PSC Discussion Papers Series

Volume 16 | Issue 4 Article 1

5-2002

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ISSN 1183-7284

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Discussion Paper no. 02-04

May 2002

On the web in PDF format: http://www.ssc.uwo.ca/sociology/popstudies/dp/dp02-04.pdf

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Abstract

Studying the dynamics of timing and spacing of births is important for several reasons including an understanding of completed family size as well as maternal and child mortality differentials. Using the 1998 DHS data, this paper examines whether there are intrinsic socio-cultural factors that affect the duration of birth intervals in Ghana. The results suggest that while most socio-cultural differences are mediated through socio-economic and demographic factors, there is the persistence of ethnic-specific norms and practices that affect the timing of births. At all durations, *Ewes* and *Mole-Dagbanis* were consistently found to have longer intervals between successive births than *Akans.* This has been explained through to ethnic differences in unobservable norms and observable practices such as lineage patterns, duration of the period of post-partum sexual abstinence and amenorrhoea. Besides the socio-economic and socio-cultural factors, other consistently significant covariates were age at first birth, birth cohorts and the survival status of the index. Age at first marriage was found to associate only with the timing of the first two children.

Introduction

For the past half century, several theoretical approaches have been developed and refined to explain variations in fertility (e.g., Blake and Davis, 1956; Becker, 1960; Easterlin, 1975; Bongaarts, 1978). While these models have undoubtedly broadened our perspectives on differentials in fertility, they mostly focus on completed or cumulative fertility as the key dependent variable. It is equally important, however, to study the variations in fertility in such entities such as timing and spacing of births. This is particularly relevant in societies characterised by low levels of contraceptive use where the interval between successive births is a key indicator of completed family size.

Studying the dynamics of birth spacing, defined as the interval between successive births, is of interest for several reasons. First, several inferences are consistent with the view that in much of the developing world, couples having large families space births closer than couples with smaller families. This suggests that the timing of births may be inversely related to completed or cumulative fertility. Further, the timing of births has a significant bearing on maternal and child health through the dynamics of *sibling competition, maternal depletion* and *interval effect* hypotheses (Hobcraft et al., 1985; Palloni and Millman, 1986; Majumder et al., 1997; Rafalimanana and Westoff, 2000; Pedersen, 2000). According to the competition hypothesis, the birth of each successive child generates competition for scarce resources among siblings in the household which subsequently leads to a lower quality of care and attention to each child. The family resources may also be stretched to the limit, increasing the probability of children in such households becoming malnourished (Gribble, 1993). Again, successive births may physiologically deplete the mother of energy and nutrition which may lead to premature births or pregnancy complications, increasing the risk of infant or maternal death, or impair the mother's ability to nurture her children. Additionally, it has also been argued that women with closely spaced births may still have very young children and, as such, are less likely to attend prenatal care services. Further, the early arrival of a new child necessitates the premature weaning of the previous child, often exposing the weaned child to malnutrition and increasing their vulnerability to infectious and parasitic diseases. Invariably, longer duration of the inter-birth interval has been found to increase profoundly the probability of infant survival (Bicego and Ahmad, 1996; Defo,1997; Pedersen, 2000).

An examination of the timing and spacing of births thus provides a thorough understanding of attitudes toward family size as well as differentials in fertility and childhood mortality levels. The median length of birth interval in Ghana is about 38 months which differ significantly among groups in a bivariate context (GSS and MI, 1999:34). In two related studies using World Fertility Survey (WFS) data, Oheneba-Sakyi (1989,1993) identified a number of socio-demographic covariates associated with birth intervals in Ghana. This paper extends this work by using more recent data and examining the relative effects of socio-economic vis-a-vis socio-cultural factors on th timing of births. The major research question is whether there are intrinsic socio-cultural factors that affect the timing and spacing of births in Ghana irrespective of socio-economic factors.

Group differences in reproductive behavior are usually explained from the characteristics and socio-cultural perspectives (e.g., United Nations, 1987;Caldwell et al., 1987,1992). While the former attributes variations in fertility behavior to socio-economic and demographic differences among groups, the latter assigns a unique role to culture as key to understanding variations in fertility. We argue that these viewpoints are synergetic in that while some socio-cultural differences are likely to attenuate in the context of socio-economic factors, there is the likelihood of the persistence of some ethnic specific practices. To test for the independent effects of socio-economic and socio-cultural factors, three models will be estimated for each birth interval. Models 1 and 2 will respectively control for the independent effects of socio-economic and socio-cultural variables while Model 3, the full model, will combine Models 1 and 2 together with the control variables. Consistent with our reasoning, it is hypothesized that if socio-cultural differences persist, they are likely to be manifested through ethnicity.

Theoretical perspectives

Generally, differences in the timing and spacing of births can be explained through demographic, socio-economic and socio-cultural factors. On the basis of previous work, we have selected an array of theoretically relevant variables, organized under socio-economic, socio-cultural and demographic controls, as likely covariates of birth intervals in Ghana. Table 1 presents the distribution of the covariates for each duration. The control factors include birth cohort, age at first marriage and at first birth, region of residence, survival status of the index child and the length of the preceding interval. A birth cohort is indicative of structural factors that have shaped the life of individuals. At the macro level, similar life experiences can be detected among women belonging to the same cohort despite subtle micro level differences. In this paper, three birth cohorts measured as a nominal variable are identified (born before 1960; born between 1960-1969; and those born after 1970). Given the changing contextual factors affecting reproduction in Ghana, we expect the younger cohorts, who became adolescents in a period of a more egalitarian gender role, efficient contraceptives, and higher female enrolments in formal education, to space births more widely than earlier cohorts.

Age at first marriage and at first birth are also of tremendous importance in fertility studies because of their inverse relation to the exposure to the risk of conception (see, e.g., Westoff, 1992). They also represent a number of unmeasured factors that predispose women to differential timing of births and, thus, overall fertility. Women who marry at younger ages or have first births earlier are likely to come from disadvantaged socio-economic backgrounds and are thus more likely to be associated with the higher risks of births than their counterparts whose first marriages or first birth occurs late (Gyimah, 2001, 2002). Women who marry late are expected to quicken the pace of the first birth because of the social pressure to prove they have not past their prime reproductive age. Further, like most developing countries, Ghana shows a marked spatial imbalance in development which has it roots in the historical and developmental processes of the country (Nabila, 1987). Generally, the level of socio-economic development is more advanced in the *south* than the *north* although the former is far from homogeneous. If the conventional relationship between development and fertility holds, women in the *south* are expected to space births more widely than their counterparts in the *north*.

Also significant in determining the length of the inter-birth interval is the survival status of the index child (Montgomery and Cohen, 1998; Preston, 1978). In Ghana, it has been demonstrated that intervals following the death of the index child tend to be significantly shorter than intervals where the child survived, a result of biological and behavioral processes (Gyimah,2001;Gyimah and Fernando, forthcoming). We thus expect the death of the index child to be associated with shorter intervals. Further, breastfeeding and contraceptive use have been found to be significant correlates of birth intervals (Sathar, 1989; Trussell et al., 1985). Unfortunately, information on these was only available on births that occurred three years before the survey. Analyzing these births only is less representative and introduces a bias since births that occurred among the older birth cohort will be excluded. To circumvent this problem, we included all births and by so doing could not use the information available on contraception and breastfeeding. However, given that the length of the preceding interval can be considered a proxy for the combined effects of proximate variables such as length of the voluntary and involuntary abstinence and effective contraceptive use (e.g., Trussell et al., 1985; Rodriguez et al., 1984), the preceding interval *I* is introduced as a categorical covariate in the transition to parity *I+1*. We expect shorter preceding intervals to associate shorter succeeding ones and vice-versa.

Turning to the socio-economic factors, there is considerable empirical evidence that associates urban residence and high levels of maternal education with low fertility. The pathways through which these happen have been explained through an array of mechanisms including late age at marriage, greater knowledge and access to contraception, high labor force participation and alternative values regarding family size (Martin, 1995;Ware 1984). In a Ghana, previous work has found a positive linear effect of education on the intervals between successive births (GSS and MI, 1999). Consistent with previous research, we expect the intervals between births to be widely spaced among urban residents and women with secondary education across models.

Among the socio-cultural factors are ethnic-specific practices, norms, and values that capture both observable and unobservable behavioral and cultural factors affecting reproductive behavior. The major ethnic groups in Ghana are the *Akans, Mole-Dagbanis, Gas,* and *Ewes* who differ on duration of post-partum abstinence and breastfeeding (see for example, Benefo et al., 1994). We expect the persistence of ethnic differences on birth spacing. Turning to marriage, on the basis of the complexity of the relationship between the type of marital union and fertility in sub-Saharan Africa at the individual level (e.g., Ahmed,1986; Garenne and van de Walle, 1989; Sichona, 1993), we classified currently married women into either monogamous or polygynous unions. Following Garenne and van de Walle (1989), we expect women in polygynous union to associate with longer birth intervals than those in monogamous unions. The premise is that not only do polygynous wives marry older men whose fertility is much lower but they also tend to spend more time away from their spouses than their monogamous counterparts. For the timing of the first birth, however, we do not expect any significant differences between monogamous and polygynous unions since women would like to prove their fecundity to their spouses irrespective of marital union.

Also, previous research has shown religious affiliation to be a strong correlate of contraceptive use and abortion. In this study, religious affiliation is measured on a nominal scale and categorized into the following (1) Catholics (2) Other Christian (3) Muslim (4) Traditional (5)Protestants, and (6) Others. For the interval between the marriage and first birth, we expect traditionalists to have longer intervals because of the practice of taking sub-fecund younger women in marriage. Catholics are known for their stance on fertility regulation and contraception, and as such, are expected to space births closer than Protestants. Similarly, the pro-natalist attitude of Moslems and traditionalists is likely to predispose them shorter interval between successive births. It is argued, however, that religious differences operate mainly through socio-economic and demographic factors and are likely to diminish when these factors are considered.

Data and methods

The 1998 Ghana Demographic and Health Survey (GDHS), undertaken by the Ghana Statistical Service in conjunction with Macro International within the broader framework of DHS program for developing countries, for was used for this study. The GDHS is a national representative, stratified, self-weighting probability sample of women in the reproductive ages of 15 to 49 years. The data includes 3427 ever married women with at least one birth of which a further 265 with premarital births were dropped. Data quality is a concern to any study that uses retrospective data to examine the timing of events as this paper does. Although there are non sampling errors on some age-related variables in the DHS, several studies suggest the data compare favorably with other large scale surveys such as the World Fertility Survey (Gage, 1995).

In general, birth intervals refer to the duration between successive births, and in the case of the first birth, the duration that elapsed since first marriage. The intervals were estimated using birth history information on birth order, dates of birth, survival status of each child and age at death, if applicable. The first interval is calculated as the duration in months between the date of marriage and the date of first birth. The other intervals were estimated by subtracting the date of birth of the lower birth order from the higher birth order. For open intervals, the date of the last child is subtracted from the interview date to obtain the length of time elapsing since the last birth. Methodological concerns in studying spacing between births have been well discussed in the literature (e.g., Trussell et al., 1985). The major issues are the truncation problem of selectivity and right censoring which may produce biased estimates. Selectivity is caused by factors such as the restriction of the sample to a specified age group and also the fact that only women surviving at the time of the survey could be studied. Right censoring is caused by the incomplete experience of the event at the time of the interview and thus excludes any event that may occur after the interview. These methodological issues are overcome by using survival models which conventionally consider censored cases in the estimation of exposure time. To overcome the problem of censoring, survival models make the assumption that censored individuals will eventually experience the event at some future time. Additionally, censoring is assumed to occur randomly over the interval such that censored individuals are assumed to be at risk of experiencing the event at the mid point of the interval.

For the multivariate analysis, a log normal Accelerated Failure Time (AFT) model which assumes the log of timing follows a normal distribution was used in examining the timing of births. This parametric distribution is suitable for duration models with non-monotonic hazard rates that initially increase and decrease thereafter. The choice of the log-normal distribution derives from its suitability in substantive theory (Richards, 1983; Trussell and Richards, 1985) and also from a series of graphical and empirical methods for discriminating between different distributions (Gyimah, 2001). The log-normal hazard $h(t)$, survival $S(t)$, and density $f(t)$ functions are :

[1]

$$h(t) = \frac{\frac{1}{t\sigma\sqrt{2\pi}} \exp\left[\frac{-1}{2\sigma^2}\left\{\ln(t) - \mu\right\}^2\right]}{1 - \Phi\left\{\frac{\ln(t)-\mu}{\sigma}\right\}}$$

[2]

$$S(t) = 1 - \Phi\left\{\frac{\ln(t) - \mu}{\sigma}\right\}$$

3]

$$f(t) = \frac{1}{t\sigma\sqrt{2\pi}} \exp\left[\frac{-1}{2\sigma^2}\left\{\ln(t) - \mu\right\}^2\right]$$

where;

$\Phi(z)$ is the standard normal cumulative distribution function;

σ is the standard deviation of the normal distribution, and

μ is the mean.

The model is implemented by setting $\mu = x\beta$, where x is the covariate and β is the coefficient vector. The focus of parametric models is primarily the timing function. The parameter estimates reflect negative or positive effects on the timing of the event under study. When coefficients are suitably transformed by exponentiation (e^{β}), they can be interpreted as time ratios. For each covariate, a time ratio greater than one indicates a longer duration for the group with the associated characteristic than for the reference group. Conversely, a time ratio less than one works to decelerate the timing of the event compared with the reference category. For example, if in the timing of second birth, the time ratio associated with variable *k* is greater than one, it is expected that women with this attribute would have a longer survival time and thus a lower risk of second birth than women in the reference category.

Findings and Discussion

Interval between marriage and first birth

Starting with the interval between marriage and the first birth, survival analysis indicate that the median duration is 15.3 months which differ among groups (Fig. 1). For example, Figure 1 suggests that about 50 percent of women with secondary education had a first birth within 10 months after marriage compared with about 30 percent of those with no education. Similar differences by ethnicity and religious affiliation are also noticeable. Table 2 presents the covariates associated with the first interval in a multivariate context. While there is no significant difference by residence, the results indicate that women with secondary education have a shorter time to first birth. As Model 1 suggests, the time to the first birth is about 12 percent shorter among women with secondary education compared with those with no education. The negative effect of education on the first interval is probably because highly educated women are more likely to cohabit before marriage and also more fecund at marriage than their counterparts with no education.

Further, some significant ethnic and religious differences are also noticeable. From the full model, the time to the first birth is 18 percent longer among traditionalists, 13 percent longer among *Gas*, and 25 percent longer among *Mole-Dagbanis*. Two sets of explanations could account for the longer transition between marriage and the first birth for these groups. First, the longer transition among the traditionalists as well as the *Mole-Dagbanis* could not be due to intentional use of contraceptive to delay first births, but most likely to the temporality of adolescent sterility and sub-fecundity— a consequence of betrothal where marriages are customarily contracted at very young ages. In a preliminary analysis (not produced here), the mean age at first marriage, for example, was found to be lowest among *Mole-Dagbanis,* with some marriages occurring as early as age six. Given the younger ages at which these women marry, it could be argued that the majority are sub-fecund at marriage and, as such, it may take a longer time to reach their full reproductive potential. The longer transition among the *Gas*, on the other hand, could be due to the use of modern contraception.

Also important in the transition to the first birth is age at first marriage. Invariably, the later a woman marries, the sooner she has a first birth validating findings elsewhere (e.g., Sathar,1988). The results suggest that a year increase in the age at first marriage reduces the median interval to the first birth by about 3 per cent. A number of explanations can be advanced to account for the observed pattern. First, women who marry late are more likely to cohabit before marriage and are also more fecund at marriage than those who marry at very young ages. Perhaps, of significant importance is the enormous social pressure usually put on women who marry late to prove their fecundity soon after marriage. As a consequence, such women are more likely to quicken the pace of the first birth than their counterparts who married early. Besides the social pressure, physiologically, women who marry late may have a smaller window for reproduction and, as a result, are more likely to hasten the pace of childbearing in order not to miss out.

Intervals between successive births

Turning to the intervals between successive births, some uniformly consistent patterns are noticeable as shown in Tables 3 to7. The log likelihood ratio for each duration suggests that the socio-economic model (Model 1) provides better fit than the socio-cultural model (Model 2). In relative terms, this implies that the socio-economic factors of education and residence explain more of the variance in the length of the birth interval than the socio-cultural factors of ethnicity, religion and marital union. At all intervals, Model 1 shows that women who live in urban areas space births more widely than their rural counterparts. Similarly, women with secondary education tend to have longer intervals between successive births than their counterparts with no education, the effect being largest at higher parities. Across models, there is only a slight change in the effects of secondary education and residence for each duration, validating the robustness of the effects. Thus, consistent with theoretical expectation, secondary education and urban residence significantly relate with the later timing of births. The stronger effects of education at higher parities indicate that secondary education has more effect on the timing of higher order births than lower parity births.

Maternal education and urban residence influence birth spacing through a number of pathways. Although secondary educated women in Ghana have significantly lower duration of post-partum insusceptibility period, they space births more widely because they tend to have better knowledge of contraception and are more likely to use more efficient methods. As demonstrated in the DHS published report, about 50 per cent of women with secondary education were current users of contraception compared with only 8.2 percent of those with no education (GSS and MI, 1999). Besides better knowledge and use of contraceptives, education also affects reproductive decisions through its influence on a wide spectrum of social psychological orientations in women, including freedom from tradition, heightened aspirations for themselves and their children, and attitudes and sentiments toward smaller families (Ware, 1984; Gyimah, 2001). For example, the ideal number of children for Ghanaian women with secondary education is 3.4 compared with 5.5 for those with no education, and 4.3 for those with primary education.

The socio-cultural model (Model 2) also shows some consistent effects of ethnicity and religious affiliation across durations. Although not always significant, Catholics, Moslems, and traditionalists tend to space births more closely than Protestants. This is consistent with the previous research on religion and reproductive behaviour. The Catholic Church's position on birth control and abortion, and the pro-natalist practices of Moslems might explain their shorter birth intervals. It is also worth noting that while traditionalists have longer median duration between marriage and first birth, the trend is reversed after the first birth, perhaps reflecting pro-natalist attitudes and non-use of modern contraception. On ethnicity, the *Ewes, Gas* and *Mole-Dagbani*s tend to have longer intervals between successive births compared with the *Akans* as indicated in Model 2.

The robustness of the socio-cultural factors and the extent to which they are mediated by socio-economic and other factors is assessed in Model 3. It is worth noting that the religious differences disappear in the full model validating recent studies that have observed a convergence in religious differences in reproductive behavior in Ghana (Addai, 1999; Gyimah, 2001, 2002; Gyimah and Fernando, forthcoming). The religious differences in the timing of births thus seem to be due to demographic and socio-economic differences. However, there is persistent ethnic differences across durations as shown in Model 3. For example, being an *Ewe* or *Mole-Dagbani* shows a uniformly consistent significant effect across durations. Relative to *Akans*, for instance, the interval between the second and third births is 15 percent longer among the *Ewes* and 8 percent longer among the *Mole-Dagbanis*.

It is worth emphasizing, however, that the longer birth intervals among the *Mole-Dagbanis* could not be due to high contraceptive use since they are among lowest users of modern contraception in Ghana. In preliminary analysis (Appendix 1), current use of modern contraception among ever married women was only 8.2 percent among *Mole-Dagbanis* and 11 percent among *Ewes* compared with 13.3 percent among *Akans* and 17 percent among *Ga*s. Similarly, the proportion who have never used contraception was found to be highest (73 percent) among *Mole-Dagbanis*. The explanation should rather be sought through ethnic norms and practices such as duration of breastfeeding and post-partum sexual abstinence that traditionally lengthen intervals between successive births. Traditionally, *Ewes* and *Mole-Dagbanis* are expected to refrain from sexual intercourse following birth for longer periods than *Akans* and *Gas* (Benefo et al., 1994). Further analysis of the DHS suggested that the median duration of breastfeeding and amenorrhea was longest among the *Mole-Dagbanis* (Appendix 2). The mean duration of amenorrhea, for example, is 20 months among the *Mole-Dagbanis* compared with 12 and 15 months among *Gas* and *Akans* respectively (Appendix 2).

Also important is the distinctive ethnic differences in lineage and residential patterns. Among the matrilineal *Akans*, the norm is for husband and wife to continue living apart after marriage unlike the patrilineal *Ewes* and *Mole-Dagbanis* where the wife moves in with the husband's family. As Christensen (1954) has observed, the *Akan* wife may continue to live with her mother and siblings who are most likely to assist her in raising her children. The matrilocal residence of *Akans* thus ensures more flexibility in childbearing and upbringing than the patrilocal residence of the *Ewes* and *Mole-Dagbanis.* The greater flexibility in who raises the child of an *Akan* woman means that mothers do not necessarily bear the overall burden of raising their children. As has been found elsewhere, cost-sharing in the up-bringing of children could sustain high fertility (e.g., Isiugo-Abanihe, 1985). Again, the hypothesis that women in polygynous unions associate with longer birth intervals than those in monogamous unions is validated by the results although the effects are not consistently significant. We expected a longer duration for polygynous unions because the presence of other wives not only reduces coital frequency but also gives such women the opportunity to observe a long post-partum period resulting in a slower pace of child bearing.

The effects of the control variables are also in the expected direction. There is a consistent effect of birth cohorts on the transition to subsequent births. At all durations, births are widely spaced among recent cohorts, the effect being largest at higher parities. The transition time to the second birth, for instance, is 15 percent longer among women born after 1970 compared with those born before 1960. Also, while effects of *northern* residence is consistent and in the hypothesized direction, the effects are not significant across durations. Further, the age at which women start reproduction affects a variety of demographic and non-demographic processes. This is more so in Ghana characterized by low levels of contraceptive use and low median ages at first birth and first marriage. The findings suggest, however, that age at first marriage is only significant for the timing of the first and second births. Thus, women who marry late quicken the pace of the first and second children after which the effect dissipates. This contradicts the findings reported by Oheneba-Sakyi (1993) where no significant effect was found. Another significant determinant on the duration between births is the age at first birth. At all durations, late age at first birth is associated with longer interval and thus a lower risk of subsequent birth. This substantiates the conventional relationship between age at first birth and completed fertility .

There is also a consistent expected effect of the survival status of the index child on the transition to subsequent births. At all durations, the death of the index child significantly reduces the transition time to subsequent births. For instance, the interval between the first and the second birth is 34 percent shorter if the first child died as an infant than if the child survived. This finding is consistent with previous research in Ghana about the effects of the status of the index child on the risk of subsequent births (Gyimah, 2001; Gyimah and Fernando, forthcoming; Nyarko et al., 1999; Oheneba-Sakyi, 1993). The theoretical pathways through which childhood mortality affects fertility have been identified as physiological, behavioral replacement, and insurance effects (e.g., Preston, 1978; Montgomery and Cohen, 1998). The physiological effect mainly operates through premature weaning and truncation of the inter-birth interval following an infant death. In its usual rendition, the behavioral hypothesis refers to the deliberate efforts a couple makes to bear another child in the hope of replacing the lost one. Additionally, women with childhood mortality experiences tend to have a significantly more children ever born than their counterparts without such experience. Again, within the framework of the behavioral effect, women with child loss experience are less likely to use contraception and, more likely to discontinue if they are already using contraception. Among Ghanaian women, for example, Nyarko et al. (1999) observed that mothers with a previous child death were 57 percent less likely to use contraception compared with mothers with no childhood mortality experience.

Conclusions

This study has highlighted the relative significance of socio-economic and socio-cultural factors on the duration of birth intervals in Ghana. For all birth intervals, the log likelihood ratios suggest that the socio-economic models explain more of the variance in the dependent variable than the socio-cultural models. Although the modernizing effects of the education and urbanization seem to be powerful influence on the timing of births, the belief that there are intrinsic observable and unobservable ethnic norms and practices is supported by these findings. Revisiting the major research question, the results thus challenge the view that ethnic differentials are mainly due to demographic and socio-economic differences among groups.

Substantively, the findings suggest that younger cohorts spaced births more widely than older cohorts, perhaps an indication of an attitudinal change regarding completed family size. Also, women with secondary education and urban residents tended to space births more widely. The wider spacing among these groups has obvious consequences for completed family size and reproductive health. Child spacing has been found to play an important role in fertility transition as a result of its inverse relationship with completed family size. In Table 8, we present the mean number of children ever born by selected characteristics. With the exception of the *Mole-Dagbanis*, groups with longer birth spacing tended to have a significantly fewer number of children ever-born. For example, the mean number of children ever born to women with secondary education is 3 compared with 4.4 among those with no education. Similarly, the mean number of children ever born to women above 35 years is 3.9 for city residents compared with 5.8 for rural residents, a difference of about two children. As Caldwell and Caldwell (2002) point out, the effect of traditional method of birth spacing on completed fertility is offset by pubertal marriage, polygyny and widow inheritance. This seems the case among the *Mole-Dagbani* whose longer intervals between successive births is not translated into smaller completed family size as the other groups. This suggests that to achieve a reduction in family size, family planning policies could focus more on modern methods of spacing.

From a policy perspective, the effect of age at first birth on the timing and spacing of births is worth emphasizing. Consistently, women who had first birth earlier were found to space births closer than those whose first births occurred late. This implies that the postponement of first births might be a key to reducing fertility and improving the reproductive life of women. Table 8 confirms the linear relationship between age at first marriage and at first birth on children ever born. Among women above 35 years, for instance, those who had first births before age 18 had about 6.4 children compared with 4.2 children among those who had first births after age 21. While recent data suggest significant increase in the median age at first birth and a decline in the proportion of births occurring before age 18 in Ghana (GSS and MI, 1999), more needs to be done to sustain this momentum. Indeed, the moral argument against youth programs on family life education in sub-Saharan Africa has been weakened in recent years by the reality of the HIV/AIDS epidemic. It is expected that family planning programs will take advantage of the present social environment to educate, inform and communicate with the youth on contraceptive use, delaying first births and getting higher education.

Finally, it was consistently observed that women with child loss experience spaced births closer than those without child loss experience. This provides evidence that improvements in child survival programs could significantly reduce fertility through both the biological and behavioural effects. Thus, any serious effort to address the problem of high fertility should also seek to improve child survival. While Ghana has somewhat efficient Maternal and Child Health (MCH) programs, more could be achieved through a carefully designed health care delivery system. In many rural communities, there is the genuine fear that immunization would rather make children more vulnerable to infectious and parasitic diseases. This calls for an intensified social campaign on antenatal, delivery and post-natal services as part of MCH and Expanded Program on Immunization (EPI) programs.

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Table 1: Percent Distribution of Selected Covariates at Diiferent Intervals

SOCIO-ECONOMIC FACTORS	Marriage and first birth interval	Interval between successive births				
		1-2	2-3	3-4	4-5	5-6
Current residence						
City	14.6	13.4	12.0	9.2	7.9	6.1
Small town	13.8	13.8	13.2	13.4	11.3	11.4
Rural (reference)	71.5	72.9	74.8	77.5	80.7	82.6
Education						
Primary	17.7	17.8	17.3	17.6	18.0	19.2
Secondary	39.2	35.8	32.1	29.0	26.0	21.9
None (reference)	43.1	46.3	50.6	53.4	55.9	58.9
SOCIO-CULTURAL FACTORS						
Religion						
Cathoilic	15.3	14.9	14.7	14.4	15.4	15.7
Moslem	13.3	13.9	14.1	13.9	14.0	14.2
Traditional	9.5	10.5	12.0	13.8	14.3	15.7
Other christian	33.5	32.1	30.6	28.9	28.7	28.4
Others	11.0	11.8	12.0	12.5	13.0	12.7
Protestants (reference)	17.3	17.2	16.4	16.4	14.6	13.4
Ethnicity						
Ga	6.6	6.4	5.8	5.4	4.2	3.9
Ewe	12.8	12.6	11.9	11.6	11.4	11.1
Mole-Dagbani	32.5	33.5	65.6	36.8	38.6	39.5
Others	3.6	3.6	3.9	4.1	4.2	4.5
Akan (reference)	44.3	43.9	42.8	42.2	41.6	41.1
Marital union						
Polygynous	22.9	25.2	26.9	28.0	29.5	29.7
Not currently married	13.7	12.3	11.7	11.8	12.1	10.9
Monogamous (reference)	63.4	62.5	61.4	60.2	28.3	59.3
CONTROL VARIABLES						
Birth cohort						
After 1970	35.6	25.1	14.5	8.0	3.1	1.5
1960-1969	31.3	35.4	37.8	36.1	31.3	25.1
Before 1960 (reference)	33.0	39.5	47.7	55.9	62.6	73.4
Region of residence						
Northern Ghana	28.9	30.1	32.5	36.3	35.6	36.9
Southern Ghana (reference)	71.1	69.1	67.5	66.4	64.4	63.1
Survival statius of index child						
Died as infant	-	17.3	16.7	15.8	16.6	17.8
Survived (reference)	-	82.7	83.3	84.2	83.4	82.2
SAMPLE SIZE	3162	2542	1966	1495	1070	740

Fig. 1: Survival Function of the Duration between Marriage and First Birth by Education, Religion and Ethnicity

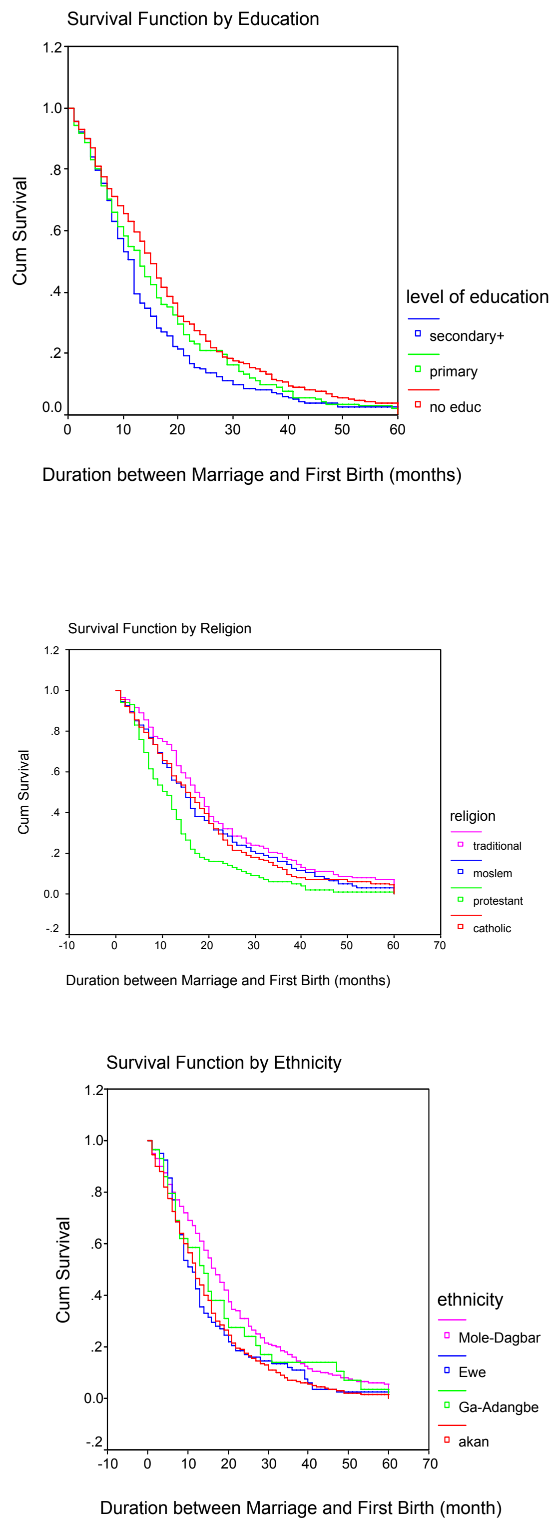


Table 2: AFT Model of the Duration between Marriage and First Birth

	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	1.03		1.04
Small town	1.00		1.02
Rural (reference)	1.00		1.00
Education			
Primary	0.00		1.03
Secondary	0.88***		1.02
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			
Cathoilic		1.03	1.02
Moslem		1.03	1.02
Traditional		1.16!	1.18*
Other christian		0.99	0.99
Others		0.96	0.95
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.13!	1.13!
Ewe		0.94	0.96
Mole-Dagbani		1.19***	1.25***
Others		0.97	1.01
Akan (reference)		1.00	1.00
Marital union			
Polygynous		0.97	0.98
Not currently married		0.95	0.94
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			
Birth cohort			1.05
After 1970			1.00
1960-1969			1.00
Before 1960 (reference)			
Region of residence			
Northern Ghana			0.95
Southern Ghana (reference)			1.00
Age at first marriage			0.97***
Sample size	3061	3061	3061
Log Likelihood	-4335	-4318	-4306
LR Chi-Square	8	43	64
Df	4	11	19
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 3: AFT Model of the Duration between First and Second Birth

	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	1.12***		1.10***
Small town	1.15***		1.14***
Rural (reference)	1.00		1.00
Education			
Primary	1.05!		1.03
Secondary	1.20***		1.17***
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			0.97
Cathoilic		0.69	0.97
Moslem		0.92!	0.94
Traditional		0.83***	0.92
Other christian		0.96	0.98
Others		0.87***	0.93!
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.13***	1.08!
Ewe		1.05	1.07*
Mole-Dagbani		0.98	1.12**
Others		0.91	0.99
Akan (reference)		1.00	1.00
Marital union			
Polygynous		1.05!	1.08***
Not currently married		1.26***	1.28***
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			
Birth cohort			
After 1970			1.15***
1960-1969			1.03
Before 1960 (reference)			1.00
Region of residence			
Northern Ghana			0.95
Southern Ghana (reference)			1.00
Survival statius of index child			
Died as infant			0.76***
Survived (reference)			1.00
Age at first marriage			0.98*
Age at first birth			1.02***
Length of preceding interval			
Under 19 months			1.08!
19-30 months			1.05
Above 30 month (reference)			1.00
Sample size	2505	2505	2505
Log Likelihood	-2536	-2542	-2443
LR Chi-Square	113	101	299
Df	4	11	22
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 4: AFT Model of the Duration between Second and Third Birth

	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	1.31***		1.33***
Small town	1.10*		1.10**
Rural (reference)	1.00		1.00
Education			
Primary	1.15***		1.11***
Secondary	1.40***		1.32***
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			
Cathoilic		0.99	1.03
Moslem		0.90!	0.96
Traditional		0.84**	1.05
Other christian		0.94	0.97
Others		0.84***	0.94
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.13*	0.98
Ewe		1.13***	1.15**
Mole-Dagbani		0.96	1.08!
Others		0.87!	0.93
Akan (reference)		1.00	1.00
Marital union			
Polygynous		0.97	1.04
Not currently married		1.38***	1.40***
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			
Birth cohort			
After 1970			1.47***
1960-1969			1.09***
Before 1960 (reference)			1.00
Region of residence			
Northern Ghana			0.96
Southern Ghana (reference)			1.00
Survival statius of index child			
Died as infant			0.72***
Survived (reference)			1.00
Age at first marriage			1.00
Age at first birth			1.01**
Length of preceding interval			
Under 19 months			0.73***
19-30 months			0.77***
Above 30 month (reference)			1.00
Sample size	1966	1966	1966
Log Likelihood	-2705	-2742	-2514
LR Chi-Square	198	124	581
Df	4	11	22
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 5: AFT Model of the Duration between Third and Fourth Birth

	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	1.58***		1.48***
Small town	1.19***		1.18***
Rural (reference)	1.00		1.00
Education			
Primary	1.12*		1.00
Secondary	1.52***		1.30***
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			
Cathoilic		0.97	1.01
Moslem		0.94	1.01
Traditional		0.76***	0.95
Other christian		0.98	1.01
Others		0.77***	0.87*
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.19*	0.99
Ewe		1.15**	1.11*
Mole-Dagbani		0.90*	1.06!
Others		0.82!	0.88
Akan (reference)		1.00	1.00
Marital union			
Polygynous		0.99	1.11***
Not currently married		1.50***	1.52***
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			1.00
Birth cohort			
After 1970			1.47***
1960-1969			1.09***
Before 1960 (reference)			1.00
Region of residence			
Northern Ghana			0.96
Southern Ghana (reference)			1.00
Survival statius of index child			
Died as infant			0.66***
Survived (reference)			1.00
Age at first marriage			0.99
Age at first birth			1.05***
Length of preceding interval			
Under 19 months			0.57***
19-30 months			0.63***
Above 30 month (reference)			1.00
Sample size	1466	1466	1499
Log Likelihood	-2523	-2568	-2207
LR Chi-Square	245	155	877
Df	4	11	22
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 6: AFT Model of the Duration between Fourth and Fifth Birth

	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	1.87***		1.75***
Small town	1.41***		1.42***
Rural (reference)	1.00		1.00
Education			
Primary	1.13*		1.04
Secondary	1.78***		1.51***
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			
Catholic		0.87!	0.92
Moslem		0.91	0.95
Traditional		0.70***	0.99
Other christian		0.89!	0.93
Others		0.68***	0.86!
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.34***	1.05
Ewe		1.20***	1.16*
Mole-Dagbani		0.83***	1.00
Others		0.70***	0.80!
Akan (reference)		1.00	1.00
Marital union			
Polygynous		0.93	1.02
Not currently married		1.51***	1.47***
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			
Birth cohort			
After 1970			3.44***
1960-1969			1.34***
Before 1960 (reference)			1.00
Region of residence			
Northern Ghana			0.92
Southern Ghana (reference)			1.00
Survival statius of index child			
Died as infant			0.59***
Survived (reference)			1.00
Age at first marriage			
Age at first birth			1.08***
Length of preceding interval			
Under 19 months			0.50***
19-30 months			0.51***
Above 30 month (reference)			1.00
Sample size	1038	1038	1038
Log Likelihood	-2169	-2238	-1800
LR Chi-Square	289	152	1029
Df	4	11	22
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 7: AFT Model of the Duration between Fifth and Sixth Birth

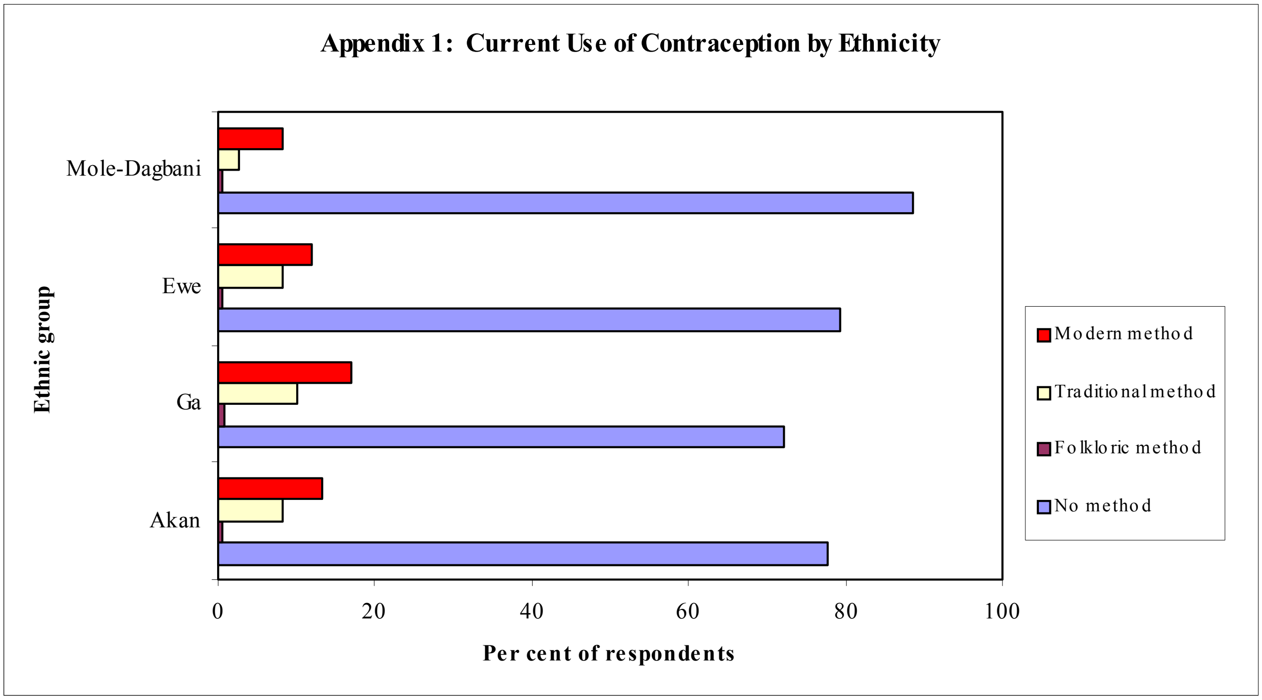
	Model 1	Model 2	Model 3
SOCIO-ECONOMIC FACTORS			
Current residence			
City	2.21***		1.88**
Small town	1.40***		1.33***
Rural (reference)	1.00		1.00
Education			
Primary	1.14!		0.95
Secondary	2.1***		1.50***
None (reference)	1.00		1.00
SOCIO-CULTURAL FACTORS			
Religion			
Catholic		0.75**	0.88
Moslem		0.78*	0.84
Traditional		0.54***	0.89
Other christian		0.78**	0.89
Others		0.58***	0.78*
Protestants (reference)		1.00	1.00
Ethnicity			
Ga		1.47***	1.24!
Ewe		1.21***	1.18!
Mole-Dagbani		0.85***	1.12!
Others		0.70*	0.83
Akan (reference)		1.00	1.00
Marital union			
Polygynous		0.95	1.05
Not currently married		1.72**	1.65***
Monogamous (reference)		1.00	1.00
CONTROL VARIABLES			
Birth cohort			
After 1970			5.76***
1960-1969			1.64***
Before 1960 (reference)			1.00
Region of residence			
Northern Ghana			0.75*
Southern Ghana (reference)			1.00
Survival statius of index child			
Died as infant			0.57***
Survived (reference)			1.00
Age at first marriage			0.97
Age at first birth			1.10***
Length of preceding interval			
Under 19 months			0.36***
19-30 months			0.40***
Above 30 month (reference)			1.00
Sample size	712	712	712
Log Likelihood	-1793	-1851	-1422
LR Chi-Square	259	144	1001
Df	4	11	22
Probability	0.00	0.00	0.00

Significance: ***= 0.00; **= 0.01; *=0.05; !=1.10.

Table 8: Mean Number of Children Ever Born (CEB) by selected Characteristics

	ALL WOMEN		WOMEN ABOVE 35 YEARS OLD	
	Mean No. of CEB	N	Mean No. of CEB	N
Birth cohort				
After 1970	1.9	1127	-	-
1960-1969	3.8	991	4.4	342
Before 1960	5.7	1044	5.7	1044
Current residence				
City	2.9	463	3.9	201
Small town	3.5	437	4.8	203
Rural	4.0	2262	5.8	902
Education				
None	4.4	1363	6.1	653
Primary	3.8	559	5.6	227
Secondary	3.0	1240	4.3	506
Religion				
Cathoilic	3.7	483	5.3	266
Moslem	3.9	422	5.6	173
Traditional	4.9	301	6.2	167
Protestant	3.5	548	4.6	283
No religion/spiritualist	4.1	346	6.0	144
Other religion	3.5	1060	5.4	393
Ethnicity				
Ga	3.2	210	4.2	91
Ewe	3.5	406	4.9	188
Mole-Dagbani	4.1	1029	5.9	450
Others	4.1	115	6.2	46
Akan	3.7	1402	5.3	611
Marital union				
Polygynous	4.3	725	5.5	383
Not currently married	3.7	433		224
Monogamous	3.4	2004	5.6	779
Age at first marriage				
Under 17 years	4.2	1065	6.1	416
17-20	3.8	1464	5.6	627
21 and above	3.1	633	4.1	343
Age at first birth				
Under 18 years	4.5	835	6.4	332
18-21 years	3.7	1439	5.8	579
above 21 years	3.1	888	4.2	475
Region of residence				
Northern Ghana	4.2	914	6.0	416
Southern Ghana	3.6	2248	5.1	970
TOTAL	3.8	3162	5.4	1386

Note: Based on ever married women with at least one birth


Appendix 1: Current Use of Contraception by Ethnicity
Ethnic group
Mole-Dagbani
Ewe
Ga
Akan
0
20
40
60
80
100
Per cent of respondents
Modern method
Traditional method
Folkloric method
No method

Appendix 2: Duration of Breastfeeding, Amenorrhea, and Abstinence by Ethnicity