Multilevel mixed effects analysis of individual and community factors associated with unmet need for contraception among married women in four East African countries

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ABSTRACT

Background: Despite the use of contraceptives being an expression of a woman's reproductive control, the prevalence of unmet need remains high and a public concern among married women in East Africa. However, limited literature has explored the associated factors in the region. We live in age of leaving no one behind unfortunately many women still have unmet for family planning todate. This study therefore intends to examine the individual and community level factors associated with unmet need for contraception among married women in Burundi, Rwanda, Tanzania and Uganda.
Methods: The study utilizes data from the four recent demographic and health surveys for Burundi, Rwanda, Tanzania and Uganda. Analyses were conducted using multilevel mixed effects logistic regressions with random community and country level effects. Results are reported using predictive probabilities and margins.
Results: This study revealed that: 20%, 22%, 28% and 33% of the married women in Tanzania, Uganda, Rwanda and Burundi respectively had unmet need for contraception. Younger women, and those: without formal education, from the poorest households, had ever experienced child loss, whose husbands desire more children than them, and have no access to family planning messages faced a higher probability of unmet need for contraception. This was also true for women living in communities with low usage of modern contraception and those in communities where there is an increasing number of children per woman.
Conclusions: The findings reiterate the need for family planning efforts to focus on younger women. Additionally, improved education, economic empowerment, calls for spousal involvement in family planning matters, support for those with child loss, and comprehensive awareness initiatives remain vital to tackling unmet need for contraception.

1. Background

Unmet need for family planning is defined as a proportion of married women who are neither pregnant nor postpartum amenorrheic and want to space their next birth at least for 2 years or prefer to stop childbearing but are not using contraceptives; or women who are currently pregnant/postpartum amenorrheic but their current pregnancy/last birth was unwanted or mistimed (Bradley et al., 2012). In 2019, an estimate of 190 million women wished to avoid pregnancies but were not using any contraceptive method globally (United Nations et al., 2019). This has become a major challenge especially in developing countries (Melhado, 2013; United Nations Department of Economic and Social Affairs,

Population Division, 2020) and it is one of the major goals of UNFPA to end unmet need for family planning by 2030 (UNFPA 2020 *About Us*, n. d.)

In sub-Saharan African countries, the overall modern contraceptive prevalence is lowest among currently married than non-married women (Wang et al., 2017). Studies have also showed a big difference between total wanted fertility and the actual fertility rate; for example, in Uganda and Tanzania, the total wanted fertility rate of 4.3 and 4.5 was lower than the actual fertility rate of 5.4 and 5.2, respectively, which implies that women still have unplanned pregnancies (MoHCDGEC, MoH, NBS, OCGS, and ICF, 2016; Uganda Bureau of Statistics and ICF, 2018).

The reasons for such married women to have the highest unmet need

for contraception are related to health risks, community influence, cultural beliefs and norms (Guttmacher Institute, 2016) and inability to access family planning services (Cahill et al., 2018). This has led to several health consequences including unplanned pregnancies (Sedgh et al., 2014) and high population growth explosions especially in the sub-Saharan African region (United Nations Department of Economic and Social Affairs Population Division, 2020).

Different studies on unmet need have been done in several African countries like: Ghana (Pav & Boadi, 2000), Ethiopia (Dingeta et al., 2019), Nigeria (Mohammed et al., 2018), Cameroon (Edietah et al., 2018), Burundi (Nzokirishaka & Itua, 2018), Kenya (Ojakaa, 2008), Uganda (Khan et al., 2008, pp. 1995–2006) and other developing countries including, but not limited to, India (Prusty, 2014; Yadav et al., 2020), Afghanistan (Dadras et al., 2022) and Indonesia (Wilopo et al., 2017). A few studies exploring both individual and community factors associated with unmet need for contraception have been done in East Africa (Khan et al., 2008, pp. 1995–2006; Nzokirishaka & Itua, 2018; Ojakaa, 2008). However, these have only been done across individual countries. This study therefore sought to add on the literature of unmet need for contraception among married women in Burundi, Rwanda, Tanzania and Uganda. It is evident that Kenya was not considered in this study since more than half of its married women (58%) were using contraceptives and with low levels of unmet need (18%) in relation to its most recent survey (Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development Nairobi, The DHS Program, 2015) as compared to its neighbors. Further, the Family Planning High Impact Practices (HIP), (FP 2020) initiative that evaluated the progress in family planning indicators among the least developed countries revealed that Kenya registered the most considerable progress, of all the East African countries both in terms of increase in uptake of modern contraceptives and demand satisfied thereby surpassing the set expectations within 5 years (Cahill et al., 2018).

Specifically, this study set out to i) Examine and identify the common individual and community level factors associated with unmet need for contraceptives among married women in the four East African countries and ii) Assess the country variations in the factors that are associated with unmet need for contraception. The authors hope that the study findings will inform the regional and individual country strategies aimed in reducing the level of unmet need for contraception among married women.

2. Methods

2.1. Data source

We used data for the most recent demographic and health surveys (DHS) for Burundi, and Tanzania. That is: 2016–2017 Burundi DHS, and 2015–2016 Tanzania DHS. Although Rwanda's and Uganda's most recent DHS data is for the 2019–20 and 2022 surveys respectively, we opted to use the second most recent data (2014–2015 Rwanda DHS and 2016 Uganda DHS) to enable us make comparisons on the basis of data collected around the same period. Subsamples of only married women aged 15–49 were used for all the countries. The surveys were based on nationally representative samples of 17,269; 13,497; 13,266 and 18,506 women aged 15–49 years of age for Burundi, Rwanda, Tanzania and Uganda respectively (Fig. 1). The derivation of the study sample used in the analysis is further presented in Fig. 1. The approval to download and use these data sets was obtained from the Measure DHS website: www.measuredhs.com upon request.

In the four countries, the DHS employed a two stage stratified sample design. The first stage comprised of a selection of enumeration areas (EAs) obtained from a list of clusters based on the most recent census in each country as the sampling frame. The second stage involved a systematic sampling of households within each cluster from which all women of child bearing age (15–49 years), who were either permanent
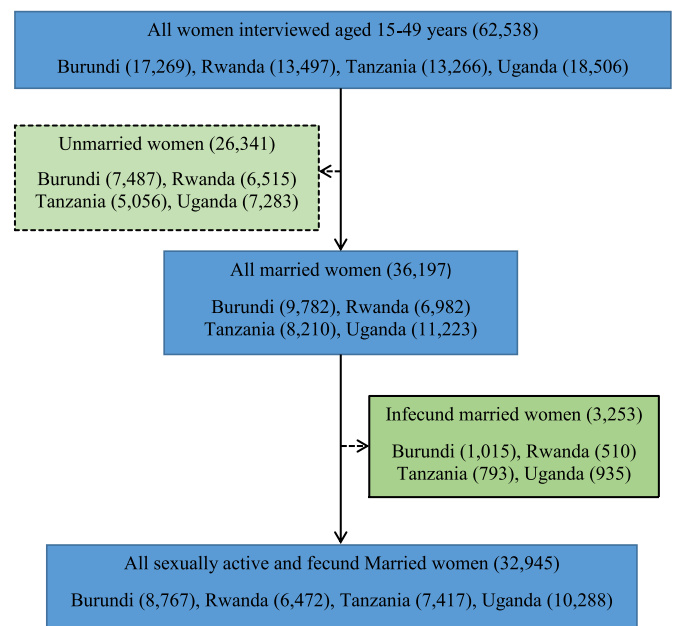

Fig. 1. Derivation of the study sample.

residents of the households or visitors who slept in the households the night before the survey were eligible to be interviewed (Ministère à la Présidence chargé de la Bonne Gouvernance et du Plan Burundi MPBGP; Ministère de la Santé Publique et de la Lutte contre le Sida Burundi MSPLS; Institut de Statistiques et d'Études Économiques du Burundi ISTEEBU; et ICF, 2018; National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International, 2015; Uganda Bureau of Statistics and ICF., 2018). In this study, women who were never married, divorced, separated and widowed or infecund were excluded. Infecund women in this study were defined as those women who were not pregnant or postpartum amenorrhea, and were either: in marriage for 5 or more years, had no children in the past 5 years, and never used contraception; responded "Can't get pregnant" regarding the desire for future children; said "menopausal/hysterectomy" as a reason for not using contraception; responded to time since last period as ≥6 month, and not postpartum amenorrhea; responded to time since last period as "menopausal/hysterectomy" or "never menstruated", or "last period was before last birth", and last birth was over 5 years ago (Bradley et al., 2012). Such women were taken to have no need for family planning (Bradley et al., 2012). The figure below shows a final weighted sample size for each country that was used in the study.

3. Variables and their measurements

3.1. Dependent variable

The outcome variable for this study is unmet need and was generated from the variable *"unmet need for contraception"* in the DHS dataset. This variable was categorized as *"never had sex; unmet need for spacing; unmet need for limiting; using for spacing; using for limiting; no unmet need; not married and no sex in last 30 days; infecund; menopausal."* A binary outcome variable was generated on that basis. All married women who reported unmet need for spacing or limiting births, were coded 1 and constituted the category "have unmet need". while, all other married women were coded 0 and constituted the category "have no unmet need" if they reported using contraceptives for spacing or limiting, or were already categorized as having no unmet need. Women who reported never having had sex, not married, infecund and menopausal were excluded because they did not qualify for inclusion in the study.

3.2. Independent variables

The independent variables were categorized into individual and community factors. Individual factors included: woman's age (15–24, 25–34, and 35–49), level of education (no education, primary, secondary/higher), working status (working and not working), number of living children (0–1, 2–3, 4–5, 6+), husband's desire for children (both want the same number of children, husband wants more, husbands want few, don't know) and wealth index (poor, middle and rich). A detailed explanation of how wealth index was generated is provided in the supplementary file. Further, history of child death categorized as (yes or no) and decision on a woman's health care, categorized as husband/partner alone, respondent alone, joint decision, and others (the categorization is based on a question in the DHS that asks about the person who usually decides on respondent's health care). Access to family planning (FP) messages was measured using four questions that required whether a woman was exposed to family planning messages on either radio, television, newspapers or phone in the last month. All responses indicating that the woman was not exposed to family planning messages through any of the four forms of media were merged, and coded 0 to generate the category 'No.' If a woman reported exposure to family planning messages through any of those forms of media, her response was coded 1. Therefore, all such women constituted the category 'Yes.'

Community factors included: place of residence (urban, rural); distance to health facility (women were asked if the distance to the health facility was a problem for them to get any medical assistance and responses were coded as: 1 if it was big problem and 0 if it was not a big problem). Other community factors were obtained by aggregation of individual level characteristics of women within their clusters (communities) since the DHS did not directly capture data that could describe these characteristics and the average values at the cluster level used as the cut off point for the categorization. This study considers a cluster as a community of women who are likely to share similar or common behaviors, values and norms. This method of aggregating individual factors is appropriate and has been used in prior studies for the analysis of community factors associated to sexual and reproductive health outcomes (Abate & Tareke, 2019; Kaggwa et al., 2008). In this case, each woman was assigned a value representing the average response of all other respondents in her cluster. These factors included: community education (coded as low for values below the average level of education while high for values equal or above the mean); community wealth (coded as high for values equal and above the mean basing on the wealth index categories of the individual women while low for values below the mean); community women working (coded as low for values below the mean while high for values equal or above the mean); community use of modern contraceptives. Modern contraceptive use was obtained from women's responses on the use of any of the following methods: male or female sterilization, injectable, intrauterine devices, contraceptive pills, implants, female or male condoms, standard days method, lactational amenorrhea, and emergency contraception. Basing on these responses, we generated a binary variable for modern contraceptive (yes or no) which was later aggregated to generate the cluster level variable of community use of modern contraceptives (coded as high for values equal and above the mean basing on the modern contraceptive variable of the individual women while low for values below the mean). Other community variables included community mean age at first marriage, community mean age at sexual debut and community mean number of living children which were treated as continuous variables.

3.3. Data analysis

Data analysis was done at three stages using STATA 15 statistical software. First, we conducted a descriptive summary of the variables using frequency distributions for categorical variables and mean values for continuous variables.

At the second stage, we based on the hierarchical nature of the data obtained from the DHS and applied a bivariate multilevel logistic regression model. The model was to examine the crude association between the individual and community-level factors versus unmet need for contraception, among married women in each of the four countries. A p-value <0.05 was set as the statistical significance level at 95% confidence level.

At the third stage, we assessed the country variations in individual and community level factors associated with unmet need by running a multivariate two-level mixed-effect logistic regression model with married women at level 1 being nested within communities at level 2. We ran four models where, model 1 was an empty model testing for random variability in the intercept, model 2 examined the effect of only the individual woman's characteristics on unmet need for contraception, model 3 examined only the effect of community-level factors, and model 4 examined the effect of both individual and community level factors simultaneously. The intra-class correlation coefficient and the proportional change in variance were also computed. The model fitted is represented as:

$$log\left[\frac{\pi_{ij}}{1-\pi_{ij}}\right] = X_{ij}'\beta + \mu_j + \varepsilon_{ij} \tag{1}$$

Where: π_{ij} is the probability that the *i*th married woman in the *j*th community had unmet need for contraception; β is a vector of coefficients to be estimated; X_{ij}' is a vector of individual and community level factors; μ_j and ε_{ij} are random effects at community and individual levels respectively.

In order to check for multi-collinearity among the selected predictor variables in all the four countries, we used variance inflation factor (VIF) and none of the factors displayed problems of multi-collinearity. Still, the log likelihood test and the Akaike Information Criterion (AIC) were used to estimate the goodness of fit of the adjusted final model.

In this study, we did not control for heterogeneity of the samples. For this reason, multivariate level results are reported in-text using predicted probabilities and predicted margins, as recommended by Mood (2010). Results indicating adjusted odds ratios (AOR) are provided in a supplementary file.

4. Results

4.1. Sample characteristics

Table 1 presents the descriptive summary of individual and community characteristics of sexually active and fecund married women who were aged 15–49 years in the four selected countries using their most recent surveys. Married women were nested within 554 clusters (communities) in Burundi, 492 in Rwanda, 608 in Tanzania and 696 in Uganda (Table 1) with the average number of eligible women per community being 15, 13, 12 and 15 in Burundi, Rwanda, Tanzania and Uganda respectively.

In terms of individual characteristics, Table 1 shows that in all the countries, the highest proportion of women were aged between 25 and 34 years, had between two and three living children, reported their husbands as desiring an equal number of children like them and also reported that their decision on seeking healthcare was made jointly with their partners. Similarly, most of the women surveyed in the four countries were working, lived with their partners, reported no history of child death, and resided in rural areas. The descriptive results also indicate that access to the nearest health facility was not a problem for most of the women in the four countries as most reported that distance to such a health facility was not a problem.

Unlike in Rwanda, Tanzania and Uganda, the proportion of women with no formal education was highest in Burundi where 4 out of 10 women reported having attained no level of education (46.3%). Further, results in Table 1 shows 6 out of 10 (68.0%) women in Burundi were reported having no access to family planning messages. In addition,

Table 1
Distribution of married women by the selected characteristics.

Selected characteristic	2016–2017 Burundi (N = 8767)		2014–2015 Rwanda (N = 6472)		2015–2016 Tanzania (N = 7417)		2016 Uganda (N = 10,288)	
	N	%	N	%	N	%	N	%
Woman's age								
15–24	1730	19.7	961	14.9	2123	28.6	3258	31.7
25–34	4219	48.1	3211	49.6	2854	38.5	4202	40.8
35–49	2818	32.2	2300	35.5	2440	32.9	2828	27.5
Level of education								
No education	4062	46.3	994	15.4	1356	18.3	1075	10.4
Primary	3709	42.3	4616	71.3	4888	65.9	6137	59.7
Secondary/Higher	996	11.4	862	13.3	1173	15.8	3076	29.9
Wealth index								
Poor	3686	42.0	2585	40.0	2879	38.8	4000	38.9
Middle	1775	20.3	1346	20.8	1382	18.6	2000	19.4
Rich	3306	37.7	2541	39.2	3156	42.6	4288	41.7
Number of living children								
0–1	1534	17.5	1464	22.6	1919	25.9	2219	21.6
2–3	3113	35.5	2603	40.2	2644	35.6	3378	32.8
4–5	2460	28.1	1643	25.4	1623	21.9	2488	24.2
6+	1660	18.9	762	11.8	1231	16.6	2203	21.4
Husband's desire for children								
Both want same	4837	55.2	3891	60.1	2933	39.6	3550	34.5
Husband wants more	1533	17.5	748	11.6	1776	23.9	3265	31.7
Husband wants fewer	1541	17.6	1152	17.8	433	5.8	1018	9.9
Don't know	855	9.7	681	10.5	2275	30.7	2455	23.9
Decision on a woman's healthcare								
Husband/partner alone	2448	27.9	1040	16.1	2010	27.1	2718	26.4
Respondent alone	1006	11.5	1468	22.7	1140	15.4	3031	29.5
Joint decision	5297	60.4	3927	60.7	4236	57.1	4499	43.7
Others	16	0.2	37	0.6	31	0.4	40	0.4
Working status								
Not working	1070	12.2	872	13.4	1649	22.2	2102	20.4
Working	7697	87.8	5600	86.6	5768	77.8	8186	79.6
Living arrangement								
Woman stays with partner	7691	87.7	5867	90.7	6867	92.6	8615	83.7
Woman stays alone	1076	12.3	605	9.3	550	7.4	1673	16.3

Selected characteristic	2016–2017 Burundi (N = 8767)		2014–2015 Rwanda (N = 6472)		2015–2016 Tanzania (N = 7417)		2016 Uganda (N = 10,288)	
	N	%	N	%	N	%	N	%
History of child death								
No[†]	6392	72.9	4938	76.3	5765	77.7	7690	74.7
Yes	2375	27.1	1534	23.7	1652	22.3	2598	25.3
Access to family planning messages								
No	5964	68.0	2830	43.7	2417	32.6	3035	29.5
Yes	2803	32.0	3642	56.3	5000	67.4	7253	70.5
Place of residence								
Urban	891	10.2	1116	17.2	2307	31.1	2477	24.1
Rural	7876	89.8	5356	82.8	5110	68.9	7811	75.9
Distance to the health facility								
Not a big problem	5913	67.5	5040	77.9	4066	54.8	6309	61.3
Is a big problem	2854	32.5	1432	22.1	3351	45.2	3979	38.7
Community education								
Low	5694	64.9	3601	55.6	3828	51.6	5237	50.9
High	3073	35.1	2871	44.4	3589	48.4	5051	49.1
Community wealth								
Low	5472	62.4	4004	61.9	4111	55.4	4638	45.1
High	3295	37.6	2468	38.1	3306	44.6	5650	54.9
Community women working								
Low	3232	36.9	2337	36.1	3405	45.9	4926	47.9
High	5535	63.1	4135	63.9	4012	54.1	5362	52.1
Community use of modern contraceptives								
High	4268	48.7	3348	51.7	3935	53.1	5404	52.5
Low	4499	51.3	3124	48.3	3482	46.9	4884	47.5
Community mean age at marriage	**19.9**	*1.8*	**21.2**	*1.5*	**18.7**	*1.7*	**18.3**	*1.5*
Community mean age at sexual debut	**19.4**	*1.6*	**20.5**	*1.4*	**17.0**	*1.5*	**16.5**	*1.1*
Community mean number of living children	**3.6**	*0.7*	**3.1**	*0.6*	**3.4**	*0.9*	**3.7**	*0.8*
Clusters (communities)	554		492		608		696	

N is the weighted frequency, % is the percentage; in bold in the frequency column is the mean of the continuous variable; in italic in the percentage column is the standard deviation.

slightly more women in Burundi and Rwanda were staying in poor households (42.0% and 40.0% respectively) compared to those in Tanzania and Uganda (38.8% and 38.9% respectively).

Regarding the community characteristics, most women in all the four countries were staying in communities with low levels of education. Relatedly, most women were staying in communities where there was a high level of involvement of women in work, and a slightly higher proportion of such women was observed Burundi and Rwanda (63.1% and 63.9% respectively) compared to Tanzania and Uganda (54.1% and 52.1% respectively). Despite most women (42.6%) in Tanzania having belonged to the rich category in terms of individual wealth index, the results on community wealth index show that most of the women (55.4%) actually stay in communities characterized by poor living standards. In Rwanda, Tanzania and Uganda, 4 in 10 married women were living in communities that have low modern contraceptive uptake. This proportion was however slightly higher in Burundi (51.3%).

On average, the community mean number of living children was at least three children in all the countries. Relatedly, community mean age at sexual debut was lower than community mean age at marriage in all the countries. Whereas the former ranged between 16.5 years in Uganda to 20.5 years in Rwanda, the latter ranged between 18.3 years in Uganda to 21.2 years in Rwanda. This indicates that, generally for all the four countries, women engage in sexual activity much earlier before marriage. Noteworthy is that, firstly, women in Rwanda delay sexual debut and marriage for at least a year when compared to the other three countries. Secondly, community age at sexual debut for women in Burundi nearly coincides with community age at marriage, an indicator that most women in Burundi have their first sexual experience in marriage.

4.2. Prevalence of unmet need for contraception

Table 2 shows the distribution of married women by the prevalence of unmet need for limiting and unmet need for spacing. The results indicate that in all the countries, the latter unmet was higher compared to the former. The prevalence of unmet need for contraception, indicated as total unmet need in the results was highest in Burundi (33.2%). However, in Uganda, Tanzania and Rwanda, the prevalence was 28.4%, 22.1% and 20.4%, respectively. The results indicate that those proportions of married women in the respective countries wanted to space or limit child bearing but were not using contraceptives (see Table 2).

4.3. Findings from bivariate analysis

The results from the bivariate analysis are presented in Table S5. The results reveal that in all the four countries, woman's age, number of living children, husband's desire for children, history of child death, community use of modern contraceptives, and community mean number of living children were significantly and positively associated with unmet need for contraception while woman's education level, wealth index, access to family planning messages, and community education, were significantly and negatively associated with unmet need for

contraception. However, whereas decision on woman's health care was significantly and positively associated with unmet need for contraception in Burundi, the results indicate a significant but negative association in Rwanda, Tanzania and Uganda.

The proportion of community women working was positively associated with unmet need for contraception but only significant in Burundi while living arrangement was significant and positively associated in only Rwanda and Tanzania. Additionally, unlike Rwanda, working status of the woman was also significantly associated with unmet need for contraception. However, the association was positive in Burundi but negative for Tanzania and Uganda. Other significant and positively associated factors included: place of residence (in Burundi, and Uganda), and distance to health facility (in Rwanda, and Uganda). Other significant but negatively associated factors included: community wealth (in Rwanda, Tanzania, and Uganda), community mean age at marriage (in Burundi, Tanzania, and Uganda), and community mean age at sexual debut (in Tanzania, and Uganda) (Table S5). The factors were considered for multivariate analysis to identify their net impact on unmet need for contraception within the four countries.

5. Findings from multivariate analysis

In all countries, younger women (15–24 years) generally exhibit a higher unmet need for contraception, with probabilities ranging from 19.2% to 34.1% (Table 3). Specifically, in Burundi, women aged 15–24 face a 34.1% probability (95% CI: 31–37%) of unmet contraceptive needs, decreasing to 28.2% (95% CI: 26–30%) for those aged 35–49. Similarly, Rwandan women aged 15–24 have a 19.2% probability (95% CI: 16–22%), decreasing to 16% (95% CI: 14–18%) for those aged 35–49. However, the age based differences are less pronounced compared to the other three countries. In Tanzania, probabilities drop from 26.9% (95% CI: 24–29%) for 15-24-year-olds to 20.1% (95% CI: 18–22%) for 35-49-year-olds. Ugandan women aged 15–24 face a 32.3% probability (95% CI: 30–34%), decreasing to 26.4% (95% CI: 24–28%) for those aged 35–49.

Additionally, educational disparities play a significant role. Women without formal education experience a higher unmet need, ranging from 20.8% to 32.9%, compared to their counterparts with secondary or higher education (ranging from 15.8% to 24.2%) (Table 3). For example, in Burundi, women lacking education face a 32.9% probability (95% CI: 31–35%) of unmet need, while Rwandan women in the same category face a 20.8% probability (95% CI: 18–23%). Similarly, in Tanzania, probabilities drop from 23.1% (95% CI: 21–25%) for uneducated women to 22.2% (95% CI: 20–25%) for those with secondary/ higher education. In Uganda, the probabilities decrease from 31.2% (95% CI: 29–33%) for women without education to 25.8% (95% CI: 24–27%) for those with secondary/higher education (Table 3).

In relation to household wealth, women from the poorest households face a slightly higher unmet need, ranging from 19.4% to 31.5%, compared to their counterparts from the richest households (ranging from 17.3% to 29.3%). Burundian women from the poorest households have a 31.5% probability (95% CI: 30–33%) of unmet need, Rwandans face a 19.4% probability (95% CI: 18–21%), Tanzanians experience a 27.7% probability (95% CI: 25–30%), and Ugandans show a 30% probability (95% CI: 28–32%) of unmet need for contraception. Overall, the results show that wealthier women tend to have a lower unmet need for contraception (Table 3).

The results in Table 3 also revealed that in Burundi and Tanzania, women who had ever lost a child face a higher probability (32.3% and 23.3% respectively) of unmet need. In Rwanda and Uganda, however, the estimated probability of unmet need for contraception was similar for both groups, with only a marginal difference between women who had never experienced child loss (18% and 28.3% respectively) and those who had ever (18.7% and 28.7% respectively). These results suggest that the relationship between child loss and unmet need for contraception is not uniform across these countries.

Table 2
Prevalence of unmet need for family planning among married women in four East African countries.

Unmet need	Burundi		Rwanda		Tanzania		Uganda	
	N	%	N	%	N	%	N	%
Unmet need for spacing	1574	17.9	745	11.5	1276	15.5	2054	18.3
Unmet need for limiting	1333	15.2	578	8.9	540	6.6	1129	10.1
Total unmet need	2907	33.2	1323	20.4	1816	22.1	3183	28.4

All estimates based on weighted data.

Table 3

Predictive probabilities of the individual and household factors associated with unmet need for contraception.

	Burundi Pr (95% CI)	Rwanda Pr (95% CI)	Tanzania Pr (95% CI)	Uganda Pr (95% CI)
Woman's Age				
15–24	34.1%	19.2%	26.9%	32.3%
	(31.0–37.0)	(16.0–22.0)	(24.0–29.0)	(30.0–34.0)
25–34	29.5%	19.5%	20.3%	26.9%
	(28.0–31.0)	(18.0–21.0)	(19.0–22.0)	(26.0–28.0)
35–49	28.2%	16.0%	20.1%	26.4%
	(26.0–30.0)	(14.0–18.0)	(18.0–22.0)	(24.0–28.0)
Level of Education				
No education	32.9%	20.8%	23.1%	31.2%
	(31.0–35.0)	(18.0–23.0)	(21.0–25.0)	(28.0–34.0)
Primary	28.5%	18.1%	21.6%	29.7%
	(27.0–30.0)	(17.0–19.0)	(20.0–23.0)	(28.0–31.0)
Secondary/ Higher	24.2%	15.8%	22.2%	25.8%
	(21.0–27.0)	(13.0–19.0)	(20.0–25.0)	(24.0–27.0)
Wealth Index				
Poor	31.5%	19.4%	27.7%	30.0%
	(30.0–33.0)	(18.0–21.0)	(25.0–30.0)	(28.0–32.0)
Middle	28.0%	16.9%	24.2%	29.7%
	(26.0–30.0)	(15.0–19.0)	(22.0–27.0)	(28.0–32.0)
Rich	29.3%	17.8%	17.3%	26.9%
	(28.0–31.0)	(16.0–19.0)	(16.0–19.0)	(25.0–28.0)
Number of Living Children				
0–1	14.2%	10.1%	13.2%	19.3%
	(12.0–16.0)	(8.0–12.0)	(12.0–15.0)	(17.0–21.0)
2–3	25.8%	17.6%	22.6%	27.6%
	(24.0–27.0)	(16.0–19.0)	(21.0–24.0)	(26.0–29.0)
4–5	36.6%	24.0%	27.2%	32.5%
	(35.0–39.0)	(22.0–26.0)	(25.0–30.0)	(31.0–34.0)
6+	50.3%	31.0%	33.6%	37.3%
	(47.0–53.0)	(27.0–35.0)	(30.0–37.0)	(35.0–40.0)
Husband's Desire for Children				
Both want same	27.2%	17.6%	22.0%	28.6%
	(26.0–29.0)	(16.0–19.0)	(21.0–23.0)	(27.0–30.0)
Husband wants more	35.0%	20.7%	25.6%	29.8%
	(33.0–37.0)	(18.0–24.0)	(24.0–28.0)	(28.0–31.0)
Husband wants fewer	31.2%	18.7%	25.1%	28.4%
	(29.0–33.0)	(17.0–21.0)	(21.0–29.0)	(26.0–31.0)
Don't know	34.9%	18.2%	18.9%	26.5%
	(32.0–38.0)	(15.0–21.0)	(17.0–20.0)	(25.0–28.0)
Decision on Woman's Healthcare				
Husband/ partner alone	29.6%	19.8%	22.5%	30.6%
	(28.0–31.0)	(17.0–22.0)	(21.0–24.0)	(29.0–32.0)
Respondent alone	31.8%	19.2%	25.7%	29.0%
	(29.0–35.0)	(17.0–21.0)	(23.0–28.0)	(27.0–31.0)
Joint decision	29.7%	17.3%	20.8%	26.7%
	(28.0–31.0)	(16.0–18.0)	(20.0–22.0)	(25.0–28.0)
Others	55.6%	43.1%	10.4%	35.8%
	(32.0–79.0)	(27.0–59.0)	(2.0–19.0)	(21.0–51.0)
Working Status				
Not working	27.8%	21.5%	27.5%	30.9%
	(25.0–31.0)	(19.0–24.0)	(25.0–30.0)	(29.0–33.0)
Working	30.3%	17.7%	20.5%	27.7%
	(29.0–31.0)	(17.0–19.0)	(19.0–22.0)	(27.0–29.0)
Living Arrangement				
Woman stays with partner	29.4%	17.1%	21.2%	28.0%
	(28.0–31.0)	(16.0–18.0)	(20.0–22.0)	(27.0–29.0)
Woman stays alone	34.2%	32.4%	34.1%	30.9%
	(31.0–37.0)	(28.0–36.0)	(30.0–38.0)	(29.0–33.0)
History of Child Death				
No	29.1%	18.0%	21.6%	28.3%
	(28.0–30.0)	(17.0–19.0)	(20.0–23.0)	(27.0–29.0)
Yes	32.3%	18.7%	23.3%	28.7%
	(30.0–34.0)	(17.0–21.0)	(21.0–25.0)	(27.0–31.0)
Access to Family Planning Messages				
No	30.8%	20.8%	24.0%	27.7%
	(30.0–32.0)	(19.0–22.0)	(22.0–26.0)	(26.0–29.0)
Yes	28.1%	16.4%	21.1%	28.7%
	(26.0–30.0)	(15.0–18.0)	(20.0–22.0)	(28.0–30.0)

Furthermore, when husbands desire more children, the probabilities of unmet need rise across all countries. For instance, in Burundi, if the husband desires more children, the probability increases to 35% (95% CI: 33–37%). Similarly, the probability is relatively higher for women in Uganda at 29.8% (95%CI 28–31%) and in Tanzania at 25.6% (95% CI: 24–28%). Notably, the results manifest that women who do not know their husbands' desires for children also tend to face high probabilities of unmet need for contraception as seen in Burundi (34.9%, 95% CI: 32–38%) and Uganda (26.5%, 95% CI: 25–28%).

In Burundi, Rwanda and Tanzania, the pattern of results indicates that a lack of access to family planning messages is associated with a higher estimated unmet need for contraception. Women with no access to family planning messages in these countries had a higher probability of unmet need ranging between 20.8% in Rwanda to 30.8% in Burundi. In contrast, women in Uganda with access to family planning messages faced the highest probability (28.7%, 95% CI: 28–30%) of unmet need. However, the relatively small difference in probabilities between those with and without access to family planning communicates that women with access to FP messages in Uganda also have a high unmet need and that other factors may also play a significant role in determining unmet need.

With regard to place of residence, the results (Table 4) show a variation in unmet need for contraception among rural-urban residence. In Burundi, it was the women in rural areas who faced a higher probability (30.1%, 95% CI: 29–31%) of unmet need. However, in Rwanda, Tanzania and Uganda, it was those in the urban areas. Notably, in Tanzania, the difference in the probabilities was substantial, pointing still to a substantial difference in unmet need between women in rural and urban areas.

The findings (Table 4) also reveal that for all the four countries, there was a consistent pattern regarding the effect of community use of modern contraceptives on unmet need for contraception. Communities with high usage of modern contraceptives showed significantly lower unmet need, ranging from 13.0% to 24.4%, whereas in communities

Table 4

Predictive probabilities of the community factors associated with unmet need for contraception.

	Burundi Pr (95% CI)	Rwanda Pr (95% CI)	Tanzania Pr (95% CI)	Uganda Pr (95% CI)
Place of Residence				
Urban	28.7%	20.3%	28.7%	30.9%
	(24.0–34.0)	(17.0–24.0)	(26.0–32.0)	(29.0–33.0)
Rural	30.1%	17.8%	18.7%	27.4%
	(29.0–31.0)	(17.0–19.0)	(17.0–20.0)	(26.0–29.0)
Distance to Health Facility				
Not a big problem	30.0%	17.8%	23.0%	27.3%
	(29.0–31.0)	(17.0–19.0)	(22.0–24.0)	(26.0–28.0)
Is a big problem	29.9%	19.9%	20.8%	30.4%
	(28.0–32.0)	(18.0–22.0)	(19.0–22.0)	(29.0–32.0)
Community Education				
Low	28.9%	18.2%	22.8%	28.6%
	(27.0–30.0)	(17.0–20.0)	(21.0–25.0)	(27.0–30.0)
High	31.8%	18.2%	21.2%	28.3%
	(29.0–34.0)	(16.0–20.0)	(19.0–23.0)	(27.0–30.0)
Community Wealth				
Low	29.3%	18.4%	21.2%	30.3%
	(28.0–31.0)	(17.0–20.0)	(19.0–23.0)	(28.0–32.0)
High	31.0%	17.8%	22.9%	27.4%
	(29.0–33.0)	(16.0–20.0)	(21.0–25.0)	(26.0–29.0)
Community Women Working				
Low	30.2%	17.8%	21.1%	28.0%
	(28.0–32.0)	(16.0–20.0)	(20.0–23.0)	(27.0–29.0)
High	29.8%	18.5%	22.8%	28.9%
	(28.0–31.0)	(17.0–20.0)	(21.0–24.0)	(27.0–30.0)
Community Use of Modern Contraceptives				
High	24.4%	13.0%	16.6%	22.2%
	(23.0–26.0)	(12.0–14.0)	(15.0–18.0)	(21.0–23.0)
Low	37.1%	25.4%	30.1%	37.5%
	(35.0–39.0)	(24.0–27.0)	(28.0–32.0)	(36.0–39.0)

with low usage, the probability of unmet need was higher, ranging from 25.4% to 37.5%.

Furthermore, the results in Fig. 2 suggest that as the average number of children per woman in a community increases, the probability of unmet need for contraception also increases. This implies that women living in communities with a higher average number of children per woman are more likely to have unmet contraception needs.

6. Discussion

The study explored both individual and community factors associated with unmet need for contraception among married women in Burundi, Rwanda, Tanzania and Uganda using data from DHS rounds conducted around the same time period. Results indicate that unmet need for contraception in the four countries is high ranging from 20% in Rwanda to 33% in Burundi. Still, 22% and 28% of the married women in Tanzania and Uganda respectively wanted to space or limit child bearing but were not using contraceptives. The proportion of married women with unmet need for contraception is similar to that reported in 2016–2017 Burundi DHS, 2014–2015 Rwanda DHS, 2015–2016 Tanzania DHS and 2016 Uganda DHS (Ministère à la Présidence chargé de la Bonne Gouvernance et du Plan Burundi MPBGP; Ministère de la Santé Publique et de la Lutte contre le Sida Burundi MSPLS; Institut de Statistiques et d'Études Économiques du Burundi ISTEEBU; et ICF, 2018; MoHCDGEC, MoH, NBS, OCGS, and ICF, 2016; National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International, 2015; Uganda Bureau of Statistics and ICF., 2018). This seemingly high rate of unmet need could be explained by several factors some of which are presented below.

The study consistently reveals a higher unmet need for contraception among younger women, aligning with prior research (Asif & Pervaiz, 2019). This disparity implies that older women might possess a deeper understanding of contraceptive advantages. Among the younger women

however, the higher unmet need could be attributed to the fact that they are highly productive (Pradhan & Dwivedi, 2015) and less likely to have achieved their fertility goals (Teshale, 2022). Hence no need for limiting births (Asif & Pervaiz, 2019). These findings imply that in order for public health and family planning programs to reduce unmet need among younger women, there is need for careful consideration of such underlying factors, and others which may heighten their vulnerability to not using contraception.

Furthermore, education significantly influences unmet need. Higher educational attainment correlates with a reduced likelihood of unmet need, aligning with earlier studies (Asif & Pervaiz, 2019; Nzokirishaka & Itua, 2018). Education empowers women to make informed decisions about their sexual and reproductive health (SRH) (Lasong et al., 2020), emphasizing the critical importance of enhancing educational access and awareness regarding family planning methods.

Economic status significantly influences unmet needs for contraception, with women in lower wealth categories facing higher probabilities compared to wealthier counterparts. This aligns with prior studies (Asif & Pervaiz, 2019; Nzokirishaka & Itua, 2018; Yalew et al., 2020). Whereas women in higher wealth quintiles may have enhanced affordability, accessibility, and choice in contraceptive methods, this may not be the case for their counter parts in the lower income groups. Studies show that when women cannot afford modern contraception, they resort to using traditional or cultural practices (Kabagenyi et al., 2016). These findings show that addressing economic disparities and improving access to family planning services, especially among lower-income populations remain key prerequisites to reducing unmet need for contraception.

Furthermore, the emotional impact of child loss significantly influences unmet need correlating with Nzokirishaka and Itua (2018)'s findings. The trauma of child loss disrupts women's reproductive intentions, compelling them to alter their family planning decisions. This highlights the urgency of providing sensitive and specialized support to
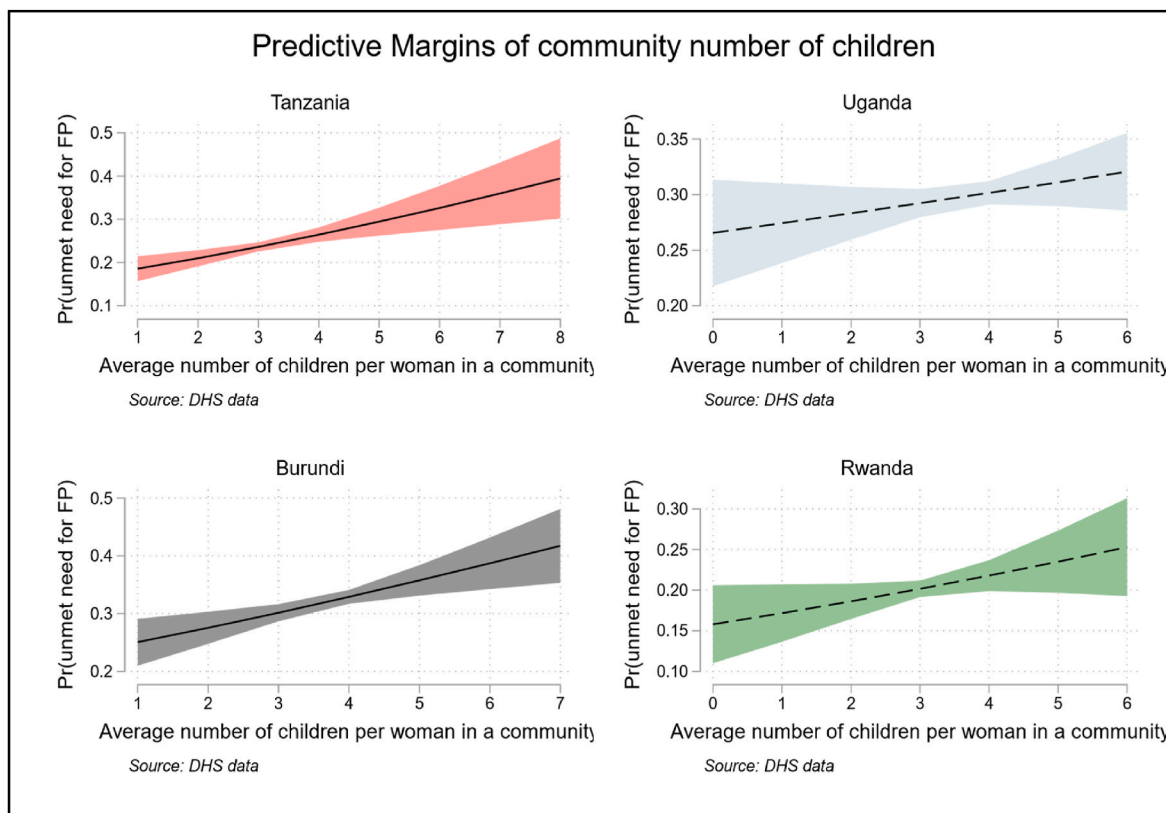

Fig. 2. Predictive Margins of community number of living children in Burundi, Rwanda, Tanzania and Uganda.

these women, acknowledging the profound psychological impact of such experiences on family planning choices.

Husbands' desires also play a crucial role; women whose husbands wish for more children are more likely to experience unmet need. Studies such as the 2015-16 Tanzanian Demographic and Health Survey (TDHS) and others (Uganda Bureau of Statistics and ICF., 2018) have consistently shown that men tend to desire larger families than women. This emphasizes the necessity of involving men in family planning dialogues. The finding that women with no knowledge of their husbands' desires for children have a heightened probability of unmet need for contraception highlights the importance of spousal communication and shared family planning decisions in reducing unmet need for contraception.

There is a difference in unmet need based on the place of residence. In Burundi and Tanzania, urban areas have slightly lower probabilities of unmet need compared to rural areas. In Rwanda and Uganda, however, the situation is different, with urban areas showing slightly higher probabilities. This contradicts with previous studies (Asif & Pervaiz, 2019; Hailemariam & Haddis, 2011; Pradhan & Dwivedi, 2015). These findings suggest that urbanization does not universally guarantee better access to contraception. The unique country context with regard to healthcare infrastructure, education, cultural beliefs and economic disparities could influence the relationship between place of residence and unmet need. Additionally, the diffusion of contraceptive technologies through increased media penetration and internet coverage can explain the reduced probabilities of unmet need in rural areas. According to Teshale (2022), media can assist women in learning about and understanding family planning options that are accessible and available.

Communities with higher adoption rates of modern contraceptives consistently exhibit lower levels of unmet need, aligning with research conducted by Pradhan and Dwivedi (2015) and Mcguire and Stephenson (2015). These studies found that communities with lower contraceptive utilization often experience shorter birth intervals. Additionally, communities with extensive knowledge about modern contraceptives, as highlighted by Solanke et al. (2019), demonstrate reduced odds of unmet need. These collective findings emphasize the critical need to promote modern contraceptive methods. When effective family planning options are readily accessible and accepted within communities, the prevalence of unmet needs significantly diminishes.

Moreover, a woman's unmet need for contraception is significantly influenced by the number of living children she has, a pattern mirrored in communities with a higher number of children. A study by Mutumba et al. (2018) indicates that larger households are linked to lower contraceptive utilization due to factors such as limited education and varying levels of knowledge about family planning. This underscores the imperative for tailored support and education initiatives for families with more children, addressing their specific challenges comprehensively.

Lastly, access to family planning messages emerges as a critical determinant. Women without access to such information are more likely to experience unmet need compared to those with access. This is in line with other prior studies elsewhere (Asif & Pervaiz, 2019; Nkoka et al., 2020; Nyauchi & Omedi, 2014; Nzokirishaka & Itua, 2018). This highlights the importance of disseminating accurate and comprehensive family planning information to all women, ensuring that awareness is not a barrier to making informed choices about their reproductive health.

6.1. Strengths and limitations of the study

The strength of this study is that it is based on a nationally representative sample of married women in Burundi, Rwanda, Tanzania and Uganda. Therefore, the results generated from the analysis may be generalized to all married women in the four countries. Still, the study applied multilevel modeling to accommodate the hierarchical nature of the DHS data in order to identify the contribution of individual and community characteristics on unmet need. A variety of factors were also assessed in this study to strengthen the associations observed. Despite the above strengths, one of the major limitations of the study is reliance on secondary data which then confines the study to only variables available in the data sets. The implication of this is that some of the most important predictor variables could have been overlooked. Also, since the study is based on cross-sectional data, it is limited in the extent to which it can attribute unmet need for contraception to the variables studied herein as it is challenging to attribute causation.

7. Conclusion

Addressing unmet need for contraception requires multifaceted approaches. Targeted efforts for younger women, improved education, economic empowerment, spousal involvement, support for those with child loss, and comprehensive awareness initiatives are vital. Moreover, variations in urban-rural dynamics and the impact of community-level factors underscore the complexity of the issue, necessitating holistic healthcare strategies and empowerment programs for sustainable change.

Availability of data and materials

The dataset used and analyzed in this paper is available from the DHS program site upon request: http://dhsprogram.com/data/

Ethics approval and consent to participate

Not applicable.

Ethical statement

All the survey protocol including the Biomaker collection for the respective country studies were reviewed and approved by the ICF institutional review Board. http://dhsprogram.com/data/.

The datasets used herein for this study are available from the demographic health and survey website upon request using http://dhsprogram.com/data/.

The approval to use the Uganda DHS data for this study was sought from the ICF.

International and confidentiality of respondents was also maintained. More information on data authorization can be accessed on www.measuredhs.com.

CRediT authorship contribution statement

Allen Kabagenyi: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Writing – original draft, Writing – review & editing. **Ronald Wasswa:** Data curation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Vincent Kayemba:** Methodology, Validation, Visualization, Writing – review & editing.

Data availability

Data will be made available on request.

Glossary

Pr	Probability
CI	Confidence interval
FP	Family Planning
DHS	Demographic and Health Survey

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2024.101602.

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