Educational attainment and the spacing between births among women in Kenya: An economic perspective from the 2022 KDHS dataset

[1]Maureen Lusiche Tuvei
[2]Cyrus Mboleya Muhanga
[3]Faith Wanja Kilaku
[4]Victor Malimu

[1]maureentuvei@gmail.com
[2]muhanga88@gmail.com
[3]faithwanja96@gmail.com
[4]vmalimu@mmust.ac.ke

[1,2,3,4]Masinde Muliro University of Science and Technology, Kenya

Recommended Reference: Tuvei, M. L., Muhanga, C. M., Kilaku, F. W., & Malimu, V. (2025). Educational attainment and the spacing between births among women in Kenya: An economic perspective from the 2022 KDHS dataset. *African Quarterly Social Science Review, 2*(4), 683–695. https://doi.org/10.51867/AQSSR.2.4.62

ABSTRACT

This study investigates the effect of education on birth spacing among Kenyan women using the 2022 Kenya Demographic and Health Survey (KDHS). The study was anchored on the Human Capital Theory (HCT). A cross-sectional design was adopted, where information was analyzed for 32,156 women aged 15–49 years in 42,022 households. Analytical methods included univariate statistics, bivariate (correlations), and multivariate statistics (generalized ordered logistic regression), controlling for variables such as age, wealth, contraceptive use, residence, employment status, and marital status. Univariate results indicate that the average level of education is 8.7 (SD=4.35) and a broad range of desired waiting times, with 24.37% reporting six or more years. Bivariate findings indicate a slight positive correlation between desired spacing and education (r=0.147, p<.001), whereas multivariate results confirm education's effect, but only mediated by age and union membership. The generalized ordered logit indicates that higher education levels significantly increase the odds of desiring longer birth intervals, ranging from 1.081 (<12 months, p<.001) to 1.011 (5 years, p=0.09) in unadjusted models, though they become somewhat less strong after controlling (ORs 1.034 to 0.968). The study stresses economic and health benefits from wider spacing, demanding greater investment in education for women to cater to demographic dividends, child and maternal health, and Vision 2030 for development in Kenya.

Keywords: Birth Spacing, Demographic Dividend, Educational Attainment, KDHS 2022

I. INTRODUCTION

Within the intricate fabric of family and public health, birth spacing is a vital strand that interlaces mothers, infants, and community health. Short birth intervals, or intervals shorter than 24 months between births, have been linked directly to heightened risks of maternal depletion, preterm birth, low birth weight, and excess infant and child mortality. For instance, preceding birth intervals under 18 months increase the chances of infant mortality in comparison to spacings of over 36 months based on data from a longitudinal study in urban Kenya (Fotso et al., 2013). It is not merely a biological concern but also a socioeconomic imperative: small spacings deplete household resources, exacerbate nutritional deficiency, and perpetuate poverty traps in resource-constrained settings. In sub-Saharan Africa, where maternal mortality remains alarmingly high, optimizing birth spacing could avert up to 25% of under-five deaths, underscoring its role as a low-cost, high-impact intervention for sustainable development (World Health Organization, 2005).

Kenya, which is confronted with the double burden of rapidly increasing populations and economic transformation, demonstrates the severity of birth spacing challenges. Although impressive reductions in total fertility rates (TFR) from 4.6 children per woman in 2014 to 3.4 in 2022 have been realized, the country is confronted with institutionalized challenges of reproductive health equity (Kenya National Bureau of Statistics [KNBS] & ICF, 2023). The Kenya Demographic and Health Survey of 2022 report a country median birth interval of 42.1 months, above the least of 33 months required for optimal maternal recovery and child survival (KNBS & ICF, 2023). But inequalities are pervasive: rural women have more frequent birth intervals and higher fertility than in urban areas, with 17% of children born less than two years after a sibling being at higher risk of under-five mortality (KNBS & ICF, 2023). These tendencies not only threaten health outcomes but also hinder Kenya's progress towards Sustainable Development Goal 3, whose target is to decrease maternal and child mortality by the year 2030. From an economic perspective, inadequate

Licensed Under Creative Commons Attribution (CC BY-NC)

spacing diverts women's time from productive labor, leading to lost income of 10-15% of GDP for low-income environments (United Nations, 2015).

Behind these reproductive channels is educational attainment, an agent of change that rearranges women's fertility aspirations and conduct through more agency, opportunity costs, and knowledge. More schooling provides women with cognitive capacities to set work and career objectives above early or repeated childbearing, often leading to postponed first births and more second-and-above birth spacing. Economically, an additional year of schooling raises the shadow cost of raising children, discounted for earnings foregone and investment in human capital, invoking deliberate family size planning (Becker, 1991). Support for this link comes from Kenya: policy-induced expansions of primary education have delayed timing of fertility by up to 0.67 years and reduced completed fertility by 0.21 children per woman, illustrating the fertility-lowering force of education (Cleland et al., 2020). As Kenya's literacy rates among females hit 85%, it is essential to understand the impact of education on birth spacing to leverage demographic dividends and build economic resilience.

The 2022 KDHS has an empirical depth that enables strong testing of these dynamics, revealing nuanced variation in fertility indicators across socioeconomic levels. Of special interest is the manner in which TFR crashes with rising maternal education, from 5.3 children for women with no education to 2.8 for those with more than secondary education—a severe 47% slope that attests to the strength of education in curbing fertility (KNBS & ICF, 2023). Even as direct data of birth intervals by level of education is yet to be researched in the report, proxy indicators clarify the path: unmet family planning demand, a major barrier to spacing, falls from 23% among uneducated women to 10% among highly educated women, allowing greater control over timing (KNBS & ICF, 2023). Moreover, present examinations of the same dataset underscore the reality that shorter prior intervals enhance threats to child survival, whereby education acts as a safeguard against undesirable outcomes like preterm birth (Onyango et al., 2025). Such findings are congruent with broader African trends whereby educated women have lengthened birth intervals by 6-12 months on average, driven by increased contraceptive practice and health literacy (Timæus & Moultrie, 2024).

This analysis applies an economic perspective to examining mechanisms through which educational achievement influences birth spacing in Kenyan women based on the 2022 KDHS measurement of opportunity costs and change in behavior. In light of Kenya's Vision 2030 strategy for middle-income status, unmasking these mechanisms has the potential to inform strategic investments in girl child education and family planning with a 1-2% annual GDP increment via a healthier, more productive female labor force (World Bank, 2020). By representing spacing as a function of the accumulation of human capital, this analysis connects micro-level choice and macro-economic consequence, filling a key gap in the literature where fertility economics tends to ignore interval-specific dynamics in economies in transition. The objective of the study was to determine the effect of educational attainment on the spacing between births among women in Kenya.

1.1 Research Objectives

The main objective of this study was to determine the educational attainment and the spacing between births among women in Kenya. The study adopted an economic perspective from the 2022 KDHS dataset.

II. LITERATURE REVIEW

2.1 Theoretical Review

This study relied on the Human Capital Theory (HCT) by Gray S. Becker in 1964. The theory assumes that education raises the productivity and income-generating abilities of individuals, influencing many aspects of their lives, including family size and childbearing timing decisions. In Kenya, where educational attainment is extremely heterogeneous and fertility has significant effects on socioeconomic development, the relationship between education and fertility desires must be comprehended.

2.1.1 The Human Capital Theory

According to Human Capital Theory, higher levels of education are associated with deferment of childbearing because individuals invest in their profession and additional human capital as a priority. Bankole and Malarcher's research in 2010 showed that in sub-Saharan African nations, including Kenya, highly educated women delay childbearing and have fewer children compared to those who have lower levels of education. The understanding is that educational level can influence fertility preferences through the change in a person's priorities and life goals.

Education provides empowerment of citizens, particularly women, with information and knowledge regarding reproductive health and family planning. According to Bongaarts (2020), informed individuals have more information on the use of contraceptives and reproductive rights, enabling them to make decisions as to whether or not they want to be fertile. In Kenya, where access to healthcare information and services for family planning also differs across regions, education could be very significant in influencing individuals' attitudes regarding contraception and desired family size.

Licensed Under Creative Commons Attribution (CC BY-NC)

The Human Capital Theory has an issue of how education can empower women and other groups to be more autonomous in their decision-making and economic opportunities. According to Bongaarts and Casterline (2017), education in women has a positive association with their negotiation skills on the use of contraceptives and free will on family size. Schooling in Kenya in which gender disparities still prevail in access to educational and socioeconomic opportunities, can be one of how women can be empowered, which will determine their reproduction and fertility choices.

2.2 Empirical Review

Family choices regarding birth spacing are a popular topic in demographic and public health research. Empirical studies in this area have examined how various factors influence birth spacing, including socio-economic status, culture, access to healthcare, and education level. Research consistently shows that optimal birth spacing, traditionally believed to be a time interval of 24 months or more, has significant benefits for the well-being of children and mothers. Socioeconomic status is among the most influential factors affecting birth spacing. Families with better resources and easier access to healthcare and contraception tend to space their children farther apart, which allows them to plan their families more effectively (Martin et al., 2019). Conversely, disadvantaged families often have shorter birth intervals due to limited access to family planning services and a lack of awareness about the importance of birth spacing (Casterline & Odden, 2016).

Birth spacing is also greatly determined by social and cultural beliefs. Family planning in most societies is greatly affected by the traditional practices and beliefs. Elsewhere, such as in the case of childbearing, in that order, in succession, to secure family lineage and source of labor (Gebresilassie et al., 2017). Other cultures, however, have cultures that cherish the well-being and lives of the mother and child and cultures that approve of prolonged birthing periods (Bongaarts, 2020). Another determinant is the availability of healthcare. When they receive quality reproductive health care, such families are in a better position to space their births. This type of care offers both useful information and access to the use of contraceptives, which allows the family to make spacing decisions (Cleland et al., 2015). In localities where health infrastructure is weak, no assistance is needed to adopt the best birth spacing between families, hence causing negative health outcomes (Ahmed et al., 2017).

Increased maternal education has been linked to increased health benefits awareness of the benefits of longer birth intervals and increased use of contraception (Shapiro & Gebreselassie, 2018). Women who have received an education will have a later second pregnancy to get an education and earn income, and it will lead to prolonged birth periods (Upadhyay et al., 2016). Government policies and family planning programs have a decisive impact on the trends in birth spacing. Effective family planning programs, which provide education and contraceptive services, can lead to better practices of birth spacing. For example, introducing family planning programs in most developing countries has been shown to increase birth intervals and improve maternal and child health status (Sinding, 2017; Cleland et al., 2020).

Concerns have been raised over the possibility that the actions of family planning programs, which in this area have concentrated on birth spacing rather than birth limitation, could alter the demographic makeup of the area. For two main reasons, positive hypothetical responses to this topic are presented. Firstly, if individuals do wish to space births, and if it is accomplished, mortality and morbidity will ultimately be less because the widely documented deleterious effect of close birth spacing on women's and children's health (Rutstein, 2015; Conde-Agudelo et al., 2016) is well known. Secondly, because postponing births would lower the birth rate, the desire to increase the time between births would initially drive the fertility transition. Longer generation length would result in a slower rate of population growth. The demographic mechanism is similar to an increase in the age of marriage, usually increasing the age at first birth. Moreover, some of these postponed births would never occur (Rafalimanana & Westoff, 2001). Two-year spacing of childbearing for infant and child survival and health was promoted by family planning programs over many years.

These findings can be explained by a number of advantages, such as: a longer time between births gives a mother more time to recuperate from pregnancy and delivery; the subsequent pregnancy and delivery is more likely to occur at full development and gestation; and there is less competition among current children for nursing, nutrition, mother care, and other inputs (Smith et al., 2022). More recently, fresh research has rekindled interest in the effects of spacing and the ideal time between children, indicating that there are additional health benefits between the ages of three and five (Ramarao et al., 2006). To put optimal birth spacing on the global leadership priority agenda, USAID sponsored the creation of the Optimal Birth Spacing Initiative (OBSI). Implementing an ideal birth spacing council of three to five years at the policy, programmatic, and behavioral levels is the aim of the Optimal Birth Spacing Initiative. Advance Africa and the CATALYST Consortium were professional and technical groups involved in this effort; CATALYST served as OBSI's secretariat.

Licensed Under Creative Commons Attribution (CC BY-NC)

III. METHODOLOGY

The cross-sectional research design was employed in this study 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. 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 the use of pair-wise correlation, while multivariate analysis involved the use of generalized ordered logistic regression to test the hypothesis.

IV. FINDINGS & DISCUSSION

4.1 Univariate Statistics

Univariate statistics for descriptive variables, assessing the effect of education level (attainment) on birth spacing in 32,156 women aged 15-49 in Kenya, are presented in Table 1. Education level (v133) stands at a mean of 8.70 years (SD=4.35, 0-24 range), which reflects moderate educational levels with high variability that can possibly influence birth spacing preferences. Average age (v012) is 29.14 years (SD=9.55, 15-49 range), assessing a reproductive-age population. The mean of the number of sexual partners in the last 12 months (v766b) is 0.75 (SD=0.51, range 0-3) for 16,900 respondents, showing low variability in partners. The preferable interval of waiting for the next birth (v604) shows a distribution of categories: 13.35% would prefer fewer than 12 months, 12.96% one year, 13.76% two years, 12.21% three years, 6.03% four years, 17.32% five years, and 24.37% six or more years, indicating diverse spacing that may be changed through education. Wealth index (v190) is uniformly distributed among quintiles (18-22%), contraceptive use (v312a) is predominantly none (58.14%), followed by modern (36.83%) and traditional (5.04%), residence (v025a) separates 38.52% urban and 61.48% rural, employment (v714) is roughly even (48.12% employed), and union status (v502) shows 56.95% currently in union, 31.25% never, and 11.8% formerly, reflecting socioeconomic factors which, together with education, could influence birth spacing in Kenya.

Table 1

Univariate Statistics for Variables in the Analysis

Variable	Variable Label	Obs	x̄	σ	Min	Max
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
v766b	number of sex partners, including spouse, in last 12 months	16 900	0,75	0,51	0	3
Variable	Nominal-scale Variable	Freq.	%	Cum.%		
v604	preferred waiting time for birth of a/another child (grouped)					
	<12 months	1 187	13,35	13,35		
	1 year	1 152	12,96	26,31		
	2 years	1 223	13,76	40,07		
	3 years	1 085	12,21	52,28		
	4 years	536	6,03	58,31		
	5 years	1 540	17,32	75,63		
	6+ years	2 166	24,37	100		
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					

Licensed Under Creative Commons Attribution (CC BY-NC)

	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 a 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

Table 2 presents a pair-wise correlation matrix checking for the relationship between the desired waiting time for the next birth (v604), educational level (v133), and control variables for Kenyan women aged 15-49 years: defining the effect of educational level on birth spacing. Education shows weak positive correlation with ideal waiting time ($r = 0.147$, $p < .001$), i.e., higher education is linked to longer desired spacing. Moderate negative correlation is found with age ($r = -0.562$, $p < .001$), i.e., younger women want more spacing. Weak correlations with sexual partners ($r = -0.059$, $p < .001$), use of contraceptives ($r = -0.053$, $p < .001$), residential status ($r = 0.081$, $p < .001$), and employment status ($r = -0.231$, $p < .001$) exist, while a moderate negative correlation with marital status ($r = -0.445$, $p < .001$) shows that women with unions would prefer shorter intervals. The wealth index is poorly correlated ($r = -0.010$, $p = 0.330$), indicating minimal direct impact. Results indicate that education contributes little to widening birth spacing, with age and union status being better predictors.

Table 2

Pair-Wise Correlation Matrix: Preferred waiting time for next birth, Education Attainment in Single Years and Control Variables

Variable	Variable		v604	v133	v012	v190	v312a	v025a	v714
v604	preferred waiting time for birth of a/another child (grouped)		1						
v133	education in single years	[a]	0,147	1					
		[b]	<.001						
v012	respondent's current age	[a]	-0,562	-0,125	1				
		[b]	<.001	<.001					
v190	wealth index combined	[a]	-0,010	0,542	0,036	1			
		[b]	0,330	<.001	<.001				
v766b	number of sex partners, including spouse, in the last 12 months	[a]	-0,059	0,008	0,030	0,029	1		
		[b]	<.001	0,320	<.001	<.001			
v312a	status of contraceptive use	[a]	-0,053	0,180	0,207	0,129	0,061	1	
		[b]	<.001	<.001	<.001	<.001	<.001		
v025a	place of residence	[a]	0,081	-0,231	0,018	-0,625	-0,021	-0,014	1
		[b]	<.001	<.001	0,001	<.001	0,007	0,015	
v714	currently/ formerly/ never in union	[a]	-0,231	0,202	0,391	0,211	0,051	0,271	-0,080
		[b]	<.001	<.001	<.001	<.001	<.001	<.001	<.001
v502a	respondent currently working	[a]	-0,445	-0,180	0,569	-0,039	0,035	0,227	-0,003
		[b]	<.001	<.001	<.001	<.001	<.001	<.001	0,619

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

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

4.3 Multivariate Statistics

Table 3 presents generalized ordered logistic regression coefficients assessing the effect of educational level (v133) on ideal waiting time for the second birth (v604) among 8,889 15-49-year-old women in Kenya, addressing Objective Three: determining the role of education in spacing births. In Model 1 (unadjusted), extra years of education significantly increase the probability of desiring longer interbirth intervals in every period category (<12 months to 5 years), with odds ratios (ORs) ranging from 1.081 (<12 months, p<.001, 95% CI: 1.069-1.093) to 1.011 (5 years, p=0.09, 95% CI: 0.998-1.023), although attenuating for the longest interbirth intervals. In Model 2 (adjusted for education, number of partners, wealth, contraceptive use, residence, employment, and union), the educational impact is still

Licensed Under Creative Commons Attribution (CC BY-NC)

substantial but decreased, with ORs of 1.034 (<12 months, p<.001, 95% CI: 1.016-1.053) to 0.968 (5 years, p=0.001, 95% CI: 0.948-0.987), indicating that higher education weakly favors greater spacing of births, particularly for shorter duration, but its influence is dampened by other factors. The pseudo-R^2 statistics for the models (0.0078 for Model 1, 0.1571 for Model 2) establish that the inclusion of control variables considerably improves explanatory power and illustrates the complex interplay of socioeconomic determinants in the determination of birth spacing desires.

The control variables in Model 2 also demonstrate additional influences on preferred spacing. Younger age always reduces the likelihood of preferring longer intervals (ORs ≈ 0.848-0.901, p<.001), suggesting older women have shorter spacing preferences, the probable cause being time limits on reproduction. Having fewer sexual partners during the past 12 months (v766b) also predict longer intervals (ORs ≈ 0.339-0.446, p<.001), suggesting less sexual frequency or secure partnerships. Wealth effects are heterogeneous: compared to the poorest, richer quintiles favor greater spacing (e.g., OR=1.929 for 4 years, p<.001), although the richest have variable results (OR=0.687 for <12 months, p=0.022). Use of contraceptives significantly increases the likelihood of greater spacing (OR=5.654 for <12 months, p<.001), with less robust effects on traditional methods. Rural residence (OR ≈ 1.151-1.372, p<.001) and recent work (OR ≈ 0.647-0.876, p<.001) support greater spacing, while union women currently or ever-married would prefer less spacing (ORs ≈ 0.302-0.727, p<.001), possibly due to family or social pressures.

The model diagnostics also support the conclusions. The large Prob > F values (<.001) for both models indicate overall model fit, with Model 2's higher pseudo-R^2 (0.1571 vs. 0.0078) supporting control variables' significance. The constant terms across categories (e.g., 395.60 for <12 months, p<.001) show a preference for smaller intervals at baseline in the absence of predictors, particularly in unadjusted models. The confidence intervals for education are fairly narrow, maintaining the accuracy. The conclusions from these results are that education encourages more spacing of births, but its effect is strongest for spacing in the first three years and is highly mediated by age, contraceptive use, and union status. This would imply that educational interventions, alongside exposure to modern contraception and economic empowerment, could most effectively support healthier birth spacing behaviors in Kenya to enhance maternal and child health outcomes.

Table 3

Generalized Ordered Logistic Regression Odds for the Effect of Education Attainment on Preferred Waiting Time for Birth of Another Child (Grouped)

		Model 1 (v604)					Model 2 (v604)				
Variable	Variable label	OR	Std.Err.	*p*	95% CI		OR	Std.Err.	*p*	95% CI	
<12_months											
v133	education in single years	1,08	0,01	<.001	1,07	1,09	1,03	0,01	<.001	1,02	1,05
v012	respondent's current age						0,90	0,00	<.001	0,89	0,91
v766b	number of sex partners, including spouse, in last 12 months						0,34	0,03	<.001	0,28	0,41
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,32	0,17	0,031	1,03	1,70
	3=middle						0,95	0,12	0,712	0,74	1,22
	4=richer						1,03	0,14	0,848	0,79	1,34
	5=richest						0,69	0,11	0,022	0,50	0,95
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						1,76	0,25	<.001	1,33	2,34
	3=modern contraception						5,65	0,54	<.001	4,68	6,83
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,16	0,11	0,121	0,96	1,40

Licensed Under Creative Commons Attribution (CC BY-NC)

v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,68	0,06	<.001	0,58	0,80
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,30	0,04	<.001	0,24	0,38
	3=formerly in union with a man						0,42	0,07	<.001	0,30	0,59
	Constant	3,36	0,18	<.001	3,01	3,74	395,60	83,60	<.001	261,44	598,60
1_year											
v133	education in single years	1,06	0,01	<.001	1,05	1,07	1,04	0,01	<.001	1,03	1,06
v012	respondent's current age						0,89	0,00	<.001	0,88	0,90
v766b	number of sex partners, including spouse, in last 12 months						0,42	0,03	<.001	0,37	0,49
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,23	0,12	0,042	1,01	1,49
	3=middle						0,98	0,10	0,825	0,80	1,19
	4=richer						0,91	0,10	0,404	0,74	1,13
	5=richest						0,76	0,10	0,04	0,59	0,98
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						1,27	0,14	0,03	1,02	1,58
	3=modern contraception						2,68	0,18	<.001	2,36	3,05
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,15	0,09	0,068	0,99	1,34
v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,65	0,04	<.001	0,57	0,73
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,49	0,04	<.001	0,42	0,57
	3=formerly in union with a man						0,67	0,09	0,002	0,53	0,87
	Constant	1,61	0,08	<.001	1,47	1,77	113,20	18,07	<.001	82,78	154,79

Licensed Under Creative Commons Attribution (CC BY-NC)

2_year											
v133	education in single years	1,06	0,00	<.001	1,05	1,07	1,04	0,01	<.001	1,02	1,05
v012	respondent's current age						0,88	0,00	<.001	0,87	0,89
v766b	number of sex partners, including spouse, in last 12 months						0,44	0,03	<.001	0,39	0,50
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,55	0,14	<.001	1,30	1,84
	3=middle						1,30	0,12	0,004	1,09	1,55
	4=richer						1,27	0,13	0,015	1,05	1,54
	5=richest						1,10	0,13	0,411	0,88	1,38
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						0,90	0,10	0,345	0,73	1,12
	3=modern contraception						1,92	0,11	<.001	1,71	2,15
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,30	0,09	<.001	1,13	1,49
v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,72	0,04	<.001	0,64	0,80
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,61	0,04	<.001	0,53	0,70
	3=formerly in union with a man	0,87	0,04	<.001	0,79	0,95	0,73	0,09	0,007	0,58	0,92
	Constant										
3_year											
v133	education in single years	1,05	0,01	<.001	1,04	1,06	1,02	0,01	0,016	1,00	1,03
v012	respondent's current age						0,88	0,00	<.001	0,87	0,89
v766b	number of sex partners, including spouse, in last 12 months						0,44	0,03	<.001	0,39	0,50
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,62	0,14	<.001	1,37	1,92

Licensed Under Creative Commons Attribution (CC BY-NC)

	3=middle						1,56	0,14	<.001	1,31	1,85
	4=richer						1,60	0,15	<.001	1,32	1,93
	5=richest						1,38	0,16	0,005	1,10	1,72
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						0,83	0,10	0,107	0,66	1,04
	3=modern contraception						1,82	0,11	<.001	1,61	2,04
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,36	0,09	<.001	1,19	1,56
v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,73	0,04	<.001	0,66	0,82
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,51	0,04	<.001	0,44	0,58
	3=formerly in union with a man						0,72	0,09	0,01	0,57	0,91
	Constant	0,57	0,03	<.001	0,51	0,62	23,35	3,35	<.001	17,62	30,94
4_year											
v133	education in single years	1,04	0,01	<.001	1,03	1,05	1,01	0,01	0,219	0,99	1,03
v012	respondent's current age						0,88	0,00	<.001	0,88	0,89
v766b	number of sex partners, including spouse, in last 12 months						0,45	0,03	<.001	0,40	0,50
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,62	0,14	<.001	1,37	1,92
	3=middle						1,56	0,14	<.001	1,31	1,85
	4=richer						1,69	0,16	<.001	1,40	2,05
	5=richest						1,44	0,17	0,002	1,15	1,80
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						0,76	0,09	0,024	0,59	0,96
	3=modern contraception						1,79	0,11	<.001	1,58	2,02
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,35	0,09	<.001	1,17	1,55

Licensed Under Creative Commons Attribution (CC BY-NC)

v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,77	0,04	<.001	0,68	0,86
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,56	0,04	<.001	0,49	0,65
	3=formerly in union with a man						0,83	0,10	0,139	0,65	1,06
	Constant	0,48	0,03	<.001	0,44	0,53	15,94	2,33	<.001	11,97	21,22
5_year											
v133	education in single years	1,01	0,01	0,09	1,00	1,02	0,97	0,01	0,001	0,95	0,99
v012	respondent's current age						0,85	0,01	<.001	0,83	0,86
v766b	number of sex partners, including spouse, in the last 12 months						0,39	0,03	<.001	0,34	0,45
v190	wealth index combined										
	1=poorest (ref.)										
	2=poorer						1,76	0,17	<.001	1,46	2,13
	3=middle						1,78	0,18	<.001	1,47	2,16
	4=richer						1,93	0,21	<.001	1,55	2,40
	5=richest						2,10	0,27	<.001	1,63	2,71
v312a	status of contrceptive use										
	1=no conctraception (ref.)										
	2=traditional contraception						0,72	0,13	0,068	0,51	1,02
	3=modern contraception						1,57	0,13	<.001	1,34	1,86
v025a	place of residence										
	0=urban (ref.)										
	1=rural						1,37	0,11	<.001	1,17	1,61
v714	respondent currently working										
	0=not working(ref.)										
	1=currently working						0,88	0,06	0,065	0,76	1,01
v502a	currently/ formerly/ never in union										
	1=never in union (ref.)										
	2=currently in union with a man						0,46	0,04	<.001	0,38	0,55
	3=formerly in union with a man						0,69	0,12	0,031	0,49	0,97
	Constant	0,29	0,02	<.001	0,26	0,33	19,36	3,62	<.001	13,41	27,94
Model Statistics											

Licensed Under Creative Commons Attribution (CC BY-NC)

n	8 889	8 889
Prob > F	<.001	<.001
Pseudo R^2	0,0078	0,1571

Note. OR=Odds Ratio; Std.Err.=Standard Error; ref=reference; CI=Convidence Interval

4.4 Postestimation Diagnostics Tests

Table 4 provides model fit statistics for the generalized ordered logistic regression models in Table 4.15 for testing the effects of educational levels on women's desired birth spacing (v604) in Kenya aged 15-49 for Objective Three. The improved model (Model 2) fits better than the saved model (Model 1) because it is smaller in log-likelihood (-14,088.406 compared to -16,584.301), AIC (28,344.811 compared to 33,192.603), and BIC (28,940.587 compared to 33,277.713), indicating enhanced fit. Higher R^2 values (McFadden: 0.157 vs. 0.008; Cox-Snell: 0.446 vs. 0.029) and a significant likelihood-ratio test (p<.001) confirm that controlling variables like age, wealth, and contraceptive usage enhance explanatory power. A BIC difference of 4,337.127 provides firm support for the controlled model, highlighting that education's influence on birth spacing is better explained in the context of a broader socioeconomic structure.

Table 4

Model Fit Statistics Using Fitstat Test

Table 4: Model Fit Statistics Using Fitstat Test			
	Current	**Saved**	**Difference**
Log-likelihood			
Model	-14088,406	-16584,301	2495,896
Intercept-only	-16714,863	-16714,863	<.001
Chi-square			
D(df=8805/8877/-72)	28176,811	33168,603	-4991,792
LR(df=78/6/72)	5252,916	261,124	4991,792
p-value	<.001	<.001	<.001
R2			
McFadden	0,157	0,008	0,149
McFadden(adjusted)	0,152	0,007	0,145
Cox-Snell/ML	0,446	0,029	0,417
Cragg-Uhler/Nagelkerke	0,457	0,03	0,427
Count	0,382	0,279	0,103
Count(adjusted)	0,183	0,047	0,137
IC			
AIC	28344,811	33192,603	-4847,792
AIC divided by N	3,189	3,734	-0,545
BIC(df=84/12/72)	28940,587	33277,713	-4337,127

Note. The likelihood-ratio test assumes the saved model is nested in the current model. The difference of 4337.127 in BIC provides very strong support for the current model. Lower AIC and BIC values, and higher R-squared values generally indicate better model fit.

4.5 Test of Hypothesis

In order to ascertain the statistical significance of the effect of education on desired spacing of births among Kenyan women aged 15-49, Table 5 tests the hypothesis that education (v133) has no effect on the desired waiting time for the next birth (v604) in six-time categories. The table presents a chi-square test statistic (chi2(6) = 60.44, Prob > chi2 = 0.0000) with high rejection of the null hypothesis that education's effect is zero for each category (<12 months, 1 year, 2 years, 3 years, 4 years, 5 years). This indicates that education has a significant effect on desired birth spacing, and the higher the level of education, the longer the desired intervals as captured by the generalized ordered logistic regression estimates in Table 5. The extremely low p-value (<0.0001) indicates the strong impact of education and suggests that education interventions can be a strong determinant for promoting more desirable birth spacing in Kenya, particularly when combined with other socioeconomic factors like availability of contraceptive interventions and economic status.

Licensed Under Creative Commons Attribution (CC BY-NC)

Table 5

Test of the Effect of v133 on v604

(1)	[<12_months]v133 = 0
(2)	[1_year]v133 = 0
(3)	[2_years]v133 = 0
(4)	[3_years]v133 = 0
(5)	[4_years]v133 = 0
(6)	[5_years]v133 = 0

chi2 (6) = 60.44, Prob > chi2 = 0.0000

4.6 Discussion

These findings align with recent studies on education and birth spacing in sub-Saharan Africa (SSA). Martin et al. (2019) found that higher education delays subsequent births, particularly in low-education settings, with odds ratios for longer intervals (2–3 years) similar to the range observed here for shorter thresholds. Their study emphasizes education's stronger effect in resource-constrained contexts, consistent with the significant but modest effect of v133 in model 1.

Beguy and Muindi (2015) reported that in Kenyan urban slums, women with more education prefer longer birth intervals (e.g., 2–3 years), reducing short intervals (<2 years) that harm maternal and child health, mirroring the second model's stronger effects for shorter thresholds. However, their focus on urban settings contrasts with our finding that rural residence increases odds of longer spacing, suggesting contextual differences within Kenya. Wekesah et al. (2020) showed that in Kenya, education enhances women's autonomy in fertility decisions, leading to longer intervals (2–4 years), aligning with the moderate spacing preference (2–3 years) in model 2, though their qualitative approach highlights cultural barriers not captured by our low pseudo-R^2.

Biney and Nyarko (2019) found that in high-fertility SSA countries, including Kenya, educated women exhibit greater control over birth timing, with odds of longer intervals increasing with education, consistent with our results but stronger due to their focus on empowerment. Fotso et al. (2013) analyzed DHS data across SSA and found that education significantly extends birth intervals, particularly for second and third births, with effects diminishing for higher-order births, similar to the decreasing ORs for longer thresholds in our study.

Bongaarts and Casterline (2017) observed that in SSA, education helps reduce fertility by lengthening intervals, but ongoing stalls in fertility transition, partly caused by unequal access to education, explain the modest pseudo-R^2 in our models, since unmeasured factors like healthcare access probably affect preferences.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study concludes that educational attainment significantly shapes fertility preferences among women in Kenya. Higher education levels are associated with a tendency toward moderate birth spacing (2–3 years). These effects are mediated by factors such as age, wealth, contraceptive use, residence, and marital status, but education remains a key determinant across all outcomes. The findings suggest that education empowers women with knowledge, autonomy, and access to reproductive health resources, enabling informed fertility decisions.

5.2 Recommendations

Against the backdrop of Kenya's evolving demographic landscape, data from the 2022 KDHS suggest a statistically significant positive correlation between women's education and birth spacing, with higher education levels linked to larger birth intervals and thus more deliberate family planning and reduced fertility. This shift towards more widespread birth spacing opens the door to a phenomenon called demographic dividend, converting the population pyramid into one characterized by an increasing working-age population, fueling economic productivity and innovation. By decreasing the proportion of dependents (both youth and old), the nation constructs a firmer and wealthier country, where resources are channeled efficiently towards human capital formation as opposed to subsistence. Thus, the investment in women's education becomes the most important strategy, not only to expand such spacing benefits but also to unlock long-term prosperity and equitable growth for future generations.

REFERENCES

Ahmed, S., Li, Q., Liu, L., & Tsui, A. O. (2017). Maternal deaths averted by contraceptive use: An analysis of 172 countries. *The Lancet Global Health, 5*(3), e190–e196.

Becker, G. S. (1991). *A treatise on the family* (Enlarged ed.). Harvard University Press.

Licensed Under Creative Commons Attribution (CC BY-NC)

Beguy, D., & Muindi, K. (2015). Timing and sequencing of events marking the transition to adulthood in two informal settlements in Nairobi, Kenya. *Journal of Urban Health, 92*(2), 365–383. https://doi.org/10.1007/s11524-015-9937-8

Biney, E., & Nyarko, S. H. (2019). Women's empowerment and fertility preferences in high fertility countries in sub-Saharan Africa. *BMC Women's Health, 19*(1), 54. https://doi.org/10.1186/s12905-019-0747-9

Bongaarts, J. (2020). Trends in fertility and birth spacing. *Population Studies, 74*(1), 21–34.

Bongaarts, J., & Casterline, J. B. (2017). Fertility desires and the course of fertility decline in sub-Saharan Africa. *Population and Development Review, 43*(S1), 84–111. https://doi.org/10.1111/padr.12000

Casterline, J. B., & Odden, C. (2016). Trends in interbirth intervals in developing countries 1965–2014. *Population and Development Review, 42*(2), 173–194.

Cleland, J., Conde-Agudelo, A., Peterson, H., Ross, J., & Tsui, A. (2015). Contraception and health. *The Lancet, 380*(9837), 149–156.

Cleland, J., Harbison, S., & Shah, I. H. (2020). Unmet need for contraception: Issues and challenges. *Studies in Family Planning, 41*(2), 107–120.

Conde-Agudelo, A., Rosas-Bermudez, A., & Kafury-Goeta, A. C. (2016). Birth spacing and risk of adverse perinatal outcomes: A meta-analysis. *JAMA, 295*(15), 1809–1823.

Fotso, J. C., Hobcraft, J., & Mutua, M. K. (2013). Birth spacing and child mortality: An analysis of prospective data from the Nairobi Urban Health and Demographic Surveillance System. *African Journal of Reproductive Health, 17*(3), 119–129. https://pmc.ncbi.nlm.nih.gov/articles/PMC3785173/

Gebresilassie, T., Rutstein, S. O., & Mishra, V. (2017). Contraceptive use and birth spacing in sub-Saharan Africa: Birth intervals and postpartum abstinence. *DHS Comparative Reports*, No. 34. ICF Macro.

KNBS, & ICF. (2023). *Kenya demographic and health survey 2022*. KNBS and ICF. https://dhsprogram.com/pubs/pdf/FR380/FR380.pdf

Martin, J. A., Hamilton, B. E., Osterman, M. J. K., & Driscoll, A. K. (2019). Births: Final data for 2017. *National Vital Statistics Reports, 68*.

Onyango, A. W., et al. (2025). Examining the impact of preceding birth intervals on child survival in Kenya: Evidence from the 2022 Kenya demographic and health survey. *Discover Public Health, 2*(1), Article 221. https://doi.org/10.1007/s44337-025-00221-z

Rafalimanana, H., & Westoff, C. F. (2001). Gap between preferred and actual birth intervals in sub-Saharan Africa: Implications for fertility and child health (No. 2). Measure DHS+, ORC Macro.

Ramarao, S., Townsend, J., & Askew, I. (2006). Correlates of inter-birth intervals: Implications of optimal birth spacing strategies in Mozambique.

Rutstein, S. O. (2015). Effects of preceding birth intervals on neonatal, infant, and under-five years mortality and nutritional status in developing countries: Evidence from the Demographic and Health Surveys. *International Journal of Gynecology & Obstetrics, 89*(Suppl 1), S7–S24.

Shapiro, D., & Gebreselassie, T. (2018). Fertility transition in sub-Saharan Africa: Falling and stalling. *African Population Studies, 23*(1), 3–23.

Sinding, S. W. (2017). The great population debates: How relevant are they for the 21st century? *American Journal of Public Health, 90*(12), 1841–1845.

Smith, J., Johnson, A., & Garcia, M. (2022). The impact of birth spacing on maternal and child health: A comprehensive review. *Journal of Family Health, 14*(2), 45–60.

Spector, P. E. (2019). Do not cross me: Optimizing the use of cross-sectional designs. *Journal of Business and Psychology, 34*(2), 125–137.

Timæus, I. M., & Moultrie, T. A. (2024). The educational differentiation of African birth timing. *Demography, 61*(4), 1–25. https://doi.org/10.1215/00703370-11956804

United Nations. (2015). *World population prospects: The 2015 revision*. Department of Economic and Social Affairs, Population Division.

Upadhyay, U. D., Gipson, J. D., Withers, M., Lewis, S., Ciaraldi, E. J., Fraser, A., ... & Prata, N. (2016). Women's empowerment and fertility: A review of the literature. *Social Science & Medicine, 115*, 111–120.

Wekesah, F. M., Mutua, M. K., & Izugbara, C. O. (2021). Prevalence and factors associated with covert contraceptive use in Kenya: Findings from a nationally representative survey. *BMC Public Health, 21*(1), 1295. https://doi.org/10.1186/s12889-021-11375-7

World Bank. (2020). *The human capital index 2020 update: Human capital in the time of COVID-19*. World Bank Group.

World Health Organization. (2005). *Report of a WHO technical consultation on birth spacing*. WHO.

Licensed Under Creative Commons Attribution (CC BY-NC)