

Factors Associated with Contraceptive Use in Sub-Saharan Africa

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Abstract

Background: Globally 10% of women have an unmet need for contraception, with higher rates in sub-Saharan Africa. Programs to improve family planning (FP) outcomes require data on how service characteristics (*e.g.*, geographic access, quality) and women's characteristics are associated with contraceptive use.

Materials and Methods: We combined data from health facility assessments (2018 and 2019) and a population-based regional household survey (2018) of married and in-union women ages 15–49 in the Kigoma Region of Tanzania. We assessed the associations between contraceptive use and service (*i.e.*, distance, methods available, personnel) and women's (*e.g.*, demographic characteristics, fertility experiences and intentions, attitudes toward FP) characteristics.

Results: In this largely rural sample ($n=4,372$), 21.7% of women used modern reversible contraceptive methods. Most variables were associated with contraceptive use in bivariate analyses. In multivariate analyses, access to services located <2 km of one's home that offered five methods (adjusted odds ratio [aOR]=1.57, confidence interval [CI]=1.18–2.10) and had basic amenities (aOR = 1.66, CI = 1.24–2.2) increased the odds of contraceptive use. Among individual variables, believing that FP benefits the family (aOR = 3.65, CI = 2.18–6.11) and believing that contraception is safe (aOR = 2.48, CI = 1.92–3.20) and effective (aOR = 3.59, CI = 2.63–4.90) had strong associations with contraceptive use.

Conclusions: Both service and individual characteristics were associated with contraceptive use, suggesting the importance of coordination between efforts to improve access to services and social and behavior change interventions that address motivations, knowledge, and attitudes toward FP.

Keywords: contraception, access to services, reproductive health

Introduction

GLOBALLY, 190 MILLION women of reproductive age (15–49 years) who wanted to avoid pregnancy were not using contraception in 2019; this translates into 10% of women having an unmet need for contraception, with rates higher in sub-Saharan Africa than in other regions of the world.¹ Family planning (FP) programs enable women and couples to act on decisions about contraception, thus helping to protect their rights and improving maternal health.^{2,3}

Programming includes service improvements (*e.g.*, locate services in communities, expand method mix) and social and behavior change (SBC) programming to increase demand for contraception. Despite the importance of linking service improvements and SBC programming, research is largely separated into studies that focus on services or on individual characteristics. We contribute to a growing number of studies that use health facility and population data to consider the role of service and individual characteristics in contraceptive use in the Kigoma region of Tanzania.^{4–10}

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Recent studies that use service and individual data assume that longer distances and poor quality are barriers to contraceptive use.^{6,8,9,11–13} Studies measure access as the closest facility to where women live, usually within a defined geographic area such as an enumeration area (EA). For example, a Haitian study measured the number of facilities with at least three contraceptive methods within a 10 km (rural) or 5 km (urban) radius of the EA.⁹ Other studies measure distance to services and quality of services separately.^{8,13} Although some of the studies include measures of individual characteristics (*e.g.*, demographics, fertility intentions, FP knowledge), few focus on individual characteristics.^{4–9,11,13} For example, a Tanzania study included woman's education, spouse's education, number of children, and dwelling characteristics, but the discussion focused on access to services.¹³

Although the results vary, shorter geographic distance to and higher quality as measured by availability of methods were associated with contraceptive use.^{7–9,11,13} Living within 10 km of one or of two or more facilities with at least three methods in rural areas of Haiti doubled the odds of contraceptive use relative to living in an area with no facilities having at least three methods.⁹ The effects of other measures of quality are less clear. In a four-country study, a quality scale (*e.g.*, having basic amenities, fees) was only associated with contraceptive use in one country.⁶ These data suggest that distance and availability of methods increase contraceptive use, and other elements of care may play a role.

A large body of literature identifies individual characteristics associated with contraceptive use.^{4,5,7–10,14–18} Among demographic factors, age, marital status, religion, living in a rural or urban area, and socioeconomic status are associated with contraceptive use.^{4,7,9,10,14–16,18} Fertility history (*e.g.*, parity, having an unintended pregnancy) and fertility intentions (*e.g.*, ideal number of children, want to avoid or delay birth) also are associated with contraceptive use.^{5,7–9,15,18} Although results are mixed, some studies suggest the importance of women's empowerment, including her employment, and her own and others' role in decision making, particularly contraceptive decision making associated with contraceptive use.^{4,14,15,18} Finally, exposure to information, knowledge, perceptions of safety and efficacy, and attitudes toward FP are associated with contraceptive use.^{5,8,9,16–19}

To better understand contraceptive use and contribute to program planning, we assess the associations of service characteristics and individual characteristics with contraceptive use in the Kigoma Region of Tanzania.

Materials and Methods

The Kigoma region is located in the northwest corner of the country where 83% of households are classified as rural.²⁰ The region has relatively low rates of contraceptive use; nationally 38% of 15–49 year old married women used contraception, but only 18% of 15–49 year old married women in Kigoma region used contraception in 2015–2016.²¹

We drew on data used to evaluate a project to improve maternal and neonatal outcomes in Kigoma.²² In its first phase, the “Reducing Maternal Mortality in Tanzania” project (2006–2012) supported hospitals and health centers (*e.g.*, provide supplies and training) and created demand for obstetric services. In Phase 2 (2013–2019), the project expanded support to dispensaries and included FP components.

Implemented by a consortium of partners (*i.e.*, Engender Health, Thamini Uhai, Ministry of Health, Community Development, Gender, Elderly, and Children, President's Office—Regional Administrative and Local Government, Global Health Advocacy Incubator, and local officials), the project was supported by Bloomberg Philanthropies and the Foundation H&B Agerup. The U.S. Centers for Disease Control and Prevention (CDC) led the evaluation. We used data from health facility assessments (HFAs) and a reproductive health survey (RHS); protocols were approved by the Tanzania Ministry of Health and Social Welfare and the Tanzania National Health Research Ethics Review Committee and classified as nonresearch by CDC. Participants did not receive incentives.

Health facility assessments

HFAs, conducted in 2013, 2016, 2018, and 2019, documented changes in capacity (*e.g.*, staffing, commodities).²³ We used data from HFAs conducted in January and February of 2018 and 2019 for all facilities ($N=197$ hospitals, health centers, and dispensaries) with at least 90 deliveries per year. The HFA documented geographic coordinates of facilities, amenities, number and types of providers, training, drug stocks, and practices (*e.g.*, neonatal care).

Reproductive health survey

Cross-sectional household-based RHSs, in 2014, 2016, and 2018, drew representative samples of women ages 15–49.²⁴ The 2018 survey, which we used, sampled ~10,000 women using a multistage design. First, we drew a random sample of 120 primary sampling units (PSUs), proportional to population size, using 2012 census EAs²⁰; PSUs were composed of one or two EAs, which were visited before field work to update household listings and capture geographic coordinates. In the second stage, between 36 and 109 households were sampled in each PSU. All women aged 15–49 in selected households were eligible. From September to November 2018, interviewers visited 10,021 households and obtained informed consent before conducting interviews; the household response rate was 98.8%. Of the 10,542 eligible women identified, 10,181 (96.6%) completed interviews. Questionnaires asked about demographics, fertility, contraceptive behaviors, and knowledge of and attitudes toward contraception.

Analytic sample

We limited our analysis to women who: were married to or living with a man; were not currently pregnant; had sex in the year before the interview; did not report that she or her partner was sterilized; and had not started using a long-acting method before January of 2017. Of the 10,181 survey respondents, 4,804 met these criteria. Because 17% of women reported that whether they become pregnant is “up to God,” we included fertility intentions as a covariate rather than limiting the sample to women who wanted to delay pregnancy.

We explored access to services by linking each woman in the sample to the nearest health facility in the HFA. Using ArcGIS software, we measured the straight-line distance between the center of the EA to the nearest facility (*i.e.*, all women in an EA were matched to the same facility). Because

the HFAs did not include all facilities in Kigoma, some women were closer to a non-HFA facility than to the HFA facility to which they were matched. In line with similar analyses, we further restricted our analyses to women matched to a facility within 10 km of the center of their EA.^{7,9} This resulted in the exclusion of 432 women, for an analytic sample of 4,372. Using Ministry of Health data, we determined that 76.7% of women in our analytic sample were matched to their closest facility.

Measures

From the HFAs, we measured the availability of contraceptive methods and basic amenities overtime, assuming that women would experience or hear about the services and be more likely to use geographically closer and higher quality services. We assessed whether a characteristic was present in 2018 and 2019 HFAs and combined that with our measure of distance; the resulting variables had three levels: characteristic was NOT present at the facility in both or in either year; characteristic present in both years at a facility that was within 1.9 km from the center of the EA; and characteristic present in both years at a facility that was 2–10 km from the center of the EA. The HFA observed if five modern reversible methods—condoms, pills, injectables, implants, and intrauterine devices (IUDs)—were available on the day of the assessment and had no stock-outs in the previous year. We counted facilities as having methods available if all five were not stocked out (*i.e.*, assessed availability continuously from approximately January 2017 to January 2019). To measure basic amenities, we summed “yes” responses to whether each of eight amenities were present (*i.e.*, electricity, backup generator, running water, toilet, private space, telephone/radio, internet access, motor vehicle with fuel) and dichotomized the resulting score (*i.e.*, 0–3 vs. 4–8). In addition, in 2019, the HFA measured the number of providers with any FP training; our measure had three levels that combined data on the presence of at least two FP trained providers and distance.

The RHS measured several individual characteristics. We defined current use of modern reversible contraception as use in the 30 days before the interview of the pill, injectable, condoms, implant, lactational amenorrhea method, or IUDs; women in the sample did not report using other modern methods (*e.g.*, diaphragm). The comparison group included women who were not currently using contraception or who used a traditional method.

We measured four sets of individual characteristics: demographics; fertility history and fertility intentions; empowerment; and FP awareness and attitudes. We measured demographic variables with dichotomous or ordinal-level variables (Table 1). Measures of fertility history and intentions included parity, intendedness at the time of conception of the last birth since 2016, and fertility intentions. We included three measures of women's empowerment and agency. We summed “yes” responses to five items to measure economic empowerment (*e.g.*, had a job and received pay, had own cash) and created a categorical variable. We created a household decision-making score using the answers to the question about which members of the household (*i.e.*, woman alone or woman and her partner vs. her partner alone or others) had input into seven household decisions (*e.g.*, her

health care, money she brings into the household, how many children to have); we treated the resulting score (ranging from 0 to 7) as a categorical variable. Initially, we considered the item assessing input into decisions about how many children to have as a single item; because it was not associated with contraceptive use, we included it in the scale of input into household decision-making. Because early marriage is often associated with lower relationship power (*e.g.*, increased controlling behaviors), we included age at first marriage.²⁵

Finally, we measured awareness of, perception of, and attitudes toward FP. We summed “yes” responses and created categorical variables to measure: the number of modern methods ever heard about (range 0–9); the number of channels (*e.g.*, radio, billboard, doctor/nurse) from which she heard FP information in the past 6 months (range 0–10); and whether it would be acceptable to hear about FP from different channels (*e.g.*, radio, school, religious leader) (range 0–6). We summed “very effective” and “effective” responses to questions asking about effectiveness of four modern methods (*i.e.*, condom, pill, injectable, IUD/implant) and did the same for responses to questions about the safety (*i.e.*, lack of side effects) of the same methods; we created dichotomous variables measuring whether a woman believed that none versus at least one method was effective or safe. We asked women whether they agreed to five statements about FP; for each we contrasted “agree” and “strongly agree” to “neither agree nor disagree,” “disagree,” and “strongly disagree” responses (Table 1).

Analysis

We began with bivariate analyses to assess the relationship between each service or individual characteristic and contraceptive use (Table 1). Next, we ran multivariate logistic regression models for each set of variables: demographics; fertility history and intentions; women's empowerment and agency; and awareness, perceptions of, and attitudes toward FP. For each set, we included variables that were significant at $p < 0.10$ in bivariate analysis (Table 2). Finally, we ran a full model that included all variables with at least one dummy variable that was significant at $p < 0.10$ in the first set of models. Models were constrained to retain variables that were significant at $p < 0.20$, although we focused on variables that were statistically significant at < 0.05 . All analyses were weighted for the inverse probability of selection at each sampling stage, and analyses were run using the “complex sampling” package in IBM SPSS Statistics (Build 1.0.0.1114).

Results

The majority of women were married to their partner (57.5%); on average, women had 4.5 children by the time of the interview. The majority of women lived in an EA that was, on average, 2.4 km from the nearest health facility in our sample. Awareness of methods was high, with 64.7% of women having heard of at least seven contraceptive methods; 66.8% of women believed that at least one method was effective and 58.3% believed that at least one method was safe.

Bivariate associations between service characteristics and contraceptive use were statistically significant (Table 1); a greater proportion of women who lived in an EA whose

TABLE 1. BIVARIATE ASSOCIATIONS BETWEEN MODERN CONTRACEPTIVE USE AND SERVICE CHARACTERISTICS, DEMOGRAPHIC CHARACTERISTICS, FERTILITY HISTORY AND INTENTIONS, WOMEN'S EMPOWERMENT, AND FAMILY PLANNING AWARENESS AND ATTITUDES FOR NONPREGNANT MARRIED/IN-UNION WOMEN, KIGOMA TANZANIA (N=4,372)

<i>Variable</i>	<i>Nonuse or used a traditional method</i>	<i>Used a modern method</i>	<i>Chi-square, p-value^a</i>
Contraceptive use	78.3% (3,432)	21.7% (940)	
Service characteristics			
Method availability at facility, January 2017–January 2019			
Not available, January 2017–January 2019	80.4% (1,960)	19.6% (480)	48.99, <0.0001
Available, facility <2 km away	70.2% (618)	29.8% (255)	
Available, facility 2 km or more away	81.8% (854)	18.9% (205)	
At least four basic amenities availability, January 2017–January 2019			
Not available, January 2017–January 2019	85.1% (1,027)	14.9% (196)	47.49, <0.0001
Available, facility <2 km away	74.2% (1,163)	25.8% (391)	
Available, facility 2 km or more away	78.0% (1,242)	22.0% (353)	
At least two providers ever trained in FP (2019 only)			
Not available, January 2019	78.8% (2,506)	21.2% (662)	15.72, 0.007
Available in 2019, facility <2 km away	74.3% (514)	25.7% (186)	
Available in 2019, facility 2 km or more away	82.9% (412)	17.1% (92)	
Demographic characteristics			
Current marital status			
Married	79.9% (2,015)	20.1% (501)	9.48, 0.006
Living with a man, not married to him	76.0% (1,417)	24.0% (439)	
Age group (years)			
15–19	78.8% (183)	21.2% (47)	16.79, <0.0001
20–29	69.9% (1,091)	30.1% (459)	
30–39	77.8% (1,152)	22.2% (333)	
40–49	90.8% (1,007)	9.2% (101)	
Residence			
Rural	79.4% (2,958)	20.6% (763)	12.07, 0.011
Urban	73.9% (474)	26.1% (177)	
Wealth tercile			
Low	80.2% (1,152)	19.8% (291)	15.80, 0.002
Middle	80.0% (1,269)	20.0% (308)	
High	74.9% (1,011)	25.1% (341)	
Religious attendance			
Daily	77.1% (541)	22.3% (153)	0.91, 0.872
Weekly	78.6% (2,392)	21.4% (647)	
Monthly or occasionally	78.5% (307)	21.5% (83)	
Not at all	76.3% (192)	23.7% (57)	
Educational attainment			
Did not attend school	82.8% (1,021)	17.2% (216)	52.35, <0.0001
Some primary school	78.8% (495)	21.2% (134)	
Primary school	77.6% (1,733)	22.4% (494)	
Some secondary school or higher	64.4% (183)	35.6% (96)	
Fertility history and fertility intentions			
Parity			
0–2	75.8% (962)	24.2% (298)	67.54, <0.0001
3–4	72.1% (740)	27.9% (300)	
5–7	81.2% (1,112)	18.8% (253)	
8 or more	87.2% (618)	12.8% (89)	
Intendedness of most recent birth (since 2016)			
Intended birth	72.2% (1,494)	27.8% (572)	210.77, <0.0001
Unintended birth (or not sure if intended)	68.6% (462)	31.4% (194)	
No births since 2016	89.8% (1,476)	10.2% (174)	
Fertility intentions			
Wants birth in next 2 years or can't conceive	94.8% (481)	5.2% (30)	137.95, <0.0001
Wants to avoid birth for at least 2 years	73.9% (2,297)	26.1% (800)	
Believes it is up to God or fate	85.0% (654)	15.0% (110)	

(continued)

TABLE 1. (CONTINUED)

<i>Variable</i>	<i>Nonuse or used a traditional method</i>	<i>Used a modern method</i>	<i>Chi-square, p-value^a</i>
Women's empowerment and agency			
Economic empowerment			
No to all 5 empowerment items	79.8% (1,865)	20.2% (468)	8.60, 0.072
Yes to 1 item	77.8% (880)	22.2% (246)	
Yes to 2–3 items	75.4% (618)	24.6% (202)	
Yes to 4–5 items	72.4% (69)	27.6% (24)	
Decision-making in the household (by herself or with husband)			
0 decisions	75.2% (588)	24.8% (180)	13.45, 0.169
1 decision	76.8% (255)	23.2% (85)	
2 decisions	81.3% (320)	18.7% (80)	
3 decisions	75.7% (320)	24.3% (99)	
4 decisions	79.0% (361)	21.0% (87)	
5 decisions	82.7% (363)	17.3% (75)	
6 decisions	78.3% (266)	21.7% (79)	
7 decisions	78.2% (834)	21.8% (230)	
Age at marriage (years)			
10–14	84.6% (140)	15.4% (32)	5.30, 0.223
15–17	77.4% (923)	22.6% (267)	
18–20	77.7% (1,303)	22.3% (361)	
21 or more	78.8% (1,052)	21.2% (277)	
FP awareness and attitudes			
Number of FP methods heard about			
0–5	85.1% (799)	14.9% (144)	41.36, <0.0001
6–7	77.9% (1,294)	22.1% (357)	
8–9	74.6% (1,339)	25.4% (439)	
Number of channels from which heard about FP			
Not heard about FP	86.8% (1,089)	13.2% (170)	107.84, <0.0001
1 channel	78.8% (1,112)	21.2% (297)	
2 channels	74.4% (633)	25.6% (218)	
3–10 channels	69.0% (598)	31.0% (255)	
Acceptability of channels for FP information			
Not acceptable to hear about on 0–5 channels	79.8% (2,714)	20.2% (667)	22.10, <0.0001
Acceptable to hear about FP on all 6 channels	72.8% (264)	27.2% (273)	
Perceived effectiveness, modern methods			
Does not perceive any methods as effective	94.2% (1,372)	5.8% (79)	341.68, <0.0001
Perceive at least one method as effective or very effective	69.9% (2,050)	30.1% (861)	
Perceived safety, modern methods			
Does not perceive any methods as safe	91.4% (1,671)	8.6% (147)	333.58, <0.0001
Perceive at least one method as safe or very safe	68.4% (1,756)	31.6% (793)	
Attitude—FP good for family welfare			
Disagree or don't know	96.9% (503)	3.1% (19)	126.63, <0.0001
Agree or strongly agree	75.6% (2,929)	24.4% (921)	
Attitude—has negative effect on fertility			
Agree or strongly agree	79.7% (2,795)	20.3% (692)	21.83, <0.0001
Disagree or don't know	72.3% (637)	27.7% (248)	
Attitude—couples should make joint decision about FP			
Disagree or don't know	84.5% (298)	15.5% (54)	8.78, 0.007
Agree or strongly agree	77.7% (3,134)	22.3% (886)	
Attitude—should only have as many children as can afford			
Disagree or don't know	84.1% (388)	15.9% (68)	9.95, 0.005
Agree or strongly agree	77.6% (3,044)	22.4% (872)	
Attitude—should have many children, because some will die			
Agree or strongly agree	81.6% (1,502)	18.4% (347)	21.90, <0.0001
Disagree or don't know	75.7% (1,930)	24.3% (593)	

^aPercentages and counts represent weighted percentages and unweighted counts of survey population, and percentages may not sum to 100 due to rounding. Rao-Scott Chi square test was used to derive *p* values.
FP, family planning.

TABLE 2. ADJUSTED ODDS RATIOS AND 95% CONFIDENCE INTERVALS FOR THE ASSOCIATIONS BETWEEN MODERN CONTRACEPTIVE USE AND SERVICE CHARACTERISTICS, DEMOGRAPHIC CHARACTERISTICS, FERTILITY HISTORY AND INTENTIONS, WOMEN'S EMPOWERMENT, AND FAMILY PLANNING AWARENESS AND ATTITUDES FOR NONPREGNANT MARRIED/IN-UNION WOMEN, KIGOMA TANZANIA (N=4,372)

	Model 1 (Facility characteristics) OR (95% CI)	Model 2 (Demographic characteristics) OR (95% CI)	Model 3 (Fertility history and intentions) OR (95% CI)	Model 4 (Women's empowerment) OR (95% CI)	Model 5 (FP awareness and attitudes) OR (95% CI)	Model 6 (All combined) OR (95% CI)
Service characteristics						
Method availability at facility, January 2017–January 2019						
Not available January 2017–January 2019	1.0 (referent)					1.0 (referent)
Available, facility <2 km away	1.69 (1.29–2.20)					1.57 (1.18–2.10)
Available, facility 2 km or more away	0.81 (0.65–1.01)					0.93 (0.73–1.19)
At least four basic amenities availability, January 2017–January 2019						
Not available January 2017–January 2019	1.0 (referent)					1.0 (referent)
Available, facility <2 km away	1.47 (1.13–1.90)					1.66 (1.24–2.20)
Available, facility 2 km or more away	1.99 (1.58–2.51)					1.71 (1.33–2.20)
At least two providers ever trained in FP (2019 only)						
Not available January 2019	1.0 (referent)					
Available in 2019, facility <2 km away	1.07 (0.83–1.39)					
Available in 2019, facility 2 km or more away	0.70 (0.53–0.93)					
Intercept	0.17 (0.15–0.21)					
Pseudo R ² (Nagelkerke)	0.03					
Demographic characteristics						
Current marital status						
Married		1.0 (referent)				1.0 (referent)
Living with a man		1.21 (1.02–1.43)				1.23 (1.01–1.48)
Age group (years)						
15–19		1.0 (referent)				1.0 (referent)
20–29		1.51 (1.05–2.16)				1.04 (0.69–1.59)
30–39		1.07 (0.74–1.55)				0.80 (0.49–1.29)
40–49		0.38 (0.24–0.57)				0.38 (0.20–0.66)
Educational attainment						
Did not attend school		1.0 (referent)				1.0 (referent)
Some primary school		1.19 (0.90–1.59)				0.90 (0.66–1.23)
Primary school		1.36 (1.10–1.69)				0.94 (0.74–1.18)
Some secondary school or higher		1.87 (1.28–2.73)				1.48 (0.94–2.32)
Intercept		0.18 (0.12–0.27)				
Pseudo R ² (Nagelkerke)		0.08				
Fertility history and fertility intentions						
Parity						
0–2			1.0 (referent)			1.0 (referent)
3–4			1.17 (0.93–1.46)			1.31 (1.00–1.72)
5–7			0.77 (0.62–0.95)			1.15 (0.84–1.59)
8 or more			0.50 (0.37–0.69)			1.21 (0.79–1.86)

(continued)

TABLE 2. (CONTINUED)

	Model 1 (Facility characteristics) OR (95% CI)	Model 2 (Demographic characteristics) OR (95% CI)	Model 3 (Fertility history and intentions) OR (95% CI)	Model 4 (Women's empowerment) OR (95% CI)	Model 5 (FP awareness and attitudes) OR (95% CI)	Model 6 (All combined) OR (95% CI)
Intendedness of most recent birth (since 2016)						
Intended birth			1.0 (referent)			1.0 (referent)
Unintended birth (or not sure if intended)			1.21 (0.96–1.53)			1.10 (0.85–1.42)
No births since 2016			0.40 (0.32–0.49)			0.50 (0.39–0.65)
Fertility intentions						
Wants birth in next 2 years or can't conceive			1.0 (referent)			1.0 (referent)
Wants to avoid birth for at least 2 years			4.43 (2.89–6.80)			4.00 (2.53–6.32)
Believes it is up to God or fate			2.51 (1.57–4.02)			2.75 (1.66–4.53)
Intercept			0.11 (0.70–0.17)			
Pseudo R ² (Nagelkerke)			0.12			
Women's empowerment and agency						
Economic empowerment						
No to all 5 empowerment items				1.0 (referent)		1.0 (referent)
Yes to 1 item				1.13 (0.92–1.38)		1.13 (0.90–1.43)
Yes to 2–3 items				1.29 (1.03–1.60)		1.27 (0.99–1.63)
Yes to 4–5 items				1.50 (0.90–2.51)		1.51 (0.81–2.81)
Intercept				0.25 (0.23–0.28)		
FP awareness and attitudes						
Pseudo R ² (Nagelkerke)						
Number of FP methods heard about						
0–5					1.0 (referent)	
6–7					1.10 (0.85–1.43)	
8–9					1.04 (0.82–1.34)	
Number of channels from which heard about FP						
Not heard about FP					1.0 (referent)	1.0 (referent)
1 channel					1.55 (1.22–1.97)	1.18 (0.92–1.52)
2 channels					1.73 (1.34–2.26)	1.13 (0.86–1.49)
3–10 channels					2.19 (1.66–2.88)	1.28 (0.95–1.72)
Acceptability of channels for FP information						
Not acceptable to hear on 0–5 channels					1.0 (referent)	1.0 (referent)
Acceptable, all 6 channels					1.01 (1.00–1.01)	1.00 (1.00–1.00)
Perceived effectiveness, modern methods						
Does not perceive any methods as effective					1.0 (referent)	1.0 (referent)
Perceive at least one method as effective or very effective					3.48 (2.54–4.78)	3.59 (2.63–4.90)

(continued)

TABLE 2. (CONTINUED)

	Model 1 (Facility characteristics) OR (95% CI)	Model 2 (Demographic characteristics) OR (95% CI)	Model 3 (Fertility history and intentions) OR (95% CI)	Model 4 (Women's empowerment) OR (95% CI)	Model 5 (FP awareness and attitudes) OR (95% CI)	Model 6 (All combined) OR (95% CI)
Perceived safety, modern methods						
Does not perceive any methods as safe					1.0 (referent)	1.0 (referent)
Perceive at least one method as safe for very safe					2.44 (1.90–3.16)	2.48 (1.92–3.20)
Attitude—FP good for family welfare						
Disagree or don't know					1.0 (referent)	1.0 (referent)
Agree or strongly agree					4.38 (2.57–7.46)	3.65 (2.18–6.11)
Attitude—has negative effect on fertility						
Agree or strongly agree					1.0 (referent)	
Disagree or don't know					1.05 (0.86–1.30)	
Attitude—couples should make joint decision about FP						
Disagree or don't know					1.0 (referent)	
Agree or strongly agree					0.69 (0.48–1.02)	
Attitude—should only have as many children as can afford						
Disagree or don't know					1.0 (referent)	
Agree or strongly agree					1.15 (0.82–1.62)	
Attitude—should have many children, because some will die						
Agree or strongly agree					1.0 (referent)	
Disagree or don't know					1.15 (0.95–1.38)	
Intercept					0.01 (0.01–0.02)	0.003 (0.001–0.006)
Pseudo R^2 (Nagelkerke)					0.21	0.31

CI, confidence interval; OR, odds ratio.

center was within 1.9 km of a facility with each characteristic (*i.e.*, contraceptive methods available, basic amenities, trained FP providers) used modern contraception. For example, 29.8% of women living in an EA within 1.9 km of a facility with all five methods available used contraception versus 18.9% of women who lived 2–10 km from such a facility. Only three of the individual characteristics (*i.e.*, frequency of attendance at religious services, women's participation in decision-making, and age at first marriage) were not significantly associated with contraceptive use at $p < 0.10$ level in bivariate analyses. Many of the fertility history (*e.g.*, parity) and FP-related variables (awareness of methods, number of channels on which heard about FP, perceived safety and efficacy, and attitudes) had statistically significant associations with contraceptive use in the expected direction. For example, only 5.8% of women who believed that no methods were effective or very effective used contraception versus 30.1% who believed that at least one method was effective or very effective.

Multivariate models identified a smaller number of variables that had statistically significant associations with contraceptive use (Table 2). In Model 1 (service characteristics), access to a facility within 1.9 km that had all five methods increased the odds of contraceptive use (adjusted odds ratio [aOR] = 1.69, confidence interval [CI] = 1.29–2.20) but having access to a similar facility 2 km or more away did not (*vs.* the closest facility not having the methods). Having a facility with at least four basic amenities increased the odds of contraceptive use, whether the facility was within 1.9 km (aOR = 1.47, CI = 1.12–1.90) or 2 km or more away (aOR = 1.99, CI = 1.58–2.51) (*vs.* the closest facility having three or fewer basic amenities). Model 2 indicates that all three demographic variables included (*i.e.*, marital status, age, and educational attainment) had statistically significant associations with contraceptive use. Being aged 40–49 significantly reduced the odds of contraceptive use (aOR = 0.38, CI = 0.24–0.57), but aORs for other age categories were not statistically significant (*vs.* being aged 15–19).

When measures of fertility experiences and intentions were the only variables in the model, all were associated with contraceptive use (Model 3). Wanting to avoid birth for at least 2 years (aOR = 4.43, CI = 2.89–6.80) or believing the timing of birth is up to God (aOR = 2.51, CI = 1.57–4.02) had greater than two times the odds of using contraception compared to wanting a birth. In Model 4 examining empowerment, economic empowerment was the only variable added to the model, but only saying “yes” to 2–3 items was statistically different from saying no to all items. Among the measures of awareness of and attitudes toward FP (Model 5), half of the measures were significantly associated with contraceptive use. The odds ratios for believing that at least one method is effective (aOR = 3.48, CI = 2.54–4.78) and believing that using FP is good for the welfare of the family (aOR = 4.38, CI = 2.57–7.46) were of the greatest magnitude.

Model 6 included variables measuring service and individual characteristics that were associated with contraceptive use at $p < 0.10$ in Models 1 through 5. Women who lived in EAs that were within 1.9 km of a facility that had the five modern reversible methods had greater odds (aOR = 1.57, CI = 1.18–2.10) of using contraception than women who lived in an EA where the closest facility did not have the five methods. Facilities having at least four of the basic amenities

were associated with increased odds of contraceptive use, whether the facility was within 1.9 km (aOR = 1.66, CI = 1.24–2.20) or from 2 to 10 km (aOR = 1.71, CI = 1.33–2.20) from the center of the EA where women lived.

Several individual variables were also associated with contraceptive use in Model 6. Marital status and age remained statistically significant. Living with a man (*vs.* being married) increased the odds of contraceptive use (aOR = 1.23, CI = 1.02–1.48), while being 40–49 year old (*vs.* being 15–19 year old) decreased the odds of contraceptive use (aOR = 0.38, CI = 0.20–0.66). An aspect of fertility history that was significantly associated with contraceptive use was not having had a birth since 2016, which decreased the odds of contraceptive use (compared to having had an intended birth) by half (aOR = 0.50, CI = 0.39–0.65). Both not wanting a birth within 2 years (or not being sure) (aOR = 4.00, CI = 2.53–6.32) and believing that the number and timing of children were up to God (aOR = 2.75, CI = 1.66–4.53) were associated with contraceptive use (compared to wanting a birth in next 2 years or believes she cannot become pregnant). Believing that at least one method was effective increased the odds of contraceptive use (aOR = 3.59, CI = 2.63–4.90), as did believing that at least one method was safe to use (aOR = 2.48, CI = 1.92–3.20). Believing that using FP was good for the welfare of the family also increased the odds of contraceptive use (aOR = 3.65, CI = 2.18–6.11).

Discussion

Data from the largely rural region of Kigoma Tanzania indicate that geographic access to facilities that have basic amenities and a choice of methods, and individual characteristics were associated with contraceptive use for married and in-union women. In particular, access to services within a short distance (*i.e.*, <2 km) from where one lives appeared to be more important than any access at all when considering availability of methods. The individual-level variables significantly associated with contraceptive use in our study have all been associated with contraceptive use in prior studies, even if the studies did not measure access to services.

Our study adds additional insight into the importance of geographic access to a choice of contraceptive methods. Our measure considered whether five short- and long-acting contraceptive methods were continuously available in health facilities for 2 years, and the positive association between our measure and use suggests the importance of a steady supply of different methods to meet women's needs. This is consistent with prior research and programmatic guidance that stresses the importance of offering methods with different characteristics (*e.g.*, mechanism of action, short- *vs.* long acting, side effects, ease of use), so women can choose a method that best meets their needs and circumstances.^{14,18,26}

In addition, our findings suggest that distance matters. Few other studies measured the joint contribution of availability of methods and distance allowed for variation in distance; we did and found that having access to contraceptive services and methods within 1.9 km but not from 2 to 10 km away was associated with increased contraceptive use. This finding adds additional impetus to efforts to make services geographically convenient to the community, through expansion of primary health care facilities, social marketing, and provision by community health workers.²⁷

Another service characteristic that was significantly associated with contraceptive use was basic amenities for services. Although this is different from quality measures explored in other studies (*i.e.*, it does not focus on FP services), basic amenities, such as privacy and confidentiality, have been identified as important.¹⁸ Furthermore, other elements of basic amenities, including such things as a steady supply of electricity, having a means of communication, and having running water and a toilet, might be related to the reliability of services (*i.e.*, likely to not close due to lack of electricity) and the comfort of services. Indeed, this aspect of services was significantly associated with contraceptive use whether services were within 1.9 km or between 2 and 10 km away, suggesting that if women do have to travel longer distances to services, they expect a minimum standard of services. Although there was a bivariate association between having at least two providers having any FP training and contraceptive use, the association was not statistically significant in multivariate analysis. This does not mean, of course, that providers need not be trained for provision of FP services or that specific aspects of training are unimportant (*e.g.*, client-centered counseling or provision of or removal of specific methods).

Select measures of demographics, fertility intentions, and perceptions of and attitudes toward FP had statistically significant associations with contraceptive use, even when measures of service characteristics were in the model. Older women were less likely than the youngest age group to use contraception. This may be related to women's perceptions of their fertility or their experiences with menopause.

Fertility history and intentions were both associated with contraceptive use. Not having had a birth since 2016 decreased the odds of contraceptive use (compared to having an intended birth); this may capture something about women's perceptions of their fertility (*e.g.*, may have gone long enough without a pregnancy that they believe they cannot get pregnant). Although it is not surprising that wanting to delay pregnancy was associated with contraceptive use, we also found that believing whether and how many children to have is up to God was associated with contraceptive use. One study has suggested that women who believe that whether they become pregnant is up to God or fate may reflect their perceptions of whether they can become pregnant when they want to (*i.e.*, achieving a pregnancy is not in their control), and thus, fatalism may not lead to nonuse.²⁸

Perceptions of the benefits, effectiveness of, and safety of contraception increased the odds of contraceptive use by factors of three or more, suggesting the importance of these variables.^{16–19} In our multivariate models, other measures of awareness and attitudes were not associated with contraceptive use, suggesting that they may be on a path to a more nuanced understanding of contraceptive methods. Such an understanding may motivate women to use contraception and help them select methods that meet their needs (*e.g.*, need for spacing or limiting, tolerance for side effects).

Limitations

Our study has limitations. Cross-sectional data from one region of Tanzania are not representative of all women. However, the Kigoma region had lower rates of contraceptive use than the country overall and, thus, represents a population that might benefit from enhanced programming. As in all

cross-sectional studies, temporal sequencing can be problematic (*e.g.*, women who use FP services may have received information on efficacy of methods during counseling). In addition, self-reported data may have been prone to recall and social desirability biases. Finally, our analysis considered what is generally available to women close to their community, not where they accessed services (if they did). None of our measures of women's empowerment, including decision-making about the number of children, was associated with contraceptive use. We may not have captured relevant aspects of decision-making. For example, we did not ask women who contributed to decision-making about contraceptive use, something that is distinct from decision-making about the number of children.

Conclusions

Our findings highlight the importance of increasing geographic access to services and using SBC programming to shift knowledge and attitudes toward FP and contraceptive methods. Having basic amenities and a stock of a variety of contraceptive methods, including short-acting (pill, injectable, condom) and long-acting (implant, IUD) methods, are important and are consistent with the global focus on ensuring confidentiality and expanding the number of methods offered to meet women's needs. SBC programming and counseling should address knowledge and attitudes, as well as the benefits of healthy timing and spacing of pregnancy for the well-being of women, children, and their families.

Author Contributions

All authors approved the final version of the article, and agreed to be and are accountable for all aspects of the work reported here, and contributed to the development of the work (*e.g.*, protocols, questionnaires, and data collection and management). The lead author made substantial contributions to the data analysis, interpretation, and writing.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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References

1. United Nations, Department of Economic and Social Affairs, Population Division. Family planning and the 2030 agenda for sustainable development: Data booklet. New York: United Nations, 2019.
2. United Nations. Report of the International Conference on Population and Development: Cairo, 5–13 September 1994. New York: United Nations, 1995.
3. Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: An analysis of 172 countries. *Lancet* 2012;380:111–125.

4. Cronin CJ, Guilkey DK, Speizer IS. The effects of health facility access and quality on family planning decisions in urban Senegal. *Health Econ* 2018;27:576–591.
5. Ettarh RR, Kyobutungi C. Physical access to health facilities and contraceptive use in Kenya: Evidence from the 2008–2009 Kenya demographic and health survey. *Afr J Reprod Health* 2012;16:48–56.
6. Fruhauf T, Zimmerman L, Kibira SPS, et al. Measuring family planning quality and its link with contraceptive use in public facilities in Burkina Faso, Ethiopia, Kenya and Uganda. *Health Policy Plan* 2018;33:828–839.
7. Hong R, Montana L, Mishra V. Family planning services quality as a determinant of use of IUD in Egypt. *BMC Health Serv Res* 2006;6:79.
8. Shiferaw S, Spigt M, Seme A, et al. Does proximity of women to facilities with better choice of contraceptives affect their contraceptive utilization in rural Ethiopia? *PLoS One* 2017;12:e0187311.
9. Wang W, Mallick L. Understanding the relationship between family planning method choices and modern contraceptive use: An analysis of geographically linked population and health facilities data in Haiti. *BMJ Glob Health* 2019;4(Suppl 5):e000765.
10. Zimmerman LA, Bell SO, Li Q, Morzenti A, Anglewicz P, Tsui AO. Individual, community and service environment factors associated with modern contraceptive use in five Sub-Saharan African countries: A multilevel, multinomial analysis using geographically linked data from PMA2020. *PLoS One* 2019;14:e0218157.
11. Skiles MP, Cunningham M, Inglis A, et al. The effect of access to contraceptive services on injectable use and demand for family planning in Malawi. *Int Perspect Sex Reprod Health* 2015;41:20–30.
12. Tumlinson K, Pence BW, Curtis SL, Marshall SW, Speizer IS. Quality of care and contraceptive use in urban Kenya. *Int Perspect Sex Reprod Health* 2015;41:69–79.
13. Arends-Kuenning M, Kessy FL. The impact of demand factors, quality of care and access to facilities on contraceptive use in Tanzania. *J Biosoc Sci* 2007;39:1–26.
14. Ayanore MA, Pavlova M, Groot W. Unmet reproductive health needs among women in some West African countries: A systematic review of outcome measures and determinants. *Reprod Health* 2016;13:5.
15. Bakibinga P, Matanda DJ, Ayiko R, et al. Pregnancy history and current use of contraception among women of reproductive age in Burundi, Kenya, Rwanda, Tanzania and Uganda: Analysis of demographic and health survey data. *BMJ Open* 2016;6:e009991.
16. Dev R, Kohler P, Feder M, Unger JA, Woods NF, Drake AL. A systematic review and meta-analysis of postpartum contraceptive use among women in low- and middle-income countries. *Reprod Health* 2019;16:154.
17. 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;41:191–199.
18. Wulifan JK, Brenner S, Jahn A, De Allegri M. A scoping review on determinants of unmet need for family planning among women of reproductive age in low and middle income countries. *BMC Womens Health* 2016;16:2.
19. Ackerson K, Zielinski R. Factors influencing use of family planning in women living in crisis affected areas of Sub-Saharan Africa: A review of the literature. *Midwifery* 2017; 54:35–60.
20. United Republic of Tanzania National Bureau of Statistics, Office of Chief Government Statistician Zanzibar. 2012 Population and housing census. Dar es Salaam and Zanzibar, Tanzania: United Republic of Tanzania National Bureau of Statistics and Office of Chief Government Statistician Zanzibar, 2013.
21. Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), ICF. Tanzania demographic and health survey and malaria indicator survey (TDHS-MIS) 2015–16. Dar es Salaam, Tanzania, and Rockville, MD: MoHCDGEC, MoH, NBS, OCGS, and ICF, 2016.
22. Bloomberg Philanthropies. Preventing maternal mortality and expanding reproductive health access, 2020. Available at: <https://www.bloomberg.org/program/public-health/maternal-health/#overview> Accessed July 29, 2020.
23. U.S. Centers for Disease Control and Prevention (CDC). 2019 Health facility assessment of emergency obstetric and neonatal care services Kigoma region, Tanzania: Final report. Atlanta, GA: CDC, 2020.
24. U.S. Centers for Disease Control and Prevention (CDC). 2018 Kigoma reproductive health survey, Kigoma region, Tanzania: Final report. Atlanta, GA: CDC, 2019.
25. Nasrullah M, Zakar R, Zakar MZ. Child marriage and its associations with controlling behaviors and spousal violence against adolescent and young women in Pakistan. *J Adolesc Health* 2014;55:804–809.
26. Ross J, Stover J. Use of modern contraception increases when more methods become available: Analysis of evidence from 1982–2009. *Glob Health Sci Pract* 2013;1:203–212.
27. High Impact Practices in Family Planning (HIP). Family planning high impact practices list. Washington, DC: USAID, 2019.
28. Jones RK. Is pregnancy fatalism normal? An attitudinal assessment among women trying to get pregnant and those not using contraception. *Contraception* 2018;98:255–259.

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