Anglican faith used modern family planning. The findings showed that there was a statistically significant correlation ($\chi^2 = 17.55$, $p = 0.007$) between religion and modern FP use. The majority of respondents—13563 or 73.3 percent—came from rural areas, while the majority of users—30.5%—came from metropolitan areas. There was a statistically significant correlation ($\chi^2 = 34.53$, $p = 0.000$) between the kind of dwelling and the use of modern FP. It was also found out that 5481 (39.5%) of the women who took part in the study were from the central region, and a higher proportion (31.2%) of them used modern FP. Table 1's findings showed a statistically significant correlation ($\chi^2 = 125.98$, $p = 0.000$) between regions that employ modern FP.

The first objective of the study was to determine the prevalence of modern contraceptive use among reproductive women in Uganda based on 2016 UDHS data. According to table 2's data, there were 27.3 modern FP users overall (95% CI: 26.3 - 28.3). This suggests that 273 out of every 1000 women in Uganda utilize contemporary FPM.

Table 2: Prevalence of Modern Contraceptive Use

	Category	Count	Percent (95% CI)
Modern Contraceptive Use	Non-User	13456	72.7 (71.7, 73.7)
	User	5050	27.3 (26.3, 28.3)

Source: UDHS Data 2016

The study's second objective was to determine how modern FP usage varied depending on where people

lived. According to table 3's findings, the majority of users came from urban areas, with 30.5% (95% CI:

28.6% - 32.4%) representing the largest percentage of urban users. This percentage is greater than the 27.3% national average. The percentage of women who used

contemporary FP in rural homes was 26.1 (95% CI: 25.0% - 27.3%).

Table 3: Variations in modern FP Use among women according to residence

		Types of Place of Residence		Z/t
		Urban (95% CI) 26.7 (25.1, 28.4)	Rural (95% CI) 73.3 (71.6, 73.3)	
Modern Contraceptive Use	Non-User	69.5 (67.6, 71.4)	73.9 (72.7, 75.0)	5.26 ***
	User	30.5 (28.6, 32.4)	26.1 (25.0, 27.3)	
Age at first birth	Mean (95% CI)	19.4 (19.2, 19.6)	18.4 (18.3, 18.5)	13.88 ***
Age at first sex	Mean (95% CI)	17.1 (17.0, 17.3)	16.3 (16.2, 16.4)	2.62 **

Source: UDHS Data 2016. *** $p < 0.001$, ** $p < 0.01$

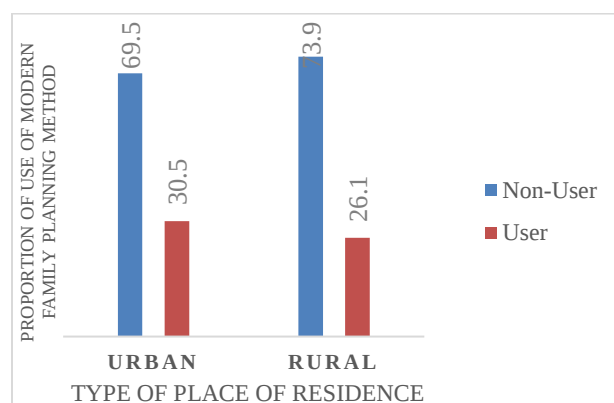


Figure 1: Rural/Urban Variations in Modern FP Method Use among Women

Source: UDHS Data 2016

According to table 3 ($Z = 5.26$, $p = 0.000$), considerable differences between urban and rural houses in terms of the proportions of modern FP usage. This suggested that women use modern FP in significantly higher numbers in urban than in rural settings. UDHS 2016 data show that, notwithstanding this heterogeneity, women in rural regions experience their first sex at a younger average age of 16.3 (95% CI: 16.2, 16.4) than their urban counterparts, who typically experience their first sex at the age of 17.1 (95% CI: 17.0, 17.3). The findings also showed a statistically significant difference between these average ages ($t = 13.88$, $p = 0.000$). The findings also showed that the average first birth age in rural areas was lower—18.4 (95% CI: 18.3, 18.5)—than in urban areas, where it was higher—19.4 (95% CI: 19.2, 19.6).

The difference in ages at first birth was therefore also statistically significant ($t = 2.62$, $p = 0.01$), as shown by Table 3 and Figure 1.

The third objective of the study was to identify factors that contribute to the use of modern FP. First, the study established whether there were any variations in woman, home, and community level characteristics at PSU. PSU was modelled as random in the random effects framework. According to table 4's findings, the utilization of modern FPM among PSUs varied significantly. The intercept's variance was calculated as [$\text{Var}(\text{intercept}) = 0.25$; 95% CI: 0.21, 0.31]. 7.2% (95% CI: 5.9% - 8.7%) was the inter-cluster correlation coefficient. Since the random effect model outperformed the traditional binary logistic regression model by a significant margin ($p < 0.05$), the random effect model was found to be superior to LRT. This established the necessity of applying a random effects model, and the outcomes are displayed.

Table 4: Null Random Intercept Effects Model for Modern Contraceptive Use

Estimates	Null Model OR (95% CI)
Intercept	0.34 (0.32, 0.36) ***
Var (Intercept)	0.25 (0.21, 0.31)
ICC	7.2% (5.9%, 8.7%)
LRT	267.9 ***
AIC	21157.4
BIC	21173.1

Source: UDHS Data 2016.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

When household level only and community level only factors are taken into account, the results in Table 5 are exclusively

for the woman level factors. The final model displays the model after every variable has been taken into account.

Table 5: Determinants of Modern Family Planning Use among Women of Reproductive Age in Uganda.

	Categories	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 4 AOR (95% CI)
Woman Level Factors					
Age in 7 groups	15 – 19	1			1
	20 – 24	1.25 (1.03, 1.50) *			1.14(0.92, 1.42)
	25 – 29	1.51 (1.25, 1.83) ***			1.38(1.10, 1.73) **
	30 – 34	1.60 (1.32, 1.96) ***			1.54(1.22, 1.94) ***
	35 – 39	1.50 (1.21, 1.86) ***			1.44(1.13, 1.85) **
	40 – 44	1.87 (1.47, 2.38) ***			1.96(1.50, 2.58) ***
	45 – 49	0.98 (0.66, 1.43)			0.99 (0.65, 1.52)
Education Level	No Education	1			1
	Primary	1.90 (1.62, 2.25) ***			1.75 (1.46, 2.11) ***
	Secondary	2.06 (1.69, 2.50) ***			1.80 (1.44, 2.25) ***
	Higher	1.86 (1.42, 2.44) ***			1.79 (1.32, 2.43) ***
Working Status	Not Working	1			1
	Working	1.13 (0.99, 1.27) ^			1.17 (1.01, 1.34) *
Current Marital Status	Never in Union	1			
	Married	1.75 (1.41, 2.18) ***			
	Living with a partner	1.62 (1.31, 2.00) ***			
	Others	1.18 (0.93, 1.49) ^			
Distance to health facility	Big Problem	1			
	Not a big problem	1.14 (1.04, 1.25) **			
Ever had pregnancy terminated	No	1			1
	Yes	0.83 (0.75, 0.93) **			0.78 (0.69, 0.88) ***
Access to Newspapers	No access	1			
	Some access	1.14 (1.00, 1.30) ^			
Access to Radio	No access	1			
	Some access	1.02 (0.92, 1.14)			
Access to television	No access	1			1
	Some access	1.19 (1.06, 1.33) **			1.17 (1.01, 1.34) *
Frequency of Internet use in last month	Never Used	1			1
	Ever Used	0.77 (0.62, 0.97) *			0.75 (0.57, 0.98) *
Owns a phone	No	1			1
	Yes	1.46 (1.32, 1.61) ***			1.34 (1.19, 1.51) ***
Last birth caesarean	No	1			1
	Yes	1.43 (1.20, 1.69) ***			1.48 (1.22, 1.80) ***
Household Level Factors					
Wealth Quintile	Lowest		1		1
	Second		1.52 (1.32, 1.74) ***		1.44 (1.23, 1.68) ***
	Middle		1.74 (1.51, 2.01) ***		1.51 (1.27, 1.79) ***
	Fourth		2.10 (1.81, 2.44) ***		1.75 (1.45, 2.11) ***
	Highest		2.34 (1.99, 2.76) ***		1.61 (1.27, 2.05) ***
Sex of HH head	Male		1		1
	Female		0.76 (0.68, 0.85) ***		0.74 (0.64, 0.84) ***
Number of HH Members	1-5 members		1		
	6 and above members		1.24(1.13, 1.35) ***		
Husbands Education	No Education		1		1
	Primary		1.62 (1.34, 1.97) ***		1.41 (1.12, 1.78) **
	Secondary or Higher		1.72 (1.41, 2.10) ***		1.50 (1.17, 1.91) ***
Who decides on Healthcare	Woman Alone		1		
	Woman and Partner		0.98 (0.88, 1.08)		
	Others		0.87 (0.78, 0.98) *		
Religion	Anglican		1		1
	Catholics		0.84 (0.76, 0.93) ***		0.88 (0.78, 0.99) *
	Others		0.78 (0.70, 0.88) ***		0.76 (0.67, 0.87) ***
Community Level Factors					
Type of place of residence	Rural			1	
	Urban			0.89 (0.79, 1.00) ^	
Region	Central			1	
	Eastern			0.86 (0.75, 0.99) *	0.87 (0.72, 1.05)
	Northern			0.54 (0.47, 0.63) ***	0.80 (0.65, 0.99) *
	Western			0.91 (0.79, 1.05) ^	0.99 (0.83, 1.21)
Intercept		0.09 (0.06, 0.12) ***	0.21 (0.17, 0.27) ***	0.46 (0.41, 0.52) ***	0.13 (0.09, 0.18) ***
Var (Intercept)		0.28 (0.22, 0.36)	0.23 (0.17, 0.30)	0.21 (0.17, 0.26)	0.26 (0.19, 0.35)
ICC		7.8% (6.1%, 9.9%)	6.5% (5.0%, 8.4%)	6.0% (4.8%, 7.4%)	7.2% (5.5%, 9.7%)
LRT		138.5 ***	115.1 ***	199.7 ***	87.3 ***
AIC		12643.9	13669.2	21073.9	10127.2
BIC		12810.2	13771.6	21120.9	10330.5

Source: UDHS Data 2016. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ^ $p < 0.2$

According to Table 5, women aged 25 to 29 were more likely to use modern FPM than women aged 15 to 19 (AOR = 1.38, 95% CI: 1.10, 1.73), followed by women aged 30 to 34 (AOR = 1.54; 95% CI: 1.22, 1.94), women aged 35 to 39 (AOR = 1.44; 95% CI: 1.13, 1.85) and women aged 40 to 44 (AOR = 1.96; 95% CI: 1.50). The results also revealed a significant correlation between the woman's education level and her present FPM. Women with a primary education were almost twice as likely to utilize modern FPM as those without one (AOR = 1.75; 95% CI: 1.46, 2.11). In a similar vein, people with secondary education or higher were almost twice as likely to use modern FPM as those with no education (AOR = 1.80; 95% CI: 1.44, 2.25) AOR = 1.17; 95% CI: 1.01, 1.34); this indicates that having a job enhances a woman's likelihood of using modern contraception by 17%. The data also revealed that women who work were 17% more likely than those who do not work to use contemporary FP. The results also showed that women who had ever had their pregnancies terminated were less likely to use modern FPM with (AOR = 0.78; 95% CI: 0.69, 0.88) compared to those had never had their pregnancies terminated.

The usage of modern FPM was shown to be positively correlated with having access to a television (AOR = 1.17; 95% CI: 1.01, 1.34), which means that individuals who have access to a television are 17% more likely to use modern FP. The use of current FP and internet usage was found to be mutually exclusive (AOR = 0.75; 95% CI: 0.57, 0.98). Modern Fuse for women was found to be strongly correlated with phone ownership (AOR = 1.34; 95% CI: 1.19, 1.51; implying a 34% higher risk of using current FP compared to those without a phone). The use of modern FP was positively correlated with the last birth being a caesarean section (AOR = 1.48; 95% CI: 1.22, 1.80).

The wealth quintile of households was found to be positively correlated with the use of modern FP, with an AOR of 1.44 (95% CI: 1.23, 1.68) for those in the second quintile, 1.51 (95% CI: 1.27, 1.79) for those in the middle quintile, 1.75 (95% CI: 1.45, 2.11) for those in the fourth quintile, and 1.61 (95% CI: 1.27, 2.05) for those in the highest quintile. The study found that current FPM usage was less common in households led by women (AOR = 0.74; 95% CI: 0.64, 0.84). Husbands' education was discovered to be positively associated with the use of modern FP, with an AOR of 1.41 (95% CI: 1.12, 1.78) for primary-level education and an AOR of 1.50 (95% CI: 1.17, 1.91) for

secondary-level education or high. The study also found that religion had a negative effect on how modern family planning is used. Compared to Anglicans, Catholics had a 12% lower likelihood of using modern FPM (AOR = 0.88; 95% CI: 0.78, 0.99). Additionally, non-Anglicans were 24% less likely to utilize modern FP than Anglicans (AOR = 0.76; 95% CI: 0.67, 0.87), including Muslims and SDAs. Women from Eastern Uganda were discovered to use modern FPM less frequently than those from Central Uganda (AOR = 0.80; 95% CI: 0.65).

The final model revealed that the intercept's variance was 0.26 (95% confidence interval: 0.19, 0.35), the ICC was 7.2% (95% confidence interval: 5.5%, 9.7%), and the LRT was 87.3 ($p < 0.001$). The resultant model's AIC and BIC were lower than those of the empty model, or a model without covariates, with AIC = 10127.2 and BIC = 10330.5, respectively. This demonstrated that the final model outperformed model 0.

4.2 Discussion

In this study, 18,506 Ugandan women of reproductive age from both urban and rural areas were studied in order to determine the characteristics that affect the use of modern FP. The study especially examined common modern FP use, how location affected it, and factors that influenced its uptake.

It was found that 27.3% of people used contemporary contraceptives (95% CI: 26.3 - 28.3%). This is consistent with the findings of (Boadu, 2022), whose research examined 37 Sub-Saharan African nations. However, it was discovered that these nations' average rates of modern FPM use were 5.3% lower than those of Uganda, with Namibia having the greatest rate—nearly 50% of women—and Central Africa Republic having the lowest—3.5%. The results also relate to the Apanga et al. (2020) study, which examined 20 African nations and found that the average prevalence of contemporary contraceptives was 26%, 1% lower than in Uganda but within the same confidence interval as that of Ugandan population. Additionally, investigations conducted by Asresie et al. (2020) in Amhara, Ethiopia in and by Akoth et al. (2021) in Kenya among urban women indicated greater prevalences of modern contraceptive usage than the one found in this study, with 95% confidence intervals (CI) of 51.3% and 53.7%, respectively. In relation to the use of contemporary FP, this prevalence is over two

times that of Uganda. This may be as a result of the various study environments. Despite the fact that the entire nation was taken into account in this study, the studies mentioned above only looked at a particular group, which may not accurately reflect the complete population. In contrast to these findings, investigations by Sserwanja et al. (2021) among Ugandan teenagers and Mahande et al. (2020) among Tanzanian postpartum women found that only 9.4% and 11.9% of Ugandan adolescents and postpartum women, respectively, used modern FP. This could also be determined by the various study environments and study sample populations.

In terms of the use of modern contraceptives, there is a significant difference between urban and rural women; urban women are more likely to use them than women who reside in rural areas. The prevalence of modern FP was found to be 53.7% among women living in urban areas in the study by Akoth et al. (2021), which is much higher than that observed in Uganda, where it was found to be 30.5% (95% CI: 28.6, 32.4%). In the study by Sserwanja et al. (2021) on modern contraceptive use among teenagers in Zambia, it was found that rural areas used modern contraceptives more frequently than urban areas did—13.7% (95% CI: 12.1–15.3% vs. 9.8%). The findings of the research mentioned above diverged from those of this study in two ways: Overall, the rates of use were lower than those discovered in Uganda, and whereas urban dwellers in Uganda tend to use contemporary contraceptives more frequently, this was not the case among Zambian teenagers. However, Sserwanja et al. (2020)'s findings concur with those of Badi (2020), who also noted a higher percentage of rural women in Ethiopia using long-acting contraceptives (14.8 percent; 95% confidence interval: 12.4 to 17.2) than did urban women (8.3 percent; 95% confidence interval: 4.5 to 12.4%). Overall, this study demonstrated that there are differences in how modern contraceptives are used depending on where people live.

The study found that factors linked with modern FP uptake were positively associated with the woman's age in regard to the usage of modern contraceptives. These results are consistent with those of Boadu (2022), who studied 37 Sub-Saharan African nations, (Tsegaw et al., 2022), who studied Liberia, Hlongwa et al. (2022), who studied KwaZulu Natal, South Africa, and Kamal, (2015), who studied Bangladesh. However, Asresie et al. (2020) found a negative correlation between age and contemporary contraception use. Kamal (2015) also discovered a negative correlation between use and older age groups. The overarching finding in this case is that age is related to the usage of contemporary contraceptives,

with younger women being much more likely to use them than older women. Different studies have found a correlation between age and at least a secondary level of education in women's education, which was also seen in this study. Therefore, it is necessary to improve women's and girls' access to education in order to increase the possibility that contemporary contraceptives will be used.

This study also found that the use of contemporary contraceptives was positively correlated with the wealth index, particularly among middle-class, wealthy, or even wealthier individuals. These results are supported by studies conducted in Liberia by Gebre and Edossa (2020), Tanzania by Mahande et al (2020), and Ethiopia by Asresie et al (2020). They show that wealthy families or women take contemporary contraceptives more frequently than those who do not. But according to research by Kamal (2015) in Bangladesh, this link was unfavorable among the wealthiest households. In Uganda, it was discovered that the use of contemporary contraceptives was inversely correlated with the household's religion. Similar results have also been noted in Liberia (Gebre & Edossa, 2020), India (Kumar et al., 2021), and all 37 Sub-Saharan African nations combined (Boadu, 2022). This suggests that beliefs and affiliations related to religion do not promote the use of contemporary contraception.

Additionally, it was found in this study that women who were working were substantially more likely than those who were not to use modern contraception. These results concur with those by Mahande et al. (2020) in Tanzania and Kamal (2015) in Bangladesh. In this study, a working woman was defined as a woman who had any type of job where she received payment for her labor. This might be the case because working women are financially capable of paying for these services or because they are informed and aware of where to find FP services. Additionally, it was discovered that access to television and having ever had a pregnancy terminated were strongly related with modern FP usage in Uganda. These results conflict with those from Liberia (Gebre & Edossa, 2020). These were discovered to be unrelated to the contemporary usage of FP in Liberia. Contrary to the findings in Uganda, Kamal (2015) found that access to television was positively associated with the use of contemporary FP in Bangladesh. The findings of studies looking at husbands' educational levels in Liberia (Gebre & Edossa, 2020) and India (Kumar et al., 2021) are consistent with those of this study.

5. Conclusion & Recommendation:

5.1 Conclusion:

According to the study's findings, contemporary contraceptive use is still not very common. Only roughly 27 out of every 100 women use current methods of birth control. This is still a low number if Uganda is to reap the rewards of modern FPM use, including lower rates of maternal death, lower costs for post-abortion care due to undesired pregnancies, reduced rates of adolescent pregnancy, and general human capital development.

According to the study, women's use of contemporary contraception varies significantly depending on whether they live in an urban or rural area. Women in cities used more than women in rural areas did. This is not surprising given that, compared to rural locations, urban areas typically have easier access to healthcare services in terms of transportation options and travel times. This is also true since metropolitan areas have easier access to information than rural ones. Leaving this altogether, neither of the residences use many contemporary contraceptives. Additionally, this calls for more group-centred strategies to boost usage and access in both rural and urban settings.

It was discovered that many woman, family, and societal characteristics were related to the use of contemporary contraceptives. The use of modern FP was substantially correlated with age, education level, and employment status, access to television, internet use frequency, and ownership of a personal phone, wealth quintile, household head's sex, husbands' educational attainment, religion, and geography. The application of a random effects model revealed that there were variances in the use of contemporary contraceptives among the primary sampling units. The likelihood ratio test demonstrated that using a random effects model as opposed to a traditional binary logistic regression model was a better choice.

5.2 Recommendation:

The study made use of secondary data that had been gathered roughly five years prior. The variables gathered throughout these surveys will determine how these data are used. Therefore, it was not possible to evaluate the relationship between characteristics that were excluded from this survey and may be related to modern FP use. These factors might include waiting times, staff attitudes, and cultural norms surrounding the use of contemporary contraceptives. These were beyond what the researcher could control and therefore

used only available variables in the data. Future scholars should probably look into how these relate to contemporary FP use in Uganda.

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