Effect of educational attainment on the preferred number of children among women in Kenya: Evidence from the 2022 Kenya demographic health survey dataset

Maureen Lusiche Tuvei[1*]
Zilpah Kageha[2]
Cyrus Muhanga[3]

[1*]maureentuvei@gmail.com
[3]zkageha@mmust.ac.ke
[4]Muhanga88@gmail.com

[1]https://orcid.org/0009-0008-9421-2720
[2]https://orcid.org/0000-0002-7378-4809
[3]https://orcid.org/0009-0004-6451-5799

[1,2,3]Masinde Muliro University of Science and Technology, Kenya

https://doi.org/10.51867/ajernet.6.4.1

ABSTRACT

This research paper discusses how educational attainment influences the desired number of children in Kenyan women using the recent Kenya Demographic Health Survey (2022) data. The theory applied in this study was the Human Capital Theory (HCT). The research design was a cross-sectional research design because the authors examined the data of 32,152 women aged 15-49 years and 42,022 households in Kenya. Validated questionnaires were used to collect data, which was pre-tested and reviewed by experts. The analysis was conducted by univariate (descriptive), bivariate (correlation), and multivariate (multiple linear regression) analysis, factoring in variables like age, wealth, and use of contraceptives. Findings of the regression model have shown that increasing educational attainment leads to a significant decrease in the preferred number of children of 0.15 children per school year of education (P<.001), even with the controlled variables. Univariate analysis revealed that the sample had a mean of 2.41 children, 8.7 years of schooling, and a mean age of 29 years. Bivariate analysis revealed that educational attainment and the number of children had a significant negative relationship ($r = -0.438$, $p < .001$), and age and marital status had a positive relationship with fertility. Even after controlling for the confounders, it was confirmed that higher education was a significant source of the preferred number of children decreasing by 0.15 per additional year ($\beta = -0.2679$, $p = 0.001$). Diagnostic tests proved that the statistical assumptions held. These results are in line with the international evidence that education enables women to become strong, enabling them to have more reproductive health knowledge and have low fertility preferences. The article highlights the importance of education in the development of preferences of family size and the facilitation of informed reproductive decisions. It suggests that more funding should be devoted to the education of women to contribute to sustainable population development and gender equity in Kenya.

Keywords: Educational Attainment, Fertility Preferences, Family Planning, Kenya Demographic and Health Survey, Reproductive Health

I. INTRODUCTION

Education plays a key role in determining individuals' attitudes and behavior towards reproductive health and family size. It has been proven that higher education, particularly among women, correlates with lower levels of fertility and higher educated fertility preferences (Berrington & Pattaro, 2014). Education tends to liberate women, enabling them to access information and knowledge that allows them to make the right decisions regarding their reproductive health, such as the age of marriage, the number of children they wish to have, and birth spacing. In Kenya, significant progress has been made in promoting access to education at various levels, including increased enrollment rates and improved educational attainment among the population. However, disparities persist, particularly in rural and disadvantaged communities, where educational quality is a significant issue (Johannes, 2010).

The ideal number of children among women in developed countries is a widespread phenomenon influenced by various socio-economic, cultural, and individual factors. Overall, the higher the level of education, the lower the number of children per woman (Gietel-Basten et al., 2022). Advanced education levels are often associated with delayed childbearing. Individuals pursuing advanced education typically invest more years developing their careers and themselves before they become mothers. This delay is equivalent to fewer children during the course of a woman's reproductive years. Australia has seen increasing levels of education attained over time, particularly among women, as

noted by Uddin (2016). Increasingly, more people are pursuing tertiary education, with more obtaining university qualifications or vocational qualifications. In fact, the country boasts an inverted population pyramid that indicates that the population of adults exceeds the population of youths.

China had a strong impact on reducing the birth rate and the perception of the number of children in a family. Even after the policy was softened to permit two children, couples still had a preference for fewer children because they had habits deeply ingrained and due to economic reasons. According to Zhang (2017), the transition towards a two-child policy back in 2016 was geared towards addressing the aging and declining labor force. However, the response has been slower, with couples citing financial constraints and not desiring more children. The concept of fertility desire among female women in Middle Eastern countries like Qatar and Jordan also takes shape under a combination of cultural heritage, economic context, and social changes (Department of Statistics, 2024; Ministry of Development Planning and Statistics, 2020). Even though traditional values continue to assign great importance to large families, increasing female education and participation in the labor force are driving the trend of decreasing family sizes (Lari et al., 2021).

South Africa Department of Health et al., (2019) confirmed that women who are educated are likely to marry later and to have fewer children. Even though work and education are very important determinants of fertility desires, society and culture have expectations. South Africa has varying cultural practices and histories that shape the ideal family sizes. Some communities believe in large families and perceive these families as a source of social support and economic. But as women become more available to higher education and employment, these cultural norms also begin to change over time (Moultrie & Timaeus, 2003). In developing countries, educational attainment among women varies from rural to urban regions and from poor to wealthy families. Ushe (2011) contends that cultural and religious beliefs closely favor high family sizes in countries like Nigeria.

The population of Kenya has been increasing at an extremely high rate until recently, and the estimates put it at a population of more than 50 million people (KNBS, 2019). However, as this expansion has occurred, the overall fertility rate (TFR) has continued to decrease over the years, with an average of about 8 children per woman in the 1970s to about 4 children per woman in recent years. According to Kibet and Mutai (2018), this is a result of the multiplicity of factors that include urbanization and access to better family planning interventions, as well as shifting socio-cultural norms. Of interest is how the number of children in the families of the more educated members of the family has drastically declined. The Kenya Demographic and Health Survey (KDHS) of 2022 offers good evidence on fertility intentions of women in Kenya. According to the survey, the Total Fertility Rate of Kenya is now 3.4 children per woman which is a tremendous decline over the last few decades (KNBS et al., 2023).

1.1 Statement of the Problem

The statistics presented by the 2022 KDHS show that fertility preferences of Kenyan families have changed, particularly the number of children in the family, the preferred sex of a child, and the birth spacing. The overall fertility rate in 2022, according to the report, is 3.4 children per woman compared to 3.9 children per woman in 2014. Other statistics (KNBS et al., 2023) depict that the education levels of the Kenyans have improved and that most Kenyans are joining higher levels of education. This is because the proportion of women lacking any education has decreased, from 13 percent in 2003 to 6 percent in 2022. At the same time, the proportion of women with a higher education level than secondary education rose to 19 (KNBS et al., 2023). Kibet and Mutai (2018), examined how schooling affected the differentials in fertility in Kenya. They argued that education led to a decline in fertility, but more so among women than among men. This reveals the necessity to address the issue of gender inequality in education to achieve drastic decreases in levels of fertility. The previous researches indicate that education, especially the education of girls, is one of the methods of lowering the fertility rate to achieve sustainable development in Kenya. There is, however, no certainty that the shifts are being induced by the educational attainment of couples and this is the reason why this study has been conducted.

1.2 Research Objective

To determine the effect of educational attainment on the preferred number of children among women in Kenya.

1.3 Research Hypothesis

$H0_1$: Educational attainment does not significantly affect the preferred number of children among women in Kenya.

II. LITERATURE REVIEW

2.1 Theoretical Review

The theory applied in this study was the Human Capital Theory (HCT). The theory presupposes that education increases the productivity and revenue-generating capacities of people, which affects most of their life topics, such as family size and the decision to have children and at what stage (Becker, 1964). The interdependence between education and fertility desires in Kenya should be understood in a country where the impact of fertility levels on socioeconomic growth is significant and the level of education is very heterogeneous.

The Human Capital Theory suggests that the greater the level of education, the later childbearing can be deferred since an individual puts investment in his career and other forms of human capital as a priority. A study conducted by Bankole and Malarcher in the year 2010 revealed that women with a higher education in countries like Kenya and other sub-Saharan countries delay bearing children and bear fewer children than their less educated counterparts. It is known that the level of education can affect fertility preferences because of the alteration of the priorities and the life goals of a person.

Through education, citizens and especially women are empowered with information and knowledge where family planning and reproductive health are concerned. Bongaarts (2010) believes that informed people possess more information regarding the use of contraceptives and reproductive rights, giving them the freedom to decide whether they would like to be fertile or not. In Kenya, where the availability of healthcare information and services to family planning varies across regions, education may play a very important role in shaping the attitude of individuals on contraception and size of the family they desire.

2.2 Empirical Review

Education is an important factor in social and economic progress at both personal and country levels (Patrinos, 2023). Earlier researchers have attributed the advancement of the world to changing trends in Education. There has been a pioneering theoretical correlation between education and development by theorists. Particularly, the fertility transition theory preconditions that in societies undergoing economic development and modernization, levels of fertility decline. Education also plays an important role in this transition because it mobilizes individuals, particularly women, by providing them with access to information, health care, and economic empowerment. Empirical evidence emphasizes that education provides women with skills and knowledge that support informed choice-making regarding family size.

Higher levels of education are generally correlated with increased economic security and increased freedom to postpone childbearing and have fewer offspring. Education has the propensity of offering exposure to appropriate sexual education and availability of modern contraceptives and whereby women are in charge of their reproductive life. This result is confirmed by more recent researchers, including McCarthy and Grodsky (2021), who demonstrate that a more educated woman will tend to have a conception of effective contraception methods and hence prefer smaller families. On numerous occasions, it has been determined that the education of women has been put in place to serve as a significant predictor of Kenyan fertility behavior.

Following the examination of the 1993 data collected by KDHS, Feyisetan and Bankole (2002) found that, educated women were more likely to delay marriage, use contraception and bear fewer children than their less educated counterparts. The increased levels of female education can be credited with the increased social trends of gender equity, economic growth, and health improvement. An example is the World Bank (2020) report that stated that the higher the educational levels of women are, the lower the fertility and the more sustainable the economic growth of a country. The macro-level confirms this, as well as the micro-level ones like Bongaarts (2010), which established the fact that the individual level of education reduces fertility rates; therefore, it makes the demographic transition to a smaller family size and decreased population growth easier. Empirical studies of the connection between the number of children that women prefer and the socioeconomic conditions of African countries determine the presence of strong regional and situational differences.

In recent years, empirical studies have emphasized the understanding of the influence of economic status, education, health care access, and cultural beliefs on the fertility choice of women. Female education and economic development are closely related and positively correlated with low fertility, as Canning et al. (2015) support. They propose their research based on evidence of many African countries that, with increasing education and employability of women, they prefer fewer children because the opportunity costs of having and raising children increase. Economic factors, such as family income and work availability, have a major impact on the fertility preference of women.

According to a study by Odusola et al. (2017), women in wealthier families or those with stable jobs will choose to have small families. This is highly evident in the towns where child-rearing and living expenses are more. The same research also concluded that women with better economic autonomy will be focused on professional life and self-development and they will want to have a small number of children. Alternatively, extended families are desirable in the

countryside where farming is the main source of livelihood, as they are required to work, thus the higher desired fertility. Africa is a strong example of how education can determine the number of children women want.

Bongaarts et al. (2017) found that the more educated a woman is, the fewer children they have. This is blamed on various reasons such as increased awareness and contraceptive usage, increased career opportunities and their understanding of the economic and health consequences of large families. As an example, one of the studies conducted in Ethiopia by Worku et al. (2016) reported that female respondents with secondary or higher education were far more likely to want small families than that of uneducated ones. It is reinforced by the policies of countries promoting the education of girls, which, by the way, reduces the level of fertility. The availability of healthcare and cultural beliefs is also important in influencing the fertility choices of women.

Much of Africa, especially in rural areas, remains dominated by traditional cultural values that value large family sizes. Nevertheless, according to Cleland et al. (2018), there is a gradual change of such values, especially among young and urban women who are gradually becoming exposed to modern values and lifestyle requirements. Second, healthcare access, especially reproductive health care, has a great impact on fertility-related choices. The study of Ezeh et al. (2017) established itself in the investigation that has proven to be fruitful in countries such as Kenya and Nigeria, whose access to family planning has resulted in a significant reduction in the size of the desired family. Women are able to have better chances to decide on their fertility using modern contraceptives, and reproductive health education enables women to make informed choices regarding their fertility, taking into account their socioeconomic status. Gender differences in education in Kenya are not yet eliminated, and they influence fertility behavior considerably.

III. METHODOLOGY

The cross-sectional research design was employed because it allows for the gathering of information at a single point in time to study a specific phenomenon (Spector, 2019). The study used the KDHS dataset, which was conducted in 2022, encompassing both urban and rural communities in all 47 counties in Kenya. This study only used data collected from women only. A nationally representative sample of 32,156 women aged 15–49 in 42,022 households was interviewed. The age bracket of 15-49 was considered the reproductive age for women. Family planning choices were also included to be controlled.

Questionnaires were used as the main data collection instrument. The pretest included classroom training and field practice for interviewers and biomarker technicians. The questionnaire that was used in the 2022 KDHS was validated using a rigorous methodology that involved pre-tests, expert review, and field tests. The questionnaire was well structured by relying on the existing DHS templates that have, with time, been tested and validated in many countries. Data was analyzed at univariate, bivariate, and multivariate levels. Univariate analysis involved basic descriptives for the study variables, bivariate analysis involved use of pair-wise correlation, while multivariate analysis involved the use of multiple linear regression to test the hypothesis.

IV. FINDINGS & DISCUSSION

4.1 Univariate Statistics

Univariate analysis provided an overview of the distribution of key variables. The mean number of children ever born (v201) was 2.41 ($\sigma = 2.36$), indicating moderate fertility levels. Educational attainment (v133) averaged 8.70 years ($\sigma = 4.35$), reflecting a range from no education to higher education. The mean age of respondents (v012) was 29.14 years ($\sigma = 9.55$). Table 1 summarizes these statistics.

Table 1

Univariate Statistics for Variables in the Analysis

Variable	**Variable Label**	**Obs**	**x̄**	**σ**	**Min**	**Max**
v201	total children ever born	32 156	2,41	2,36	0	15
v133	education in single years	32 156	8,70	4,35	0	24
v012	respondent's current age	32 156	29,14	9,55	15	49
Variable	**Nominal-scale Variable**	**Freq.**	**%**	**Cum.%**		
v190	wealth index combined					
	1=poorest	7 073	22	22		
	2=poorer	5 742	17,86	39,85		
	3=middle	6 345	19,73	59,58		
	4=richer	7 160	22,27	81,85		
	5=richest	5 836	18,15	100		
v312a	status of contraceptive use					
	1=no contraception	18 694	58	58,14		

	2=traditional contraception methods	1 620	5	63,17		
	3=modern contraception methods	11 842	37	100		
v025a	place of residence					
	0=urban	12 386	39	38,52		
	1=rural	19 770	61	100		
v714	respondent currently working					
	0=currently not working	16 681	51,88	51,88		
	1=currently working	15 475	48,12	100		
v502	1=never in union	10 048	31,25	31,25		
	2=currently in union/living with a man	18 312	56,95	88,2		
	3=formerly in union/living with a man	3 796	11,8	100		
Note. Obs=Observation; Min=Minimum; Max=Maximum; Freq.=Frequency; Cum=Cumulative						

4.2 Bivariate Statistics

Bivariate analysis assessed correlations between the preferred number of children and independent variables. Educational attainment was negatively correlated with the preferred number of children (r = -0.438, $p < .001$), suggesting that higher education is associated with fewer preferred children. Age showed a strong positive correlation (r = 0.701, $p < .001$), while wealth index, contraceptive use, residence, working status, and marital status were also significantly correlated with v201 ($p < .05$), except for the number of sexual partners. Table 2 presents the correlation matrix. Note. Pair-wise correlation: ≤0.35 = Weak correlation; 0.36-0.67 = Moderate correlation; 0.68-0.89=Strong correlation; ≥0.90 = Very strong correlation; Adapted from "Interpretation of Correlation Coefficient, " by R. Taylor, 1990, *Journal of Diagnostic Medical Sonography, 6*(1), p. 37.

Table 2

Pair-Wise Correlation Matrix: Total Children Ever Born, Education Attainment in Single Years, and Control Variables

Variable	**Variable**		**v201**	**v133**	**v012**	**v190**	**v766b**	**v312a**	**v025a**
v201	total children ever born		1						
v133	education in single years	[a]	-0,438	1					
		[b]	<.001						
v012	respondent's current age	[a]	0,701	-0,125	1				
		[b]	<.001	<.001					
v190	wealth index combined	[a]	-0,261	0,542	0,036	1			
		[b]	<.001	<.001	<.001				
v766b	number of sex partners, including spouse, in the last 12 months	[a]	0,010	0,008	0,030	0,029	1		
		[b]	0,182	0,320	0,000	0,000			
v312a	status of contraceptive use	[a]	0,162	0,180	0,207	0,129	0,061	1	
		[b]	<.001	<.001	<.001	<.001	<.001		
v025a	type of place of residence	[a]	0,160	-0,231	0,018	-0,625	-0,021	-0,014	1
		[b]	<.001	<.001	0,001	<.001	0,007	0,015	
v714	respondent currently working	[a]	0,174	0,202	0,391	0,211	0,051	0,271	-0,080
		[b]	<.001	<.001	<.001	<.001	<.001	<.001	<.001
v502a	currently/ formerly/ never in union	[a]	0,502	-0,180	0,569	-0,039	0,035	0,227	-0,003
		[b]	<.001	<.001	<.001	<.001	<.001	<.001	0,619

[a] Pearson correlation coefficient; [b] *p*-values (α=.05)

4.3 Multivariate Statistics

Two multiple linear regression models were estimated to determine the impact of educational attainment on the preferred number of children. Table 3 shows the findings of a multiple linear regression analysis of the impact of educational attainment (v133) on the total number of children ever born (v201) among 32,156 women aged 15-49 years, two models, in which Model 1 includes only the education variable, and Model 2 is used to include other control factors, including age (v012), wealth index (v190), contraceptive use (v312a), place of residence (v025a), employment status (

In the first model, education is found to negatively influence several children born (coefficient = -0.237, p <.001, β = -0.44). In other words, every additional year of education lowers the number of children born by about 0.237.

In Model 2, this effect weakens but remains significant (coefficient = -0.15, p < .001, β = -0.2679), with age (β = 0.5667) and being currently in union (β = 0.2145) showing strong positive associations with total number of children ever born. The wealth index reveals a decreasing trend in fertility as wealth increases, with the richest quintile having the largest negative effect (coefficient = -0.8265, p < .001). Model 1 has an R^2 of 0.1917, explaining 19.17% of the variance in total number of children ever born, and the root mean squared error (RMSE) of 2.13 suggests a moderate fit. Model 2 has an R2 of 0.6624, explaining 66.24% of the variance in the total number of children ever born, and the RMSE of 1.73 suggests a moderate fit, as shown in Table 3. Note. Coef=Coefficient; RMSE=Standard deviation of the regression model (the closer to zero, the better the fit); Std.Err.=Standard Error; ref=reference.

Table 3

Multiple Linear Regression Coefficients of the Effect of Education Attainment on Total Number of Children Ever Born

		Model 1 (v201)				**Model 2 (v201)**			
Variable	Variable label	Coef	Std.Err.	*p*	β	Coef	Std.Err.	*p*	β
v133	education in single years	-0,237	0,00	<.001	-0,44	-0,15	0,00	<.001	-0,2679
v012	respondent's current age					0,14	0,00	<.001	0,5667
v190	wealth index combined								
	1=poorest (ref.)								
	2=poorer					-0,22	0,03	<.001	-0,0354
	3=middle					-0,44	0,03	<.001	-0,0748
	4=richer					-0,69	0,03	<.001	-0,122
	5=richest					-0,83	0,03	<.001	-0,1348
v312a	status of contraceptive use								
	1=no contraception (ref.)								
	2=traditional contraception					0,14	0,04	<.001	0,0132
	3=modern contraception					0,25	0,02	<.001	0,052
v025a	place of residence								
	0=urban (ref.)								
	1=rural					-0,01	0,02	0,667	-0,0018
v714	respondent currently working								
	0=not working(ref.)								
	1=currently working					-0,10	0,02	<.001	-0,0218
v502a	currently/ formerly/ never in union								
	1=never in union (ref.)								
	2=currently in union with a man					1,02	0,02	<.001	0,2145
	3=formerly in union with a man					0,47	0,03	<.001	0,0637
Constant		4,48	0,03	<.001		-0,67	0,04	<.001	
Model Statistics									
n		32156				32156			
Prob > F		<.001				<.001			
R^2		0,1917				0,6624			
Root Mean Squared Error (RMSE)		2,13				1,73			

4.4 Postestimation Diagnostic Tests

Model diagnostics for the multiple linear regression were conducted.

4.4.1 Normality Test

The assumptions underlying the linear regression are that the errors should be normally distributed. Technically, normality is necessary only for hypothesis tests to be valid. Estimation of the coefficients only requires that the errors be identically and independently distributed. Another assumption of the regression model is that residuals behave normally. Residuals are the difference between the observed values (Yhat) and the predicted values (X). In practice, normality does not represent much of a problem when dealing with really big samples. Figure 1 shows the kernel density estimate graph that helps check for normality in the residuals.

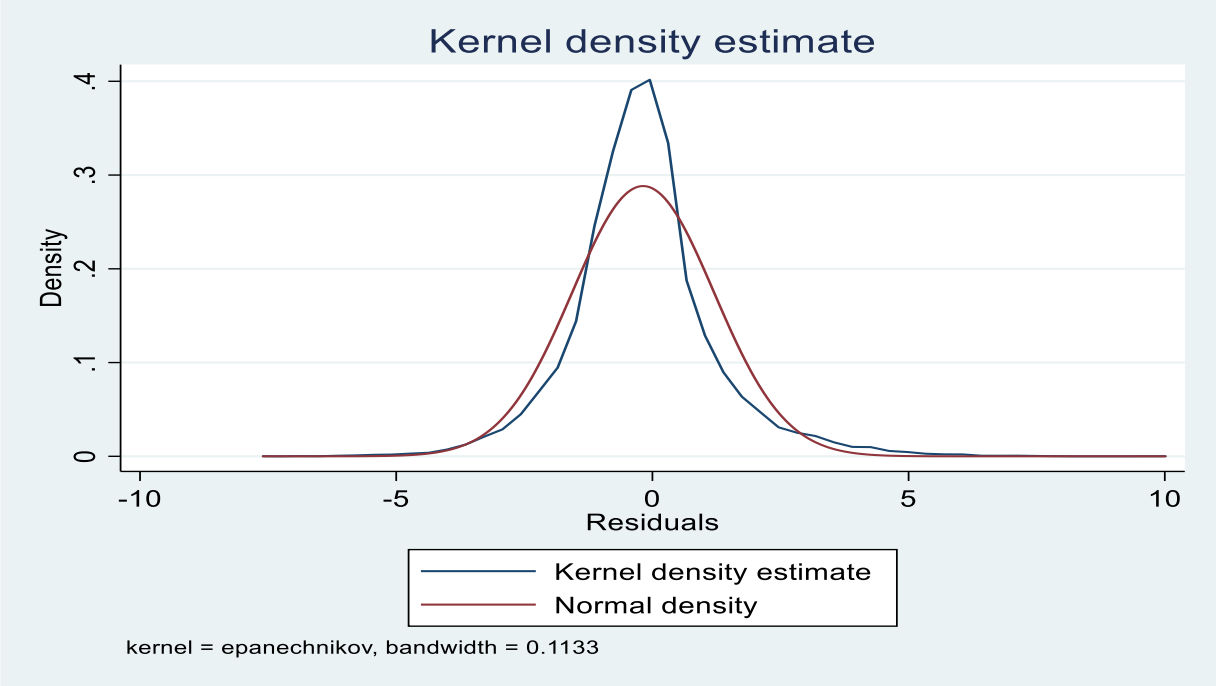

Figure 1
Kernel density estimate for normality test

The residuals appear to follow a normal pattern, suggesting that the model is fine.

4.4.2 Testing for Linearity

The relationships between the predictors and the outcome variable should be linear. For an assessment of the model, a scatter plot was run, and Figure 2.

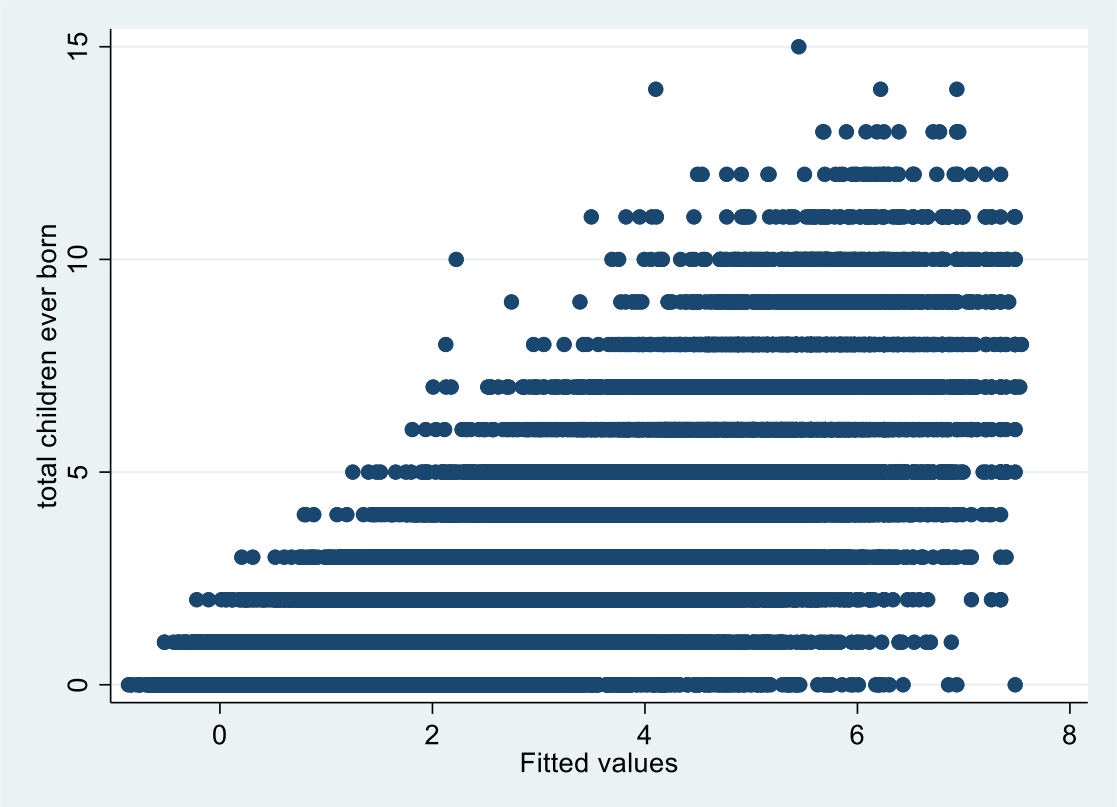

Figure 2
A Scatter Plot

A 45-degree pattern is expected in the data. The y-axis is the observed data, and the x-axis is the predicted data (Yhat). In this case, the model appears to be fine.

4.5 Test of Hypothesis

The null hypothesis was that the educational attainment of women does not have a significant effect on the preferred children among women in Kenya. The output of Model 2 ($p < .001$) showed that the effect of education on preferred children was significant and negative, and the null hypothesis was therefore rejected.

Table 3

Test of Hypothesis

Testing for the effect of v133 on v201	
(1)	v133 = 0
	F(1, 32143) = 3184.32
	Prob > F = <.001

4.6 Discussion

The results show that increased education levels greatly lower the preferred number of children among women in Kenya, as it is also the case in the literature. Wekesah et al. (2019) found that educated women in Kenya tend to have smaller families due to economic reasons and the availability of reproductive health services. These findings are in line with the negative impact of education ($\beta = -0.264$), where the annual increase in education decreases fertility preferences by an average of 0.143 children.

The positive influence of age is significant (r 0.574), which is caused by cultural and biological factors because older women might have more fertility preferences because they have an established family or have a social pressure to give birth (Muganda, 2021). Consumer behavior based on wealth index revealed that wealthier households have fewer children, which is in line with Gietel-Basten et al. (2022), who indicated that rich women in sub-Saharan Africa usually embrace the low fertility norms because of the lifestyle and economic constraints.

The use of contraceptives, especially implants and injections, was connected with increased preferred children, which is possibly because of the successful family planning that enables women to plan bigger families (Pkaremba, 2024). The unimportance of residence ($p = 0.775$) can be compared with other researchers (Kibet & Mutai, 2018), who reported that rural women choose bigger families because they have to work in agriculture, indicating that circumstances vary in Kenya.

The wealth index reveals a decreasing trend in fertility as wealth increases, with the richest quintile having the largest negative effect (coefficient = -0.8265, $p < .001$). These results are inconsistent to the findings by Odusola et al. (2017), who found that women in wealthier families or those with stable jobs will choose to have small families. This is highly evident in the towns where child-rearing and living expenses are higher. The same researchers also concluded that women with better economic autonomy will be focused on professional life and self-development, and they will want to have a small number of children.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The researchers established a strong negative correlation between educational level and desired number of children among Kenyan women between the age of 15 and 49. The research establishes that the educational attainment has a strong influence on fertility preference of women in Kenya. The more the education, the fewer the children are preferred. Age, wealth, contraceptive use, residence, and marital status are some of the factors which mediate these effects, though education has been found to be an important determinant in all the results. The results imply that education gives women knowledge, autonomy and access to reproductive health resources that allow them to make informed choices on fertility.

5.2 Recommendations

An increased population implies that there are more people to feed. The outcomes have demonstrated that education makes the number of children go down. Thus, it is advisable that families put more money into education. Family planning consumes so much money, yet education appears to be a better alternative; therefore, it is recommended that more resources should be invested in education.

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