"Contemporary Context and the Timing of Births: Effects of Education on the Second Birth Interval in Kenya"

By David Ojakaa[1]

1. Introduction

A number of demographic studies suggest that historical and contemporary events and processes have profoundly shaped social change in sub-Saharan Africa. In this regard, the changes in the political, economic, and cultural domains in Kenya, a country situated in East Africa, are illustrative. Relatively speaking, the political violence that proceeded the presidential elections of December 2007, Kenya has been a politically stable country (Weinreb 2001). The first formal contact with Western culture was established in 1895 when Britain declared it a protectorate colony; the country gained independence in 1963 after the Mau Mau rebellion of the 1950s; it reverted to multiparty democracy after the 2002 elections. The transition from the traditional to the modern economy has however not been as stable: while high Gross Domestic Product (GDP) growth rates were registered during the 1960s and early 1970s, the 1990s were marked by economic crises; but the economy has grown rapidly again since 2002 (KNBS 2007). With the arrival of western civilization, it is suggested that reproductive culture in a number of regions in the country has changed in three ways (Watkins 2000). In the pre-independence days (before the 1960s) children were seen as riches; subsequently smaller family sizes were perceived to represent modernity; more lately modern methods of family planning are increasingly being used. In this study, it is argued that in Kenya, as in other countries of sub-Saharan Africa, these contexts have affected the fertility and reproductive behaviour of different classes of women - the uneducated and educated - in disparate ways (Johnson-Hanks 2004). Deserving further note is the research finding that the second interval may, surprisingly, represent a transition to female adulthood: this study therefore tests how these contemporary contexts have influenced the timing of the second birth.

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2. The Idea of Contingent Lives

Studies conducted in the West African states of The Gambia and Cameroon document how context affects reproduction. In the Gambia, the timing of births is contingent, not necessarily upon senescence towards menopause as implied in the idea of parity-specific control and a fixed desired family size, but on women's fragile reproductive capacity and unpredictability of the socio-economic environment (Knodel 1977; Bledsoe et al. 1994; Bledsoe et al. 1998; Bledsoe and Banja 2002). In Cameroon, the socio-economic context is similarly important: the second birth interval among young women is longer and more variable among educated as compared to uneducated women. This due to the uncertainty of means to achieve two irreconcilable ends – education or the working career, and high fertility (Johnson-Hanks 2004). These studies have neither been replicated nor the ideas behind them tested in Kenya, a country in which the socio-economic and fertility settings present both similarities and contrasts to the situation in The Gambia and Cameroon. To assess the proposition that the timing of births is contingent on socio-economic and related contexts, this study will addresses the following research questions:

1. What is the effect, and mechanism for the influence, of educational level on the transition to a second birth in Kenya?
2. What has been the influence of the different socio-economic contexts in Kenya on the timing of the second birth for uneducated and educated women?

In line with these questions, the following hypothesis is tested in the study:
Women with no education progress more rapidly to the second birth; those with at least secondary education do so at a slower pace.

3. Data and Methods

Data for this study come from the 2003 Kenya Demographic and Health Survey (KDHS). Unlike the previous four – those for 1988/89, 1993, 1998, and 2003 – the 2003 KDHS survey covers regions of the country not included before (North-Eastern and parts of Eastern and Rift Valley provinces). To study the transitions to the second birth largely within union (and exclude factors affecting reproduction during the state of single parenthood), the sample is restricted to women who have been ever-married. Similarly, to examine the effects of covariates on the duration to the second birth, all first births that occurred within 12 years before the 2003 KDHS are observed until the event (second birth), or censoring, occurs.

The dependent variable in the analysis is the duration of time from the first to the second birth. Some of the criteria for selection of independent variables to be included in the analysis included issues such as measurement and simultaneity of relationships between variables. For example, one of the variables included in the analysis, ideal family size, is thought to be a biased estimate of fertility demand: its effects are therefore analysed with this limitation in mind. Similarly, variables that are thought to be highly endogenous in the duration of birth intervals, such as contraception and breastfeeding, are excluded from the analysis.

Taking these and other considerations into account resulted in the following covariates of the second conception: region of residence; period of first birth; age at first birth; educational level; survival status and gender of the first birth; household socio-economic status; ethnic group; religion; ideal family size. For the variable period of first birth, the observation period of first births that occurred 12 years before the survey was divided into two equal periods of six years each. The two represent distinct phases in the recent transition in Kenyan fertility – a period when fertility was still falling (1991-1997), and one when the levelling off in fertility was underway (1997-2003).

Survival analysis is the main method used for data analysis; its choice was based on the ability to handle the problem of censoring which is inherent in data on the waiting time or duration to an event (Cleves et al. 2004). Within survival analysis, a number of specific methods are employed. First, life table techniques are used to derive estimates of the medians – and the 25th as well as the 75th percentiles - of the second birth interval. Secondly, the Kaplan-Meier method is used to estimate survivorship probabilities in the state of first birth. Thirdly, the Cox semi-parametric regression model is applied in the estimation of the risk of progression to the second birth. The choice of the Cox model, over parametric survival regression, was based on the objective of the analysis - to determine the effect of the covariates of the birth interval without necessarily taking into account the baseline hazard function.

In conducting Cox regression analysis, four models are developed in order to evaluate the effects of the hypothesized covariates on the hazards of a second birth. First, a basic model that comprises only the initially hypothesized effects (education, region of residence, and age at first birth) on the timing of the second birth is applied. The second model incorporates the remaining covariates; the third is restricted to only women with at least secondary-level education. Finally, a fourth regression is conducted, incorporating ideal family size and the other covariates. The inclusion of ideal family size in a separate regression is due to the observation that the covariate is not a precise measure of fertility demand.

4. Results

4.1 Univariate Analysis

Distribution of Covariates

The absolute and percentage distributions of covariates for the second birth interval are shown in Table 1 below, and the results indicate that for each of the variables, the sample sizes are for the most part large enough for analysis. Thus, Table 1 shows that out of a total sample size of 3,106 women who delivered their first child between 1991 and 2003, our ultimate sub-sample is 2,706 ever-married women.

Table 1: Distribution of Women Having 1st Birth 0-12 Years Before the Survey, Kenya

Observation Period	1991-2003	
Percentage/Number	Percentage	Number
Ever Married Status:		
Yes	87.1	2706
No	12.9	400
Total	**100.0**	**3106**
Region :		
Nairobi	9.8	266
Other Urban	15.3	413
Central Rural	11.6	315
Other Rural	63.3	1713
Period of First Birth:		
Start of Stagnation (1991-1997)	52.6	1425
Stagnation Underway (1997-2003)	47.4	1282
Age at First Birth:		
10-17	27.6	746
18-24	64.5	1746
25+	7.9	215
Educational Level:		
None	10.6	288
Primary	62.6	1695
Secondary+	26.7	723
Total		
Survival of First Birth (by interview time):		
1 Girl	43.9	1187
1 Boy	47.4	1284
0 Survivor	9.7	236
Ethnic Group:		
Kikuyu	21.3	577
Luhya	15.1	410
Luo	11.9	323
Kalenjin	11.2	302
Other	40.4	1094
Religion:		
Catholic	23.7	641
Protestant	64.5	1744
Muslim	8.6	233
Other	3.1	85
Household Wealth:		
Low	32.2	572
Medium	34.1	604
High	33.7	598
Ideal Family Size:		
≤3	45.4	1229
4-5	38.4	1038
≥6	12.0	324
Non-numerical	4.3	116
Total	**100**	**2706**

Note: For the variable, “household wealth”, the total sample of households is 1,774.

Time to the Next Birth

Medians for the second, third, fourth and subsequent intervals - up to the tenth - were first estimated in order to compare the trends in the intervals by parity. These results are presented in Table II, which shows the cumulative percentage distribution of women proceeding to the next birth for the second through the tenth intervals. The distributions have been estimated using life table techniques in order to take into account the censoring that arises from the experience of women who have not yet had their next birth. Thus, for each birth (first to tenth) that started no earlier than 12 years before the 2003 KDHS survey, the respective percentile duration to (next) birth was estimated. This life-table estimation procedure takes into account both the durations that result in a birth and those which are censored by the time of the 2003 interview.

From the cumulative durations of the second to tenth intervals shown in Table II, it can be observed that the first 25% of women waited for between 24 and 27 months before delivering their second baby. It is also to be noted that this duration has been relatively stable over the parities. Examination of the other extreme measure of centrality – the 75th percentile – reveals a striking contrast. The 75th percentile is much longer for all parities (at least 50 months). In addition, by duration 109 months (about nine years) the remaining 25% had not yet proceeded to have their ninth or tenth child. These very long birth intervals may be an indication of stopping behaviour at the higher parities.

Table 2 also shows that medians have slowly increased with parity, being lowest - at 33.7 months - for the second birth interval, and highest (at about 40 months) by the time of the tenth interval. The lengthening of the intervals with parity is consistent with the idea of fertility demand: as parity increases, couples are presumably more motivated to limit their fertility.

In principle, change in two proximate determinants could explain the observed increase in the length of the intervals – an increase in the period of post-partum amenorrhea due to a similar change in the duration of breastfeeding, and an increase in the duration to conception through contraceptive use. Between these two, increased use of contraception is the more plausible, as prevalence of modern contraceptive methods in Kenya increased from 4.3% in 1977/78 to 31.4% in 1998, and rose marginally to reach 33.4% in 2003. In contrast, the median durations for breastfeeding, post-partum amenorrhea, and sexual abstinence were 19.4, 10.8, and 2.6 months respectively by the time of the 1988/89 KDHS. In the 2003 survey however, they had only marginally changed to 20.1, 9.7, and 2.9 months respectively (NCPD 1989; NCPD 1994 ; NCPD 1999; CBS et al. 2004). Thus, these results indicate a possible association between increased length of intervals and use of modern contraceptives for fertility control – spacing at the earlier parities such as the second interval, and limiting at the higher parities.

Table 2: Percentile Distribution of Inter-Birth Intervals, Parities 1 to 10, Kenya

Observation Period:	**1991-2003**		
Percentile	P25	P50	P75
Birth Interval:			
Second	24.1	33.7	50.9
Third	25.1	35.0	62.9
Fourth	24.7	35.3	65.6
Fifth	26.4	36.9	67.4
Sixth	25.5	35.2	63.2
Seventh	24.9	35.9	84.1
Eighth	26.0	38.3	109.2
Ninth	26.8	40.0	-
Tenth	24.7	39.5	-

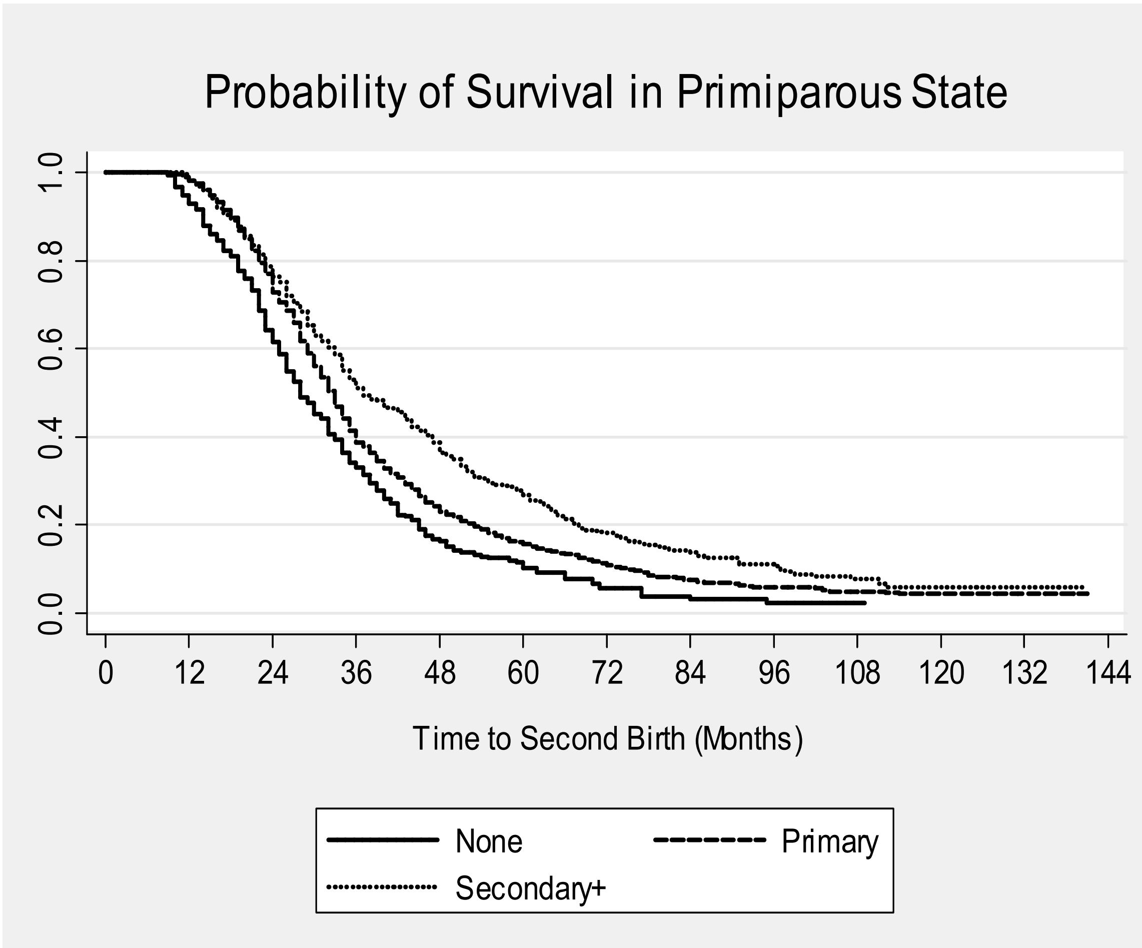
Notes: The respective percentiles (P) represent the duration in months in which the first 25, 50, and 75 percent of the women who gave a respective birth within twelve years of the survey took to proceed to the next birth. The dash (-) indicates that lee than 75% of the women had proceeded to have the indicated birth (ninth and tenth respectively) by the time of the end of the observation period (144 months before the survey).

Survivorship in the States of First and Second Birth

Figure 1 below shows Kaplan-Meier (KM) survivor functions by educational level. They represent the proportion of women who, having given birth to the first child, have not yet progressed to the second. A question that arises is whether the curves are significantly different from each other or the apparent differences are merely due to random error. To answer this question, the Cox univariate test for equality of survivor functions was applied to the second interval. The results indicate that the chi-square values are highly significant ($p \leq 0.000$), so that we are led to reject the null hypothesis that the three survivor functions for educational level are the same. Instead, we accept the alternative hypothesis that in fact the three are significantly different.

Coupled with this significance, the survivor functions in Figure 1 show that as a whole, the probability of progressing to the second birth is highest among women with at least secondary education, and lowest among those with no education, with women who have attained primary education being in between. Between months 24 and 108 (two and nine years), a widening in the probabilities between the categories of education is evident from Figure 1. While the probabilities for no education and some primary education lie closer to each other, those for women with at least secondary education stand out at a higher level. This means that between these durations, a higher proportion of women with at least secondary education are yet to transit to the second birth. The second remarkable observation from Figure 1 is that between the durations of about 12 and 24 months (1 and 2 years) the proportions of women with at least primary and secondary education who remain in the primiparous state is more or less the same. The third observation from Figure 1 is with regard to the probability of survival after nine years (108 months). Beyond this duration, among women with no education, there are none waiting for a second birth. However, a small proportion (less than 10%) of women with primary or at least secondary education continues to proceed to the second birth. It is possible that these divergences represent two different types of family building behaviour – one for women with no education or only primary-level schooling, and the other for those with at least secondary education. The first might be traditional and proceed rapidly to have the second child, and the other may be modern, taking more time to move on to the second birth.

Figure 1: Kaplan-Meier Survival Functions for Probability of Remaining in Sate of First Birth by Educational Level, Kenya 1991-2003



4.2 Multi-variate Analysis
Hypothesized Effects

Cox regression results for the relative risk of progressing to the second birth and for the four models are presented in Table III below. It had been hypothesized that the higher the educational level, the lower the risk of transition to the second birth. The results are as expected. The relative risk of a second birth is lowest among women with at least secondary education. Although the risk among women with primary education is similarly less than one, it is nevertheless higher than that associated with secondary or higher education. These results are true both in the model in which only three covariates (education, maternal age at first birth, and region of residence) are considered. However, when ideal family size is included in the regression (model 3) the significance of education disappears. This possibly points to the biasing effects of ideal family size as a measure of fertility demand.

Inclusion of Additional Variables

To examine the effects of education on the risk of the second birth in more detail, it is useful to explore the changes in risks between the various models. As can be observed in Table III, when other covariates are introduced into the regression (model 2), the significance of the risks associated with both primary and at least secondary education diminishes. The value of the risks also reduces slightly – in the case of primary education from 0.789 to 0.779, and for secondary or higher level of education from 0.692 to 0.659. It is possible to speculate on which factor might in turn be associated with the changing risks for education. When the risks for residence in Nairobi are compared, it can be seen that they increase from 0.603 in regression model 1 (with only three covariates) to 0.739 in model 2 (more covariates included).

Among the other covariates introduced in the second regression (model 2), a number turn out to be significant – just as residence in Nairobi city, which is the only significant category among regions of residence in model two. First, the fact that the first child has passed away significantly increases the relative risk of a second birth, in comparison to the situation where the surviving child is female. Secondly, belonging to a household of medium or high wealth is associated with a reduced relative risk of a second birth. Thirdly, being Muslim, relative to professing the Catholic faith, is associated with an increased and significant risk of a second birth. Lastly, membership of the next three major ethnic groups – the Luhya, Luo, and Kalenjin – or other ethnicities in the country relative to the biggest group is associated with high and significant risk of a second birth.

The Risk of Second Birth among Educated Women

Given the high significance of secondary education in the relative risk of transition to the second birth, it was decided to investigate which aspects might be associated with these risks. Accordingly, in model 4, only women with at least secondary education are considered in the regression. The results (in the last column) show that among women who have attained a minimum of secondary-level education, the risk of a second birth is significantly reduced by residence in the capital city (Nairobi) relative to residing in other rural areas. This is by a ratio of 0.598 (column 4). Apart from residence in the city, belonging to two of the other major ethnic groups in the country, relative to the biggest community (Kikuyu) is associated with a higher relative risk of a second birth for women with secondary or a higher level of education. Thus, although residence in the city has a significant effect on family formation patterns for these young couples, ethnic identity continues to exert some influence on the reproductive behaviour of educated women from other rural areas of Kenya, relative to those from Central.

The Effects of Ideal Family Size

The biasing effects of ideal family size notwithstanding, it turns out that this covariate is a significant predictor of the risk of a second birth. As can be seen at the bottom of column 3, Table 3, the higher the ideal family size desired, the higher the risk of a second birth. Women who are ambivalent about how many children they would want in life also have a high likelihood of a second birth. Nevertheless, the risks associated with ideal family size – and indeed risks for other covariates – may be biased. This is because ideal family size itself may be biased for a number of reasons, one of which being the downward adjustment of births desired in life by women who think that they have exceed the number believed to be ideal.

Table 3: Cox Regression Hazards for the Second Birth Interval, Kenya 1991-2003

Model:	Model 1	Model 2	Model 3	Model 4
<u>Covariate</u>				
Educational Level:				
None	1.000	1.000	1.000	
Primary	0.789**	0.779*	0.956	
Secondary+	0.692***	0.659**	0.869	
Region of Residence:				
Other Rural	1.000	1.000	1.000	1.000
Nairobi	0.603***	0.739**	0.750*	0.598*
Other Urban	0.689***	0.836	0.898	0.751
Central Rural	0.708***	1.136	1.229	1.185
Age at First Birth:				
10-17	1.000	1.000	1.000	1.000
18-24	1.073	1.081	1.094	1.027
25+	0.806	0.878	0.886	0.871
Survival of First Birth:				
1 Girl		1.000	1.000	1.000
1 Boy		1.047	1.023	1.071
0 Survivor		1.634**	1.660***	1.799
Year of First Birth:				
1991-1997		1.000	1.000	1.000
1997-2003		0.967	1.032	0.854
Wealth Index:				
Low		1.000	1.000	1.000
Medium		0.754**	0.786**	0.676
High		0.827*	0.891	0.819
Religion:				
Catholic		1.000	1.000	1.000
Protestant		1.024	0.980	1.002
Muslim		1.350*	1.184	0.832
Other		1.020	0.911	1.240
Ethnic Group:				
Kikuyu		1.000	1.000	1.000
Luhya		1.837**	1.799***	1.636*
Luo		1.654***	1.549**	1.602*
Kalenjin		1.587***	1.558**	1.581
Other		1.307*	1.316*	1.231
Ideal Family Size:				
≤3			1.000	
4-5			1.563***	
≥6			1.919***	
Non-numerical			1.802***	

Notes: 1. ***: p<0.001; **: p<0.01; *: p<0.05; 2. Reference categories are marked with a relative risk of unity (1.000).

5. Discussion and Conclusion

Results from this study have shown that education is negatively associated with the relative risk of a second birth. The relative likelihood of a second birth is lower among women who have attained at least secondary-school education than it is among those who have been educated to the primary level. Among women with at least secondary education, the covariates of risk are telling. Residence in the capital city is significantly associated with reduced risk of a second birth. Residual effects of belonging to particular ethnic groups are also significantly associated with increased risk of a second birth for these educated women.

The effects of education on birth-spacing might act through the change of attitudes that adolescent girls who attend school, in comparison to those who do not, go through (Westoff and Potvin 1966; Axinn and Barber 2001). That women with a secondary or higher level of education should be associated with lower risk of a second birth in Nairobi also underscores the importance of urbanization and the modern sector of the economy in family formation. This evokes the idea of the quality-quantity trade-off, whereby parents with higher incomes invest more in the children's quality and hence curtail fertility, and by implication resort to longer birth-spacing (Jensen 1985; Becker 1991; Hanushek 1992; Lam and Duryea 1999; Bryant and Zick 2005).

A number of conclusions follow from this study. First, unlike for those who have not attended schooling, formal education may at first affect birth spacing and hence fertility by changing adolescent women' attitudes towards fertility control as they are completing primary school. Secondly, there is a bigger and more significant influence of education on birth spacing once one has attained secondary-school or higher education (and particularly once living in an urban environment). At this level, aspects unique to the urban context, such as employment and hence the issue of time for childbearing and rearing, would become critical in the determination of fertility control (in this case birth-spacing and limitation). This implies that for these urban and educated women who have ever been in a union, the question of uncertainty (Johnson-Hanks 2004) in the socio-economic environment assumes the inverse dimension. Second birth intervals are not longer because of an uncertain future; the role of mother to many, more common in the rural areas, is constrained by the certain status of working mother.

Several recommendations - for policy and further research – ensue from the conclusions enumerated above. First, for a reproductive health policy that seeks to enhance birth spacing, continued and sustained education of girls (not just to primary-school level but to secondary and above) is the right way to go. Secondly, a longitudinal analysis that tracks the covariates of transitions to adulthood among young women (for example from adolescence to completion of school, to employment, to marriage, to first birth, and then to the second birth) would be informative on further dynamics of birth spacing.

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