WORKING PAPER: The effect of contraceptive-confidence on first-birth timing in post-Socialist Moldova

1. Introduction

This paper is the first of two analyses examining the influences on birth timing in the Republic of Moldova. The principle aim of these papers in an evaluation and expansion of the contraceptive confidence hypothesis (Keyfitz 1980, Ni Bhrolchain 1988). Recent trends have lead to a shortening of birth intervals (Ni Bhrolchain 1985) in order to maximise time in the labour force, and the opportunity to build a career. Keyfitz (1980) suggests that a key mechanism in this birth interval shortening is the effect of the availability of modern contraceptive techniques. Modern, effective contraception give a woman a mechanism by which she can be almost certain of the control of future fertility. This allows the compression of births into a smaller proportion of a woman's life, in the knowledge that future unwanted births are highly unlikely. In contrast, a woman with little security in her contraceptive method is forced to space her births to ensure that she attains somewhere near her desire completed family size (see section 2 for greater detail). Keyfitz therefore argues that the increased availability of modern contraceptive methods lead to a shorter duration between births. Moldova offers an excellent opportunity to evaluate the validity of this hypothesis, due to the persistence of natural method use within the country side-by-side with highly effective modern methods.

One major caveat to extending the effect of contraceptive confidence is the different fertility control behaviours of Moldovan women compared to Western women with regard to use of induced abortion. Whereas the use of induced abortion is somewhat limited in Western settings, 46.2% of Moldovan women report having at least one abortion (author's calculations, MDHS 2005). The combination of natural method use and induced abortion as a mechanism for fertility control is well documented (Agadjanian 2002, Popov 1991, Popov et al. 1993, Sobotka 2003, Westoff 2005). This study will therefore expand the traditional contraceptive confidence hypothesis to examine differential fertility behaviours under a regime where induced abortion is a frequently use means of preventing unwanted birth.

While the primary aim of these papers is to evaluate the validity and expand the understanding of contraceptive confidence, a major contribution of these papers is to evaluate other influences on birth timing. This is particularly true in the present analysis, as the transition into motherhood is a significant life course event, and is determined by many complicated external influences. Moldova and many other former Soviet bloc countries have undergone considerable change in fertility behaviour, characterised by collapse of fertility in the post-independence period. The Moldovan TFR reached a low of 1.3 children per woman, before increasing slightly to 1.7 in 2005 (NCPM 2006). Sobotka (2003) identifies that in addition to quantum declines in the transition to higher parities, a large part of the fertility decline in the East can be accounted for by postponement (tempo effects) characterised by an increasing age at first birth. The age at first marriage has remained relatively static in Moldova, increasing from 19.0 years in the 1970-79 marriage cohort to 20.3 years in the post-2000 cohort (MDHS 2005, author's calculations).

This implies that the interval between marriage and first birth is increasing. This represents a shift in childbearing patterns in Moldova, as traditionally the first birth followed marriage within a relatively short time period. By examining the influences on the duration of the marriage to first birth interval, this analysis will provide a source of understanding for these recent trends.

1.2 Structure

The remainder of this paper is defined as follows. Section 2 identifies the relevant influences on birth timings, and formulates research hypotheses based on existing literature. Section 3 examines the data available for this analysis, and discusses potential issues. This section also defines the analysis sample for this paper. The methodology and modelling strategy for this analysis is described in section 4, and the potential explanatory variables considered in section 5. The results of modelling are presented in section 6. The results are summarised and discussed in section 7.

2: Theoretical motivation and research hypotheses

2.1: The effect of contraceptive confidence on birth timings

The effect of contraceptive confidence on inter-birth intervals was proposed by Keyfitz (1980), and Keyfitz and Caswell (2005). Couples using less effective contraceptive methods (such as natural methods) have lower levels of contraceptive confidence due to higher contraceptive failure rates. Low contraceptive confidence is associated with use of contraception throughout the reproductive life span in the knowledge that couples can achieved their desired family size through the periodic failure of contraception. In contrast users of effective contraceptive methods (for example hormonal or clinically administered methods) have high contraceptive confidence due to the negligible incidence of contraceptive failure. These couples can compress their reproduction into a shorter period and subsequently use effective contraception to prevent any further births (stopping behaviour), in order to take advantage of economies of scale in childcare or minimise career disruption (Ni Brochlain 1988). A detailed consideration of the theoretical implications of contraceptive confidence is considered in the second paper on birth timing.

The effect of compression of reproductive spans is reflected in birth intervals. The use of natural methods in an effort to space births is associated with relatively long birth intervals. The compression of reproductive spans given the availability of modern methods is associated with a shortening of birth intervals. Evidence of this effect is found largely in historical populations. Hionidou (1998) argues that the use of natural methods as a mechanism for birth spacing unrelated to parity can be seen in the fertility histories of Mykoniati women. Mykoniati women also report the use of natural methods in in-depth interviews, in particular the use of LAM by extended periods of breastfeeding and the use of coitus interruptus instigated by their husbands. Hionidou also finds that the introduction of stopping behaviour is preceded by the availability of modern contraceptive methods, consistent with the effect of the introduction of effective contraception under the contraceptive confidence model.

The effect of contraceptive confidence on the marriage to first birth interval is more complicated than other birth intervals (Ni Bhrolchain 1988, 1986a, 1986 b), and results can be complicated by the greater importance of external influences (Witte and Wagner 1995). Given that this analysis also attempts to control for these influences (see 2.3), we attempt to analyse the effect of contraceptive confidence on the entry into motherhood. It is anticipated *ceteris paribus* that greater contraceptive confidence should be associated with a more rapid entry into motherhood, as a woman uses no method in the marriage to first birth interval as is confident that she can control her later fertility. In contrast, the use of natural methods in the marital interval among women should delay the first birth following marriage. The first research hypothesis therefore tests the validity of the hypothesised effect of contraceptive confidence;

Hypothesis 1: Natural method users will have longer intervals between marriage and first birth than modern method users.

2.2: The role of induced abortion in the Moldovan fertility control regime

The traditional analysis of contraceptive confidence is limited to the effect of contraceptive choice. Consistent with many post-Socialist republics (Agadjanian 2002, Popov 1991, Popov et al. 1993, Sobotka 2003, Westoff 2005), Moldova demonstrates a considerable reliance on induced abortion, with 46.2% of women who have ever had sex having used abortion at least once, and 40.9% of these women have had two or more subsequent abortions (MDHS 2005, author's calculations). Westoff (2005) estimates that approximately 43% of these abortions in Moldova results from the failure of natural contraception. Agadjanian (2002) notes that abortion and contraception are perceived as complementary element of fertility control, rather than discrete alternatives. This view is particularly prevalent among older women, who are also more likely to use natural contraceptives (see chapter X). The use of induced abortion offers a potential mechanism for natural method users to increase their confidence in the ability to control their fertility, and to exploit the advantages of shorter birth intervals. After attaining a desired family size, and given a propensity to use induced abortion, a woman can use a natural method to attempt to delay unwanted pregnancy. Following this, potential births in excess of desired family size can be terminated- women using abortion as a mechanism for stopping behaviour by women who have completed their desired childbearing (Agadjanian 2002). The increased confidence afforded by induced abortion should have a similar theoretical influence on the first birth interval as the availability of more effective contraceptive methods. This theoretical effect is tested by the second research hypothesis;

Hypothesis 2: Natural method users who use induced abortion will have shorter first birth interval than natural method users who are less prepared to abort unwanted pregnancies.

<u>2.3: The effect of economic instability and fertility suspension</u>

Following the collapse of the USSR, there was a nearly universal collapse in fertility in the former Soviet bloc. This decline was also observed in Moldova, with fertility declining from 2.78 in 1989 to a record low of 1.3 in 2000 (Sobotka 2003). Fertility rates have since rebounded slightly, increasing to 1.7 in 2005 (NCPM 2006). One potential explanation for this decline is the ‘freeze’ in fertility, reflecting insecurity surrounding economic collapse in the Soviet bloc (Witte and Wagner 1995, Kohler and Kohler 2002). This arguments is termed the ‘crisis’ explanation. An alternative explanation is a transition to a Westernised childbearing pattern resulting from the transition to Western social and institutional system, termed the ‘adjustment’ explanation.

The reasoning behind the crisis argument is based on economic fertility theory. In the post-independence period the Soviet bloc suffered universal worsening of economic environment, with declines in GDP, increasing inflation and worsening of the labour market reflected in increasing unemployment and job instability, combined with the difficultly in maintaining living standards, for example through the non-payment of wages (Kohler and Kohler 2002). This economic worsening was especially severe in Moldova, with 2005 estimated at 40% of its 1991 level, and a fall in real wages by 70% (NCPM 2006). The instability in the economic environment leads to a decline in the ability of coupes to afford children, leading to a collapse in fertility in the short term. Witte and Wagner (1995) use East-German panel data to analyse this effect, and find that concerns about both general economic developments and personal economic situation both result in a substantial reduction in the probability of birth. This effect is particularly strong for first births, with a fall in probability of having a first birth by 24% points given a concern over person economic situation (compared to 13% points for all parities). The transition to parenthood is a major change to labour market options whereas for higher parity births labour market adjustments have already been implemented, which accounts for the exaggerated effect of economic instability on first births (Witte and Wagner 1995). These effects are likely to be strongest among women who are most economically vulnerable and disadvantaged.

The alteration in fertility patterns in the long term in Eastern Europe has been attributed by some authors as a process of ‘adjustment’ (Conrad et al. 1996, Lechner 2001, Witte and Wagner 1995). This adjustment is reflected in the adoption of a Western fertility model, and a movement away from the former Socialist pattern (Witte and Wagner 1996, Sobotka 2003). The effect of modernisation is felt particularly on the timing of first births. Under the Socialist system, marriage was followed rapidly by first birth and entry into parenthood occurred early, with a peak in fertility around the age of 20 (Sobotka 2003, NCPM 2006). Witte and Wagner (1995) attribute this pattern to the prevailing social system. Motherhood was the only means to receive an apartment and to attain independence, while the availability of state run childcare facilities meant that early parenthood did not interfere with labour market or career opportunities. In the transition to a Western society, many of these incentives to early motherhood were removed. Housing was no-longer centrally allocated removing the requirement to enter motherhood to guarantee accommodation, and the gradual erosion of affordable childcare provision made combining labour market activity and motherhood increasingly difficult. Additionally, there was an increasing trend towards a Western lifestyle, with an increasing emphasis on the establishment of career and a general postponement on first birth. These effects are likely to be strongest among women with the greatest career potential, such as highly educated women or women in a professional career.

3. Data

3.1 Dataset

The data for this analysis are drawn from the 2005 Moldovan Demographic and Health Survey. This survey was the first DHS conducted in Europe, and builds on earlier surveys (Moldova Reproductive and Health Survey 1997, MRHS 1997). The survey collected information on family planning, reproductive health, maternal and child health and HIV/AIDS, and included a module on abortion reflecting the importance of abortion in the Moldovan fertility control regime. This analysis exploits the birth history module. This module collected the birth dates of all births to the nearest month, and includes additional information on child age, sex, survival status and (where applicable) age at death. Although no marriage history is collected, the date of first marriage is collected to the nearest month. The first birth interval is defined as the difference in months between the date of marriage and the first birth. For women who have not yet experienced first birth, the first birth interval is right-censored by the survey with an exposure equal to the difference in months between the date of marriage and the date of interview.

The major data limitations for this analysis are twofold. Firstly, many of the influences identified as important are attitudinal, and are not collected. For example, there is direct measure of contraceptive confidence available from the dataset, nor any indication of a woman's career motivation. Much of the current analysis is therefore reliant on the use of proxy variables, which by their nature cannot capture the true effect of the influences of interest to this analysis. Secondly, much of the information available is related to the time of survey, whereas the marriage to first birth interval may have occurred a number of years in the past. In certain circumstances the change in status is likely to be only small or relevant only to a limited number of women. For other variables, particularly contraceptive method, there is the potential for considerable discrepancy between survey and first birth interval. Where possible this analysis attempts to reduce the effect of these changes by including other variables (e.g. the last contraceptive method discontinued). Finally there are some influences which this analysis is unable to capture- for example temporary spousal separation. In these circumstances the analysis is forced to assume that there no systematic effect of these influences after controlling for significant influences. Further analysis of calendar data in subsequent papers (see proposal F) will help to assess the validity of this assumption.

3.2 Analysis sample

The sample of women used in this analysis is determined by the requirements of the hazard model. These requirements are a) a defined start point for the period of exposure and b) that the start of exposure precedes the terminal event. This analysis defines the start points as marriage, and the terminal event as first birth. The limitation of the analysis sample to ever married women although necessary, restricts the inferences that can be made from this analysis. The motivations for choice of marriage as a start to exposure are twofold. Practically, the date of first intercourse and hence the start of exposure to the risk of pregnancy is unavailable from the MDHS dataset (except where intercourse occurred at marital union). The exposure since first intercourse cannot therefore be accurately estimated. Secondly, extra-martial childbearing is still relatively rare in Moldova (Sobotka 2003). The majority of pre-marital intercourse would therefore not occur within a setting where a woman was trying to enter motherhood- motherhood only usually occurring within the setting of marriage. In analysing the transition to motherhood, the risk of first birth is therefore only truly applicable to women in martial union.

The original MDHS sample consists of 7440 women. Of this, 1884 are never married, and are therefore excluded from this analysis as the start of their exposure cannot be estimated. The majority of these women have not yet had sex (1401, 74.4%), and therefore have no risk of ever having had a birth. Only 32 (1.7%) of never married women report at least one birth. This indicates the rarity of extra-marital childbearing in Moldova, which results from persistent social pressure and taboos surrounding pre- and extra-marital fertility (Sobotka 2003, Anderson *et al.* 1994).

Of the ever married women in the MDHS, 179 have a negative first birth interval- that is, their first birth occurred prior to marriage. These women are excluded as the event of interest (birth) for this analysis precedes the start of exposure (marriage). These women account for only 3.2% of the ever married sample, again highlighting the rarity of extra-marital childbearing in the Moldovan context (Sobotka 2003). The final analysis sample therefore consists of 5337 women. The construction of the analysis sample is presented in table F.1.

Original sample		**7440**
	Never married	1884
	Pre-marital first birth	179
Analysis sample		**5337**

Table z.F.1; Definition of analysis sample, marriage to first birth interval

4. Methodology

4.1 Regression model

This analysis used a piecewise constant hazard model to examine the effects of covariates on the hazard of first birth. The hazard of first birth for woman i at time t is denoted as $h_i(t)$. In this case, $h_{i(t)} = \Pr(y_i(t) = 1 \mid y_i(t-1) = 0)$ where $y_i = 1$ if the woman experiences a first birth and $y_i = 0$ if she does not have a birth at time t or is right-censored by the survey. This is the conditional probability of the first birth at time t for woman i given that she has not already experienced first birth at time t. The model for the hazard of first birth takes the form of equation 1;

$$\log it[h_i(t)] = \alpha(t) + \boldsymbol{\beta}^T \mathbf{x}_i(t)$$

Equation 1

Where $h_i(t)$ is the hazard of birth to woman i at time t. $\alpha(t)$ is the time specific intercept (logit of the baseline hazard for interval t), $\boldsymbol{\beta}^T$ is a transposed vector of beta coefficients and $x_i(t)$ a vector of explanatory variables for time period t.

In MDHS dates of births (and date of marriage) are recorded to the nearest month. The first birth interval is therefore defined as the number of discrete months from marriage until the first birth. Since some of the birth intervals are lengthy (in excess of 300 months), the discrete times used will not take the form of months but periods of a number of months. It is assumed that the hazard of first birth is constant during each period. This reduces the size of the dataset, and allows more straightforward model interpretation. The periods will usually take the form of six-monthly intervals or a multiple of six months (to ensure consistency with existing literature, e.g. Steele *et al.* 1996). The exception to this is the first period which is set at 9 months. This allows for the identification of pre-marital conceptions in the marriage to first birth model.

A number of alternative specifications of the model for analysing this variable were considered, but were found to be unsuitable. Braun (1980) considers specifying the waiting time between births as a gamma distributed continuous variable. The regression analysis is the application of a generalised linear model to examine the effect of covariates on the mean waiting time. This model specification is unsuitable for this analysis however, as Braun used historical data, where birth histories were complete. The MDHS data are survey data, and therefore include women who have births right censored by the date of the survey. The exclusion of these women from the analysis could introduce a source of bias, as these women are likely to be younger or those spacing births. To account for censoring, an event history model is necessary. Van Bavel (2004) considers the use of a Cox semi-parametric proportional hazards model. This model is not appropriate to the present analysis however, as the hazards of next birth are expected to be non-proportional[1], violating the fundamental assumption of the Cox model. In addition the recording of dates of birth to the nearest month introduces ties in failure times, which can result in biased parameter estimates from the Cox model (Yamaguchi 1993). The same bias can also be present in other parametric survival models, such as a Gompertz model appled to birth intervals (e.g. Ross and Madhavan, 1981).

4.2 Modelling strategy

The model building procedure for the marriage to first birth interval is as follows. The model is built from a model incorporating time only by including the variables of substantive interest. The variables identifying temporal effects (marriage cohort, employment type, education and asset wealth) are then tested for significance at 5% level, and if significant are added to the model. Other control variables are then added to the model. If variables already entered in the model are found to be non-significant on the addition of a new term, they are subsequently deleted from the model. Once all significant main effects have been determined, the model is extended to incorporate interaction effects. In order to examine the effect of induced abortion in increasing contraceptive confidence, a two way interaction between current contraceptive method and propensity to use induced abortion is tested for significance. This allows the investigation of the effect of induced abortion specifically in conjunction with natural method use (Agadjanian 2002, Popov 1991, Popov et al. 1993, Sobotka 2003, Westoff 2005). Secondly, an

[1] The compression of birth intervals resulting from high contraceptive confidence among modern method users should lead to a higher hazard than among natural method users in early periods of exposure. However, the efficacy of modern methods means that stopping behaviour of modern methods users would result in a lower hazard than natural method users at longer exposures. The hazards are therefore non-proportional across the exposure period.

interaction between current contraceptive method and the previous method discontinued is introduced. This allows an examination of the effect of changes in contraceptive method on contraceptive confidence. Finally, in order to assess the impact of temporal conditions the first birth interval, two way interactions between marriage cohort and asset wealth, type of employment, periodicity of employment and highest educational level are tested for significance. Significant interactions will capture the differential effect of these variable on women married in different marriage cohorts. The final stage of the modelling procedure is a relaxation of the assumption of the proportional effect of explanatory variables across time. Interactions between time and all terms already in the model are tested for significance at 5% level. Significant interactions between time and an explanatory variable indicates a time dependent effect. The final model presented and interpreted in section 6 therefore incorporates significant main effects, interaction effects and time dependent effects.

5. Explanatory variables

5.1 Contraceptive confidence: Current contraceptive method

The first research hypothesis is tested using a measure of contraceptive confidence. Ní Bhrolcháin (1988) notes that the ideal measure of contraceptive confidence is the fertility preferences, contraceptive taste, method familiarity and cultural influences on the couple at the start of the birth interval in question. This information is however unavailable. This analysis makes use of current contraceptive method as a measure of contraceptive confidence, with the assumption that natural method users have a lower contraceptive confidence than modern method users. This parallels Ní

Bhrolcháin (1988), who uses the contraceptive method used in the open birth interval as an indicator of contraceptive confidence. It is noted in chapter X however, that a considerable amount of contraceptive switching is present in Moldova- in particular from natural to modern methods. The current method used may therefore not accurately reflect the true contraceptive confidence of a couple, as the couple may discontinue their current, temporary method in favour of either a more effective method, or a method more suited to their contraceptive preferences once this becomes avaliable. The model also therefore includes a control for the type of the previous method discontinued, and will look for potential interactive effects with current method (see modelling strategy z.4.2).

Although the true measure of contraceptive confidence is unavailable, MDHS does collect information about the preferred future method of women, which would serve as a superior proxy to the current method, as future method is likely to be more closely correlated with future contraceptive confidence. This variable is of little practical use due to the high degree of uncertainty however- 83.0% of ever married women could not provide a definitive response to their preferred future method.

5.2 Abortion propensity: Abortion ratio

The estimation of the propensity of a respondent to use induced abortion is problematic. The ideal measure would be the attitude toward abortion use of the respondent collected upon entry into sexual union. As with current contraceptive method, this information is unavailable. Current attitude to abortion could serve as a useful proxy for this information, but was omitted from the MDHS questionnaire schedule. Even if this information had been collected, its validity can be questioned due to post-hoc re-rationalisation of attitude to abortion based on life-circumstances and experiences (Westoff (2005) finds that the odds of approval of abortion are 139% higher among Moldovan women who have past experience of induced abortion). This analysis is therefore makes use of the abortion ratio (proportion of pregnancies which have been aborted) as a measure of propensity to use induced abortion, under the assumption that a woman with a higher propensity to use induced abortion is likely to translated a greater proportion of her pregnancies than a woman with a low propensity to use induced abortion *ceteris paribus*. The proportion of pregnancies aborted is categorised into 'None', 'Low' (0.01-0.39, incorporating ¼ of pregnancies aborted), 'Medium' (0.40-0.59, incorporating ½ of pregnancies aborted) and 'High' (0.60-1.00, incorporating ¾ of pregnancies aborted).

Simply using a count of the number of past abortion is methodological problematic, and cannot identify a propensity to use induced abortion. For example, a greater number of abortions may reflect a greater exposure to pregnancies (with a selection effect, older women being more likely to have a higher count of abortions than younger), or be confounded by unobservable such as fecundibility. Since the MDHS records both the number of abortion and the number of total pregnancies, the propensity to use induced abortion will be measured using the proportion of pregnancies terminated. This should reduce the selection effect, as a woman with a high propensity to use induced abortion should terminate a greater proportion of pregnancies than a woman who is more reluctant to use induced abortion.

In many contexts, abortion is likely to be underreported, but this taboo is unlikely to be present in Moldova. There is a close association between abortion and fertility control resulting from the wide availability of induced abortion during the Soviet era (Westoff 2005). This association is particularly strong among Moldovan women with higher education, rural residence and among younger women. Significantly the odds of preferring abortion are 99% higher among women who have experience of modern method use- indicating the association between abortion and all methods of birth control. Agadjanian (2002) finds that the major obstacles to obtaining an abortion were the cost of the procedure, rather than any concerns over health side effects or moral considerations. Finally Anderson *et al.* (1994) examined the consistency of abortion reporting with known past abortion status, and found that fewer than 7% of women did not report a past abortion, although a significantly great proportion did erroneously report timing. Anderson *et al.* also note that confusion over the status of vacuum-aspiration as an abortion procedure may have upwardly biased the levels of misreporting. Overall, it is unlikely that there is any systematic misreporting of past abortion use, and it is considered that this measure is more reliable than current abortion attitude.

5.3 Temporal effects

Temporal effects are likely to be strong in Moldova, either as a result of economic crisis or adjustment. To identify the effect of external environment on the fertility behaviour following marriage, the explanatory variable of marriage cohort is included in the analysis. This variable provides the year of marriage in five year age-groups. It is anticipated that the progression from marriage to first birth should be rapid in the cohorts 1970-79, 1980-84 and 1985-89, as these cohort all married under the Socialist system and where therefore exposed to the incentives to early marriage. In the post-independence marriage cohorts (1990-94, 1995-99 and 2000 or more recent), it is expected that there should be a considerably longer interval between marriage and first birth, reflecting the postponement of first birth in the post-independence era (Sobotka, 2003).

The analysis also includes variables designed to identify competing effects of economic crisis and adjustment. Economic effects are identified using the index of asset wealth constructed in paper X. The index is an adaptation of the index proposed by Filmer and Pritchett (2001), and uses the same methodology but extended only to asset ownership. It is expected that the effect of economic crisis in Moldova should be consistent with the hypotheses of Kohler and Kohler (2002), where couples with the least economic security (lowest category of wealth) should see the largest postponement of births in more recent cohorts, compared to couples in higher wealth categories, whose fertility behaviour should be less affected by external economic conditions.

Potential measures of modernisation available are educational level, type of employment and periodicity of employment. The transition to a Westernised social system alters the incentives for childbearing, with the result that many women in transition economies face increasing pressure to delay their first birth to establish a career. These effects are strongest among women with the best employment prospects, such as those with higher education (Witte and Wagner 1995). This analysis therefore controls for educational level as a measure of compatibility with Western employment and fertility patterns. This analysis also exploits the availability of type of employment and periodicity of employment as a measure of incentive to delay childbearing. Women in ‘career’ type jobs (professional/ clerical) or those with a strong career motivation (all year employment) are likely to have stronger incentives to alter their childbearing consistent with a Western pattern than those in employment types not associated with career in a Western model (agricultural or not working) or with a lower career motivation (occanisal/ seasonal employment).

5.5 Control variables

The model controls for a number of relevant influences on fertility as identified by Davis/Blake (1956) and Bongaarts (1978). The influences relevant to the marriage to first birth interval are identified as age at marriage, marital dissolution and use of contraception.

Age is significantly related to length of birth interval, with declines in fecundibility with increasing age resulting in longer waiting time until birth. This effect can be drastic, Larsen and Vaupel (1993) finding that fecundibility approximately halves from age 20 to age 35. This decline appears to be largely driven by a decline in female ability to conceive, as there is little effect of the age of the male partner on fertility. Van Bavel (2003) finds no significant effect of the difference in spousal ages on (female) age specific fertility rates, male age therefore appearing to have no significant effect on the ability of a couple to conceive. This analysis therefore controls for the age of the mother at marriage only.

Marital status is closely associated with exposure to coitus, which is a key determinant of fertility (Davis and Blake 1956, Bongaarts 1978). Since all women are married by definition of the analysis sample, this analysis controls for whether a woman separates during the first birth interval, and is hence not exposed to regular coitus or in a childbearing union. Unfortunately, a complete marriage history is not included in MDHS. We have available two potential variables which attempt to control for marital separation to an extent. Firstly, a variable which identifies ever separation is specified, where a woman is said to be never separated if a woman reports one marital union and is currently married. If a woman reports more than one union, or is currently unmarried (all women start the analysis being married) she is said to be ever separated. The second variable attempts to identify whether a woman was separated during a given birth interval. MDHS records duration of first marriage- although this is defined in broad intervals (5 years). It is assumed that where a couple separates, the separation occurs at the mid-point of the interval. This separation date is then compared to the birth time, and can therefore be used to estimate whether a separation occurred during a given birth interval. This variable is by no means perfect. The assumption that separation occurs at the mid-point of an interval means that some intervals will be classified as having a separation while in reality they do not (that is, the duration of the marriage is understated due to the assumption of separation at the interval mid-point) while some intervals will be classified has not having a separation while they actually do (that is the duration of marriage is overstated).

The use of contraception is key in determining the length of birth interval. However, actual use of contraception during the marriage to first birth interval is not collected by the MDHS (see z.5.1). Contraceptive use is therefore identified using the MDHS variable identifying parity at first contraceptive use. Women who were parity 1 or greater at first use of contraception have clearly not used contraception during the marriage to first birth interval. Women who report use of contraception at parity zero are classified as having used contraception either before or during the marriage to birth interval. This analysis is therefore able to control for the influence of contraceptive experience on the marriage to first birth interval.

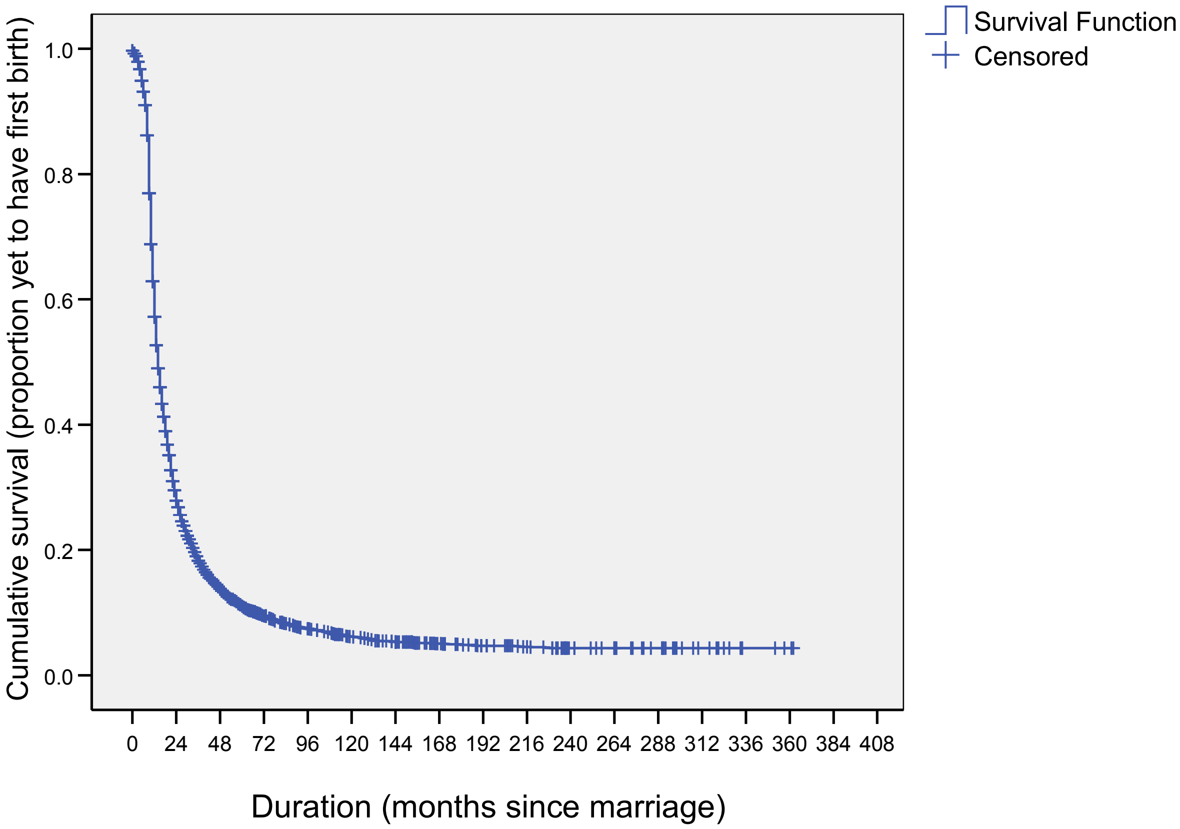
Paper X found a number of key influences on the type of contraceptive method in current use. To ensure that the effect of the proxy variable of current contraceptive method is not confounded by one of these other variables, this analysis will control for the potential effects of; urban/rural residence, region of residence, exposure to family planning media, awareness of HIV/AIDS and ethnicity.

6 Results

6.1 Descriptive analysis

The vast majority of women experience a first birth, with only 12.0% having intervals right censored by survey. This is indicative that, despite low fertility in Moldova, childlessness is rare, and that the childbearing patterns observed in much of former Soviet Europe (‘at least one, no more than two’) are also present in Moldova (Sobotka 2003). The Kaplan-Meier estimated survival curve of the marriage to first birth interval is presented in figure z.5.1. This indicates that there is a relatively rapid progression from marriage to first birth for the majority of women. The median survival time is 14 months indicating that 50% of women who experience first birth do so in just over one year following marriage. There is a flattening of the survival curve for later first birth times, with a tail of women having extremely long marriage to first birth intervals. The mean survival time (which is skewed by the long survival times) is 37.8 months- considerably greater than the median indicating the effect of this tail. 167 women have an interval between marriage and first birth greater than 2 years (3.1% of the analysis sample) indicating the rapidity of first birth following marriage in Moldova.

Figure z.5.1: Kaplan-Meier survival distribution for marriage to first birth interval



Median survival time; 14.0 (13.6, 14.4)

Mean survival time; 37.8 (35.5, 40.1)

N=5377

Events=4733 (88.0%)

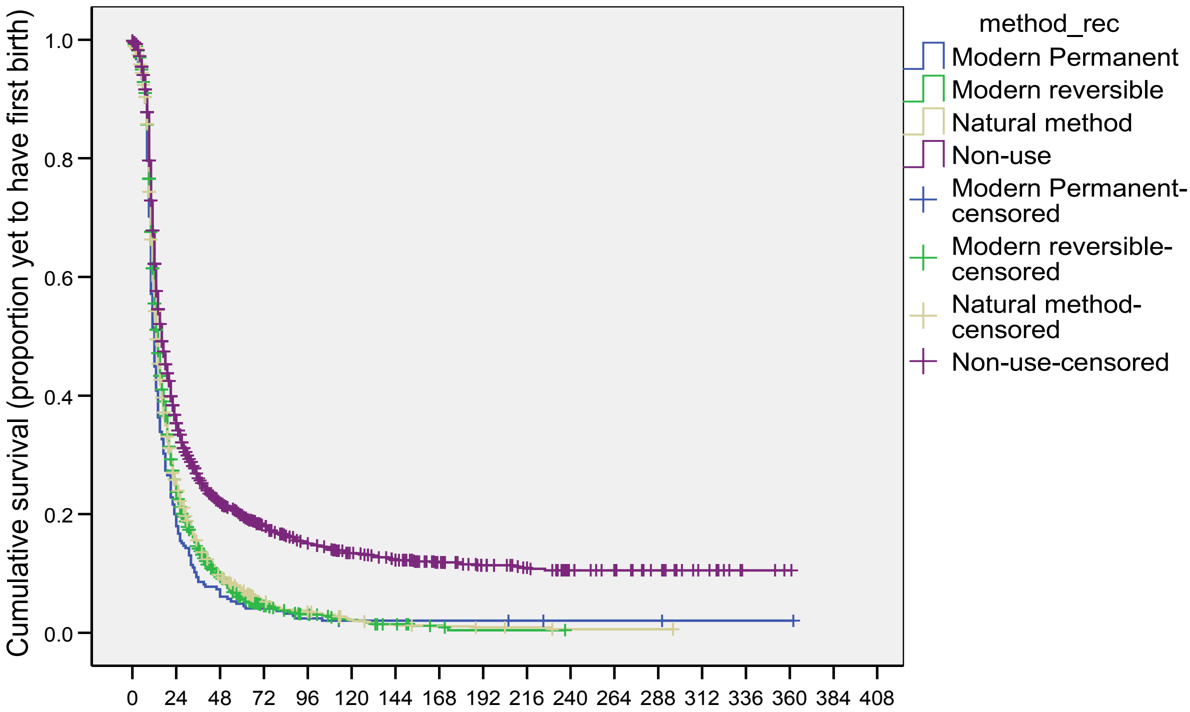
#TABLE Z.5.2 ABOUT HERE#

Current contraceptive method	Median survival time (95% confidence interval)	Mean survival time (95% confidence interval)
Modern reversible	14.0 (13.5, 14.6)	23.0 (21.5, 24.4)
Non-use	16.0 (15.0, 17.0)	62.1 (56.5, 67.6)
Natural	13.0 (12.3, 13.7)	24.0 (21.9, 26.1)
Modern permanent	12.0 (11.0, 13.0)	23.9 (17.5, 30.2)

Table z.5.3: Kaplan-Meier estimates of median and mean time from marriage until first birth by current contraceptive method

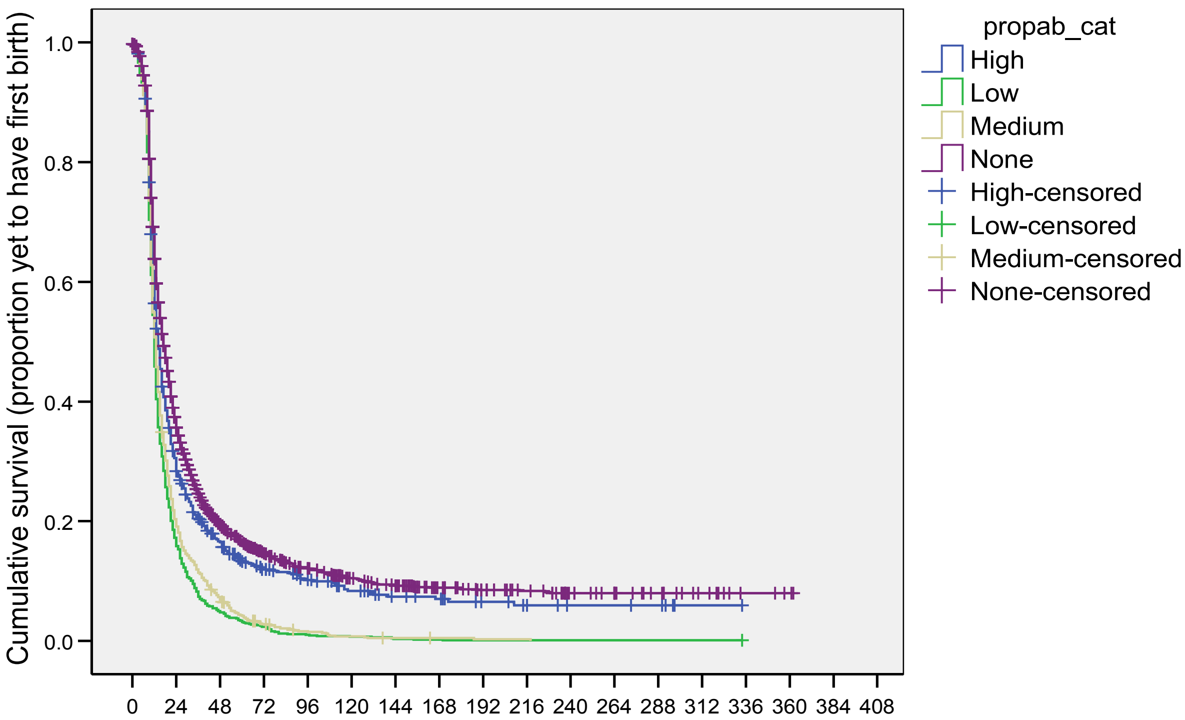
The distribution of women by potential explanatory variables is presented in table z.5.2. Kaplan-Meier survival plots for current contraceptive method and propensity to use induced abortion are presented in figures z.5.2 and z.5.3 respectively, with associated estimated medians and means presented in tables z.5.3 and z.5.4.

Figure z.5.2: Kaplan-Meier survival distribution for marriage to first birth interval, stratifed by current contraceptive method



Examining the differing survival distribution by current method (figure z.5.2, and table z.5.3), it is clear that there is in fact relatively little variation in time from marriage to first birth by method. All three categories of contraceptive use show similar median and mean survival times, with half of the women in each category experiencing first birth in 12 to 14 months. The one exception is the group of women who were not using a contraceptive method at time of survey, who have a median and mean survival time significantly longer than the other categories.

Figure z.5.3: Kaplan-Meier survival distribution for marriage to first birth interval, stratified by propensity to use induced abortion



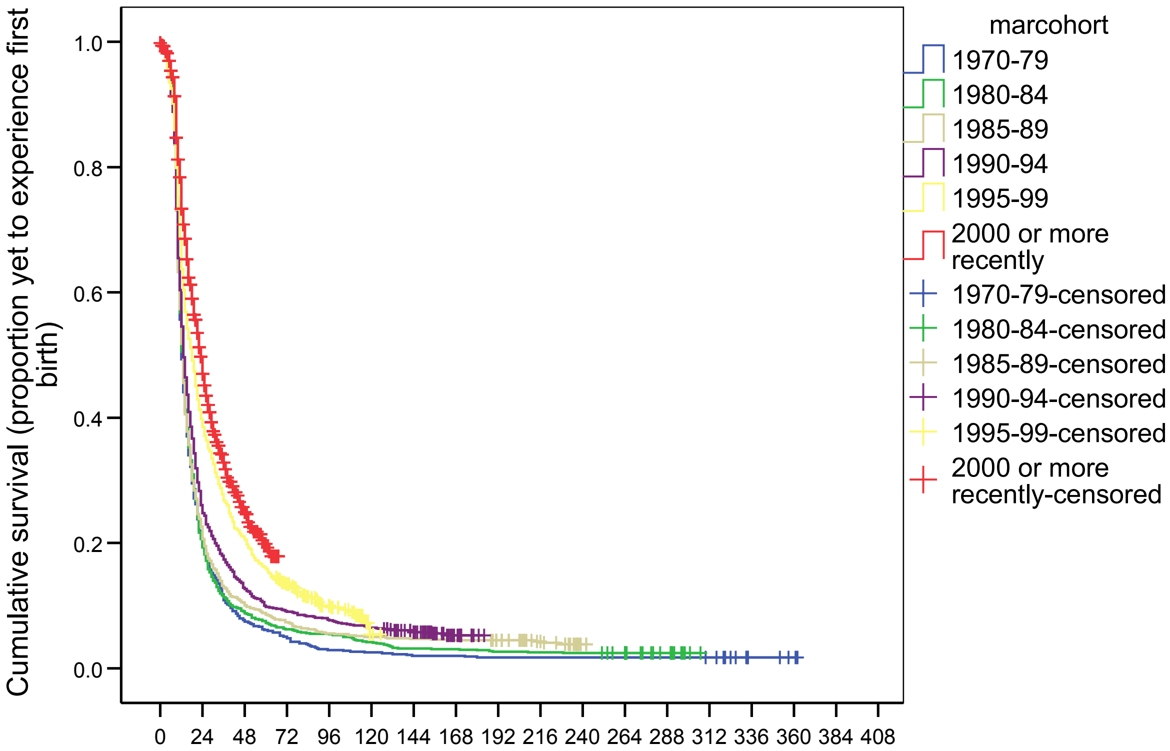
<u>Table z.5.4: Kaplan-Meier estimates of median and mean time from marriage to first birth by propensity to use induced abortion.</u>

Propensity to use induced abortion	Median survival time (95% confidence interval)	Mean survival time (95% confidence interval)
None	17.0 (16.1, 17.9)	53.3 (48.9, 57.6)
Low	12.0 (11.5, 12.5)	17.6 (12.2, 18.9)
Medium	13.0 (12.9, 15.1)	19.5 (18.2, 20.8)
High	14.0 (13.6, 14.4)	42.8 (36.1, 49.5)

The Kaplan-Meier survival curve shows a clear dichotomy in survival distributions by propensity to use induced abortion. Women who have a low or medium propensity to use induced abortion have a much more rapid progression to first birth following marriage than women who do not use abortion, as indicated by the more rapid fall in proportion yet to have first birth (figure z.5.3), and the significantly lower median and mean times of first birth (table z.5.4). One strange result is the women who have a high propensity to use induced abortion. The curve for this stratum is close to that for women who have never use abortion- indicating a longer time until first birth than women with a low or medium propensity to use induced abortion. It is noted that the median survival time for the category high is significantly lower than that for women with no propensity to use induced abortion that is that the initial progression to first birth is more rapid among women with a high propensity to use induced abortion than women with no abortion use, although not as rapid as among low or medium propensities.

The estimated survival distribution by marriage cohort is presented in figure z.6.3. A clear effect of marriage cohort is evident, and demonstrates the increasingly long interval between marriage and first birth evident among more recent marriage cohorts. This is also reflected in the estimates of the median time until first birth (see table z.5.2). In all cohorts married before 1994, the median months until first birth are in the region of 12-13 months. However, in the 1995-99 cohort this time rises to 18 months, and in the post 2000 marriage cohort to 23 months. Also is significant is the declining proportion of women in later cohorts who have made the transition to motherhood; in all pre-1995 cohorts over 95% of women have had a first birth, compared to just over 56% in the post 2000 marriage cohort. This reflects an increasing impact of right censoring by the survey- no post 2000 woman has more than 72 months of exposure, with many of these women likely to progress to first birth at a later stage.

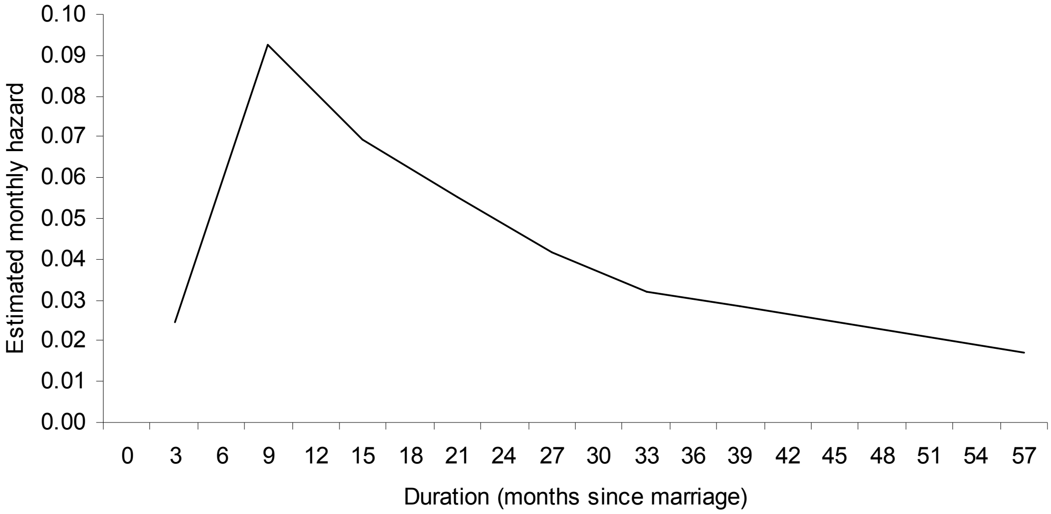
Figure z.6.3: Kaplan-Meier survival distribution for marriage to first birth interval by marriage cohort



6.2 Regression modelling results

The estimated hazard distribution from the null model (no covariates) is presented in figure z.6.D. This illustrates the underlying relationship between time and hazard of first birth. From this plot is clear that the hazard of first birth is low in the 9 months following marriage- which indicates a low level of premarital conception. This is consistent with expectations, as premarital sexual activity is relatively rare in Moldova due to social pressure and taboos (Sobotka 2003, Anderson 1994). The hazard of first birth peaks in the 9-11 month period indicating that entry in motherhood following marriage is rapid among Moldovan women. After this, the hazard of first birth gradually declines- indicating that the probability of a long first birth interval is low.

Figure z.6.D: Estimated hazard distribution of first birth for null model (no covariates)



The final regression model is presented in table z.6.M. Since many of the variables of interest to this analysis are included in at least one interaction and the effects are time dependent, cumulative hazards as well as estimated monthly hazards and associated survival curves are presented to clarify interpretation.

The interaction between current contraceptive method and propensity to use induced abortion is key to determining the validity of the main research hypotheses. This interaction was significant at the 5% level. Although both main effects are time dependent, the interaction term could be interacted with time due to low numbers of events in certain cells. The interaction is therefore assumed to have a proportional effect on the first birth interval- that is the interaction does not vary across marital duration. The cumulative probability of first birth after 36 months is presented in table z.6.N. Across all level of propensity to use induced abortion, it is significant that the proportion of women to have had a first birth is lower for natural method users than among modern reversible or modern permanent method users across all levels of propensity to use induced abortion.

Current contraceptive method	Propensity to use induced abortion			
	None	Low	Medium	High
Reversible modern method	0.914	0.917	0.910	0.911
None	0.728	0.883	0.874	0.813
Natural method	0.880	0.920	0.884	0.869
Permanent modern method	0.872	0.974	0.946	0.915

Table z.6.N: Cumulative 36 month hazard of first birth by current contraceptive method and propensity to use induced abortion.

The probability of first birth is lowest among women who are current non-users. This result is puzzling- non-use of contraception should be associated with 'natural' fertility conditions and more rapid progression to births than users of any contraceptive method. Two potential explanations are considered; a) the use of induced abortion as a mechanism for delaying first birth (implying overall a high propensity to use induced abortion) or b) the self selection of these women to contraceptive non-use due to difficulty in conceiving. Testing these explanations for this effect are hampered by a lack of information regarding contraceptive use during the marriage to first birth interval. Using information at available at time of survey as a proxy, it is clear from table z.6.S that the mean number of lifetime abortions is not higher for women currently using no method than for all other contraceptive methods- in actuality it is lower. Further, although clearly not applicable during the first birth interval, women using no contraceptive clearly have a considerably higher proportion who are infecund than all other contraceptive methods. Cautiously, this suggests that the long birth intervals observed in the marriage to first birth interval are indicative of difficulties in conceiving which eventually result in infecundity.

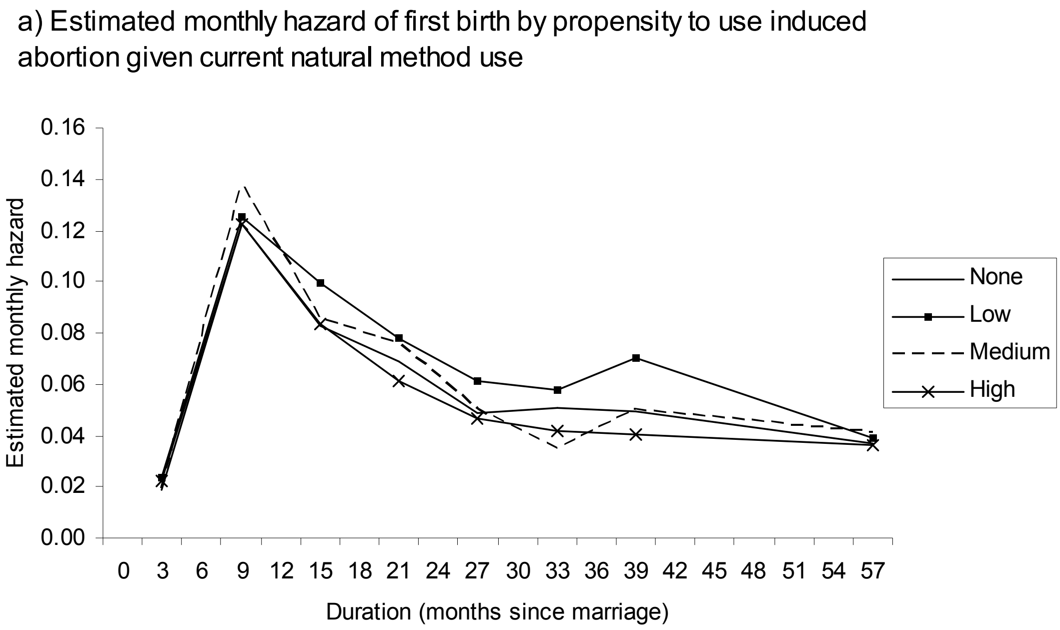
Current contraceptive method	Mean number of lifetime abortions	Percentage of women reporting infecundity	Number of women
Non-use	1.0	44.9	2001
Natural	1.1	3.4	1174
Modern permanent	1.4	26.1	245
Modern reversible	1.1	1.5	1957

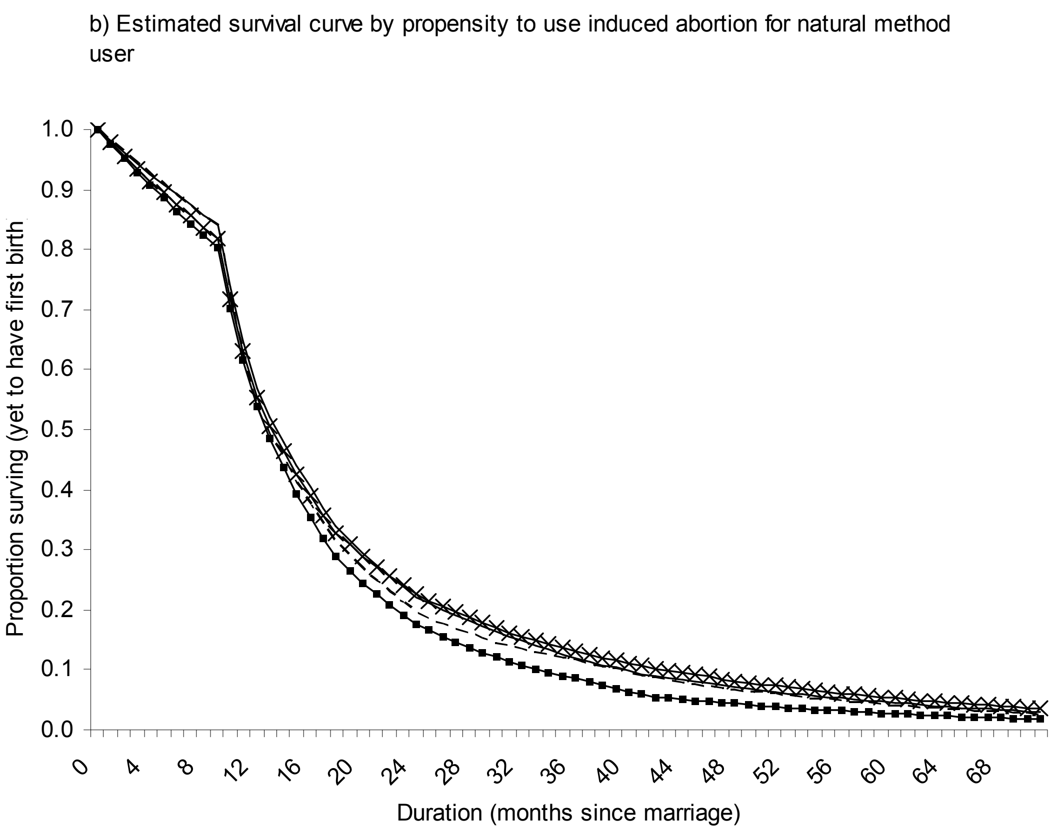
Table z.6.2: Mean number of lifetime abortions and percentage of women reporting infecundity by current contraceptive method.

Figure z.6.T provides the estimated hazard distribution for current contraceptive method at each level of propensity to use induced abortion, and figure z.6.P displays the associated estimated survival plots. These figures allow the evaluation of the different effects of covariates over time. From this figure a consistent pattern emerges; women who are current modern reversible or permanent method users have the most rapid transition to motherhood, indicated by consistently high hazard of first birth across all time periods (figure z.6.T-a and -d) and the rapid fall in the proportion yet to have first birth (figure z.6.P-a and -d). Women who are current natural method users have a slower transition to first birth, with a lower hazard of first birth across time periods. It should be noted that the fall in hazard of first birth does not fall away with increasing duration since marriage for natural method users (see figure z.6.T) as with modern method users. This is reflected in a convergence in the proportion of women yet to have a first birth for modern users and natural users in the later durations since marriage (see figures z.6.P c) and d) in particular). This is taken to indicate the use of natural methods as a spacing mechanism, with the lower hazard of first birth in early durations delayed by natural contraceptive use. The eventual failure of natural method however lead to higher hazards of first birth in later durations, leading to natural method users catching up their first births. Current non users are have the slowest transition to motherhood across all abortion propensities, reflected in the low monthly hazard of first birth across all abortion propensities (figure z.6.T), and the high proportions of women yet to become mothers at later durations (z.6.P). This has been attributed to the self selection of sub-fecund women to contraceptive non-use. These results support research hypothesis 1, indicating that natural method users have a slower transition to first birth when compared to modern method users.

The effect of induced abortion use is generally to raise the hazard of first birth, and to hence shorten the first birth interval. Table z.6.N indicates that for all method users, the cumulative probability of first birth is higher for women with a low, medium or high propensity to use induced abortion than those who have no propensity to use induced abortion. The exception to this is among modern method users, where there is no substantial effect of abortion use on probability of first birth. The level of abortion use does not have a clear effect on the probability of first birth, with the low, medium and high propensities having a similar probability of first birth. This pattern is consistent when examining the hazards (see figures z.6.T and z.6.P). Women with no propensity to use induced abortion have the lowest estimated monthly hazards of first birth regardless of contraceptive method, and consequently the slowest transition to motherhood. The hazards for low, medium and high propensity women are higher and similar for all methods- although there does appear to be a slight fall in hazard of first birth in medium and high propensity women when compared to low propensity women. This perhaps reflects the use of abortion early in a women reproductive career. The effect of this is to slow the transition to motherhood through the termination of pregnancies in the first birth interval - although due to the lack of data on the timing of induced abortion this is only a speculative explanation.

Research hypothesis 2 focussed on the effect of induced abortion on the timing of first births resulting from increased contraceptive confidence among natural method users. The estimated monthly hazard of natural method users and associated survival curve are presented in figure z.6.V.





<u>Figure z.6.V The effect of abortion use on the timing of first birth for natural method user indicated by a) the estimated monthly hazard of first birth by abortion propensity and b) the estimated survival curve for first births by abortion propensity.</u>

The effect of propensity to use induced abortion is consistent for natural method users as for all other levels of contraceptive use. Low, medium and high propensity to use induced abortion increases the hazard of first birth, resulting in a more rapid transition to motherhood among these groups than women who have no abortion experience. However, with increasing exposure to induced abortion, the increase in the hazard of first birth attenuates towards that of women with no abortion use. From figure z.6.V it is clear that although women with a low and medium propensity to use induced abortion have a more rapid progression to first birth, women with a high propensity to use induced abortion have virtually the same proportion yet to have first birth at any given duration as women with no abortion propensity. These results do support the second research hypothesis to an extent- as abortion use does increase the speed of the transition to motherhood- a very high propensity to use induced abortion is associated with a slow entry into motherhood. This possibly results from abortion use in the early reproductive career, data deficiencies mean that this explanation cannot be fully tested.

In the final model, the two-way interaction between current contraceptive method and previous method discontinued was significant at the 5% level. Due to an insufficient number of cases in certain cells, the interaction effect again could not be extended to be time dependent (three way interaction between current method, previous method discontinued and time). The predicted probability of first birth by 36 months is presented in table z.6.W.

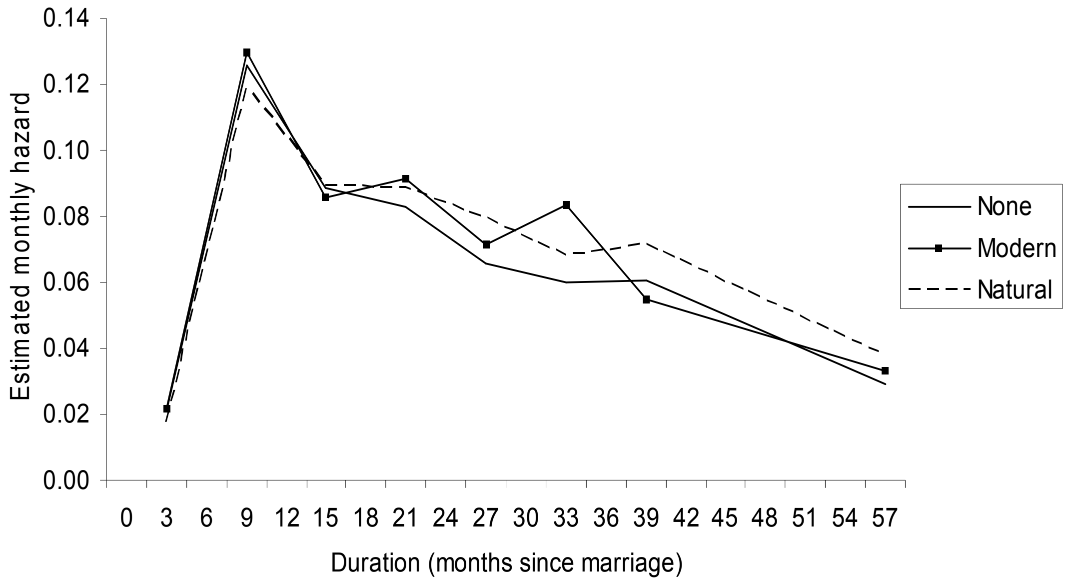
Current contraceptive method	Previous method discontinued		
	None	Modern	Natural
Reversible modern method	0.914	0.932	0.924
None	0.728	0.829	0.854
Natural method	0.880	0.916	0.914
Permanent modern method	0.872	0.899	0.964

Table z.6.W: Cumulative 36 month hazard of first birth by current contraceptive method and previous method type discontinued.

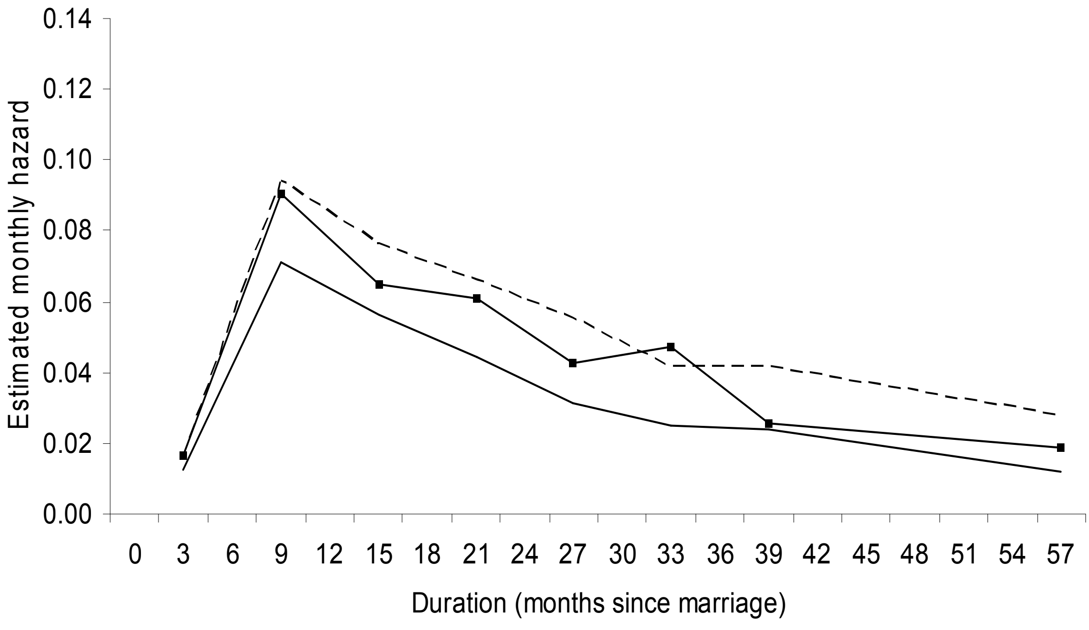
From table z.6.W, it is clear that for current non-users, natural method users and permanent method users, any previous reported discontinuation results in a higher probability of first birth than women with no discontinuation. The exception to this pattern is current modern method users, where the probability of first birth is comparable regardless of previous method discontinued. In the case of current non-use and natural method use, the probabilities of first birth are comparable for modern and natural method discontinuation. However, in the case of permanent method use, the probability of first birth is substantially higher for women who had discontinued a natural method.

The estimated hazard plots of first birth are presented in figure z.6.V and the associated survival curves in figure z.6.O. From these figures a similar pattern emerges to that in table z.6.W. For non-users, natural method users and permanent method users, any previous discontinuation is associated with a more rapid progression to first birth reflected in the higher estimated hazards. In the case of permanent method users, the hazard of first birth is substantially higher than the hazard for modern or no-discontinuation-especially in the period 9-11 months. Among permanent method users with a modern discontinuation, the hazard is comparable to that of women with no discontinuation. The major difference in the hazard profile occurs in the period 30-35 months. This is reflected in the survival plot, where the proportion yet to have first birth is identical for non-discontinuers and modern discontinuers until around 30 months, where there is a drop in the proportion surviving for modern method discontinuers. It is again noted that the hazards for current modern reversible method users are comparable regardless of previous method discontinued (figure z.6.V-a). This is reflected in the survival curves (figure z.6.O-a), which are approximately level at any given month since marriage.

a) Estimated monthly hazard of first birth by last contraceptive method discontinued for current reversible modern method



b) Estimated monthly hazard of first birth by last contraceptive method discontinued for current non-user



c) Estimated monthly hazard of first birth by last contraceptive method discontinued for current natural method user

d) Estimated monthly hazard of first birth by last contraceptive method discontinued for current permanent method user

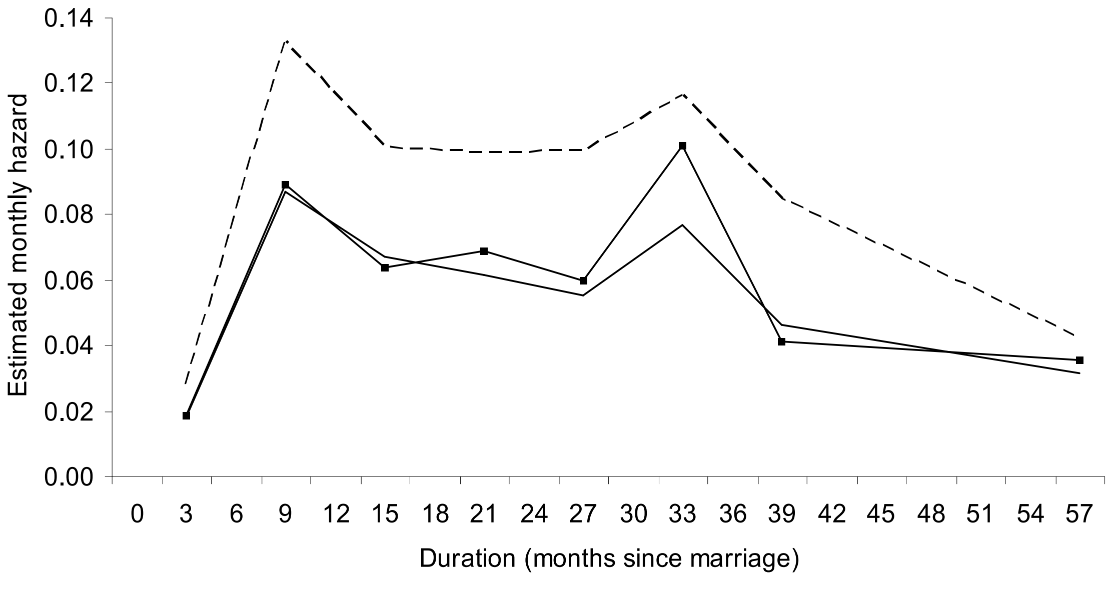
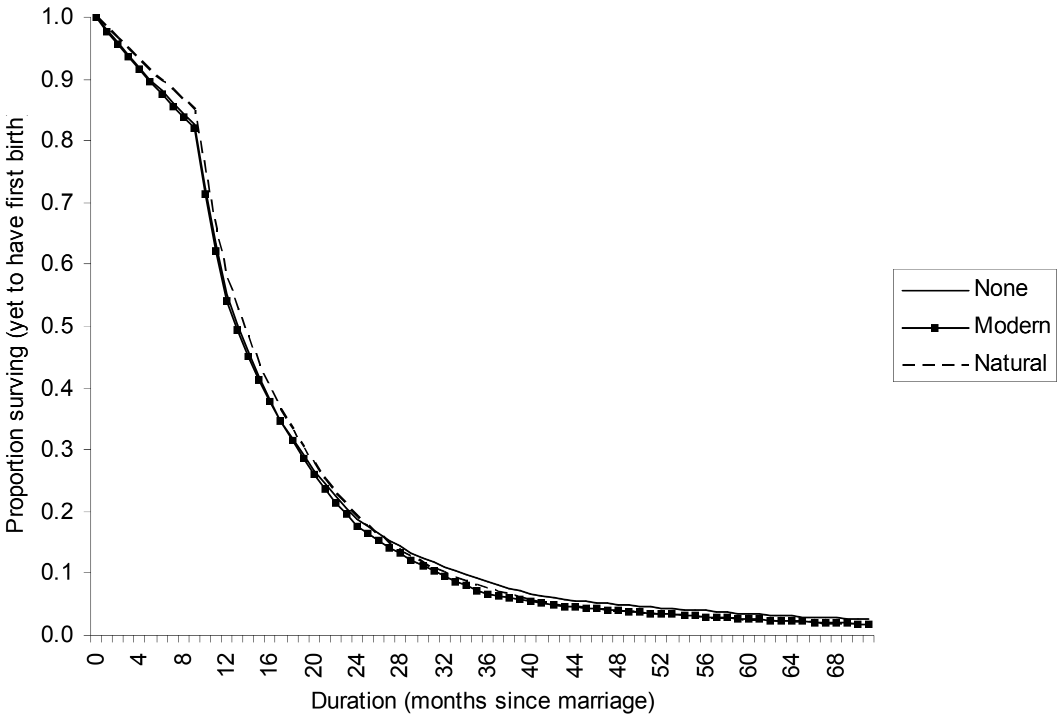
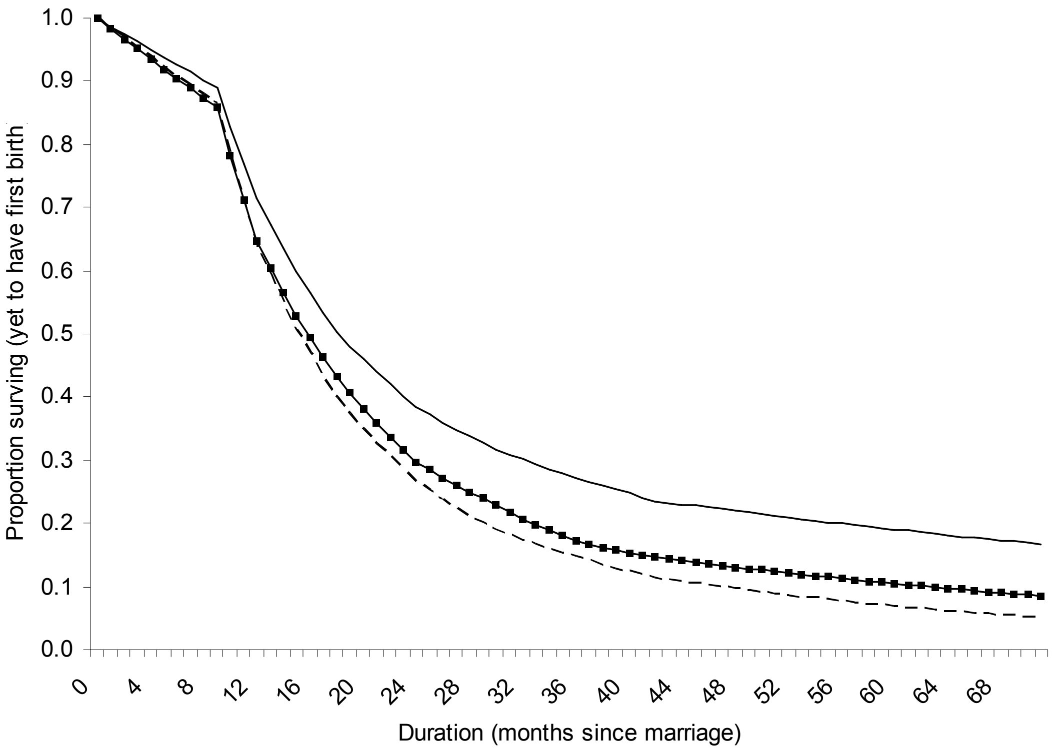


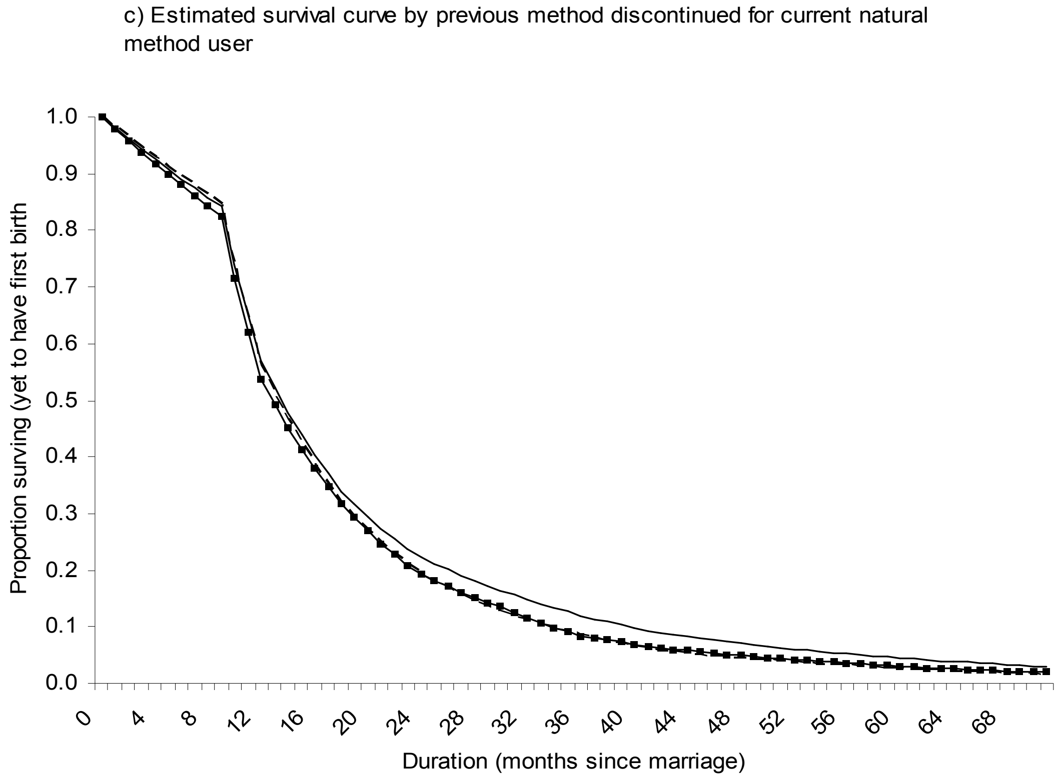
Figure z.6.V: Estimated hazard plots by previous method discontinued given a) current reversible method use, b) current non-user, c) current natural method use and d) current permanent method use.

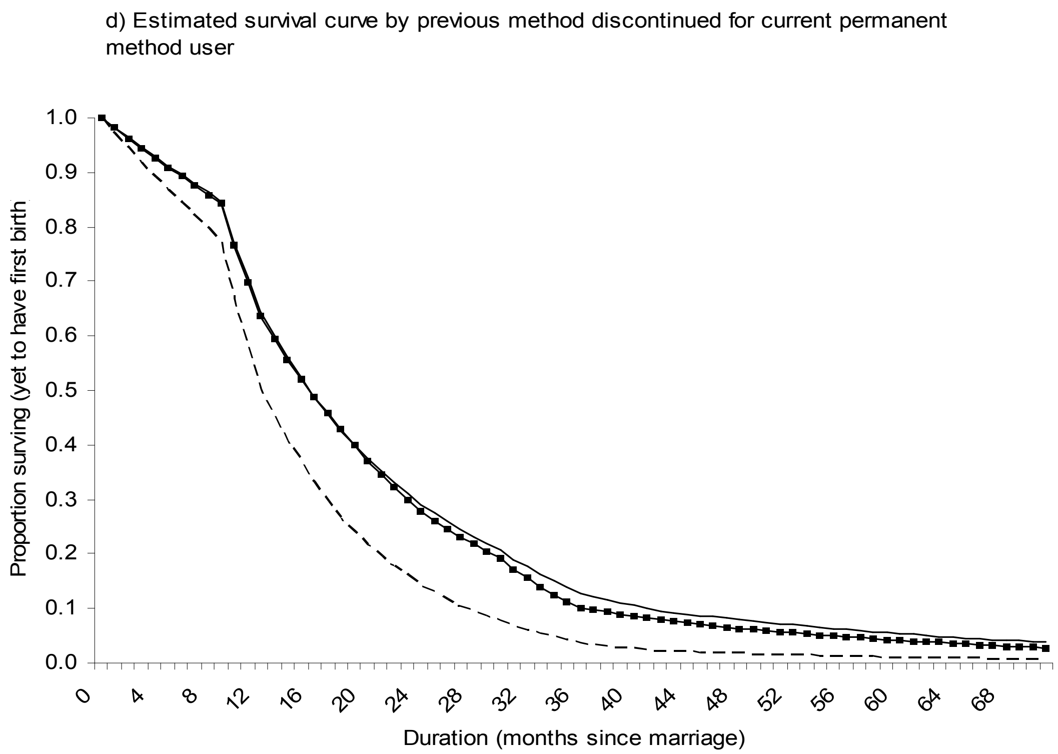
a) Estimated survival curve by previous method discontinued for current modern method user



b) Estimated survival curve by previous method discontinued for current non-user







<u>Figure z.6.O: Estimated survival curves by previous method discontinued given a) current reversible method use, b) current non-user, c) current natural method use and d) current permanent method use.</u>

Marriage cohort has a clear and consistent effect; more recent cohorts have a much longer time from marriage until first birth (from a non-interaction model not presented). Of the variables considered as indicators of economic status and adjustment, only education was significant. The interaction between education and marriage cohort is significant at the 5% level and interpreted here.

Table z.6.Q presents the cumulative hazard of first birth at 36 months by cohort and educational level. For all educational levels, the effect of cohort is clear, with a higher probability of first birth among older cohort (1970-79, 1980-84) than among the most recent cohorts (1995-99, 2000 or more recent). This is consistent with the expected effect of economic crisis in the post-independence period. In general, the probability of first birth is lowest among women with higher education than among women with a secondary education and (in general) less than secondary education. This effect is evident in all cohorts (except 2000) in the post 1985 cohort. Further the effect of education appears to be increasing among more recent cohorts (the difference in probability between secondary and higher education is 0.04 in 1985-89, 0.08 in 1990-94, 0.11 in 1995-99). This result provides evidence of an adjustment effect. Anomalous results are found for the less than secondary category in 1980-84 and 1985-89. These terms are non-significant, which is attributed to data sparsity in these categories.

Marriage cohort	Educational level		
	Less than secondary	Secondary	Higher
1970-79	0.89	0.87	0.87
1980-84	0.47	0.86	0.86
1985-89	0.67	0.87	0.83
1990-94	0.84	0.85	0.77
1995-99	0.81	0.80	0.69
2000 or more recent	0.75	0.72	0.73

Table z.6.Q: Cumulative hazard of first birth by marriage cohort and educational level.

The estimated hazard plots for marriage cohorts by each educational level are presented in figure z.6.B, with the associated survival curves presented in figure z.6.X. In the early marriage cohorts (1970-79, 1980-94, 1985-89), the hazard of first birth peaks around 9-23 months, and then falls away rapidly (see z.6.B), indicating a rapid transition to first birth after marriage, with very few long post marriage birth intervals. The associated survival curves (figure z.6.X) follow this trend, with a precipitous decline in the number of women yet to become mothers in the early durations followed by a flattening of the survival curve. In contrast, later marriage cohorts tend to have a lower hazard of first birth in the early durations following marriage, but the hazard of first birth in later durations tends to decline much less than among early cohorts. This indicates a higher hazard of first birth in later durations following marriage. This is reflected in the survival plot (figure z.6.X) which has a flatter profile than among older marriage cohorts. Among the more recent cohorts, the transition to motherhood is less rapid than older cohorts, with a considerable proportion of women remaining childless in the early months after marriage. However, during later months the proportion of women yet to experience child birth declines more rapidly among later marriage cohorts, leading to younger cohorts catching up the older cohorts in the proportion experiencing first birth (recuperation). The extent to which this recuperation occurs is dependent on the level of education. Among women with a less than secondary[2] of secondary education, the recuperation is dramatic enough that the proportion yet to experience first birth are practically identical among all marriage cohorts after around 40 months (figures z.6.X- b and –c). However, for women with a higher education, although the proportion not having a first birth does fall more rapidly among women in the later cohorts in the later periods , this fall is not rapid enough for the post 1990-94 cohorts to catch the pre-independence marriage cohorts. After 71 months of marriage, the delay in childbearing has not been fully recuperated among more recent cohorts, and the proportion childless is still higher in more recent marriage cohorts than pre-independence ones. Compared to the 1970-79 cohort, the percentage childless is 5.6% higher in the 1990-94 marriage cohort, and 7.0% in the 1995-99 marriage cohort. This delay in childbearing in the post-independence cohorts is consistent with the findings of existing literature (Witte and Wagner 1995, Kohler and Kohler 2002, Conrad et al. 1996, Lechner 2001) and the increasing diversity of childbearing behaviour has also been noted by Sobotka (2003).

The effect of other covariates within the model can be examined directly from table z.6.M. These effects are not involved in interactions, and are not time

[2] Ignoring the 1980-84 and 1985-89 cohorts, which are non-significant due to small event numbers

dependent (i.e. the effect of the covariate is proportional). The hazard of first birth is highest among women who are 20-24 or 25-29, the odds of first birth for these ages being 24% higher than among women who were under 20 at marriage. Following his peak, the odds of first birth decline with increases in age, with very low odds of first birth in the over 35- group. This is consistent with the effect of declining fecundity at older ages. Women in rural areas have odds of first birth 11% higher than women in urban areas, while women in the north, centre and south regions have odds of first birth 6%, 15% and 18% higher respectably than women in Chisinau. This is indicative of a more rapid transition into motherhood in rural areas as a result of a shorter interval between marriage and first birth. For women who were separated during the marriage to first birth interval, the odds of first birth are significantly and substantially lower than among women whose marriages remained intact. The odds of first birth for separated women are 94% lower than among women who did not separate. For women whose contraceptive use occurred before or during the marriage interval, the odds of first birth were 47% lower than among women who started using contraceptive only after first birth. This is consistent with the effect of contraception delaying the first birth.

7 Summary and conclusions

The aim of this analysis was to examine the influences on the first birth timing of Moldovan women. In particular there was a focus on the contraceptive confidence effect, where women using less effective contraceptive methods space their births in order to achieve a completed family size close to their ideal. The traditional theory of contraceptive confidence was extended to incorporate the key role of induced abortion in the Moldovan fertility control regime. It was proposed that a high propensity to use induced abortion should increase the confidence of natural method users, and facilitate a compression of birth intervals. The analysis also attempted to investigate the influences of recent economic circumstances on the timing of first births in Moldova. In particular, the analysis attempts to test the validity of the crisis and adjustment hypotheses.

The first research hypothesis argued that the marriage to first birth interval should be longer among natural method users than among ‘effective’ method users. The results of the modelling supported this hypothesis, as the hazard of first birth was higher among modern reversible and permanent method users than natural method users. This implication of this is that natural method users have a longer interval between marriage and entry into motherhood. One puzzling result in this instance is the very low hazard of first birth among current non-users- indicating a longer birth interval among these women than among contraceptive users. It is difficult to provide a concrete explanation to this result due to a lack of data during the first birth interval. However, given data available at survey, current non-users had a higher proportion of currently infecund than among other groups. Tentatively, it can be concluded that longer marriage to birth interval in this group therefore reflects sub- or infecundity during a woman’s reproductive life, which lead to non-use at survey.

The second research hypothesis extended the traditional contraceptive confidence hypothesis and incorporated the significant impact of induced abortion in Moldovan fertility control. It was expected that a higher propensity to use induced abortion should be associated with higher confidence, and hence a shorter birth interval. This result was supported by the data. Women with no abortion history had the lowest hazard of first birth, and therefore the longest wait until first birth. Any propensity to use induced abortion had a higher hazard of first birth than non-users- indicating a quicker entry into motherhood. The very highest propensity to use induced abortion did experience an attenuation of this increase however- potentially as a result of use of abortion early in the reproductive life delaying first birth. It is concluded overall that the availability of induced abortion is a key determinant of the birth intervals, and provides a mechanism by which Moldovan women are able to meet their fertility preferences.

The evaluation of the influences on temporal trends identified a clear postponement effect among more recent cohorts. This is attributed to the influence of economic depression decreasing the likelihood of first birth, consistent with the results of Witte and Wagner (1995). Among women with a secondary or lower educational level, these birth were recuperated. However, among women with a higher education this recuperation was incomplete, and did not compensate for the fall in fertility in the period immediately following marriage. This is indicative an adjustment effect, where women with the greatest career prospect are more motivated to continue in the labour-force in a Western style childbearing pattern. This study therefore concludes that, although the effect of economic crisis was clearly significant on Moldovan fertility, the recuperation as a result of improving economic conditions will not be complete due to an increasingly Western career-orientated lifestyle among the better educated groups.

References

Agadjanian, V. (2002). "Is "Abortion Culture" Fading in the Former Soviet Union? Views about Abortion and Contraception in Kazakhstan." Studies in Family Planning **33**(3): 237-248.

Anderson, B. A., Katus, K., Puur, A., Silver, B.D. (1994). "The Validity of Survey Responses on Abortion: Evidence from Estonia." Demography **31**(1): 115-132.

Bongaarts, J. (1978). " A Framework for Analyzing the Proximate Determinants of Fertility." Population and Development Review **4**(1): 105-132.

Braun, H. I. (1980). "Regression-Like Analysis of Birth Interval Sequences." Demography **17**(2): 207-223.

Conrad, C., Lechner, M., Werner, W. (1996). "East German Fertility After Unification: Crisis or Adaptation?" Population and Development Review **22**(2): 331-358.

Davis, K., and Blake, J. (1956). "Social structure and fertility: An analytic framework." Economic and Cultural Change **4**(4): 211-235.

Filmer, D., Pritchett, L.H. (2001). "Estimating Wealth Effects without Expenditure Data- or Tears: An Application to Educational Enrolments in States of India." Demography **38**(1): 115-132.

Hionidou, V. (1998). "The Adoption of Fertility Control on Mykonos, 1879-1959: Stopping, Spacing or Both?" Population Studies **52**(1): 67-83.

Keyfitz, N. (1980). "Population Appearances and Demographic Reality." Population and Development Review **6**(1): 47-64.

Keyfitz, N., Caswell, H. (2005). Applied Mathematical Demography: Third Edition, Springer Science.

Kohler, H., Kohler, I. (2002). "Fertility Decline in Russia and the Early and Mid 1990s: The Role of Economic Uncertainty and Labour Market Crises." European Journal of Population **18**: 233-262.

Larsen, U., Vaupel, J.W. (1993). "Hutterite Fecundibility by Age and Parity: Strategies for Frailty Modelling of Event Histories " Demography **30**(1): 81-102.

Lechner, M. (2001). "The Empirical Analysis of East German Fertility after Unification: An Update." European Journal of Population **17**: 61-74.

Ni Bhrochlain, M. (1988). "The Contraceptive Confidence Idea: An Empirical Investigation." Population Studies **42**(2): 205-225.

Ni Bhrochlain, M. (1986)a "Women's paid work and the timing of births- Longitudinal evidence." European Journal of Population **2**: 43-70.

Ni Bhrochlain, M. (1986)b "The interpretation and role of work-associated accelerated childbearing in post-war Britain." European Journal of Population **2**: 135-154.

Ni Bhrolchain, M. (1985). "Birth intervals and women's economic activity." Journal of Biosocial Sciences **17**: 31-46.

Popov, A. A. (1991). "Family Planning and Induced abortion in the USSR: Basic Health and Demographic Characteristics." Studies in Family Planning **22**(6): 368-377.

Popov, A. A., Visser, A.P, Ketting, E., (1993). "Contraceptive Knowledge, Attitudes, and Practice in Russia during the 1980s." Studies in Family Planning **24**(4): 227-235.

Ross, J., Madhavan, S. (1981). "A Gompertz Model for Birth Interval Analysis." Population Studies **35**(3): 439-454.

Sobotka, T. (2003). "Re-Emerging Diversity: Rapid Fertility Changes in Central and Eastern Europe after the Collapse of the Communist Regimes." Population (English Edition, 2002-) **58**(4/5): 451-485.

Steele, F., Diamond, I., Wang, D. (1996). "The Determinants of the Duration of Contraceptive Use in China: A Multi-level Multinomial Discrete-Hazards Modelling Approach." Demography **33**(1): 12-23.

Van Bavel, J. (2004). "Deliberate Birth Spacing before the Fertility Transition in Europe: evidence from Nineteenth-Century Belgium." Population Studies **58**(1): 95-107.

Van Bavel, J. (2003). "Does an Effect of Marriage Duration on Pre-Transitional Fertility Signal Parity Dependent Control? An Empirical

Test in Nineteenth-Century Leuven, Belgium." Population Studies **57**(1): 55-62.

Westoff, C. (2005). Recent Trends in Abortion and Contraception in 12 Countries. DHS analytical studies No 8. . Calverton Maryland, ORC Macro.

Witte, J. C., Wagner, G.G. (1995). "Declining Fertility in East Germany After Unification: A Demographic Response to Socioeconomic Change." Population and Development Review **21**(2): 387-397.

Yamaguchi, K. (1993). Event History Analysis, Sage.

Variable	Number of respondents	Percentage experiencing first birth	Median survival time (Kaplan-Meier Estimate)
All	5377	88.0	14.0
Current contraceptive method			
Reversible	1957	79.0	14.0
None	2001	93.3	16.0
Natural	1174	98.0	13.0
Permanent	245	92.8	12.0
Propensity to use induced abortion			
Never-used	2727	79.7	17.0
Low	883	99.9	12.0
Medium	1075	99.9	13.0
High	692	88.9	14.0
Last method discontinued			
Modern	1203	87.4	15.0
Natural	1116	94.4	14.0
None recorded	3058	85.9	14.0
Highest education			
Less than secondary	39	82.1	21.0
Secondary	4137	90.4	13.0
Higher	1201	79.9	18.0
Marriage cohort			
1970-79	756	98.3	12.0
1980-84	979	97.5	13.0
1985-89	898	95.9	13.0
1990-94	941	94.4	13.0
1995-99	800	89.4	18.0
2000 or more recently	1003	56.9	23.0
Periodicity of employment			
All year	2906	88.6	14.0
Seasonal	579	91.9	14.0
Occasional	110	82.7	18.0
Does not work	1782	86.2	15.0
Type of employment			
Not working	1805	85.9	15.0
Professional/technical	1266	87.8	15.0
Clerical/services	696	87.0	15.0
Agricultural	541	94.5	13.0
Household/services	373	89.0	14.0
Manual	696	89.3	14.0
Ever separated			
No	4738	88.0	14.0
Yes	639	87.9	19.0

Variable	Number of respondents	Percentage experiencing first birth	Median survival time (Kaplan-Meier Estimate)
Separation before birth			
No	5188	90.6	14.0
Yes	189	16.9	-
Has used contraception at marriage			
No	3817	94.6	13.0
Yes	1560	71.9	24.0
Age at marriage			
Less than 19	2605	89.0	15.0
20-24	2351	88.6	13.0
25-29	354	81.6	14.0
30-34	49	73.5	21.0
35 or more	18	33.3	-
Knows how to avoid AIDS			
No	850	87.5	14.0
Yes	1961	87.1	15.0
Never heard of AIDS	107	87.9	17.0
Unsure	2459	88.9	14.0
Region of Residence			
North	1541	90.2	14.0
Centre	1270	91.3	13.0
South	1037	90.8	12.0
Chisinau	1529	81.2	18.0
Urbanicity			
Urban	3111	84.9	16.0
Rural	2266	92.4	13.0
Asset wealth index			
Low	2122	86.4	15.0
Medium	1914	88.1	15.0
High	1341	90.5	13.0
FP media exposure			
Low	2216	89.2	14.0
Medium	1385	58.4	15.0
High	1776	88.6	14.0
Ethnicity			
Moldovan	3954	88.4	14.0
Romanian	131	83.2	15.0
Ukrainian	463	87.0	17.0
Russian	402	84.3	18.0
Gagauzan	227	90.3	12.0
Bulgarian	128	93.8	13.0
Other	72	87.5	17.0

Table z.5.2: Descriptive statistics for potential explanatory variables for marriage to first birth interval.

		β		Standard error (β)	Odds ratio	95% confidence interval for odds ratio		
	Time							
	0-8months	-2.025	* *	0.189	0.13	0.09	-	0.19
	9-11 months	-0.713	* *	0.166	0.49	0.35	-	0.68
	12-17 months	-0.263		0.181	0.77	0.54	-	1.10
	18-23 months	-0.318		0.217	0.73	0.48	-	1.11
	24-29 months	-0.638	*	0.269	0.53	0.31	-	0.90
	30-35 months	-0.732	*	0.327	0.48	0.25	-	0.91
	36-41 months	-0.699		0.368	0.50	0.24	-	1.02
	42-71 months	0.579		0.374	1.78	0.86	-	3.71
	72 months or more	1.768	* *	0.614	5.86	1.76	-	19.52
† ^	**Current contraceptive method (ref= Modern reversible)**							
	None	-1.501	* *	0.447	0.22	0.09	-	0.54
	Natural	0.942		0.636	2.57	0.74	-	8.92
	Permanent	0.288		0.907	1.33	0.23	-	7.89
† ^	**Abortion history (ref= None)**							
	Low	3.204	*	1.389	24.63	1.62	-	374.82
	Medium	1.806	*	0.715	6.09	1.50	-	24.71
	High	-0.515		0.419	0.60	0.26	-	1.36
† ^	**Marriage cohort (ref 1970-79)**							
	1980-84	-0.145		0.548	0.87	0.30	-	2.53
	1985-89	-1.236	*	0.563	0.29	0.10	-	0.88
	1990-94	-1.881	* *	0.546	0.15	0.05	-	0.44
	1995-99	-2.630	* *	0.590	0.07	0.02	-	0.23
	2000 or more recent	-0.197		0.418	0.82	0.36	-	1.86
	Age at marriage (ref <19)							
	20-24	0.213	* *	0.038	1.24	1.15	-	1.33
	25-29	0.216	* *	0.078	1.24	1.07	-	1.45
	30-34	0.148		0.200	1.16	0.78	-	1.72
	35 or older	-0.789		0.442	0.45	0.19	-	1.08
^	**Highest educational level (ref Higher)**							
	Less than secondary	0.082		0.908	1.09	0.18	-	6.43
	Secondary	-0.034		0.132	0.97	0.75	-	1.25
	Residence (ref Urban)							
	Rural	0.101	*	0.043	1.11	1.02	-	1.20
	Region (ref Chisinau)							

	North		0.054			0.053	1.06	0.95	-	1.17
	Centre		0.137	*		0.058	1.15	1.02	-	1.28
	South		0.162	*	*	0.059	1.18	1.05	-	1.32
	Previous method discontinued									
† ^	**(ref= None)**									
	Modern		1.308	*	*	0.453	3.70	1.52	-	8.99
	Natural		2.809	*	*	0.679	16.59	4.38	-	62.79
	Separated prior to birth (ref=No)									
	Yes		-2.786	*	*	0.195	0.06	0.04	-	0.09
	Has used contraception by start of interval (ref=No)									
	Yes		-0.632	*	*	0.047	0.53	0.48	-	0.58
	Interaction									
	Contraceptive method x Abortion use									
	None x Low		0.624	*	*	0.122	1.87	1.47	-	2.37
	None x Medium		0.613	*	*	0.111	1.85	1.49	-	2.29
	None x High		0.331	*	*	0.128	1.39	1.08	-	1.79
	Natural x Low		0.194			0.130	1.21	0.94	-	1.57
	Natural x Medium		0.040			0.126	1.04	0.81	-	1.33
	Natural x High		-0.040			0.156	0.96	0.71	-	1.30
	Permanent x Low		0.907	*	*	0.248	2.48	1.52	-	4.03
	Permanent x Medium		0.574	*		0.228	1.78	1.14	-	2.78
	Permanent x High		0.291			0.274	1.34	0.78	-	2.29
	Contraceptive method x Previous method discontinued									
	None x Modern		0.252	*		0.104	1.29	1.05	-	1.58
	None x Natural		0.432	*	*	0.112	1.54	1.24	-	1.92
	Natural x Modern		0.079			0.125	1.08	0.85	-	1.38
	Natural x Natural		0.142			0.116	1.15	0.92	-	1.45
	Permanent x Modern		-0.010			0.267	0.99	0.59	-	1.67
	Permanent x Natural		0.675	*		0.308	1.96	1.07	-	3.59
	1980-84 x Less than secondary		-1.486			1.241	0.23	0.02	-	2.58
	1980-84 x Secondary		0.048			0.169	1.05	0.75	-	1.46
	1985-89 x Less than secondary		-0.711			1.027	0.49	0.07	-	3.68
	1985-89 x Secondary		0.201			0.168	1.22	0.88	-	1.70
	1990-94 x Less than secondary		0.218			0.987	1.24	0.18	-	8.61
	1990-94 x Secondary		0.403	*		0.165	1.50	1.08	-	2.07
	1995-99 x Less than secondary		0.358			1.046	1.43	0.18	-	11.11
	1995-99 x Secondary		0.432	*	*	0.169	1.54	1.11	-	2.15
	2000 x Less than secondary		0.140			1.012	1.15	0.16	-	8.36
	2000 x Secondary		0.462	*	*	0.170	1.59	1.14	-	2.21
	Time specific effects									
	Method x Time									
	None	0-8months	0.951	*		0.456	2.59	1.06	-	6.33
	Natural	0-8months	-1.059			0.645	0.35	0.10	-	1.23
	Permanent	0-8months	-0.444			0.922	0.64	0.11	-	3.91
	None	9-11 months	0.745			0.453	2.11	0.87	-	5.12

Natural	9-11 months	-0.979		0.642	0.38	0.11	-	1.32
Permanent	9-11 months	-0.799		0.918	0.45	0.07	-	2.72
None	12-17 months	0.808		0.455	2.24	0.92	-	5.47
Natural	12-17 months	-1.061		0.644	0.35	0.10	-	1.22
Permanent	12-17 months	-0.736		0.925	0.48	0.08	-	2.94
None	18-23 months	0.584		0.462	1.79	0.73	-	4.43
Natural	18-23 months	-1.248		0.651	0.29	0.08	-	1.03
Permanent	18-23 months	-0.756		0.942	0.47	0.07	-	2.98
None	24-29 months	0.510		0.473	1.67	0.66	-	4.21
Natural	24-29 months	-1.374	*	0.662	0.25	0.07	-	0.93
Permanent	24-29 months	-0.545		0.970	0.58	0.09	-	3.88
None	30-35 months	0.381		0.492	1.46	0.56	-	3.84
Natural	30-35 months	-1.176		0.675	0.31	0.08	-	1.16
Permanent	30-35 months	0.105		0.992	1.11	0.16	-	7.76
None	36-41 months	0.295		0.508	1.34	0.50	-	3.64
Natural	36-41 months	-1.237		0.689	0.29	0.08	-	1.12
Permanent	36-41 months	-0.667		1.085	0.51	0.06	-	4.30
None	42-71 months	-0.116		0.500	0.89	0.33	-	2.37
Natural	42-71 months	-1.108		0.690	0.33	0.09	-	1.28
Permanent	42-71 months	-0.487		1.066	0.61	0.08	-	4.96
Abortion use x Time								
Low	0-8months	-3.129	*	1.393	0.04	0.00	-	0.67
Medium	0-8months	-1.816	*	0.721	0.16	0.04	-	0.67
High	0-8months	0.723		0.429	2.06	0.89	-	4.78
Low	9-11 months	-3.369	*	1.329	0.03	0.00	-	0.47
Medium	9-11 months	-1.668	*	0.718	0.19	0.05	-	0.77
High	9-11 months	0.554		0.424	1.74	0.76	-	3.99
Low	12-17 months	-3.064	*	1.393	0.05	0.00	-	0.72
Medium	12-17 months	-1.777	*	0.720	0.17	0.04	-	0.69
High	12-17 months	0.571		0.428	1.77	0.76	-	4.10
Low	18-23 months	-3.199	*	1.393	0.04	0.00	-	0.63
Medium	18-23 months	-1.696	*	0.720	0.18	0.04	-	0.75
High	18-23 months	0.376		0.428	1.46	0.63	-	3.37
Low	24-29 months	-3.077	*	1.397	0.05	0.00	-	0.71
Medium	24-29 months	-1.811	*	0.726	0.16	0.04	-	0.68
High	24-29 months	0.498		0.442	1.65	0.69	-	3.91
Low	30-35 months	-3.228	*	1.404	0.04	0.00	-	0.62
Medium	30-35 months	-2.336	* *	0.736	0.10	0.02	-	0.41
High	30-35 months	0.293		0.461	1.34	0.54	-	3.31
Low	36-41 months	-2.882	*	1.413	0.06	0.00	-	0.89
Medium	36-41 months	-1.835	*	0.761	0.16	0.04	-	0.71
High	36-41 months	0.295		0.521	1.34	0.48	-	3.73
Low	42-71 months	-3.122	*	1.430	0.04	0.00	-	0.73
Medium	42-71 months	-1.042		0.765	0.35	0.08	-	1.58
High	42-71 months	0.467		0.486	1.60	0.62	-	4.14
Marriage cohort x Time								
1980-84	0-8months	0.162		0.550	1.18	0.40	-	3.46
1985-89	0-8months	1.343	*	0.565	3.83	1.27	-	11.59
1990-94	0-8months	1.901	* *	0.550	6.69	2.28	-	19.67
1995-99	0-8months	2.626	* *	0.596	13.82	4.30	-	44.44
2000 or more recent	0-8months	-0.139		0.431	0.87	0.37	-	2.03
1980-84	9-11 months	-0.054		0.542	0.95	0.33	-	2.74

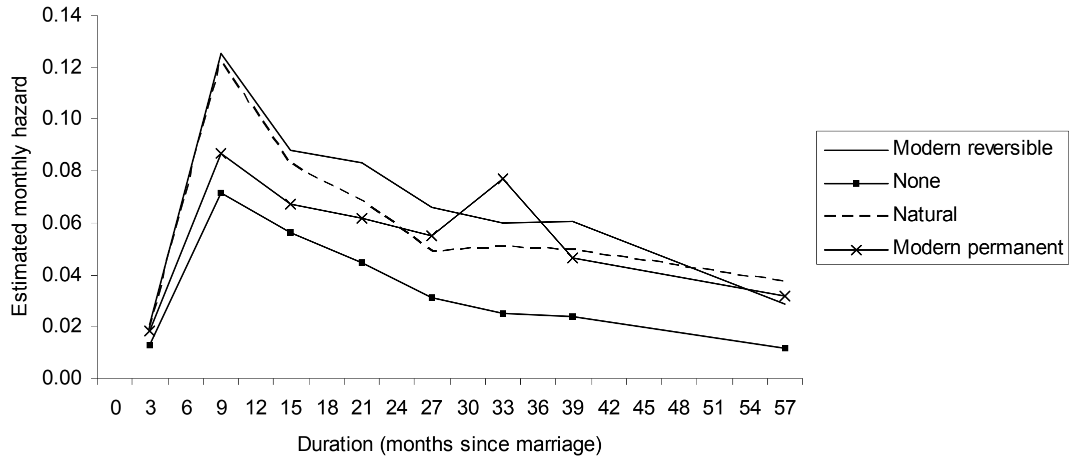
1985-89	9-11 months	0.845			0.558	2.33	0.78	-	6.95
1990-94	9-11 months	1.235	*		0.543	3.44	1.19	-	9.97
1995-99	9-11 months	1.690	*	*	0.590	5.42	1.71	-	17.23
2000 or more recent	9-11 months	-0.940	*		0.420	0.39	0.17	-	0.89
1980-84	12-17 months	0.007			0.548	1.01	0.34	-	2.95
1985-89	12-17 months	1.158	*		0.563	3.18	1.06	-	9.60
1990-94	12-17 months	1.402	*	*	0.548	4.06	1.39	-	11.89
1995-99	12-17 months	1.757	*	*	0.594	5.80	1.81	-	18.56
2000 or more recent	12-17 months	-0.629			0.424	0.53	0.23	-	1.22
1980-84	18-23 months	0.113			0.562	1.12	0.37	-	3.37
1985-89	18-23 months	0.825			0.579	2.28	0.73	-	7.10
1990-94	18-23 months	1.471	*	*	0.562	4.35	1.45	-	13.10
1995-99	18-23 months	1.741	*	*	0.607	5.70	1.74	-	18.74
2000 or more recent	18-23 months	-0.611			0.445	0.54	0.23	-	1.30
1980-84	24-29 months	0.140			0.586	1.15	0.36	-	3.63
1985-89	24-29 months	1.046			0.601	2.85	0.88	-	9.24
1990-94	24-29 months	1.112			0.590	3.04	0.96	-	9.66
1995-99	24-29 months	1.700	*	*	0.630	5.47	1.59	-	18.82
2000 or more recent	24-29 months	0.088			0.471	1.09	0.43	-	2.75
1980-84	30-35 months	-0.109			0.620	0.90	0.27	-	3.02
1985-89	30-35 months	1.005			0.631	2.73	0.79	-	9.41
1990-94	30-35 months	1.017			0.618	2.76	0.82	-	9.28
1995-99	30-35 months	1.964	*	*	0.650	7.13	1.99	-	25.48
2000 or more recent	30-35 months	-0.089			0.520	0.91	0.33	-	2.54
1980-84	36-41 months	-0.347			0.651	0.71	0.20	-	2.53
1985-89	36-41 months	0.539			0.672	1.71	0.46	-	6.40
1990-94	36-41 months	1.073			0.642	2.92	0.83	-	10.29
1995-99	36-41 months	2.124	*	*	0.671	8.36	2.25	-	31.16
2000 or more recent	36-41 months	0.675			0.553	1.96	0.66	-	5.81
1980-84	42-71 months	-0.475			0.648	0.62	0.17	-	2.21
1985-89	42-71 months	0.563			0.663	1.76	0.48	-	6.44
1990-94	42-71 months	1.228			0.634	3.41	0.99	-	11.83
1995-99	42-71 months	2.166	*	*	0.667	8.72	2.36	-	32.24
2000 or more recent	42-71 months	-			-	-	-	-	-
Previous method discontinued x Time									
Modern	0-8 months	-1.265	*	*	0.460	0.28	0.11	-	0.70
Natural	0-8 months	-2.985	*	*	0.684	0.05	0.01	-	0.19
Modern	9-11 months	-1.260	*		0.547	0.28	0.10	-	0.83
Natural	9-11 months	-2.889	*	*	0.682	0.06	0.01	-	0.21
Modern	12-17 months	-1.364	*	*	0.460	0.26	0.10	-	0.63
Natural	12-17 months	-2.797	*	*	0.684	0.06	0.02	-	0.23
Modern	18-23 months	-1.127	*		0.468	0.32	0.13	-	0.81
Natural	18-23 months	-2.696	*	*	0.690	0.07	0.02	-	0.26
Modern	24-29 months	-1.180	*		0.483	0.31	0.12	-	0.79
Natural	24-29 months	-2.503	*	*	0.699	0.08	0.02	-	0.32
Modern	30-35 months	-0.774			0.498	0.46	0.17	-	1.22
Natural	30-35 months	-2.620	*	*	0.715	0.07	0.02	-	0.30
Modern	36-41 months	-1.459	*	*	0.528	0.23	0.08	-	0.65
Natural	36-41 months	-2.558	*	*	0.724	0.08	0.02	-	0.32
Modern	42-71 months	-0.885			0.508	0.41	0.15	-	1.12
Natural	42-71 months	-1.729	*		0.724	0.18	0.04	-	0.73

Notes:

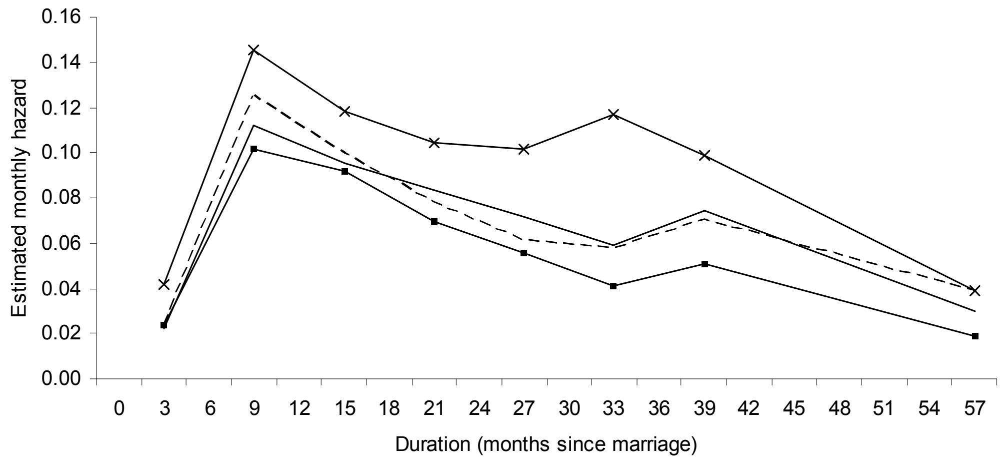
** denotes p<0.01
* denotes p<0.05
^ denotes component in two-way interaction
† denotes time specific effect
No parameter estimate is possible for the term in 42-71 period for the 2000 or more recent marriage cohort as this period is censored by the survey date.

<u>Table z.6.M: Parameter estimates for piecewise constant hazard model for duration of marriage to first birth interval</u>

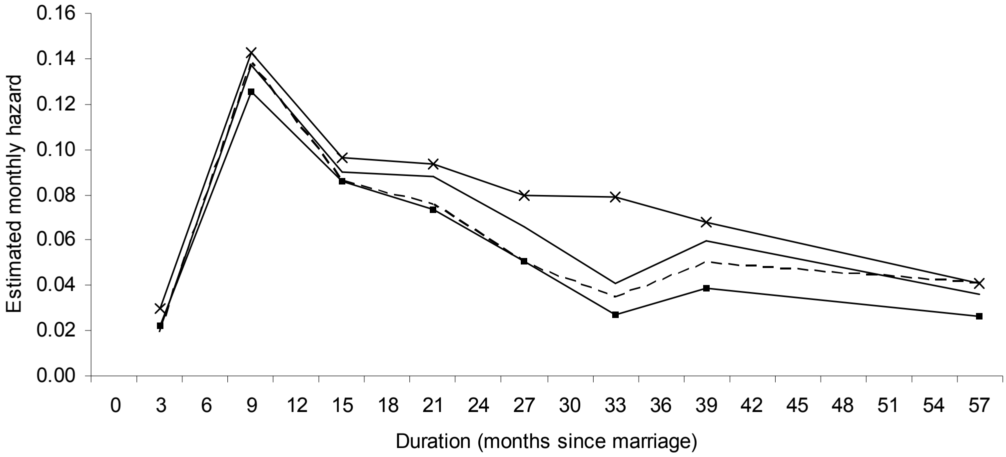
a) Estimated monthly hazard of first birth by current contraceptive method given no propensity to use induced abortion



b) Estimated monthly hazard of first birth by current contraceptive method given low propensity to use induced abortion



c) Estimated monthly hazard of first birth by current contraceptive method given medium propensity to use induced abortion



d) Estimated monthly hazard of first birth by current contraceptive method given high propensity to use induced abortion

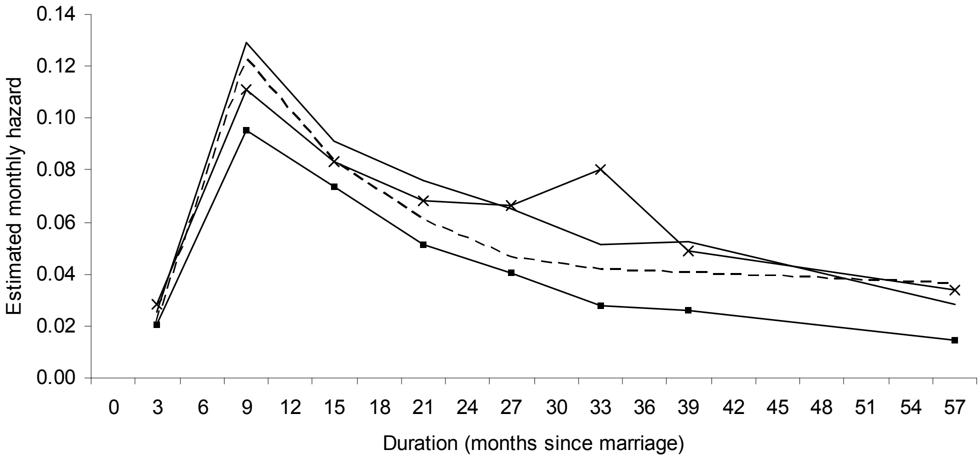
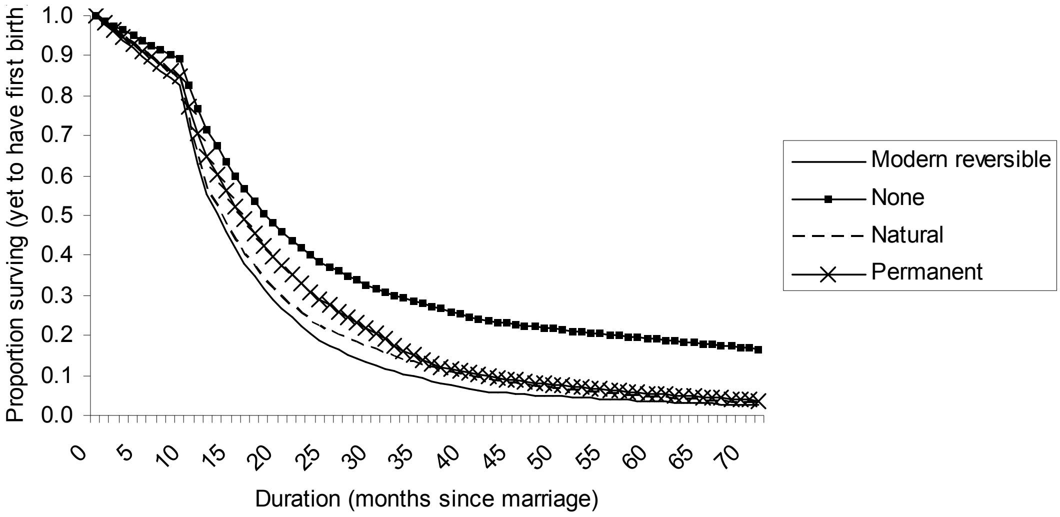
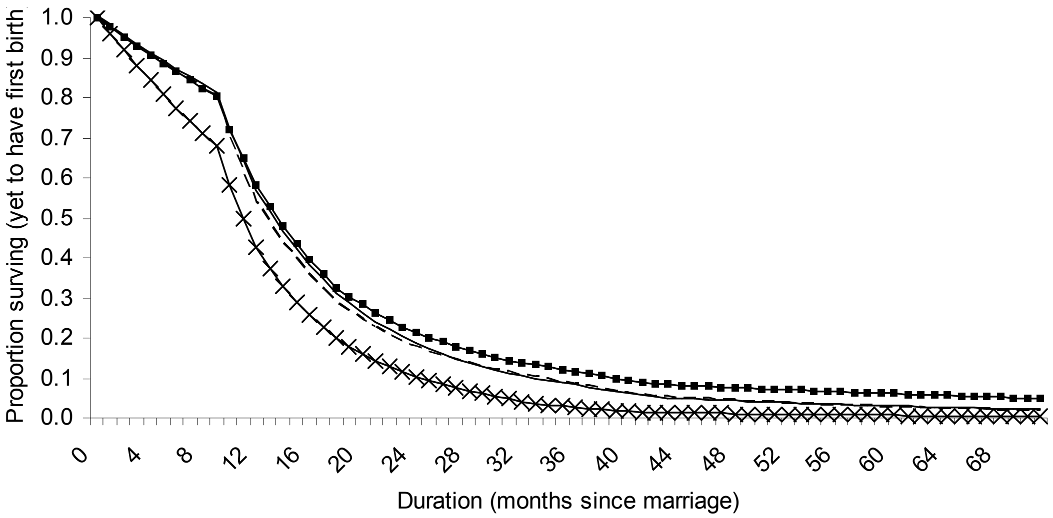


Figure z.6.T Estimated monthly hazard of first birth for current contraceptive method given a) no abortion use, b) low abortion use, c) medium abortion use and d) high abortion use.

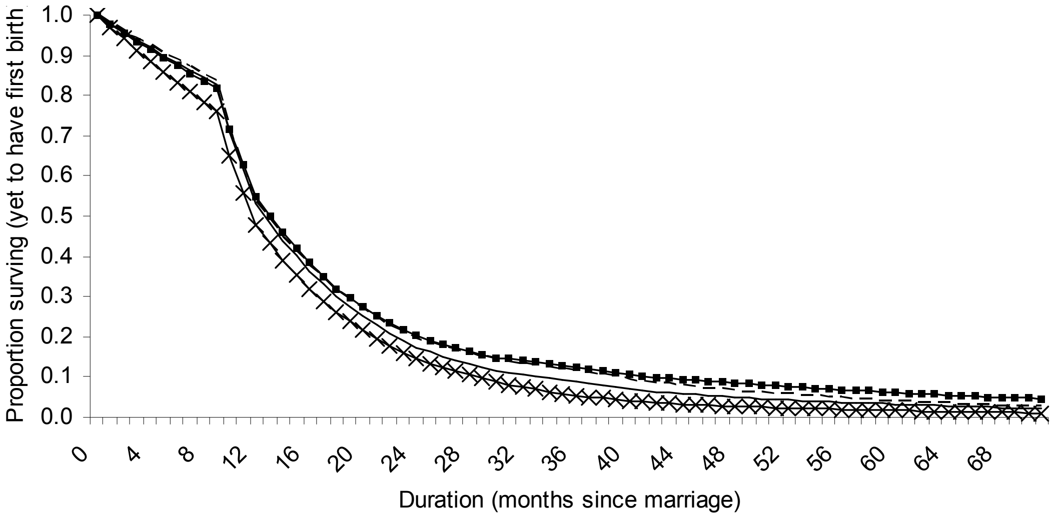
a) Estimated survival curve by current contraceptive method given no propensity to use induced abortion



b) Estimated survival curve by current contraceptive method given low propensity to use induced abortion



c) Estimated survival curve by current contraceptive method given medium propensity to use induced abortion



d) Estimated survival curve by current contraceptive method given high propensity to use induced abortion

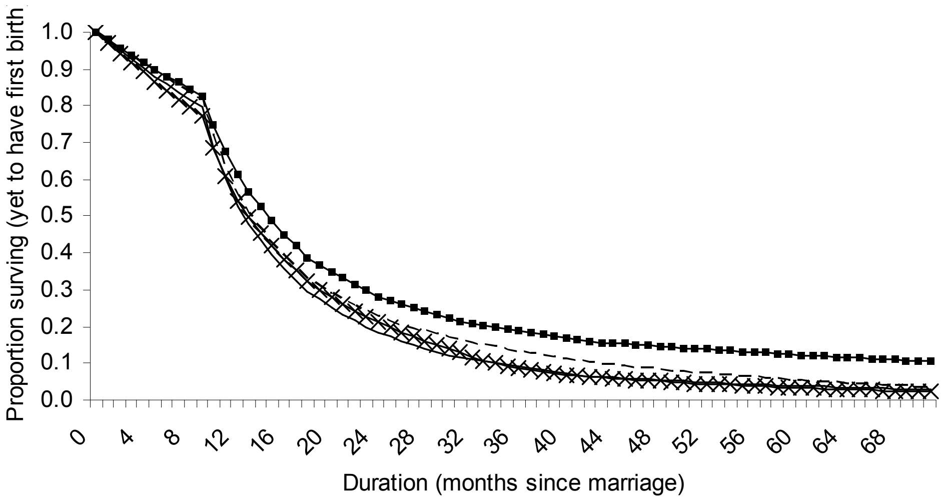
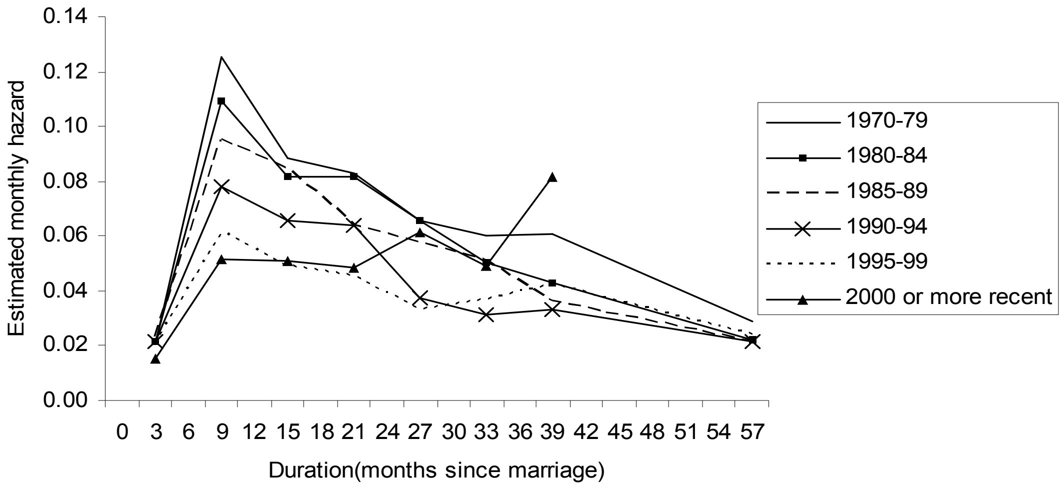
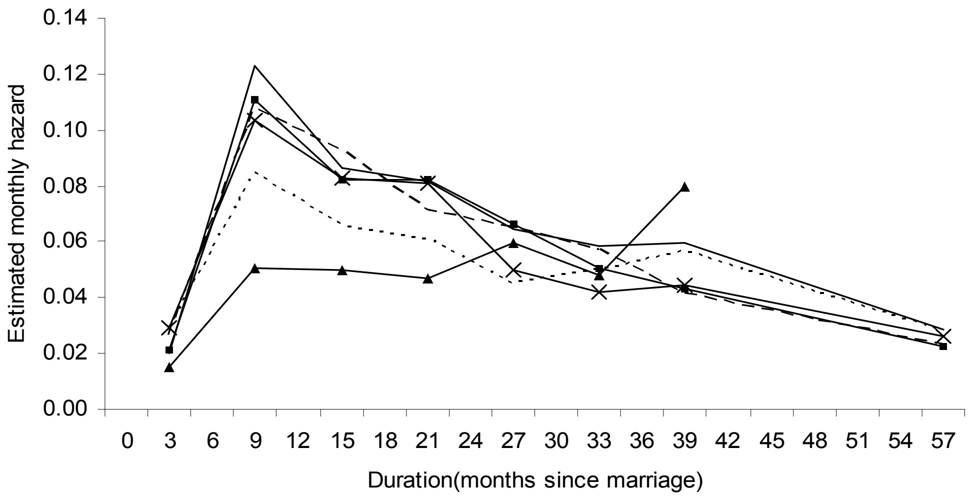


Figure z.6.P Estimated survival curves for current contraceptive method given a) no abortion use, b) low abortion use, c) medium abortion use and d) high abortion use.

a) Estimated monthly hazard of first birth by marriage cohort given higher education



b) Estimated monthly hazard of first birth by marriage cohort given secondary education



c) Estimated monthly hazard of first birth by marriage cohort given less than secondary education

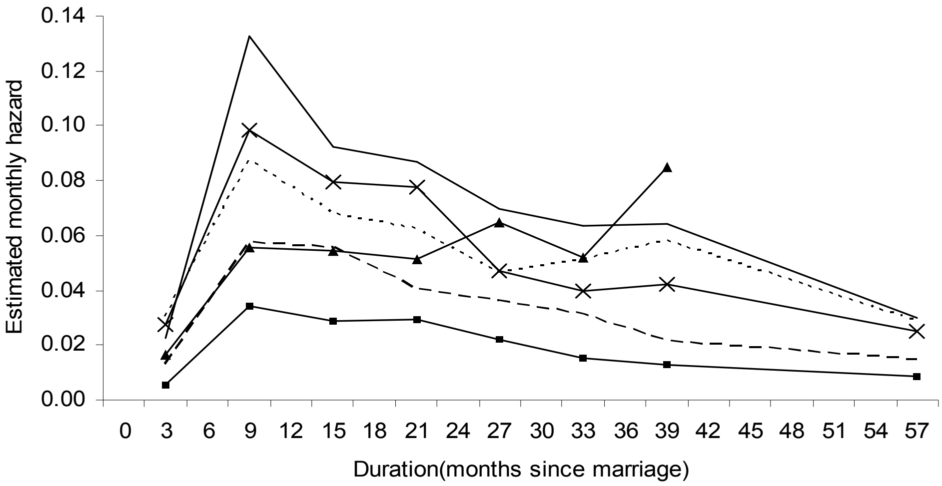
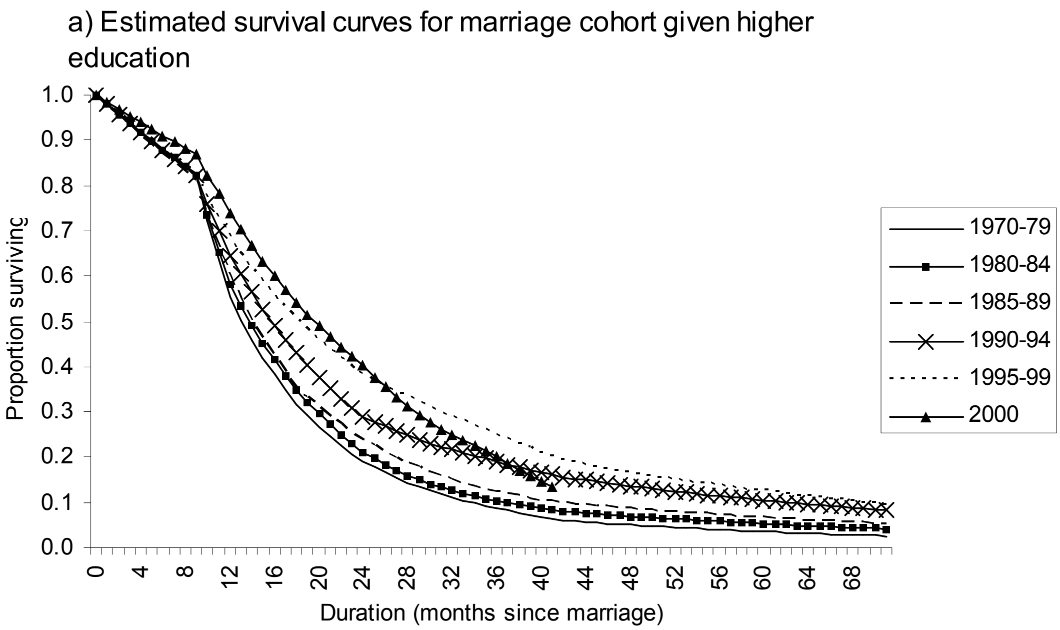
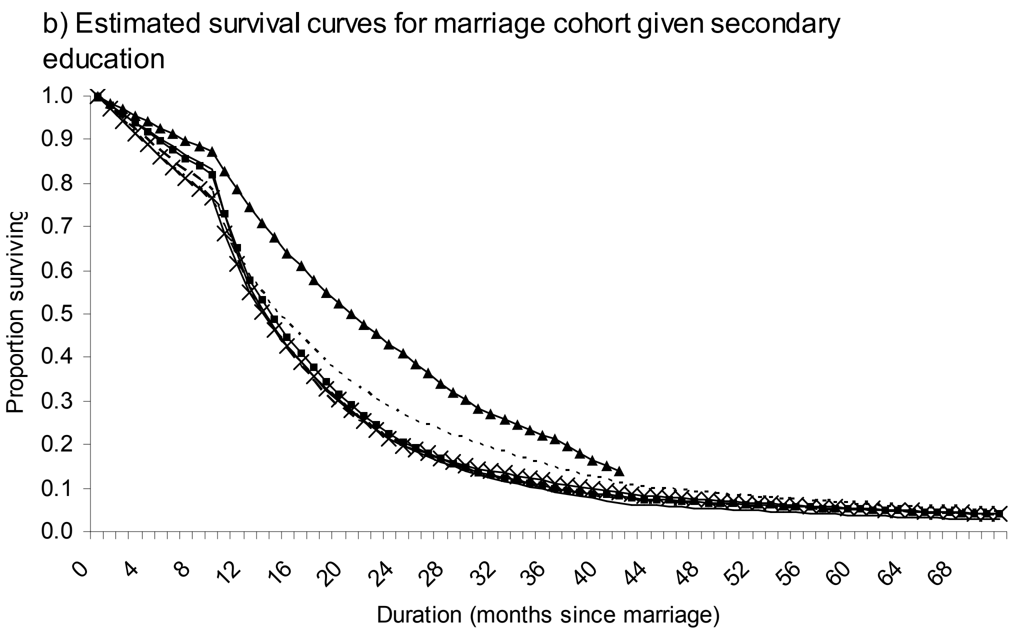


Figure z.6.B: Estimated monthly hazard of first birth by marriage cohort given a) higher education, b) secondary education and c) less than secondary education.



a) Estimated survival curves for marriage cohort given higher education
Proportion surviving
Duration (months since marriage)
1970-79
1980-84
1985-89
1990-94
1995-99
2000



b) Estimated survival curves for marriage cohort given secondary education
Proportion surviving
Duration (months since marriage)

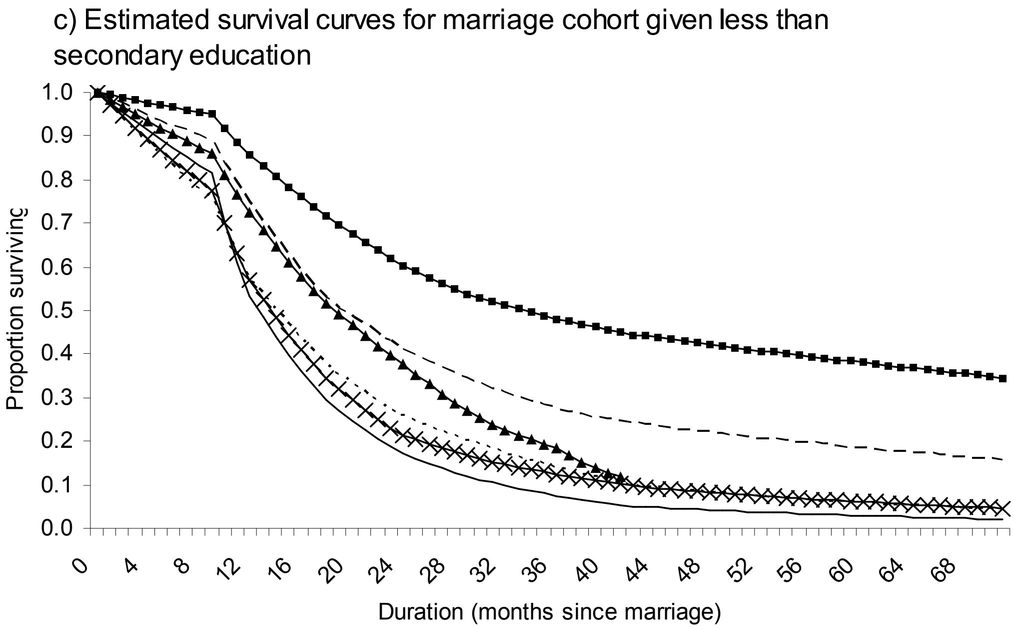


Figure z.6.X: Survival curve by marriage cohort given a) higher education, b) secondary education and c) less than secondary education.