Schooling and childbearing: Fertility time preference and family planning among adolescents in Sub Sahara African countries

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Abstract

The objective of this research is to assess the impact of fertility timing preferences on unintended pregnancies among adolescent students. Data from the Performance Monitoring for Action (PMA) program for 2019-2020 is utilized, with a specific focus on four African nations: Burkina Faso, The Democratic Republic of Congo, Kenya, and Nigeria. The study utilizes both Exploratory and Confirmatory Factor Analysis (EFA-CFA) to identify various indicators, including attitudes toward reproductive health, knowledge, perceptions, and exposure to family planning messaging. The research findings indicate that fertility time preferences only decrease unintended pregnancies in Kenya, albeit insignificantly when controlling for perceptions regarding contraceptive methods. Additionally, the research reveals that factors such as decision-making abilities concerning childbearing, knowledge of contraceptive methods, education completion desires before having children, and exposure to family planning messaging significantly impact unintended pregnancies. Furthermore, the study indicates that adolescents have lower proficiency in natural and non-hormonal contraceptive methods, and family planning messaging exposure is limited.

Introduction

Population growth has traditionally been seen as a positive sign of progress and a means of meeting the demands of the labor market. However, as living conditions have changed, increased birth rates have become a challenge for developing countries, in particular, with potential negative effects on their socio-economic development. The concept of the demographic dividend thus emerged, suggesting that reductions in birth and mortality rates could have positive effects on the development of countries.

High fertility rates are still prevalent in African countries, and many Sub-Saharan African countries have yet to undergo their demographic transition. A change in the population's age structure could have a positive impact on their economic performance. As birth and death rates decrease, the amount of investment required to meet the needs of the youngest age group also decreases. This means that resources can be used to invest in economic growth and family welfare. According to demographic projections, the African population will increase from 1.2 billion in 2020 to 2.6 billion in 2050, accounting for 60% of worldwide population growth across all age groups. Early fertility may contribute to an increase in the total number of children. For example, in the Democratic Republic of Congo, 21.2% of teenagers are mothers (Figure 4).

African countries have varying fertility patterns, with a common one being the desire for large families, which is still present in many African countries (Pritchett and Summers, 1994; Bongaarts and Casterline, 2013; Casterline and Agyei-Mensah, 2017). Traditional, cultural, and religious considerations largely explain this pattern. However, as the economy grows and child mortality rates decrease, jobs are created, and the cost of childbearing increases, leading to a decrease in the desire for large families and ultimately influencing the fertility rate (Casterline, 2017). Therefore, declines in desired fertility are strongly correlated with total fertility declines.

Studies on fertility in Africa have mainly concentrated on the effect of education on fertility rates. When it comes to adolescents, research tends to examine how teenage pregnancy affects their education and how it influences them once the pregnancy occurs. The literature usually focuses on women who have either completed their education or dropped out of school, using methods like impact analysis to explore the relationship between education and fertility. However, since teenage pregnancy is usually unplanned, it is crucial to address the issue before it leads to unwanted consequences. Thus, our focus has shifted towards fertility time preference. We believe that by identifying fertility time preferences and taking precautions such as family planning, we can prevent teenage pregnancy and reduce unplanned or unintended pregnancies among adolescents.

It is common for young people, in particular, to experience unplanned pregnancies. To better understand this phenomenon, many studies use contraception as a way to measure the intentions of individuals regarding having children. In line with this methodology, we are conducting

research to determine whether fertility time preference can be used to increase the usage of contraceptives and decrease the occurrence of unintended pregnancies among adolescents.

Fertility time preference refers to the decision-making process that young people undertake when considering the trade-off between education and fertility. This preference is a crucial factor in determining the choices that young people make regarding their reproductive health. Our study aims to investigate whether educating adolescents about fertility time preference can increase their knowledge and understanding of this concept and, as a result, lead to an increase in contraceptive use and a decrease in unintended pregnancies.

Through our research, we hope to provide valuable insights into the factors that influence adolescent reproductive health decision-making and contribute to the development of effective interventions that can reduce the incidence of unintended pregnancies among young people.

According to Bongaarts et al. (1990), the quality and quantity of family planning services can reduce unintended fertility rates. However, Pritchett and Summers (1994) suggests that a decrease in fertility is typically due to the decline in wanted fertility, and a reduction in unwanted fertility is not significant. Nonetheless, without contraceptive methods, women would be at a higher risk of unintended pregnancies, even if they do not intend to have large families (Bongaarts, 1997). Family planning programs can help reduce unwanted fertility by improving knowledge, perceptions, and attitudes toward reproduction and contraceptive methods. They can also influence the desire for smaller families by highlighting the benefits of small families and the need to reduce births through contraceptive methods (Bongaarts, 2020). Therefore, we have considered the indicators of family planning methods, including knowledge, perceptions, and attitudes toward reproduction, while conducting our research.

Our analysis is based on data collected from the Performance Monitoring for Action (PMA) program across several African countries. However, we focus on data obtained from Burkina Faso, The Democratic Republic of Congo, Kenya, and Nigeria in the years 2019-2020. To analyze the data, we utilized Exploratory and Confirmatory Factor Analysis (EFA and CFA). Additionally, we used a bivariate recursive probit model for estimations. Our findings show that fertility time preference has a significant impact on the decision to use contraception, but only in the case of Kenya. However, when controlling for perceptions about contraceptive methods, the effect is not significant. Nonetheless, we found that in all countries, decision-making power regarding fertility time, knowledge of contraceptive methods, and exposure to family planning messages significantly affect the decision to use contraception. We also found that adolescents possess limited knowledge of the different contraceptive methods.

The study is structured as follows: in the first section, we present a review of the literature of studies that studies the relationship between education and fertility. In the second section, we provide a detailed description of the data and analysis methods that we have used for this study. It includes a discussion of the data sources that are used, the variables that are measured, and the

statistical techniques that have been employed to test our hypotheses. We present the empirical results in sections 3 and 4, providing a detailed analysis of the findings that have emerged from the econometric model. Finally, in sections 5 and 6, we discuss the implications of our findings for policy and practice.

1 Background information and literature review

Please find below a more detailed rewrite of the text you provided:

The distribution of fertility rates among 15-19-year-olds in Sub-Saharan Africa varies among Burkina Faso, Nigeria, Kenya, and the Democratic Republic of Congo, as depicted in Figure 1. Among these countries, Congo DRC has the highest fertility rate, with an average of 147 births per 1,000 women aged 15-19, while Kenya has the lowest with an average of 62 births per 1,000 women aged 15-19.

Unfortunately, a high percentage of teenagers in these countries have already started childbearing or are already mothers. Between 2003 and 2013, 27.2% of teenage women in Congo DRC had started childbearing, while 21.2% had become mothers. In Nigeria, 19% of teenage girls had already given birth, while 16% were pregnant with their first child. Burkina Faso and Kenya also have high percentages of teenage pregnancies and early childbearing.

Moreover, the use of contraceptive methods among young women in these countries is low, as shown in Figure 2. In Burkina Faso, only 10% of sexually active teenagers use any form of contraception, while in Nigeria, the percentage is even lower, at 5%. In Congo DRC, only 2% of married adolescents use any form of contraception. Kenya, however, has one of the oldest family planning programs in Africa, and the percentage of young women currently using any method of contraception was 10.1% between 2003 and 2014, with a higher percentage among urban women compared to their rural counterparts.

Figure 1: Age-specific fertility rate 15-19

Age specific fertility rate: 15-19

Age-specific fertility rate for the three years preceding the survey for age group 15-19 expressed per 1,000 women

96 106 124 138

ICF. 2015. The DHS Program STATcompiler. Funded by USAID. http://www.statcompiler.com. July 27 2021
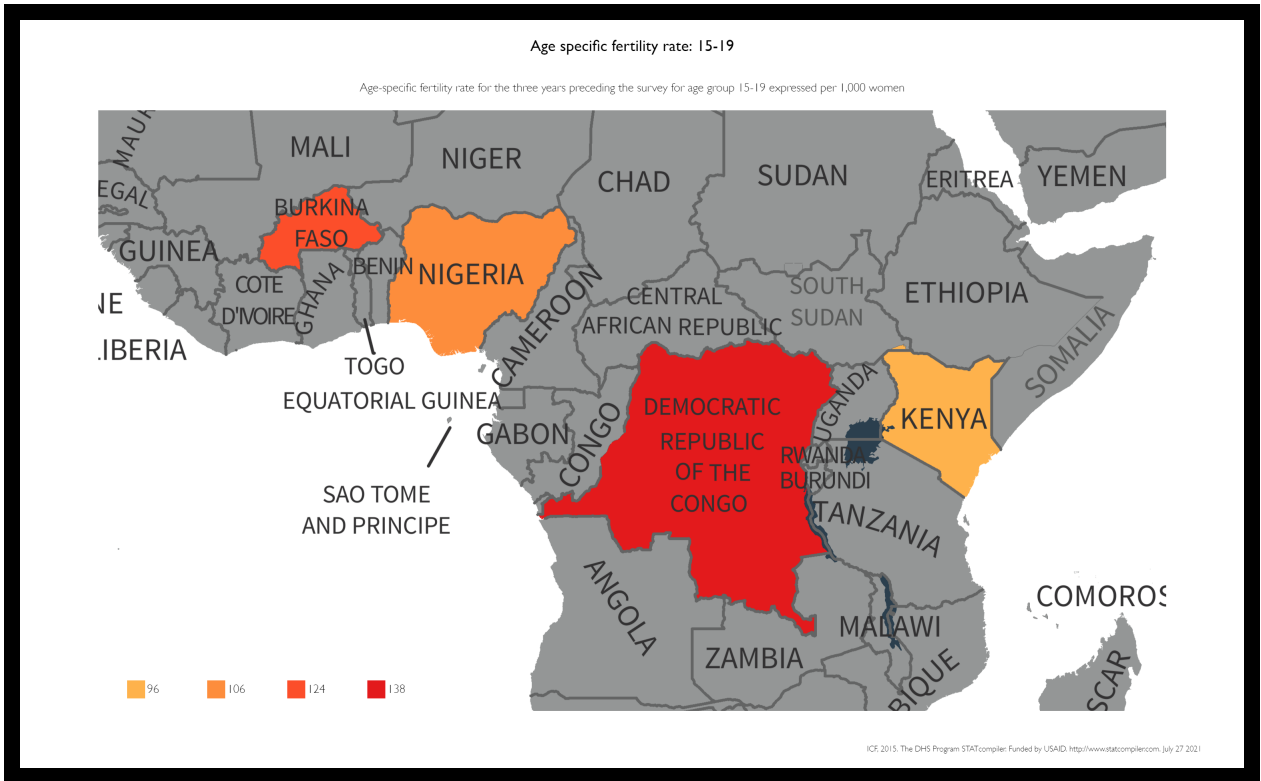
Figure 2: Current use of any method of contraception (young women)

Current use of any method of contraception (young women)

Percentage of young women currently using any method of contraception

2.9 6.3 10.1 11.5

ICF. 2015. The DHS Program STATcompiler. Funded by USAID. http://www.statcompiler.com. July 27 2021
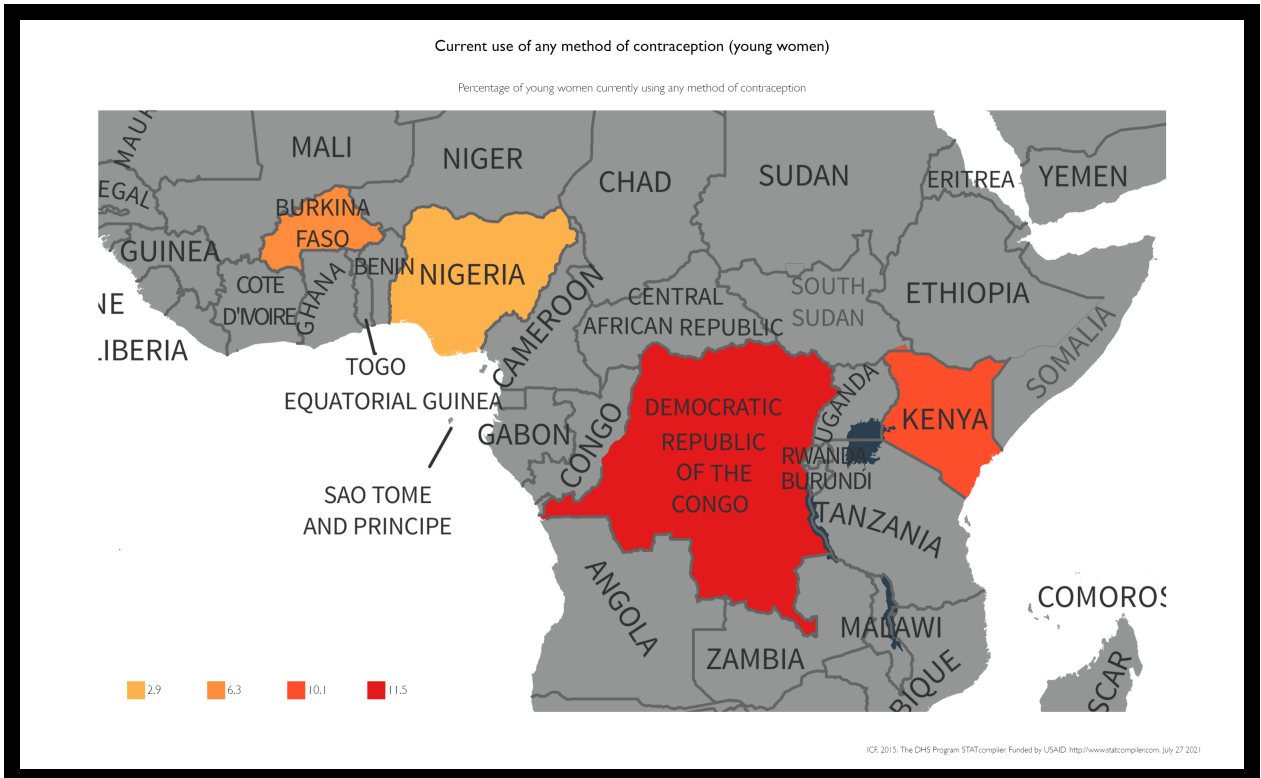
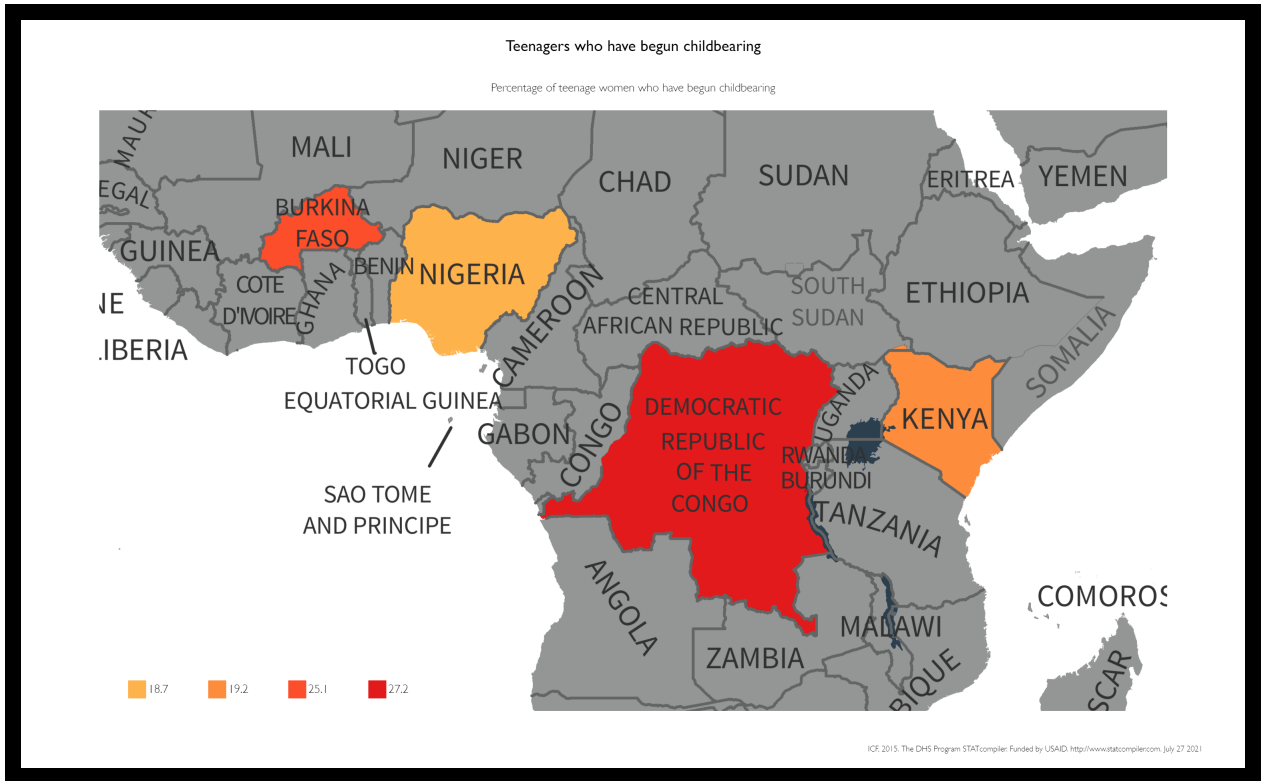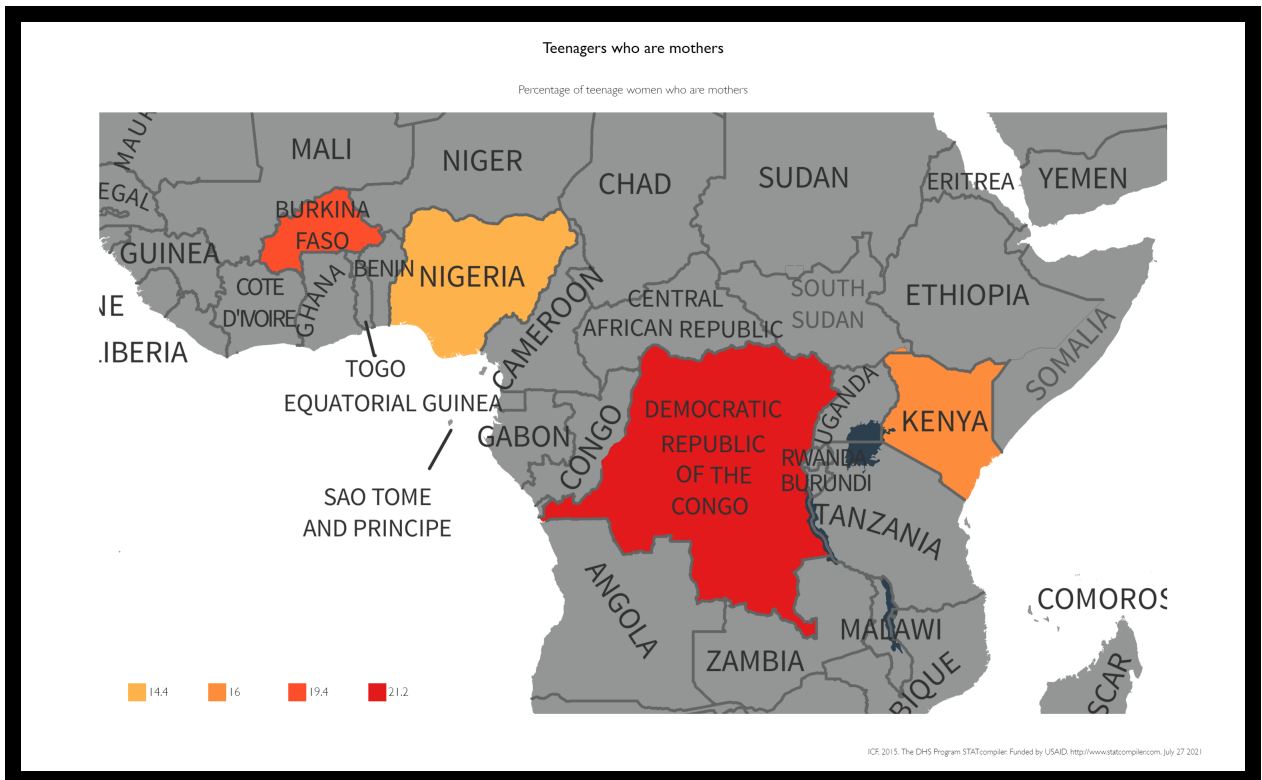Figure 3: Teenagers who have begun childbearing

Figure 4: Teenagers who are mothers

Studies have shown that education and fertility have a reverse causal relationship (Rindfuss et al., 1980; Rindfuss and St. John, 1983). In particular, the impact of early childbearing on schooling has been a topic of debate in the literature, with mixed results depending on the methodology used. Negative results are the most commonly found. For example, Klepinger et al. (1995) found that adolescent childbearing has a largely negative impact on the level of schooling achieved, using longitudinal data and the average age of first menstruation as an instrument for fertility. The number of years of education typically declines by 1 to 3 years, depending on race. Similarly, Moore and Waite (1977) found that delaying the age of first birth by even just 1 to 2 years increases the level of schooling. Teenage mothers, in particular, are unable to achieve the same level of education as their classmates who postpone childbearing. Comparing the two groups, it becomes apparent that teenage mothers are at a more significant economic and social disadvantage than those who delay births. Furthermore, the negative impact of early childbearing on education persists over time. According to the National Research Council, teenage mothers are less likely to attain an education and more likely to have a large family than those who delay childbirth. Hoffman et al. (1993), accounting for unobserved family characteristics, found that the effect of early childbearing is still significant and negative but not large. The high incidence of early motherhood can be attributed to factors like family size, high school graduation, and economic status (Fletcher and Wolfe, 2009; Moore and Waite, 1977).

According to a study conducted by Hotz et al. (2005), teenage childbearing can result in economic and social disadvantages for women. The study suggests that delaying pregnancy until adulthood can slightly decrease the probability of poverty and increase the chances of completing high school education. In other words, although adolescent mothers are more likely to face social and economic challenges, postponing pregnancy until adulthood can have positive consequences. Economic hardships prior to motherhood can contribute to the negative outcomes associated with early childbearing. Adolescents who experience greater social and economic inequalities have a higher likelihood of becoming pregnant at a young age. Therefore, policies aimed at reducing teenage pregnancy rates should prioritize addressing these inequalities among young girls, as suggested by (Geronimus, 1991).

The effect of education on childbearing is that it generally leads to a positive and significant reduction, and it goes through the age of first birth. Women may experience unplanned pregnancies in their early stages of development, especially when they are still in school. Education helps in increasing the age at first birth through the accumulation of human capital, "incarceration," and the income effect (Black et al., 2008). Women with higher levels of education tend to have better-paying jobs, so they may postpone their first birth to increase their level of education. The decision to delay or avoid childbirth during adolescence is determined by the opportunity costs of having a child, the returns on investment in education, and the expected life-cycle income. Having higher expectations may encourage young women to delay their first sexual activity or

use contraceptive methods (either traditional or modern) to avoid childbirth.

Education plays a vital role in the human capital effect, which leads to the "knowledge" effects of extended schooling. Higher levels of education provide better access to information regarding family planning and contraception, as supported by research studies (Thomas et al., 1991; James and Vujić, 2019). Education not only influences fertility preferences by shaping thoughts but also by enabling the acquisition and use of knowledge that empowers women to make informed choices.

In addition, education may also have a direct and negative impact on childbearing. For example, adolescents who are currently attending school are more likely to have less parental control and are more likely to find their partner at school, as pointed out by research (Meekers, 1994). This could increase their chances of getting pregnant if they do not use contraceptive methods.

2 Data

The data used in this study is from the Performance Monitoring for Action (PMA) program. The program's objective is to provide information for policy-making and improve the well-being of communities, especially young girls and women. Its focus areas include family planning, maternal and child health, nutrition, water and sanitation, neglected tropical diseases, and Covid-19. The PMA program often conducts longitudinal and cross-sectional panel surveys at the household and service delivery point levels in nine African and Asian countries: Burkina Faso, Ivory Coast, The Democratic Republic of Congo, Ethiopia, Ghana, India, Indonesia, Kenya, Niger, Nigeria, and Uganda.

The longitudinal data comprises many waves. During Wave I, the program identified households and women to be surveyed. The second wave re-examined households and women surveyed during Wave I, which occurred from 2019 to 2020. However, data from the second wave is currently unavailable, and we focus our analysis on data from Wave I. Data is available for only four countries: Burkina Faso, The Democratic Republic of Congo, Kenya, and Nigeria. In Nigeria and The Democratic Republic of Congo, data is collected only in Kano and Lagos (for Nigeria) and Kinshasa and Central Congo (for The Democratic Republic of Congo). For Burkina Faso and Kenya, data is collected at both national and subnational levels.

The data is standardized, which allows for fair comparisons between countries. The sampling method and questionnaires are consistent across all countries, with the only variation being the sample size. The women's questionnaire is used for all women in the household between the ages of 15 and 49. It provides useful information on socio-economic characteristics, contraception, reproduction, pregnancy and fertility preferences, sexual activity, and empowerment.

Measures

Our research is focused on providing a detailed analysis of adolescents, which are defined by the World Health Organization (WHO) as girls and boys aged 10 to 19 years old. However, for our study, we have chosen to focus solely on young girls aged 15 to 19 years old. For the purpose of our analysis, we are only considering adolescents who are not pregnant or mothers at the time of the survey. We are also taking into account whether or not they are enrolled in school or a training program, or neither, as this can have a significant impact on their overall well-being and development. Our sample sizes are 1483 for Burkina Faso, 1008 for Congo (DRC), 2063 for Kenya, and 510 for Nigeria.

Our study, based on the methodology ofPeipert et al. (2012); Moreau et al. (2013), uses the "use of contraceptives" as a measure of unwanted fertility. We aim to investigate the impact of identifying fertility time preferences on young girls' contraceptive use and its link to teenage pregnancy. Our dependent variable is contraceptive use, which we analyzed based on three aspects: current use, ever used, and intention to use. To account for all young women in the sample, we combined data from those who currently use, those who have ever used, and those who intend to use contraceptive methods. We also included those who are entirely reluctant to use contraceptive methods (those who have never used and do not intend to use them). It's worth noting that some women prefer traditional methods (such as rhythm, withdrawal, beads, or lactational amenorrhea method) to modern ones for various reasons such as health, access, or reliability. We included these women in the analysis with those who have ever used contraceptive methods but are not currently using them to consider discontinued methods such as condoms (which are used once at a time).

Fertility time preference is a measure of whether a woman would prefer to complete her education before having a child. It is equal to 1 if she would like to finish her education first and 0 otherwise. Women's level of patience affects how they value future returns. Education can act like an incarceration effect, which can influence a woman's patience (Frederick et al., 2002). Students who expect higher returns from education tend to have a lower discount rate and are more likely to delay having children, compared to those with a lower expected return and a higher discount rate (James and Vujić, 2019). However, having higher expectations of education returns may not necessarily prevent a delay in childbearing. Adolescents, for whom the opportunity cost of childbearing is higher, are more likely to delay having children. Thus, the variable *Fertility time preference* is used to measure the trade-off between schooling and childbearing or a woman's time preference. As part of our research, we used several variables to measure the future aspirations(within two years) and time preferences of the participants. These variables included "Important to complete studies"(secondary of university), "Important to have a job," "Important to have a business," "Important to have children," and "Important to

get married" (for definitions, please refer to the annex). For instance, the variables "Important to have children" and "Important to get married" aimed to measure the participants' time preference concerning childbearing and marriage. We assume that adolescents who reported that having children in two years is "very important" (in response to the question about "Important to have children") have a high discount rate and are less likely to use contraceptive methods to delay childbearing.

On the other hand, adolescents who reported that completing secondary school or attending university in two years is "very important" are more risk-averse and more likely to use contraceptive methods to avoid childbearing. We also assume that this group of girls has higher expectations of education returns.

It is important to consider the aspirations of parents or guardians for their children. These aspirations can be different or similar for each child. For instance, some parents may encourage their children to find a job or get married, while their children may have other aspirations. The method used to identify these aspirations is the same for children. The variables used to measure these aspirations are all measured similarly. For example, if respondents report that it is "very important for their parents or guardians that they achieve secondary school or attend university in two years," then the variable is equal to 1 and 0 otherwise. This variable is measured in the same way as the "Important to complete studies" variable. The tables 6 and 10 present the descriptive statistics and descriptions of these variables.

The level of education is measured by the highest level of schooling attained. We also take into account those in a training program. The variable *School level* is coded as 1 if the girl has completed at least primary school and 0 otherwise. *School level* is also equal to 1 for those in a training program.

Fertility decisions are influenced by women's reproductive or sexual behavior, as stated in a study by Timæus and Moultrie (2015). We used three variables to measure reproductive behavior. Firstly, physical maturity, which may influence sexual activity, was measured by the number of years since the first menstrual period (Averett et al., 2002). Secondly, decision-making power can be influenced by the environment in which young girls live. The third variable indicates whether the respondent currently has a partner or not.

There are various types of contraceptive methods available, such as traditional, neotraditional, or modern. Traditional and neo-traditional methods include periodic and post-partum abstinence, breastfeeding, and withdrawal. However, these methods are less effective than modern methods, as per the report by (Rossier and Corker, 2017). Modern methods are widely used by women, but their utilization depends on factors such as the level of education, income, socio-professional category, marital status, husband's role (for married women), cost, and accessibility.

The survey provides a comprehensive range of information on contraceptive methods. The variables are divided into three groups representing knowledge of natural, hormonal, and non-

hormonal contraceptive methods. The second group of variables is related to attitudes towards reproduction and contraception. These variables help to understand the decision-making power of individuals when it comes to using contraception methods. The third group of variables is related to perceptions about family planning methods. We have assumed that community perceptions can influence the decision to use contraceptive methods, especially in the case of young girls. The last group of variables concerns exposure to family planning messages through different media channels like radio, television, mobile, magazines, and social networks.

The analysis also included religion, age, ethnicity, household wealth, and residential area as factors. However, information on ethnic groups is unavailable for Kenya and we have no information on the residential area of Congo (DRC). The head of the household provided information on his ethnic and religious groups. In Congo (DRC) and Kenya, the majority of people are Christians, so the variable *religions* is coded as 1 for Christians and 0 for other groups. However, in Nigeria and Burkina Faso, Islam is the major religion. In Burkina Faso, other religious groups are also important, so the variable *religions* is coded 1 for Muslims, 2 for Christians, and 3 for other religious groups. Ethnic groups are different depending on countries. For example, in Burkina Faso, the Mossi are the major ethnic group, while in Nigeria, the Hausa, Yoruba, and Igbo are the major ethnic groups. In Congo (DRC) database, ethnic groups are grouped into three categories: 1 for girls from Bakongo, 2 for those from Kasai, and 3 for other ethnic groups. The marital status is coded as 1 for adolescents who are living with someone, married, or separated, and 0 for the other group, for all countries.

The survey also provided information on household wealth, which is coded from 1 for the lowest quintile to 5 for the highest quintile of wealth, except for Burkina Faso (where the variable is coded from 1 for the lowest tertile to 3 for the highest tertile of wealth). The variable was computed using information from the household questionnaire (in the "assets" section) and the Principal Component Analysis (PCA) method.

Analytical approach

We first used the Exploratory Factor Analysis (EFA) method to describe the data and create indices. In factor analysis, each observed variable is a linear function of common factors ($X_i = function(factor_j, \epsilon_i)$ with $i = 1, ...p, j = 1, ...m$ with m < p, ϵ, the specific factors or random errors and X_i the observed variables) while in principal component analysis, each component is a linear combination of observed variables ($Component_j = function(X_i)$ with $i = 1, ...p$) and $j = 1, ...m$ with m < p). We used factor analysis to identify the common factors and variable-specific factors, which is not possible with principal component analysis. To ensure that our model was appropriate for factor analysis, we conducted a Kaiser-Meyer-Olkin (KMO) test. This test helps to determine if the observed variables have enough common variance to proceed with the factor analysis. If the KMO value is less than 0.6, it indicates that the model

is inadequate. The following are the assumptions of our model:

$$X_i = function(factor_j, \epsilon_i) \tag{1}$$

The specific and common factors have a normal distribution:

$$E(\epsilon_i) = 0; i = 1; .., p \tag{2a}$$

$$E(factor_j) = 0, j = 1, ...m \tag{2b}$$

The variance of specific factors (specific variance) differs for each observed variable, while common factors share the same variance (equal to 1). Moreover, the correlation between common and specific factors equals zero.

$$Var(\epsilon_i) = \phi_i; i = 1; .., p \tag{3a}$$

$$Var(factor_j) = 1, j = 1, ...m \tag{3b}$$

$$Cov(\epsilon_i, \epsilon_k) = 0, i \neq k \tag{3c}$$

$$Cov(factor_j, factor_l) = 0, j \neq l \tag{3d}$$

$$Cov(factor_j, \epsilon i) = 0 \tag{3e}$$

We used the principal axis factor to extract factors and parameter estimates. We considered factors with eigenvalues greater than 1 (Kaizer-criterion)[1]. The Principal axis factor assumes that the commonality is less than 1 (equal to 1 - the specific variance) and uses the squared multiple correlation coefficient between factors and the variable.

To avoid multicollinearity between factors, we used the oblique oblimin rotation for factor interpretation. Factors extracted can be interpreted using different types of rotations, with orthogonal and oblique rotations being the most commonly used. While the orthogonal rotation (usually varimax rotation) is easy to interpret, it requires factors to be independent, which may not reflect reality. On the other hand, the oblique rotation requires no factor structure, but factor correlation in ProMax rotation (one of the oblique rotation techniques) makes it challenging to interpret the results. The oblimin rotation allows setting the degree of correlation between factors, and we chose to obtain weakly correlated factors since we used factor scores as independent variables in the analysis.

In addition, we used the regression method to predict scores, which provides accurate scores despite the biased results. For example, factor A scores correlate with factors A and B even when using an orthogonal rotation. The Bartlett method provides unbiased scores but non-accurate estimates, while the Anderson-Rubin method gives accurate and uncorrelated scores.

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[1]Since we also used the Confirmatory Factor Analysis method to determine the model that fits the data best, we used some factors with eigenvalues less than 1 as they give a best-fitted model.

To assess the reliability of our models, we employed a Confirmatory Factor Analysis (CFA) approach. CFA examines the relationship between observable and latent variables. It is a measurement model and a component of the Structural Equation Modeling (SEM) technique. In order to use a CFA model effectively, it is essential to determine the number of factors and understand how variables are correlated.

It is important to note that a factorial structure found in Exploratory Factor Analysis (EFA) may not be applicable in CFA. Therefore, we employed an iterative EFA-CFA process. This involved moving back and forth between EFA and CFA to add or remove items, or adjust the number of factors to obtain an optimal CFA model. Since the observed variables were binary and categorical, we used the robust weighted least squares estimator (WSLMV) with standard errors and oblique rotations. Unlike the maximum likelihood estimator used in CFA, the WSLMV estimator does not require variables to have a normal distribution.

We carried out EFA using Stata 15, and CFA using Mplus7, as the WSLMV estimator is not available in Stata. The quality of the models was assessed using three goodness-of-fit measures: Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), and Comparative Fit Index (CFI). RMSEA is the most commonly used measure of model fit. SRMR is a standardized measure of the difference between the observed and predicted correlation (Hu and Bentler, 1999). The SRMR is also an absolute measure of fit. The model is generally considered a good fit when RMSEA is less than 0.05 or SRMR is less than 0.08. CFI compares the goodness-of-fit of a hypothesized model with that of a baseline model. Bentler and Bonett (1980) suggests that the model is best fitted when the CFI is higher than 0.9. We selected models that met at least one of the above-mentioned criteria for a good fit.

3 Results of factor analysis (EFA-CFA)

Results for aspirations

We used an iterative process of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) to identify measures of aspirations. Our questions were related to both the respondents' and their parents' aspirations. At first, we included personal and parental aspirations in a single model, but the CFA results showed that the model did not fit the data well. To address this issue, we divided the variables into personal and parental aspirations and conducted EFA again. The results of the EFA (shown in Table 1) revealed a two-factor model. Although the KMO statistic for Burkina Faso and Nigeria was lower than 0.9 in both groups, the results from CFA suggest that the two-factor model fits the data best. In particular, the Comparative Fit Index (CFI) and Standardized Root Mean Square Residual (SRMR) meet the good fit criteria for the model.

The first factor comprises variables that indicate the intentions to achieve secondary school

education, attend university, start a business, or have a job. We have named this factor as "economic" since it represents personal and parental aspirations related to economic choices. On the other hand, the second factor includes variables that represent intentions to marry or have children. We have named this factor as "familial" since it reflects family choices.

Results for knowledge of contraceptive methods

We used an iterative process of EFA-CFA to identify measures of knowledge of contraceptive methods and determine which factors had the highest explanatory power. Initially, we applied EFA to all variables of knowledge of contraceptive methods, which resulted in the identification of three factors. However, the third factor only explained two variables ("knowledge of female sterilization" and "knowledge of male sterilization"). Furthermore, the results of CFA confirmed that the three-factor model did not fit the data well. We then tried a two-factor model, but the results were similar to the three-factor model. As a result, we categorized variables into three groups (natural, hormonal, and non-hormonal contraceptive methods) and considered a 1-factor model for each group. We removed "knowledge of female sterilization" and "knowledge of male sterilization" from the analysis since they did not contribute to the best fit of the data.

The table 2 shows the factor loadings obtained from EFA for each group. The Kaiser-Meyer-Olkin (KMO) statistic had a value greater than 0.6 in all models except for the non-hormonal methods model in Kenya and Congo (DRC). However, the results of Confirmatory Factor Analysis (CFA) indicate that the non-hormonal method model in Kenya and Congo (DRC) is the best fit as it meets all the goodness-of-fit criteria.

We found that only CFI met the goodness-of-fit criteria for the model of "knowledge of natural methods" in all countries. The confirmatory factor analysis (CFA) showed that the one-factor model was the best fit for all groups' data. In the models for natural, hormonal, and non-hormonal methods, the factor was named "nat," "hormon," and "nonhorm," respectively.

Results for the decision-making power and the perceptions about the consequences of using contraceptive methods

The findings of the EFA-CFA analysis are shown in Table 3. Our analysis revealed that two factors best represent the given data. The CFA results confirmed that the two-factor model provides an adequate explanation for the correlation between the variables related to decision-making and the perceptions regarding the outcomes of using contraceptive methods. Each factor was uniquely measured by a specific set of variables.

To analyze the factors that impact the decision-making power of fertility preferences, two variables are considered: personal decision-making power regarding fertility time preference and having confidence in discussing it with a partner. However, according to the general rule of Confirmatory Factor Analysis (CFA), each factor should have at least three variables. If a factor has only two variables, the correlation between them should be higher than 0.7, and their correlation with other variables should be low. This rule comes from Worthington and Whittaker (2006).

We have decided to retain the factor with two variables as they hold significant meanings.

Table 1: Factor loadings from Exploratory and Confirmatory Analysis (EFA-CFA) for aspirations

Variables	Burkina Faso			DRC			Kenya			Nigeria		
	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness
				Exploratory Factor analysis								
Personal aspirations												
Important to have a business		0.6340	0.5332		0.6090	0.5930		0.5777	0.5862	0.3948	0.5192	0.5414
Important to complete studies		-0.3943	0.8506		0.3945	0.8569		0.3982	0.8555		0.4463	0.7566
Important to get married	0.9042		0.1727	0.8406		0.2786	0.8568		0.2686	0.9216		0.1540
Important to have children	0.9011		0.1801	0.8471		0.2890	0.8532		0.2581	0.9072		0.1729
Important to have a job		0.5990	0.5770		0.6301	0.5802		0.6872	0.5141		0.6929	0.4947
N	928			753			1723			358		
Chi2 (10)	1870.21			1134.76			2877.41			807.11		
sampling adequacy	0.5899			0.6102			0.6032			0.5826		
Parents' aspirations for their children												
Important to have a business		0.6479	0.5427		0.5987	0.5702		0.6128	0.5747	0.3164	0.6239	0.4860
Important to complete studies		0.4453	0.7990		0.4089	0.8500		0.4197	0.8350		0.3884	0.7869
Important to get married	0.8712		0.2385	0.8642		0.2177	0.9051		0.1832	0.9609		0.0679
Important to have children	-0.8727		0.2361	0.8811		0.2347	0.8998		0.1821	0.9597		0.0644
Important to have a job		0.6858	0.5095		0.6365	0.5391		0.7112	0.4901		0.7103	0.4854
N	929			757			1719			356		
chi2(10)	1635.30			1364.95			3517.43			1127.63		
sampling adequacy	0.5660			0.6186			0.5856			0.5750		

Notes : In the factors column blanks represent abs (loading) < 0.3

Table 2: Factor loadings from Explanatory analysis of knowledge of contraceptive methods

Variable	Burkina Faso Factor1	Uniqueness	DRC Factor1	Uniqueness	Kenya Factor1	Uniqueness	Nigeria Factor1	Uniqueness
Natural methods								
Heard about beads	0.4845	0.7652	0.3929	0.8457	0.5240	0.7255	0.5260	0.7233
Heard about LAM	0.3744	0.8599	0.2694	0.9274	0.4430	0.8037	0.4554	0.7926
Heard about rhythm methods	0.5203	0.7292	0.3968	0.8425	0.5634	0.6826	0.5616	0.6846
Heard about withdrawal	0.5818	0.6615	0.5000	0.7500	0.6180	0.6180	0.6562	0.5693
Heard about other methods	0.1850	0.9658	0.2134	0.9545	0.2893	0.9163	0.4509	0.7967
N	1480		1008		2060		501	
Chi2 (10)	608.56		216.16		1169.48		366,77	
sampling adequacy	0.6771		0.6153		0.7279		0.7214	
Hormonal methods								
Heard about implants	0.6935	0.5191	0.5530	0.6942	0.6990	0.5114	0.6705	0.5504
Heard about IUD	0.4946	0.7553	0.3807	0.8551	0.5941	0.6470	0.4877	0.7621
Heard about injectables	0.6851	0.5306	0.6141	0.6229	0.6931	0.5196	0.7698	0.4074
Heard about pills	0.6822	0.5346	0.5810	0.6624	0.6835	0.5329	0.7281	0.4699
Heard about emergency method	0.4027	0.8379	0.4664	0.7825	0.5827	0.6605	0.3135	0.9017
N	1483		1 006		2062		510	
chi2(10)	1732.92		680.65		2889.32		649.11	
sampling adequacy	0.7496		0.7316		0.8078		0.7446	
Non-hormonal methods								
Heard about male condoms	0.4720	0.7772	0.4045	0.8364	0.2321	0.9461	0.4776	0.7719
Heard about female condoms	0.5752	0.6691	0.4365	0.8094	0.4064	0.8349	0.5845	0.6584
Heard about diaphragm	0.5052	0.7448	0.2121	0.9550	0.6635	0.5598	0.6074	0.6311
Heard about foam or jelly	0.4275	0.8172	0.2312	0.9465	0.6557	0.5701	0.5872	0.6551
N	1482		1006		2063		509	
Chi2(6)	673.40		135.01		1095.25		375.83	
sampling adequacy	0.6025		0.5265		0,5907		0.6009	

Notes : In the factors column blanks represent abs (loading) < 0.3

In all the countries under consideration, the correlation between personal decision-making about fertility time preference and the confidence to discuss it with one's partner is weak. The correlation coefficients are 0.42, 0.46, 0.64, and 0.47 for Kenya, Burkina Faso, Nigeria, and Congo (DRC), respectively. Each variable has a weak correlation with other variables analyzed, but they are crucial for the analysis.

We assumed that the variables "Future children will have anomalies," "Will have trouble getting pregnant next time," and "Partner will seek another partner" all measure the same indicator, which is perceptions regarding the consequences of contraceptive methods. We also assumed that the second group of variables, "personal decision-making power about fertility time preference and having confidence in discussing it with a partner," measures the decision-making power about fertility time preference.

Results for perceptions about family planning programs

In the survey, two groups of perceptions were identified: the perceptions of the respondents and the community. These groups were then combined, and an EFA (Exploratory Factor Analysis) was performed. CFA (Confirmatory Factor Analysis) was also conducted, which revealed two factors with an eigenvalue greater than one. The factor loadings are presented in Table 4a. The questions used to evaluate both the respondents' and the community's perceptions about family planning programs correspond to the variables that measure factors 1 and 2. For all countries except Nigeria, the KMO (Kaiser-Meyer-Olkin) Statistic is higher than 0.6, indicating that the two-factor model fits the data well. However, only CFI (Comparative Fit Index) complies with the goodness-of-fit criteria for Burkina Faso, Kenya, and Nigeria. The Comparative Fit Index (CFI) is higher than 0.9 in all countries. The CFA results indicate that the variables used to measure perceptions about family planning methods are correlated and can be explained by two factors, which we have named *personal perceptions* and *community perceptions*.

The variables that measure factors 1 and 2 correspond to the questions used to evaluate the perceptions of the respondents and community about family planning programs, respectively. In all countries, except for Nigeria, the KMO Statistic is higher than 0.6, indicating that the two-factor model fits the data appropriately. Only CFI meets the goodness-of-fit criteria for Burkina Faso, Kenya, and Nigeria. The Comparative Fit Index (CFI) is higher than 0.9 in all countries. According to the CFA results, the variables of perceptions about family planning methods are correlated and explained by two factors. We named the first factor "personal perceptions" and the second-factor "community perceptions."

Results for exposure to family planning messages

We conducted an analysis of variables related to exposure to family planning messages using a consistent process across all countries. However, we encountered an issue with the variable

Table 3: Factor loadings from explanatory analysis for reproductive attitudes

Variables	Burkina Faso			DRC			Kenya			Nigeria		
	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness
Personal decision-making power about fertility time preference		0.6280	0.6004	0.5481		0.6959		0.5477	0.7035	0.7677		0.4211
Having confidence in discussing with the partner		0.6271	0.6103	0.5618		0.6865		0.5501	0.6915	0.7517		0.4128
Future children will have anomalies	0.5559		0.6923		0.4227	0.8226	0.6426		0.5863		0.5364	0.7186
Will have trouble getting pregnant next time.	0.5942		0.6517		0.3388	0.8614	0.6949		0.5236		0.6018	0.6401
Partner will seek another partner	0.5214		0.7194		0.4743	0.7753	0.5564		0.6836		0.4628	0.7591
N	989			691			1638			226		
chi2(10)	679.93			243.61			1293.09			222.04		
sampling adequacy	0.5825			0.5359			0.6134			0.5537		

Notes : In the factors column blanks represent abs (loading) < 0.3

Table 4: Factor loadings from EFA for perceptions about family planning methods and exposure to family planning messages

Variable	Burkina Faso			DRC			Kenya			Nigeria		
	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness
Adolescents using FP are promiscuous	0.5431		0.6889	0.4508		0.7837	0.4072		0.7331	0.1214	-0.5276	0.6569
FP is only for married people	0.6524		0.5775	0.6817		0.5497	0.7042		0.5435	0.5255	-0.1086	0.6675
FP is only used to avoid pregnancies	0.5692		0.6861	0.6216		0.6150	0.6213		0.6153	0.6996	0.1171	0.5609
For community members: Adolescents using FP are promiscuous		0.5547	0.6988		0.4638	0.8063		0.5394	0.7479	0.0595	0.6448	0.6106
For community members: FP is only for married people		0.5881	0.6666		0.5686	0.6473		0.5322	0.6485	-0.3922	0.3011	0.6633
For community members: FP is only used to avoid pregnancies		0.4466	0.7830		0.4967	0.7282		0.5057	0.6985	-0.6070	0.0795	0.5875
N	1337			911			2033			442		
chi2(15)	1164.72			860.99			2277.93			581.75		
sampling adequacy	0.6545			0.6135			0.6629			0.5812		

Notes : In the factors column blanks represent abs (loading) < 0.3

(a) perceptions about family planning methods

Variable	Burkina Faso			DRC			Kenya			Nigeria		
	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness	Factor 1	Factor 2	Uniqueness
radio		0.4940	0.7774	0.5846		0.6798	0.5780		0.7138	0.5353		0.7454
television		0.4660	0.7038	0.6003		0.6380	0.5194		0.5966	0.6246		0.5848
magasine	0.4001		0.7597			0.8171	0.4058		0.6102	0.3335		0.7012
mobile	0.5245		0.7457	0.6534		0.6094		0.5683	0.6928		0.4200	0.8324
social-media	0.4979		0.7576	0.5947		0.5877		0.5762	0.6088		0.3027	0.7104
N	1475			1006			2060			506		
chi2(10)	688.59			754.36			1849.54			316.63		
sampling adequacy	0.6781			0.6612			0.7570			0.6983		

Notes : In the factors column blanks represent abs (loading) < 0.3

(b) Exposure to family planning messages

"magazine" in Congo (DRC) as it was not loading to any factorial structure. Consequently, we removed it from the EFA-CFA process in Congo (DRC). The EFA factor loadings are presented in Table 4b, and the KMO Statistic is higher than 0.6 for all countries, indicating a good model fit. The results from CFA confirmed the results from EFA, and we found that the two-factor model met at least one of the goodness-of-fit criteria.

In Nigeria and Kenya, "radio" and "television" loaded on the first factor, while in Burkina Faso and Congo (DRC), they loaded on the second factor. The second factor was measured by "mobile" and "social media" in the case of Nigeria and Kenya, while in Burkina Faso and Congo (DRC), they loaded on the first factor. To simplify the analysis, we assumed that the first factor is measured by "radio," "television," and "magazine," and named it factor *audio-visual media* (audio-visual). The second factor is measured by "mobile" and "social media," and we termed it *other media*. However, in the case of Burkina Faso, "magazine" is explained by the second factor and belongs to *other media*.

Predicting factor scores

The descriptive statistics of factor scores are shown in Tables 5. We transformed the factor scores to a range between zero to one. The first indicator, which assesses the decision-making power of fertility time preference, showed that all countries had almost the same average score and that adolescents had a strong decision-making power in this regard. This is indicated by an average score higher than 0.7, which we assumed would significantly affect the outcome variable. The second indicator, which measures perceptions about the consequences of using contraceptive methods, also had almost the same average score for all countries, with Kenya having the highest. The average score is higher than 0.7 for all countries, indicating that young girls are not fearful of using contraceptive methods. They don't believe that the methods will harm their future babies' health, prevent them from getting pregnant, or cause their partner to leave them. We included both indicators in the analysis, as there is a weak and positive correlation coefficient of perceptions about the consequences of using contraceptive methods indicators for all countries except Congo (DRC), where the correlation coefficient is negative. The correlation matrix of the index is presented in table 12a, table 12b, table 13a, and table 13b.

Our analysis focused on two indicators of perceptions regarding family planning programs: personal perceptions and community perceptions. Nigeria scored the lowest (0.29) in terms of personal perceptions, while scoring the highest (0.67) in community perceptions. This implies that young girls in Nigeria have a positive perception of family planning, whereas communities have a negative perception. In other words, respondents (on average) in Nigeria do not believe that adolescents who use family planning are promiscuous or that family planning is only for married women or women who do not want more children. However, they think that the majority of people in their communities hold opposite beliefs. Since the average score of community

perceptions is high (0.67), many Nigerian communities believe that adolescents who use contra-
ceptives are promiscuous. This negative perception can impact the decision of young girls to use
or not use contraceptive methods. Personal and community perceptions are moderately and neg-
atively correlated; hence, both indicators were included in the list of independent variables. For
Burkina Faso, Congo (DRC), and Kenya, the average score of perceptions about family planning
is moderate. This suggests that some people in the communities of these countries believe that
adolescents who use contraceptive methods are promiscuous. The correlation coefficient of per-
sonal perceptions and community perceptions is higher for Congo (DRC) and Kenya. Therefore,
only one indicator of perceptions was included in the list of independent variables of their model.

Among the three indicators of knowledge regarding contraceptive methods, the second indi-
cator, 'hormonal,' has obtained the highest score. This indicates that hormonal contraceptive
methods such as pills, implants, and injectables are more commonly known compared to nat-
ural methods like LAM, beads, and withdrawal, as well as non-hormonal methods. The index
correlation matrix shows a moderate correlation between these three indicators, which led us to
include them in our model.

Many channels are available for transmitting knowledge about contraceptive methods, includ-
ing radio, television, magazines, mobile devices, and social media. However, in most countries,
the exposure index for family planning messages is weak, indicating that family planning pro-
grams are low or non-existent in many regions. The correlation coefficient between traditional
media (TV, radio, and magazines) and other media (social and mobile) is high. Therefore, only
one indicator of exposure to family planning messages is included in the list of independent
variables.

We also found that the personal aspirations of young girls in all countries primarily revolve
around economic goals. This means that for them, finishing high school or attending university,
starting a business, or having a job are the top priorities. While family aspirations are moderately
important, getting married or having a child in the next two years is not as high of a priority as
economic aspirations.

When it comes to making decisions about their children's future, parents' economic aspi-
rations seem to be more important than their family aspirations. This indicates that parents
prioritize their children completing their secondary education, attending university, finding a job,
or starting a business, just as their teenagers do. Moreover, "parents' economic aspirations" and
"parents' family aspirations" are positively and moderately correlated, indicating that economic
and family choices are not incompatible.

Table 5: Index descriptive statistics (factor scores)

Variables	Burkina Faso Mean (SD)	Congo (DRC) Mean (SD)	Kenya Mean (SD)	Nigeria Mean (SD)
Decision-making power regarding fertility time preference	0.72 (0.30)	0.79 (0.26)	0.74 (0.32)	0.79 (0.29)
Perceptions about the consequences of using methods	0.78 (0.3)	0.74 (0.25)	0.92 (0.19)	0.74 (0.24)
Personal aspirations				
Economic aspirations	0.67 (0.34)	0.60 (0.33)	0.74 (0.28)	0.62 (0.30)
Family aspirations	0.43 (0.44)	0.35 (0.41)	0.31 (0.40)	0.36 (0.43)
Parents' aspirations for their children				
Economic aspirations	0.69 (0.36)	0.62 (0.33)	0.77 (0.28)	0.62 (0.36)
Family aspirations	0.52 (0.43)	0.36 (0.43)	0.33 (0.43)	0.44 (0.44)
Knowledge of methods				
Natural	0.20 (0.31)	0.40 (0.24)	0.27 (0.28)	0.18 (0.25)
Hormonal	0.64 (0.31)	0.56 (0.30)	0.60 (0.35)	0.45 (0.35)
Non-hormonal	0.39 (0.26)	0.33 (0.16)	0.26 (0.26)	0.20 (0.24)
Exposure to messages				
Media and audio-visual	0.23 (0.24)	0.16 (0.22)	0.38 (0.31)	0.14 (0.21)
Other media	0.13 (0.2)	0.07 (0.17)	0.25 (0.28)	0.23 (0.27)
Perceptions about family planning programs				
Personal perceptions	0.58 (0.32)	0.49 (0.32)	0.54 (0.32)	0.29 (0.27)
Community perceptions	0.44 (0.26)	0.43 (0.26)	0.42 (0.28)	0.67 (0.27)

4 Empirical model

Deciding whether or not to have children is a complex decision that can be influenced by a variety of factors. One such factor is the cost and potential benefits associated with investing in education. For instance, young women who prioritize their education may choose to delay having children or use contraception to prevent unwanted pregnancies. This decision is often made with the recognition that having children can be costly and may limit their ability to pursue educational opportunities. The aim of this study is to explore the extent to which this consideration plays a significant role in young women's decision-making with regard to childbearing and contraception use. By examining this relationship, we hope to gain a better understanding of the factors that impact reproductive decision-making and inform strategies for supporting women's health and well-being.

In the case of adolescents, we made the assumption that the decision to use or intend to use contraceptive methods is also linked with being sexually active. We hypothesized that these variables would be positively correlated and considered that some unobserved individual characteristics could impact both variables simultaneously. To account for this possibility, we simultaneously estimated two equations instead of performing separate estimations. This approach allows us to model sexual activity and controlled fertility (use or intention to use contraceptive methods), which can provide insights into the effective effects. It is similar to the seemingly unrelated regression model but applied to non-linear models (Greene, 2003). The model can be expressed as follows:

$$Y_1^* = X_1\beta_1 + \epsilon_1, with\ Y_1 = 1\ if\ Y_1^* > 0,\ 0\ otherwise \tag{4a}$$

$$Y_2^* = X_2\beta_2 + \delta Y_1^* + \epsilon_2, with\ Y_2 = 1\ if\ Y_2^* > 0,\ 0\ otherwise, \tag{4b}$$

$$E(\epsilon_1) = E(\epsilon_2) = 0 \tag{4c}$$

$$Var(\epsilon_1) = Var(\epsilon_2) = 1 \tag{4d}$$

$$Cov(\epsilon_1, \epsilon_2) = \rho \neq 0 \tag{4e}$$

Y_1 and Y_2 are respectively *sexual activity* and *controlled* and, X_1, X_2 are vector of independent variables. Some variables used in the first equation are also used in the second equation (wealth, religion, ethnic groups). However, variables of family planning indicators are only used in the second equation.

In statistical analysis, it is assumed that the correlation between error terms, denoted as rho (ρ), is not zero. If the Wald test confirms that ρ is not zero, then it is reasonable to estimate the two equations simultaneously. However, if we fail to reject the null hypothesis that ρ equals zero, then the two equations are independent and are equivalent to two separate probit models. This implies that unobserved factors are not correlated. However, recent research by Filippini et al. (2018) highlighted that a zero or near-zero correlation in a bivariate probit model does not always imply independence between the equations. It can result from estimation errors that occur when using a bivariate probit model on a recursive bivariate probit data. Therefore, to account for this, we employed a recursive bivariate probit model, following Burnett (1997), which assumes that the probability of using contraceptive methods is correlated with sexual activity. The correlation coefficient is denoted by δ, and the model allows the dependent variable in one equation to be a predictor variable of the second equation.

5 Results

The tables 7, 8, 6 present marginal effects for model parameters estimated using the maximum likelihood estimator for Burkina Faso, Congo, DRC, and Kenya.

The results from all countries support the idea that having or identifying a preference for fertility timing has a positive impact on controlled fertility. However, this effect is only significant in Kenya, but only if we do not control for knowledge of methods or perceptions. As a reference point for interpreting the results, we will use the case of Kenya. We found that the desire to complete school before having children (*Fertility time preference*) has a positive and significant effect on controlled fertility. However, when considering perceptions, the effect is no longer significant. As *economic aspirations* and *parents' economic aspirations* are strongly correlated, they are separately included in the analysis. In model 2, *economic aspirations* is not significant while *parents' economic aspirations* is significant. However, the effect is negative and surprising. It suggests that even though completing secondary school (or attending university), having a job, and starting a business (in two years) are much more important for parents; young girls are less likely to control their fertility. Family choices could explain the result. The kernel density function (Figure 5) of *parents' economic aspirations* is almost the same as for *family aspirations*. The negative effect of *parents' economic aspirations* can be explained by the fact that parents with economic purposes for their children also have family goals. Indeed, *parents' economic and family aspirations* are positively and significantly correlated.

On the other hand, the effect of decision-making power is significant and positive. The effect increases when controlling for personal aspirations and decreases when considering personal and community perceptions about family planning programs. In other terms, adolescents are more likely to use contraceptive methods when they can choose their childbearing time preference.

We included both *community perceptions* and *personal perceptions* in the analysis but in separate models (6 and 7) as they are strongly correlated and have different effects. *community perceptions* has a positive effect (at 10%) while the effect of *personal perceptions* is negative. The negative effect of *personal perceptions* implies that a high score of *personal perceptions* implies that people disagree with the fact that family planning is only for married women or those who do not have children but are less likely to use contraceptive methods. On the contrary, the positive effect of *community perceptions* implies that a high score means that the community agrees that family planning is only for married women and adolescents using it is promiscuous. Still, the result suggests that adolescents are more likely to control their fertility. The results for perception indicators are surprising. On the other hand, we found that knowledge and exposure to family planning messages on television or radio have the expected effects.

We also found that people with higher levels of education are more likely to control their fertility. The effect decreases and becomes non-significant when we control for perceptions and

consequences about family planning programs or the use of methods. In Burkina Faso and Congo, DRC, the effect of personal perceptions about family planning is positive and significant.

Table 6: Marginal effects from the bivariate probit model(Kenya)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fertility time preference(ref.yes)	0.383*	0.358*	0.346	0.360	0.334	0.235	0.238
	(2.32)	(1.98)	(1.91)	(1.93)	(1.77)	(1.20)	(1.21)
Decision-making power of fertility time preference	0.646***	0.659***	0.660***	0.661***	0.678***	0.600***	0.579***
	(6.29)	(6.33)	(6.31)	(6.17)	(6.26)	(5.37)	(5.15)
Personal economic aspirations		-0.199					
		(-1.55)					
Parents' economic aspirations			-0.274*	-0.267*	-0.316*	-0.354**	-0.350*
			(-2.11)	(-2.01)	(-2.35)	(-2.60)	(-2.56)
Knowledge of methods							
Non hormonal methods				0.0365	-0.00680	-0.0142	-0.0103
				(0.21)	(-0.04)	(-0.08)	(-0.06)
Hormonal methods				0.675***	0.618***	0.611***	0.597***
				(5.16)	(4.65)	(4.57)	(4.45)
Natural methods				-0.138	-0.179	-0.199	-0.207
				(-0.80)	(-1.02)	(-1.13)	(-1.17)
Exposure to media							
Media and audio-visual					0.471***	0.455***	0.454***
					(3.67)	(3.51)	(3.50)
Personal perceptions about the consequences of using methods						0.424*	0.421*
						(2.08)	(2.06)
Personal perceptions about family planning programs							-0.292*
							(-2.52)
Community perceptions about family planning programs						0.234	
						(1.81)	
Sexual activity	1.141***	1.165***	1.156***	0.990***	0.919***	0.908***	0.902***
	(6.17)	(6.33)	(6.14)	(4.60)	(4.09)	(3.93)	(3.86)

Table 6 – *Continued from previous page*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
School level	0.578**	0.453*	0.470*	0.402	0.334	0.292	0.283
	(2.75)	(1.97)	(2.06)	(1.71)	(1.41)	(1.22)	(1.18)
Religion (ref. monotheist)							
Non-believer and other religions	0.0625	0.0455	0.0568	0.0234	0.0280	0.0233	0.0200
	(0.45)	(0.32)	(0.40)	(0.16)	(0.19)	(0.16)	(0.14)
Wealth (ref.lowest)							
Lower	0.161	0.113	0.120	0.0720	0.0680	0.0746	0.0634
	(1.51)	(1.04)	(1.10)	(0.65)	(0.61)	(0.66)	(0.56)
Middle	0.232*	0.203	0.211	0.157	0.124	0.130	0.125
	(2.15)	(1.84)	(1.91)	(1.38)	(1.09)	(1.12)	(1.08)
Higher	0.156	0.136	0.139	0.0670	0.0220	0.0348	0.0289
	(1.33)	(1.13)	(1.15)	(0.54)	(0.18)	(0.27)	(0.23)
Highest	0.0657	0.0489	0.0492	-0.0375	-0.0815	-0.0473	-0.0556
	(0.49)	(0.35)	(0.35)	(-0.26)	(-0.57)	(-0.32)	(-0.38)
Residential area (ref. urban)							
Rural	-0.138	-0.109	-0.106	-0.121	-0.0938	-0.101	-0.108
	(-1.59)	(-1.22)	(-1.19)	(-1.34)	(-1.02)	(-1.09)	(-1.16)
Age	0.0592*	0.0581*	0.0613*	0.0294	0.0240	0.0220	0.0228
	(2.07)	(2.00)	(2.11)	(0.98)	(0.80)	(0.73)	(0.75)
Marital status	-0.275	0.0458	0.0679	0.0924	0.0747	0.137	0.138
	(-1.25)	(0.16)	(0.23)	(0.31)	(0.25)	(0.45)	(0.45)
In training /in school	-0.245	-0.237	-0.229	-0.167	-0.168	-0.142	-0.138
	(-1.66)	(-1.55)	(-1.49)	(-1.06)	(-1.05)	(-0.89)	(-0.86)
N	1519	1449	1448	1448	1447	1434	1434
Rho	-0.444**	-0.508***	-0.448**	-0.345*	-0.302*	-0.30*	-0.291
$Wald\_test\_of\_rho$	10.85	11.56	10.40	5.62	4.22	3.92	3.65

t statistics in parentheses

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

Table 7: Marginal effects from the bivariate probit model (Burkina Faso)

Variables Variables	(1)	(2)	(3)	(4)	(5)
Fertility time preference (ref. yes)	0.0484	0.0258	0.0464	0.0311	0.0741
	(0.42)	(0.21)	(0.39)	(0.24)	(0.51)

Table 7 – *Continued from previous page*

Variables	(1)	(2)	(3)	(4)	(5)
Decision-making power of fertility time preference	0.897***	0.942***	0.900***	0.939***	0.837***
	(5.69)	(5.66)	(5.62)	(5.54)	(4.30)
Personal economic aspirations		-0.0113		0.00834	-0.00745
		(-0.07)		(0.05)	(-0.04)
Knowledge of methods					
Non hormonal methods			-0.0184	0.00543	0.0291
			(-0.07)	(0.02)	(0.10)
Hormonal methods			0.770***	0.615**	0.637**
			(3.59)	(2.70)	(2.58)
Natural methods			0.568*	0.657*	0.550
			(2.12)	(2.26)	(1.79)
Exposure to media					
media and audio-visual				0.309	0.321
				(1.40)	(1.35)
Personal perceptions about the consequences of using contraceptive					0.278
					(1.25)
Personal perceptions of family planning programs					0.496*
					(2.22)
Community perceptions about family planning programs					-0.418
					(-1.54)
Sexual activity	1.505***	1.469***	1.399***	1.361***	1.173***
	(6.78)	(6.61)	(5.79)	(5.56)	(4.16)
Religions (ref. Muslims)					
Christian	0.144	0.112	0.119	0.106	0.102
	(1.39)	(1.03)	(1.13)	(0.94)	(0.86)
Traditional and others	0.531*	0.489	0.567*	0.534*	0.612*
	(2.11)	(1.93)	(2.20)	(2.05)	(2.22)
Ethnic groups (ref. Mosses)					
The major ethnic groups	-0.0581	-0.0101	-0.0439	0.0244	-0.0481
	(-0.51)	(-0.08)	(-0.38)	(0.20)	(-0.37)

Table 7 – *Continued from previous page*

Variables	(1)	(2)	(3)	(4)	(5)
The minority ethnic groups	-0.183	-0.106	-0.204	-0.122	-0.140
	(-1.23)	(-0.68)	(-1.35)	(-0.77)	(-0.81)
Other nationalities	-0.394	-0.476	-0.620	-0.633	-0.784
	(-1.15)	(-1.24)	(-1.77)	(-1.60)	(-1.92)
Wealth (lowest)					
Middle	-0.185	-0.187	-0.218	-0.209	-0.211
	(-1.10)	(-1.06)	(-1.28)	(-1.17)	(-1.10)
Highest	0.196	0.273	0.148	0.204	0.258
	(1.16)	(1.55)	(0.86)	(1.14)	(1.33)
Residential area (ref. urban)	-0.0577	-0.0194	-0.00762	0.0276	0.0605
	(-0.43)	(-0.14)	(-0.05)	(0.19)	(0.38)
Age	-0.0345	-0.0489	-0.0918*	-0.108*	-0.101*
	(-0.86)	(-1.17)	(-2.20)	(-2.47)	(-2.17)
Marital status	-0.829***	-0.329	-0.886***	-0.510	-0.400
	(-3.40)	(-0.69)	(-3.51)	(-1.06)	(-0.70)
In training /in school	0.218	0.194	0.0548	0.0242	-0.0319
	(1.68)	(1.39)	(0.40)	(0.16)	(-0.19)
N	773	694	773	692	644
Rho	-0.582**	-0.615**	-0.546**	-0.571**	-0.489*
$Wald\_test\_of\_rho$	9.067	8.98	7.579	7.455	5.171

t statistics in parentheses

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

Table 8: Marginal effects from the bivariate probit model (Congo (DRC))

	(1)	(2)	(3)	(4)	(5)
Fertility time preference(ref.yes)	0.0307	0.0181	0.105	0.0648	0.165
	(0.15)	(0.08)	(0.47)	(0.29)	(0.64)
Decision-making power of fertility time preference	0.814***	0.850**	0.838**	0.849**	1.106***
	(3.34)	(3.21)	(3.06)	(3.08)	(3.53)
Personal economic aspirations		-0.174	-0.301	-0.298	-0.446*
		(-0.88)	(-1.47)	(-1.46)	(-2.00)
Knowledge of methods					
Non hormonal methods			-0.457	-0.481	-0.535

Continued on next page

Table 8 – *Continued from previous page*

Variables	(1)	(2)	(3)	(4)	(5)
			(-0.98)	(-1.03)	(-1.04)
Hormonal methods			0.387	0.459	0.344
			(1.42)	(1.63)	(1.14)
Natural methods			1.329***	1.371***	1.248**
			(3.68)	(3.77)	(3.28)
Exposure to medias					
Audio-visual medias				-0.322	-0.0682
				(-1.06)	(-0.20)
perceptions about the consequences of using methods					0.0756
					(0.27)
Personal perceptions about family planning programs					1.084***
					(4.64)
Sexual activity	1.104***	1.137***	0.999***	0.980***	0.912***
	(5.74)	(5.66)	(4.79)	(4.67)	(3.77)
School level	0.970**	1.161**	0.838*	0.867*	0.936
	(2.58)	(2.86)	(1.97)	(2.03)	(1.85)
Religion (ref.Christian)	0.176	0.108	0.0575	0.0460	0.0977
	(1.16)	(0.68)	(0.35)	(0.28)	(0.54)
Ethnic groups (ref.Bakongo)					
Kasai	0.0975	0.164	0.113	0.131	0.116
	(0.75)	(1.16)	(0.77)	(0.89)	(0.72)
Other ethnic groups (including non Congoleese)	0.414*	0.527**	0.385	0.393	0.392
	(2.19)	(2.59)	(1.83)	(1.87)	(1.70)
Wealth (ref.lowest)					
Lower	-0.278	-0.239	-0.133	-0.151	-0.164
	(-1.37)	(-1.12)	(-0.61)	(-0.69)	(-0.68)
Middle	-0.171	-0.177	-0.0926	-0.109	-0.216
	(-0.81)	(-0.80)	(-0.41)	(-0.47)	(-0.86)
Higher	-0.0765	-0.0692	-0.0591	-0.0779	-0.158
	(-0.40)	(-0.35)	(-0.29)	(-0.38)	(-0.68)
Highest	0.274	0.432	0.521*	0.517*	0.478
	(1.32)	(1.94)	(2.27)	(2.25)	(1.88)
Age	0.0429	0.00887	-0.0496	-0.0459	-0.115*
	(0.94)	(0.18)	(-0.94)	(-0.86)	(-1.97)

Table 8 – *Continued from previous page*

Variables	(1)	(2)	(3)	(4)	(5)
Marital status	0.461	0.428	0.414	0.377	0.624
	(1.15)	(0.83)	(0.77)	(0.71)	(1.08)
In training /in school	0.0264	-0.0589	-0.0464	-0.0258	-0.0223
	(0.14)	(-0.29)	(-0.22)	(-0.12)	(-0.10)
N	591	527	525	525	438
Rho	-0.408**	-0.420**	-0.408**	-0.403**	-0.512*
$Wald\_test\_of\_rho$	7.95	7.45	7.06	6.99	7.04

t statistics in parentheses

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

For Nigeria, the correlation coefficient of error terms (ρ) is not significant. As a result, the two equations are independent. Since we focused on the likelihood of using contraceptive methods, we only presented marginal effects from the probit model in table 11 as descriptive.

6   Discussion

The number of teenage mothers or pregnant teenagers in Sub-Saharan African countries is still high, as shown in Figures 3 and 4. However, a factor analysis indicates that they have the ability to determine when they want to have children. The decision-making power is high in all countries, as shown in Table 5, and this has an impact on controlled fertility according to the results of a bivariate probit model. When we looked at young girls in school or training programs, we found that identifying their preferences for when to have children increased the likelihood of controlling their fertility in Kenya. However, this effect disappeared when perceptions about family planning indicators were taken into account.

Many qualitative studies showed that young women are reluctant to use modern methods because of the fear of side effects or religious factors(Nsubuga et al., 2015). Side effects include infertility or difficulties in conceiving when they get married due to hormonal methods (Williamson et al., 2009; Otoide et al., 2001; Castle, 2003). Studies have shown that in some African communities, young women's reputations are seen as a hindrance to contraceptive use, with pre-marital sex perceived negatively. Young girls who engage in such activities are often labeled "promiscuous women". As a result, seeking contraception from a clinic or pharmacy is often viewed as an admission of sexual activity. The perception of contraception in Nigeria is that only married women should use it, with young women who use it seen as promiscuous.

According to Meekers (1994), the school environment allows young women to interact with boys. Parents have less control over their girls' sexual behavior. They might engage in sexual relations even with their oldest partners because of money or gifts. Young girls from lower levels

may be exposed to sexual relations more than those from the highest levels for gifts or money. It is also possible that young girls from privileged backgrounds have sexual activity (as those from disadvantaged backgrounds) if they have less parental support(either financially or morally). We found that teenagers are more likely to have sexual activity if they have a current partner. However, the desire to achieve schooling before having a child increases their likelihood of using contraceptive methods (for Kenya).

Despite its effectiveness on fertility declines, contraception is weakly used in Africa because of poor political support (Caldwell and Caldwell, 2002; Bankole et al., 2015; Bongaarts, 2020; Bongaarts and Casterline, 2013). Within countries, family planning programs are either non-existent or insufficient in some regions, particularly rural ones. Women's needs are not always met, even in regions with family planning programs. Table 5 confirms that knowledge of contraceptive methods among young girls is low. Only knowledge of hormonal methods is high (implants, injectables, and pills). The results are not surprising because they have low exposure to family planning messages. It indicates that awareness-raising campaigns need to be strengthened and natural methods need to be emphasized even though they are less effective in avoiding pregnancy than modern methods (Rossier and Corker, 2017). It also appears that women substitute traditional methods for modern methods. From 2003 to 2014, the percentage of women using modern methods increased from 12 to 17% while the percentage of women using traditional methods declined from 6 to 4% (Bankole, 2015). Meanwhile, Pritchett and Summers (1994) highlighted unmet needs for modern contraceptive methods. Unmet needs involve availability and access to appropriate methods. We found for Burkina Faso and The Democratic Republic of Congo that knowledge of natural or traditional methods of contraception significantly and positively affects the use of contraception. Natural methods include rhythm, withdrawal, beads, and abstinence methods. Therefore, in the absence of appropriate modern methods of contraception, natural methods can be used as complementary methods. Thus, the importance of promoting natural methods is also crucial.

Conclusion

The percentage of adolescents who are mothers or have begun childbearing remains high in Sub-Sahara Africa. Many studies have shown the negative effects of early childbearing on education and future income. In Africa and many developing or developed countries, teenage motherhood is one of the causes of school dropouts. Abortions are illegal in many African countries, and because of the fear of parents or society's attitude toward pregnant young girls, they resort to unsafe abortions. It indicates a non-use or ineffective use of the contraceptive method or that the pregnancy was unexpected.

In this study, we assumed that the identification of fertility time preference and the knowledge

and perceptions about different methods of contraception could influence adolescents' decision to use a contraceptive method. In particular, we assessed whether the desire to achieve school before having children or the decision-making power of fertility time preference influences the decision to use a contraceptive method. We used factor analysis methods to identify measures of knowledge of contraceptive methods, the perceptions about the consequences of using contraceptive methods, perceptions, and exposure to family planning messages on the 2019-2020 data of the Performance Monitoring for Action (PMA) program. The results show that, on average, young girls have a higher decision-making power of their fertility time preference. However, they have low knowledge of natural and non-hormonal methods. Their low exposure to family planning messages could explain the result.

Using a bivariate probit model, we showed that the decision to use contraceptive methods is simultaneous to sexual activity. The results also show that the capacity to decide when to have children, the knowledge of contraceptive methods, the desire to achieve school before having children, and the exposure to family planning messages significantly affect the decision to use contraception.

Appendix

Table 9: List of variables

Variable name	Variable definition	Categorical value
Contraceptive use	Using or intending to use	1- yes 0-no
Sexual activity	Had sexual relationship in the 3 months before the survey	1- yes 0-no
School level	Has at least six years of schooling	1- yes 0-no
In training /in school	Is still in school or in training	1- yes 0-no
Number of years	Number of years from the time you had your first menstruation.	
Decision making(sexual relationship)	I can decide when to have sex	1- yes 0-no
Current partner	Do you currently have a boyfriend or a partner?	1- yes 0-no
Religions	The religion of the head of household	
Wealth	Household's wealth	
Age	Age	
Marital status	Married or ever married or separated	1- yes 0-no
Fertility time preference	I want to complete my education before I have a child.	1- yes 0-no
Aspirations		
Personal aspirations		
Important to start a business	How important is it for you to start a business in the next two years	Very, Somewhat or Not Important
Important to complete studies	How important is it for you to achieve this in the next two years? Education	Very, Somewhat or Not Important
Important to get married	How important is it for you to get married in the next two years	Very, Somewhat or Not Important

Continued on next page

Table 9 – *Continued from previous page*

Variable	Variable definition	Categorical value
Important to have children	How important is it for you to have children in the next two years	Very, Somewhat or Not Important
Important to have a job	How important is it for you to have a job in the next two years	Very, Somewhat or Not Important
Parental choices (in two years)		
Important to start a business	How important for your parents/guardian that you start a business in the next two years	Very, Somewhat or Not Important
Important to complete studies	How important for your parents/guardian that you achieve this in the next two years: Education	Very, Somewhat or Not Important
Important to get married	How important for your parents/guardian that you get married in the next two years	Very, Somewhat or Not Important
Important to have children	How important for your parents/guardian that you have children in the next two years	Very, Somewhat or Not Important
Important to have a job	How important for your parents/guardian that you have a good job the next two years	Very, Somewhat or Not Important
Knowledge of contraceptive methods		
Knowledge of natural methods		
Heard about beads	Have you ever heard of the standard days' method or Cycle Beads?	1- yes 0-no
Heard about LAM	Have you ever heard of the Lactational Amenorrhea Method or LAM?	1- yes 0-no

Table 9 – *Continued from previous page*

Variable	Variable definition	Categorical value
Heard about rhythm methods	Have you ever heard of the rhythm method?	1- yes 0-no
Heard about withdrawal	Have you ever heard of the withdrawal method?	1- yes 0-no
Heard about other methods	Have you ever heard of any other ways or methods to avoid pregnancy?	1- yes 0-no
Hormonal Methods		
Heard about implants	Have you ever heard of the contraceptive implant?	1- yes 0-no
Heard about IUD	Have you ever heard of the IUD?	1- yes 0-no
Heard about injectables	Have you ever heard of injectables?	1- yes 0-no
Heard about pills	Have you ever heard of the (birth control) pill?	1- yes 0-no
Heard about emergency method	Have you ever heard of emergency contraception?	1- yes 0-no
Non-hormonal methods		
Heard about male condoms	Have you ever heard of male condoms?	1- yes 0-no
Heard about female condoms	Have you ever heard of female condoms?	1- yes 0-no
Heard about diaphragm	Have you ever heard of the diaphragm?	1- yes 0-no
Heard about foam or jelly	Have you ever heard of foam or jelly as a contraceptive method?	1- yes 0-no
Attitudes towards reproduction and family planning		
Personal decision-making power about fertility time preference	I can decide when I want to start having children.	Agree, Strongly agree, indifferent, disagree and strongly disagree
Having confidence in discussing with the partner	I feel confident discussing with my partner when to start having children	Agree, Strongly agree, indifferent, disagree and strongly disagree

Table 9 – *Continued from previous page*

Variable	Variable definition	Categorical value
Future children will have anomalies	If I use family planning, my children may not be born normal	Agree, Strongly agree, indifferent, disagree and strongly disagree
Will have trouble getting pregnant	If I use FP, I may have trouble getting pregnant the next time I want to	Agree, Strongly agree, indifferent, disagree and strongly disagree
Partner will seek another partner	If I use family planning, my husband/partner may seek another sexual partner	Agree, Strongly agree, indifferent, disagree and strongly disagree
Perceptions about family planning methods		
personal perceptions		
Adolescents who use family planning are promiscuous.	Adolescents using FP are promiscuous	Agree, Strongly agree and Disagree, strongly disagree
Family planning is only for women who are married	FP is only for married people	Agree, Strongly agree and Disagree, strongly disagree
Family planning is only for women who do not want any more children.	FP is only used to avoid pregnancies	Agree, Strongly agree and Disagree, strongly disagree
Community perceptions		
For community members: Adolescents using FP are promiscuous	Adolescents who use family planning are promiscuous.	Most, some or few agree
For community members: FP is only for married people	Family planning is only for women who are married.	Most, some or few agree
For community members: FP is only used to avoid pregnancies	Family planning is only for women who don't want any more children.	Most, some or few agree
Exposure to family planning methods		

Table 9 – *Continued from previous page*

Variable	Variable definition	Categorical value
Radio	Have you heard about family planning on the radio?	1- yes 0-no
Television	Have you seen anything about family planning on television?	1- yes 0-no
Magasine	Have you read about family planning in a newspaper or magazine?	1- yes 0-no
Mobile Phone	Have you received a voice or text message about family planning on a mobile phone?	1- yes 0-no
Social-media	Seen anything on social media about family planning	1- yes 0-no

Table 10: Descriptive statistics of variables

Variable	Burkina Faso Mean(SD)	Congo (DRC) Mean(SD)	Kenya Mean(SD)	Nigeria Mean(SD)
Fertility time preference	0.74 (0.44)	0.89(0.31)	0.96 (0.2)	0.85 (0.36)
Contraceptive use	0.64(0.48)	0.72(0.44)	0.72(0.45)	0.39 (0.49)
Sexual activity	0.35 (0.47)	0.35 (0.48)	0.22 (0.42)	0.23 (0.42)
School level	0.65 (0.48)	0.9 (0.29)	0.90 (0.3)	0.78 (0.41)
In training /in school	0.68 (0.47)	0.75 (0.43)	0.82 (0.38)	0.74 (0.44)
Number of years since the first menstrual period	2.98 (1,84)	3.29 (1.78)	2.84 (1.64)	3.47 (1.69)
Decision making (sexual intercourse)	0.62 (0.48)	0.6 (0.49)	0.83 (0.37)	0.69 (0.46)
Current partner	0.55 (0.5)	0.46 (0.5)	0.36 (0.48)	0.52 (0.5)
Religions	1.47 (0.65)	0.74 (0.44)	0.91 (0.28)	1.3 (0.48)
Wealth	2.01 (0.82)	3.08 (1.41)	2.71 (1.31)	3.07 (1.37)
Age	16.95 (1.46)	17.01 (1.43)	16.89 (1.43)	16.91 (1.38)
Marital status	0.28 (0.45)	0.11 (0.32)	0.09 (0.28)	0.23 (0.42)

Aspirations

personal aspirations

Table 10 – *Continued from previous page*

Variable	Burkina Faso Mean(SD)	Congo (DRC) Mean(SD)	Kenya Mean(SD)	Nigeria Mean(SD)
Important to start a business	1.58 (0.77)	0.51 (0.5)	0.66 (0.47)	0.67 (0.47)
Important to complete studies	0.66 (0.47)	0.78 (0.41)	0.90 (0.29)	0.77 (0.42)
Important to get married	2.01 (0.88)	0.40 (0.49)	0.26 (0.44)	0.42 (0.49)
Important to have children	1.90 (0.88)	0.35 (0.48)	0.32 (0.47)	0.46 (0.5)
Important to have a job	1.29 (0.59)	0.73 (0.44)	0.83 (0.38)	0.61 (0.49)
Parental choices (in two years)				
Important to start a business	0.58 (0.49)	0.5 (0.5)	0.67 (0.47)	0.68 (0.47)
Important to complete studies	0.62 (0.48)	0.79 (0.41)	0.91 (0.28)	0.74 (0.44)
Important to get married	0.48 (0.5)	0.41 (0.5)	0.3 (0.46)	0.45 (0.50)
Important to have children	1.75 (0.87)	0.35 (0.48)	0.34 (0.47)	0.49 (0.5)
Important to have a job	0.74 (0.44)	0.73 (0.44)	0.84 (0.37)	0.59 (0.49)

Knowledge of contraceptive methods

Knowledge of natural methods

Heard about beads	0.29 (0.45)	0.33 (0.47)	0.24 (0.43)	0.11 (0.32)
Heard about LAM	0.09 (0.45)	0.09 (0.29)	0.21 (0.41)	0.11 (0.31)
Heard about rhythm methods	0.40 (0.49)	0.77 (0.42)	0.43 (0.49)	0.23 (0.42)
Heard about withdrawal	0.16 (0.37)	0.55 (0.5)	0.35 (0.47)	0.26 (0.44)
Heard about other methods	0.03 (0.16)	0.12 (0.33)	0.06 (0.24)	0.12 (0.32)

Hormonal Methods

Heard about implants	0.78 (0.41)	0.73 (0.44)	0.64 (0.48)	0.40 (0.49)
Heard about IUD	0.30 (0.46)	0.16 (0.36)	0.35 (0.48)	0.17 (0.37)
Heard about injectables	0.76 (0.42)	0.75 (0.43)	0.76 (0.42)	0.59 (0.49)
Heard about pills	0.74 (0.44)	0.54 (0.5)	0.71 (0.45)	0.59 (0.49)
Heard about emergency method	0.18 (0.38)	0.32 (0.47)	0.44 (0.5)	0.18 (0.38)

Non-hormonal methods

Heard about male condoms	0.80 (0.39)	0.88 (0.32)	0.91 (0.28)	0.59 (0.49)
Heard about female condoms	0.47 (0.5)	0.51 (0.5)	0.49 (0.5)	0.27 (0.45)
Heard about diaphragm	0.15 (0.36)	0.02 (0.15)	0.16 (0.37)	0.09 (0.29)
Heard about foam or jelly	0.11 (0.31)	0.05 (0.22)	0.11 (0.31)	0.08 (0.27)

Reproduction and family planning attitudes

Table 10 – *Continued from previous page*

Variable	Burkina Faso Mean(SD)	Congo (DRC) Mean(SD)	Kenya Mean(SD)	Nigeria Mean(SD)
Personal decision-making power about fertility time preference	2.5 (0.84)	2.71 (0.62)	2.98 (0.44)	2.54 (0.78)
Having confidence in discussing with the partner	2.58 (0.79)	2.66 (0.67)	2.81 (0.56)	2.6 (0.75)
Future children will have anomalies	2.54 (0.82)	2.7 (0.63)	2.5 (0.84)	2.56 (0.74)
Will have trouble getting pregnant next time.	2.28 (0.93)	2.25 (0.88)	2.34 (0.91)	2.31 (0.85)
Partner will seek another partner	1.72 (0.45)	1.75 (0.43)	1.81 (0.39)	1.68 (0.47)
Perceptions about family planning methods				
personal perceptions				
Adolescents using FP are promiscuous	1.53 (0.5)	1.48 (0.5)	1.52 (0.5)	1.71 (0.45)
FP is only for married people	1.53 (0.5)	1.5 (0.5)	1.51 (0.5)	1.77 (0.42)
FP is only used to avoid pregnancies	1.7 (0.46)	1.5 (0.5)	1.47 (0.5)	1.66 (0.47)
Community perceptions				
Adolescents using FP are promiscuous	1.64 (0.8)	1.69 (0.8)	1.73 (0.85)	1.52 (0.76)
FP is only for married people	1.79 (0.8)	1.81 (0.79)	1.77 (0.82)	1.5 (0.67)
FP is only used to avoid pregnancies	2.09 (0.81)	1.93 (0.71)	1.96 (0.85)	1.69 (0.74)
Exposure to family planning methods				
Radio	0.48 (0.5)	0.25 (0.43)	0.68 (0.47)	0.48 (0.5)
Television	0.19 (0.39)	0.32 (0.47)	0.42 (0.49)	0.28 (0.45)
Magasine	0.09 (0.29)	0.11 (0.32)	0.34 (0.47)	0.09 (0.29)
Mobile	0.05 (0.23)	0.05 (0.21)	0.09 (0.3)	0.05 (0.23)
Social-media	0.06 (0.23)	0.06 (0.25)	0.19 (0.39)	0.17 (0.37)

Notes: All variables of perceptions (personal and community perceptions) were recorded.   .

Higher scores reflect favourable perceptions

Table 11: Marginal effects from the probit model (Nigeria)

	(1)	(2)	(3)	(4)	(5)
School level	-0.0977	-0.241	-0.298	-0.295	-0.257
	(-0.68)	(-1.27)	(-1.48)	(-1.46)	(-1.28)
Sexual activity	0.0104	0	0	0	0
	(0.08)	(.)	(.)	(.)	(.)
Religions (ref.Islam)					
Chritianism	-0.116	-0.0579	-0.00544	0.000755	-0.00959
	(-1.46)	(-0.61)	(-0.05)	(0.01)	(-0.09)
Ethnic groups (ref. Hausa)					
Yoruba	0.107	0.0852	0.0978	0.104	0.148
	(0.98)	(0.71)	(0.81)	(0.85)	(1.17)
fulfulde and Igbo	0.145	0.0528	0.0628	0.0645	0.140
	(1.24)	(0.41)	(0.48)	(0.49)	(1.00)
Other ethnic groups	0.0693	0.000325	0.0216	0.0191	0.0531
	(0.57)	(0.00)	(0.16)	(0.14)	(0.38)
Wealth(ref.lowest)					
Lower	-0.341**	-0.464***	-0.458***	-0.453***	-0.445***
	(-3.17)	(-3.91)	(-3.98)	(-3.86)	(-3.41)
Middle	-0.476***	-0.588***	-0.589***	-0.590***	-0.571***
	(-4.48)	(-5.25)	(-5.41)	(-5.39)	(-4.73)
Higher	-0.344**	-0.346**	-0.346**	-0.344**	-0.326**
	(-3.27)	(-3.20)	(-3.29)	(-3.25)	(-2.75)
Highest	-0.287**	-0.355***	-0.359***	-0.357***	-0.328**
	(-2.99)	(-3.51)	(-3.70)	(-3.63)	(-2.90)
Residential area (ref.urban)	-0.288**	-0.298**	-0.271*	-0.273*	-0.261*
	(-3.18)	(-2.87)	(-2.49)	(-2.51)	(-2.36)
Age	0.0646*	0.0654*	0.0600*	0.0606*	0.0630*
	(2.51)	(2.23)	(2.03)	(2.05)	(2.11)
Marital status (ref.living or ever lived)	-0.0320	0.149	0.136	0.134	0.166
	(-0.22)	(0.76)	(0.67)	(0.66)	(0.81)
In training /in school	0.126	0.155	0.168	0.165	0.138
	(1.41)	(1.46)	(1.51)	(1.48)	(1.23)
Fertility time preference	0.0423	0.0449	0.0294	0.0254	0.0137
	(0.43)	(0.40)	(0.26)	(0.22)	(0.12)
Decision-making	0.172	0.215	0.225	0.235	0.172
	(1.22)	(1.40)	(1.46)	(1.49)	(1.02)
Economic aspirations		-0.0989	-0.0982	-0.0930	-0.131
		(-0.86)	(-0.84)	(-0.79)	(-1.10)

Continued on next page

Table 11 – *Continued from previous page*

	(1)	(2)	(3)	(4)	(5)
Non hormonal methods			-0.0896	-0.0867	-0.0963
			(-0.58)	(-0.56)	(-0.62)
Hormonal methods			0.188	0.193	0.219
			(1.41)	(1.43)	(1.63)
Natural methods			-0.00413	0.00181	-0.0395
			(-0.02)	(0.01)	(-0.20)
Media and audio-visual				-0.0519	-0.0650
				(-0.31)	(-0.38)
Consequences					0.116
					(0.78)
Personal perceptions					-0.0931
					(-0.59)
N	199	158	157	157	153
LR chi2 (17)	57.13	47.66	48.77	48.86	48.70
$Prob > chi2$	0.000	0.000	0.000	0.000	0.000

t statistics in parentheses

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

Notes: From model 2 to model 5, the marginal effect of sexual activity is equal to zero because Sexual activity = 1 predicts success perfectly.

Table 12: Index correlation matrix

(Burkina Faso)

	decision making	consequences	economic aspirations	parents' economic aspirations	family aspirations	parents' family aspirations	natural methods	hormonal	Non-hormonal	media and audio-visual	other media	personal perceptions	community perceptions
decision making	1												
consequences	0.361***	1											
Economic aspirations	-0.0529	0.113**	1										
Parents' economic aspirations	-0.0630	0.0844*	0.713***	1									
Family aspirations	-0.0946*	-0.0537	0.355***	0.243***	1								
Parents' family aspirations	-0.101**	-0.0268	0.273***	0.154***	0.718***	1							
natural methods	0.102**	0.134***	0.0386	0.0279	0.104**	0.0792*	1						
hormonal	0.0585	0.139***	-0.0591	-0.0240	0.0279	0.0439	0.493***	1					
Non-hormonal	0.0799*	0.109**	-0.0273	-0.00509	0.0284	0.0211	0.569***	0.583***	1				
media and audio-visual	0.102**	0.0922**	-0.0115	-0.0112	0.0463	0.0528	0.292***	0.333***	0.268***	1			
other medias	0.0917*	0.101**	0.00547	0.0135	0.0683	0.0407	0.301***	0.310***	0.295***	0.868***	1		
personal perceptions	0.247***	0.118**	0.0325	0.0749*	0.00650	-0.0324	0.130***	0.142***	0.0776*	0.0388	0.0338	1	
community perceptions	0.177***	0.0399	-0.0361	-0.00902	0.00781	-0.0213	0.0476	0.0204	-0.0307	-0.0140	-0.0240	0.597***	1

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

(a) Burkina Faso

(Congo (DRC))

	decision making	consequences	economic aspirations	parents' economic aspirations	family aspirations	parents' family aspirations	natural methods	hormonal	Non-hormonal	media and audio-visual	other media	personal perceptions	community perceptions
decision making	1												
consequences	-0.135**	1											
economic aspirations	0.141***	-0.0590	1										
parents' economic aspirations	0.104*	-0.0554	0.732***	1									
family aspirations	-0.0105	-0.0147	0.551***	0.467***	1								
parents' family aspirations	-0.00423	-0.0295	0.457***	0.512***	0.807***	1							
natural methods	0.0966*	0.0527	0.195***	0.173***	0.159***	0.136**	1						
hormonal	0.0399	-0.0368	0.103*	0.101*	0.126**	0.135**	0.504***	1					
Non-hormonal	0.114**	0.0978*	0.157***	0.126**	0.126**	0.0946*	0.460***	0.438***	1				
media and audio-visual	0.0527	0.0446	0.0567	0.0233	-0.0204	-0.0342	0.244***	0.319***	0.119**	1			
other mediasia	-0.0191	0.0588	0.0737	0.0454	0.0461	0.00862	0.168***	0.233***	0.107*	0.797***	1		
personal perceptions	-0.0609	0.167***	0.0959*	0.0416	0.0526	0.0422	0.109**	0.0949*	0.0920*	-0.0974*	-0.0775	1	
community perceptions	-0.139**	0.126**	0.0946*	0.0283	0.0569	0.0375	0.0571	0.0419	0.0162	-0.138**	-0.110**	0.754***	1

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

(b) Congo (DRC)

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Table 13: Index correlation matrix (continued)

(Kenya)

	decision making	consequences	economic aspirations	parents' economic aspirations	family aspirations	parents' family aspirations	natural methods	hormonal	Non-hormonal	media and audio-visual	other media	personal perceptions	community perceptions
decision making	1												
consequences	0.190***	1											
economic aspirations	0.0313	0.0972***	1										
parents' economic aspirations	0.0361	0.0850***	0.789***	1									
family aspirations	0.0638*	0.0803**	0.544***	0.449***	1								
parents' family aspirations	0.0222	0.0519*	0.442***	0.458***	0.820***	1							
natural methods	0.0571**	0.0771**	0.151***	0.121***	0.165***	0.173***	1						
hormonal	0.0296	0.0640*	0.0645*	0.0472	0.0720**	0.0686**	0.554***	1					
Non-hormonal	0.0278	0.0763**	0.149***	0.128**	0.144***	0.128**	0.554***	0.443***	1				
media and audio-visual	0.0187	0.107***	0.161***	0.142***	0.111***	0.126***	0.255***	0.315***	0.256***	1			
other_media	0.0164	0.100***	0.157***	0.150***	0.128***	0.149***	0.280***	0.299***	0.269***	0.929***	1		
personal perceptions	-0.168***	-0.0918***	-0.0122	-0.0264	0.0110	0.00522	-0.118***	-0.138***	-0.0822**	-0.0369	-0.0331	1	
community perceptions	0.135***	0.0751**	0.0216	0.0505*	0.00835	0.00522	0.0979***	0.0872***	0.0756***	0.00781	0.0116	-0.858***	1

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

(a) Kenya

(Nigeria)

	decision making	consequences	economic aspirations	parents' economic aspirations	family aspirations	parents' family aspirations	natural methods	hormonal	Non-hormonal	media and audio-visual	other media	personal perceptions	community perceptions
decision making	1												
consequences	0.212**	1											
economic aspirations	0.181*	-0.0461	1										
parents' economic aspirations	0.113	-0.0321	0.693***	1									
family aspirations	-0.436***	-0.189*	0.107	0.214**	1								
parents' family aspirations	-0.455***	-0.124	0.0311	0.120	0.862***	1							
natural methods	0.0286	0.0747	-0.112	-0.120	-0.160*	-0.173*	1						
hormonal	-0.0382	-0.00828	-0.0296	-0.0790	0.0741	0.0549	0.513***	1					
Non-hormonal	0.170*	0.132	0.000382	-0.0455	-0.290***	-0.346***	0.523***	0.345***	1				
media and audio-visual	0.281***	0.116	0.137	0.0813	-0.321***	-0.358***	0.302***	0.193*	0.380***	1			
other mediasia	0.306***	0.167*	0.169*	0.0690	-0.378***	-0.411***	0.338***	0.197*	0.398***	0.912***	1		
personal perceptions	0.0475	0.164*	-0.0174	-0.0526	-0.111	-0.164*	0.144	0.0632	0.135	0.0144	0.0138	1	
community perceptions	0.0658	-0.0841	0.00254	-0.0129	-0.00876	0.0673	-0.218**	-0.141	-0.213**	0.0368	0.0673	-0.693***	1

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

(b) Nigeria

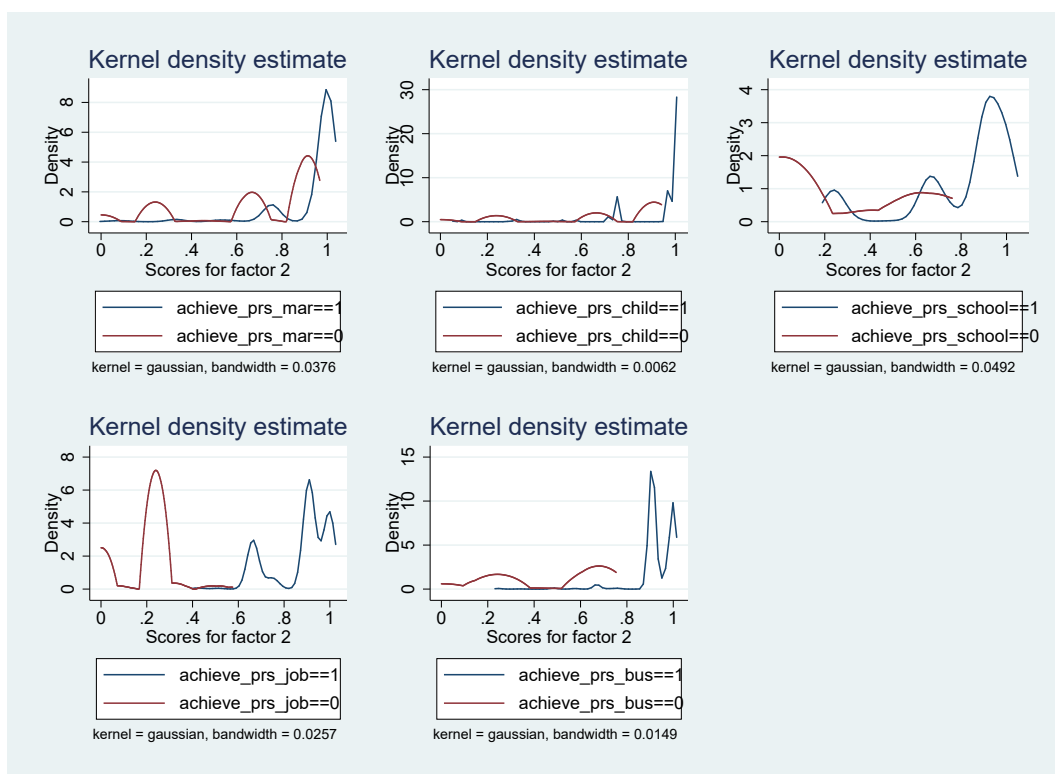Figure 5: Kernel density function of factor *parents' economic aspirations* per variable (Kenya)

Table 14: Descriptive statistics of of factor *parents' economic aspirations* per variable (Kenya)

Variables	Mean	SD
Important to get married	0.95	0.14
Important to have children	0.94	0.15
Important to complete studies	0.81	0.24
Important to have a job	0.88	0.13
Important to start a business	0.93	0.08

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