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Fertility and contraceptive use dynamics in Iran: Special focus on low fertility regions

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Abstract

Iran has experienced a sharp fertility decline during the late 1980s and 1990s, and reached replacement-level fertility in 2000. However, it is well known that trends in the cross-sectional total fertility rate can be confounded by changes in the timing of births across women's lifetimes (tempo) as well as by changes in the numbers of children that they have by the time they end their childbearing (quantum). Synthetic parity progression ratios provide a much richer interpretation of the trend in period fertility in Iran than does the conventional age-based model. Using the 2000 Iran Demographic and Health Survey (IDHS) and the 2005 Iran Low Fertility Survey, synthetic parity progression ratios are applied to examine the fertility dynamics in Iran during the last two decades. Progressions from marriage to the 1st birth and from the 1st to subsequent births for Iran and the low fertility provinces are presented. The trends of a decomposition of the change in the period lifetime fertility between 1981 and 1999 into changes in the progression to marriage and the progression to each successive birth are also shown. It is observed that there is an emerging trend to delay the first birth following marriage, a longer term trend towards wide spacing between the first and the second birth, and cessation of childbearing after the second birth. Then, based on data relating to four low fertility provinces, the paper examines the contraceptive dynamics associated with the observed changes in parity progression. In particular, contraceptive use before the first birth, in the interval between the first and the second birth and following the cessation of childbearing is analysed. The mix of contraceptive methods varies across the four provinces and by socio-economic characteristics but the fertility outcomes are similar. The paper also examines how the reproductive life span of Iranian women has changed. The paper concludes that, if as expected, the fertility behaviour across Iran converges to the patterns of delay and limitation observed in the four low fertility provinces, the Total Fertility Rate will continue to fall to levels well below replacement. The implications of these trends for economic and social planning in Iran and for the family planning program are discussed.

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1. Introduction

Iran has experienced a sharp fertility decline over the last three decades. The total fertility rate decreased from 7.7 in 1966 (Amani 1970) to around 6.0 by the mid-1970s, rising slightly during the late 1970s and early 1980s, and decreasing sharply during the 1990s, eventually falling to replacement level in 2000 (Abbasi-Shavazi 2002a). Applying the own-children method to the 1986 and 1996 Censuses and the Iran 2000 Demographic and Health Survey, Abbasi-Shavazi and McDonald (2005) revealed that the pattern of fertility decline in Iran is one in which fertility has fallen simultaneously in all age groups, and in all geographic settings. The decline has occurred in both rural and urban areas of Iran, and all provinces have followed the national fertility trend over the last two decades, all but a few provinces reaching low levels of fertility in recent years.

This phenomenon is particularly unexpected because of its occurrence in an Islamic context. The decline occurred a short period after the establishment in 1979 of the Islamic Republic of Iran in a pronatalist atmosphere where both the government and religious leaders had encouraged early marriage and increased childbearing. Further, the *Imperial Palavi* family planning program established in 1967 was suspended after the revolution in 1979 (Iran Ministry of Health 2003). Iran's fertility decline differed from other Islamic countries such as Egypt, Pakistan, Indonesia, Bangladesh, Morocco or Malaysia that, like Iran, had initiated birth-control programs in the 1960s, but had not suspended the program (United Nations 2004).

Iranian scholars generally believe that the unprecedented fertility decline in Iran is a combination of the reimplementation of family planning program and of social developments including the expansion of education particularly for women, rural development and establishment of a health network system throughout the country (Ladier-Fouladi 1997; Mirzaie 1998; Aghajanian and Mehryar 1999a; Mehryar *et al.* 1999; Abbasi-Shavazi 2000a; Hoodfar and Assadpour 2000; Abbasi-Shavazi 2001b, 2002b; Abbasi-Shavazi *et al.* 2002; Abbasi-Shavazi 2005). They have generally considered that cross-sectional political and socio-economic events have influenced fertility decline.

Various reasons have been given for this fertility decline. The reasons include nuptiality change, rural development, the expansion of education, and the establishment of a health network system, as well as the legitimization and implementation of family planning in post-revolutionary Iran (Mirzaie 1998; Mehryar *et al.* 1999; Abbasi-Shavazi *et al.* 2002). One of the main features of fertility decline in Iran is its rapidity in rural areas due to rural development, and the improvement in the health network system after the revolution. Health houses in rural areas of Iran have played a key role in reducing infant mortality rates which indirectly contributed to the fall of fertility by the late 1980s. The reasons given for the fertility decline in Iran will be reviewed in the consequent sections.

Marriage

Marriage patterns are important contributors to fertility change (Bongaarts and Potter 1983), particularly in a religious and traditional society like Iran, where arranged marriage and religious rules make early marriage common and premarital sex and thus premarital pregnancy quite rare. A rising age at marriage has been important in fertility reduction in Iran, although its impact is less important than that of other factors. Only

around 15 per cent of the change in the total fertility rate between 1976-86 and 1986-96 was due to the rising age at marriage, suggesting that other factors account for most of the fertility decline in Iran (Abbasi-Shavazi 2000a). Despite rapid fertility decline in Iran during the last three decades, and its similarity to patterns in some low fertility countries, marriage patterns in Iran have not followed other countries that have reached low fertility levels (Dixon 1978; Coale *et al.* 1991; Klitsch 1994).

The singulate mean age at marriage (SMAM) shown in Table 1 is an indirect estimate of mean age at first marriage based on the proportion of never married people in five-year age groups (Hajnal 1953). The singulate mean age at marriage for women in rural areas in the period 1966–1976 increased from less than 18 years to around 19 years, and in urban areas it rose from around 19 to 20 years. The female age at marriage stabilised during 1976–1986 in urban areas, but rose slightly in rural areas. This period coincided with the early years of the Islamic Revolution which was followed by a pronatalist ideology that encouraged early marriage. After the Islamic Revolution, according to *Sharia* (Islamic Law), the minimum age of marriage for girls and boys was decreased from 15 and 18 to 13 and 15 years, respectively (Azimi 1981). However, the pronatalist approach to marriage did not lead to declines in the female age at marriage during 1976–1986.

Table 1: Singulate mean age at marriage (SMAM) and percentage of never married population aged 15–19 and 20–24, Iran, 1996–2000

Year	Singulate Mean Age at Marriage						Percentage of never married women	
	Male			Female				
	Total	Urban	Rural	Total	Urban	Rural	15–19	20–24
1966[a]	25.0	25.6	24.4	18.4	19.0	17.9	54.4	13.7
1976[a]	24.1	25.1	22.7	19.7	20.2	19.1	65.7	21.4
1986[a]	23.6	24.2	22.6	19.8	20.0	19.6	67.7	27.7
1991[a]	24.6	24.9	23.5	20.9	21.0	20.8	74.5	22.9
1996[a]	25.60	26.2	24.5	22.4	22.5	22.3	82.3	39.9
2000[b]	25.9	26.4	24.9	23.0	22.9	23.1	83.7	45.8

Sources: a. (Statistical Centre of Iran 2002); b. Estimated for this research using the 2000 IDHS

Family planning

When the official family planning program was implemented in 1989, it enjoyed the support of religious leaders who had been opposed to government involvement in birth control before the revolution and even after the revolution. The program may have changed the behaviour of women in rural areas of Iran in recent decades. The 2000 Iran Demographic and Health Survey (Iran Ministry of Health 2002) showed a contraceptive prevalence of 74.0 per cent (56 per cent modern and 18 per cent traditional) among all currently married women of reproductive age, the use of modern methods in 2000 being higher in rural areas (57.3 per cent) than in urban areas (55.2 per cent). One of the main facilitating reasons for the fall of fertility suggested by scholars has been the family planning program during the 1990s (Mehryar *et al.* 1998; Aghajanian and Mehryar

1999b). However, due to lack of data, studies have failed to examine contraceptive dynamics and their impact on fertility regulation in Iran.

The Health Network System in Iran

Iran has a well-established health network system throughout the country that covers approximately all of the urban population and 95 per cent of the rural population. Iran was one of the countries that signed and was committed to the resolution of the 1978 International Primary Health Care conference organised in Alma Ata by the World Health Organisation. The current Health Network System was established in 1979 immediately after the revolution to provide primary health care to people throughout country. However the pilot of this system had been trialled before the revolution in East Azerbaijan province.

A comprehensive health network system was established at the district level throughout Iran. District health centre directors monitored and supervised all of the health centres and health houses in their jurisdiction, and they in turn were accountable to the head of the provincial health centre, and through them to the national Ministry of Health. This is the basis or model of the health network system in all districts of Iran through which every health program is directed and implemented, and provides the related services to people. The local people in rural areas are provided primary health services from *Behvarz* including family planning services (family planning including pills, condom and injectable (DMPA); ante and prenatal health care; children's health care including vaccination, monitoring nutrition and height and weight of children, and environmental health). Specifically for family planning, *Behvarz* follows all of their clients and if they volunteer for IUD, norplant or sterilization methods, the *Behvarz* refers them to the health centre or district hospital for treatment at no cost to the user.

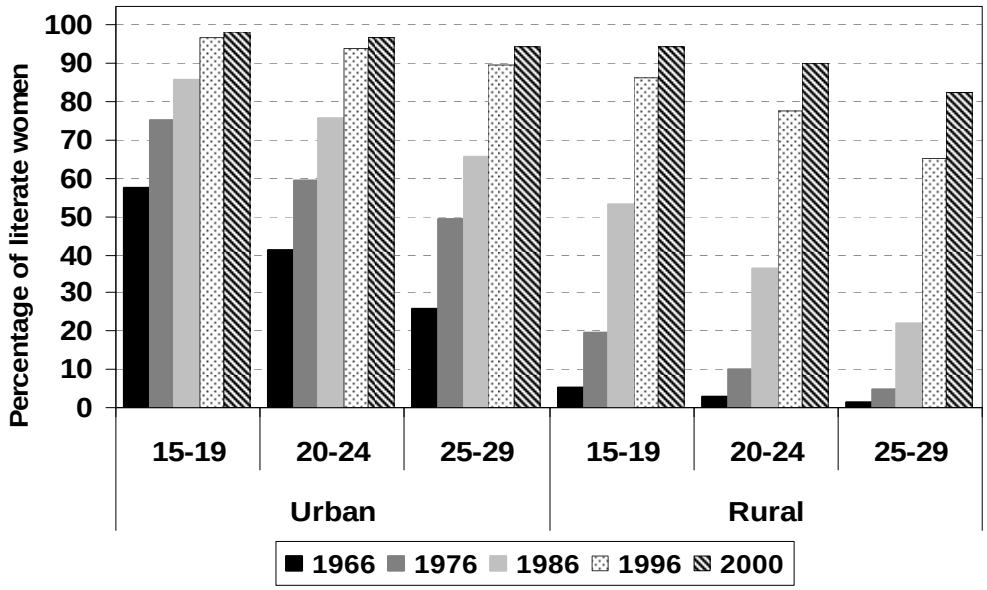
In the remote areas where there is no available health house, mobile teams supply people with family planning needs including pills and condoms. This health network system has greatly contributed to the implementation of the family planning program and to the reduction of infant mortality, and thus, has reduced the demand for children. The basis of the system was and is to provide primary health care to people in urban and rural areas. (Pileroudi 2001). The expansion of the health network system, particularly in rural areas of Iran, has made a great contribution to the decline of infant mortality (discussed in the next section), increasing access to family planning, diffusion of small family size ideas, and thus, fertility decline in Iran after the revolution.

Socio-economic development

Fertility change in Iran has occurred in a context of considerable changes in social and economic development (Mehryar and Tajdini 1998; Aghajanian and Mehryar 1999a). A report documented by former Plan and Budget Organisation of Iran indicates that the socio-economic development situation in Iran has considerably improved during the decade 1988–98. It shows that the general Human Development Index (HDI) for Iran increased from 0.64 in 1988 to 0.76 in 1997. The report noted a 20 per cent growth in development across Iran in this decade (Management and Planning Organization 1999). For example, the general literacy rate as one of the elements in the HDI increased across all age groups of both males and females from 1976 to 1996, particularly the proportion of literate women aged 15–29 rose to over 90 per cent by 2000 (Figure 1). However, the

gross enrolment ratio for women (combined primary, secondary and tertiary level education) had not improved as much as literacy rates. Increase in literacy was achieved also through extensive adult literacy programs across Iran. However, in Iran, in spite of a considerable rise in the female literacy rate, the rate of female employment has remained low at between 15 to 18 per cent according to the last Labour Force Survey conducted by the Statistical Centre of Iran in Winter 2006 (Statistical Centre of Iran 2006b).

Figure 1: The literacy rate for women aged 15–29 by area of residence, Iran, 1966–2000



Source: Figure derived from the 1966, 19976, 1986 and 1996 Censuses (Statistical Centre of Iran 2006a) and the Iran 2000 Demographic and Health Survey.

2. Data

This paper is designed to explore the pattern and dynamics of fertility decline including the starting, spacing and stopping of childbearing among Iranian women, and its relationship to contraceptive use across fertility decline years in four low fertility provinces (Gilan, Yazd, Isfahan and the city of Tehran). The study will address the individual and structural determinants related to fertility control in Iran particularly in low fertility provinces. To meet the objectives of this paper two data sets are utilised. The 2000 Iran Demographic and Health Survey and the 2005 Iran Low Fertility Survey are the main data sets used for most analysis in this paper.

The 2000 Iran Demographic and Health Survey (IDHS)

The IDHS was conducted in October 2000 by the Ministry of Health. Using the 1996 Census framework and the systematic cluster stratification sampling method, 113,957 households throughout the country were visited by interviewers and members of 111,989 households were successfully interviewed. At the time of the 1996 Census, Iran was geographically divided into 28 provinces. The sample size of IDHS was optimised to enable most of the fertility and reproductive health indices to be estimated at the

provincial level. It was designed so that in each of 27 provinces, 4000 households (2000 households equally in each rural and urban area) were interviewed. In Tehran province, 2000 households exclusively in Tehran City were interviewed while, in the rest of the province like other provinces, 2000 urban households, and 2000 rural households were interviewed. The response rate was very high (97.9 per cent). A total of 93,000 ever married women aged 10–49 were identified and 90924 women were successfully interviewed about their reproductive life and behaviour. The questionnaire was designed in two main sections including a general questionnaire for the demographic characteristics of all members of the household, and a specific questionnaire for ever-married women of reproductive age. The specific questionnaire for women included sets of questions around the following subjects: background and history of their marriage and fertility: maternal care in the last pregnancy that ended during the two-year period preceding the survey; current family-planning practice; plus a set of questions about children under five addressing breastfeeding, diarrhoeal diseases and acute respiratory infections.

The 2005 Iran Low Fertility Survey (ILFS)

The Iran Low Fertility Survey was also conducted by M.J. Abbasi-Shavazi and P. McDonald with the author's collaboration during April-May 2005 through an award from the Wellcome Trust. The general aim of the ILFS was to investigate the health and social consequences of early cessation of childbearing in Iran. The survey was conducted in the three provinces of Yazd, Isfahan, Gilan, and the greater city of Tehran. A sample of 7350 households was approached, and 5526 ever married women aged 15–54 were interviewed, specifically for their behaviours and attitudes regarding reproductive life. This data set together with the IDHS comprises the main source of data for the present research.

This data set was specifically designed for detailed in-depth analysis of contraceptive use and fertility behaviour together to show how women have regulated their fertility during their reproductive lives using contraception to delay or limit their fertility. The questionnaire was divided into two sub-questionnaires: household questionnaire and (eligible) women's questionnaire. Eligible women in this survey were ever married and aged between 15 and 54 years. A comprehensive questionnaire was designed for women to be questioned about both their pregnancy history and contraceptive use history. The age range of women studied in the ILFS 2005 allows investigation and comparison of the reproductive behaviour of Iranian women across as many as three generations over the last 30 to 35 years. For example, fertility regulation among three generations of women aged 20-24 of three birth cohorts can be compared, and the changes underlying fertility decline in Iran over time can be explored.

The questionnaire was designed to derive age at first marriage precisely for both men and women as well as other demographic characteristics of the couple. Particular attention was paid to wanted and unwanted fertility for projecting how many more children women wanted to have in the future, and when and how they planned to stop bearing children in the future. Based on the objectives of the Low Fertility Survey, women were interviewed for previous, present, and future labour force participation as well as their daily activity, and the economic status and 'modernise' (i.e., uptake of technology and ownership of such items as motor vehicle, white goods etc.) of the

household in which they were resident. However, the latter data will not be drawn on for the purposes of this particular research.

3. Methodology

Both bivariate and multivariate analyses are applied to the data to show the trends, similarities and variations as well as factors associated with the fertility level and contraceptive practice. Fertility levels and trends are examined by using different methodologies and estimates to illustrate the fertility changes over the last three decades. These methods will be described more detailed where the related results are discussed. Logistic regression and multinomial logistic regression models are applied where the results of the analysis need to be tested for the correlations involved in differentials in contraceptive practice.

Life table analysis is utilised to measure the continuation rates of different types of contraception as well as the time of first use of contraception at each parity level. The multivariate analysis of the determinants of contraceptive discontinuation, and failure are based on hazards model analysis. Theoretically, in the analysis, three levels exist in the models. The first level is episodes or intervals of use, the second is the woman, and the third level comprises women clustered for education level, pregnancy order, or place of residence. These methodologies will be described where they were applied to the data to produce the results targeted in that section.

4. Fertility: Trends and levels

In general, fertility patterns, trends and differentials can be presented in two ways, an age-based approach, and a parity approach that gives more insight into the fertility changes over time. Measures such as the crude birth rate or total and general fertility rates show the level of fertility at a specific point in time and are time or age structure dependent. The mean number of children ever born by age is also a time dependent measure, although it presents more detailed information of fertility experiences during the reproductive life. The parity progression ratios and the mean age at each parity present the changes of childbearing over time. No single measure can comprehensively reflect the fertility behaviour during a given period. Thus, this paper uses both age-based and parity-based approaches to study fertility changes in Iran and the low fertility provinces in recent decades.

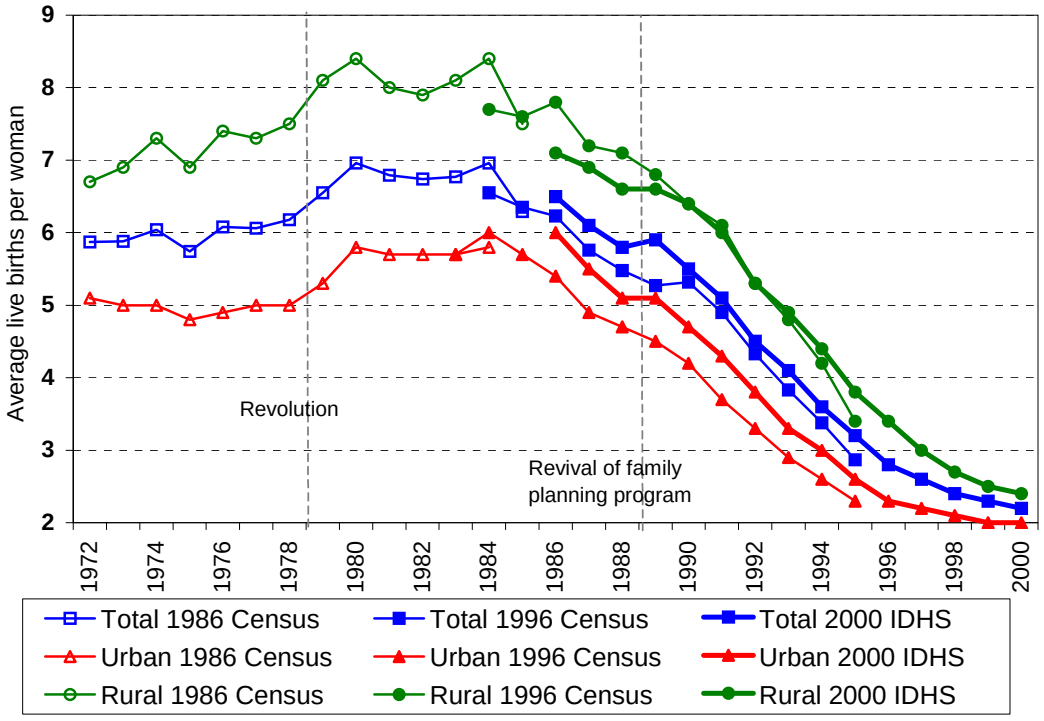
This section will present first the trend of fertility in Iran over the last three decades using the results from own-children estimates of fertility (Abbasi-Shavazi 2000a, b, 2001b, a; Abbasi-Shavazi and McDonald 2005). It will then present direct estimates of fertility in 2000 using the Iran Demographic and Health Survey by province and rural and urban areas. As the remainder of the paper will focus on the analysis of the Iran Low Fertility Survey, levels and trends in fertility in the four low-fertility provinces will also be presented. Finally, we focus on fertility dynamics in Iran and the low-fertility provinces using parity progression ratios derived from the IDHS and the ILFS.

Age-based fertility measures: levels and trends

This section reviews the total fertility rates and age-specific fertility rates in Iran from 1970 to 2000 (Abbasi-Shavazi 2000a, 2001a, 2002a; Abbasi-Shavazi and McDonald 2005). As mentioned earlier, Iran has witnessed remarkable declines in fertility, over the last three decades. The total fertility rate decreased from around 7.0 in 1966 to around 6.5 in 1976 (Amani 1970; Padidar-Nia 1977) due to the implementation of the family planning program and some socio economic development programs under Mohammad Reza Shah Pahlavi. The rate rose to around 7.0 in 1979 at the time of the Islamic Rvolution. But the trend was downward from 1985, and had fallen to around replacement level by 2000 (Abbasi-Shavazi and McDonald 2005). This sharp fertility decline in Iran has also been observed in other studies using cross-sectional data (Aghajanian and Mehryar 1999a; Mehryar *et al.* 1999; Mirzaie 2005). The own-children results estimated by Abbasi-Shavazi (2002a) were consistent with estimates obtained by Ladier-Fouladi (1997) using registration data for the late 1970s and the 1980s.

Single calendar-year time trends in the total fertility rate illustrated in Figure 2 show a precise association of the fertility decline to the timing of the momentous socio-political and population policy shifts and family planning programs before and after the 1979 Islamic Revolution. These associations suggest an interpretation of the fertility decline that is dominated by the influence of cross-sectional events discussed in earlier in the introduction.

Figure 2: Own-children estimates of total fertility rates, Iran, 1972–2000

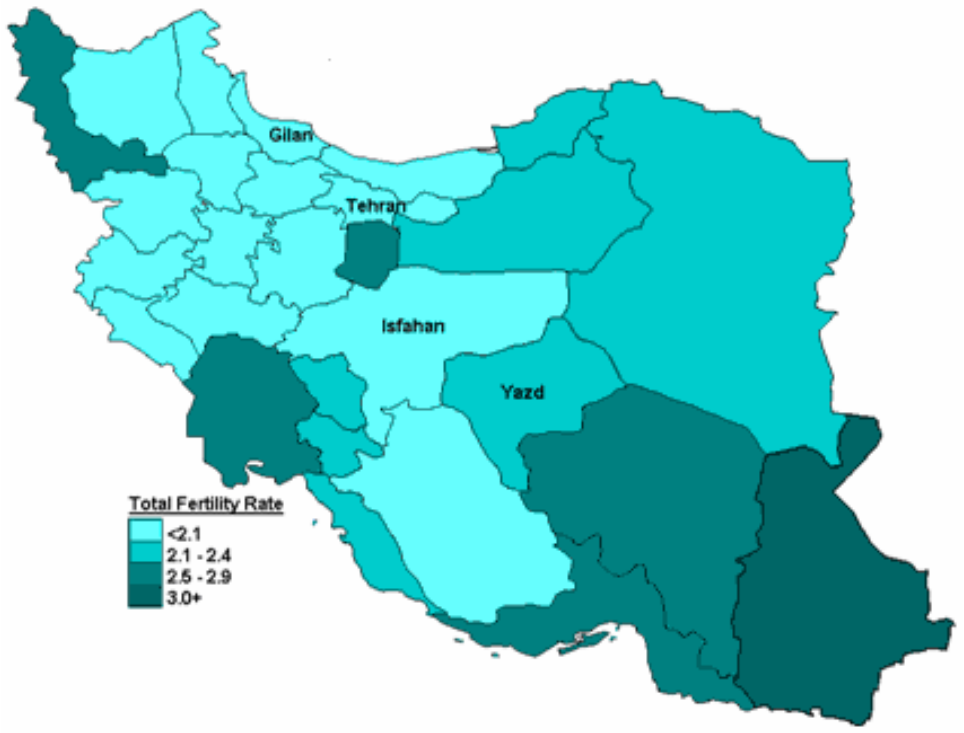


Source: Data derived from Abbasi-Shavazi and McDonald (2005)

Important points about fertility decline in Iran are that fertility rose simultaneously in both rural and urban areas during the 1980s, that the pace of decline was relatively similar for both rural and urban areas, and that the gap between rural and urban areas has narrowed. Abbasi-Shavazi and McDonald (2006) in an evaluation analysis using the 1976 Iran Fertility Survey and the registered births cited in Ladier-Fouladi's paper (1997) concluded that all data sources support a small rise of fertility during early years of 1980s and the onset of fertility decline from 1984. Before the revolution and under the Shah's family planning program (1967–78), on average the level of fertility was around 7.0 births per woman in rural areas and around 5.0 in urban areas. A sample study conducted in rural and urban areas of Iran in 1982 (Hekmat *et al.* 1983) noted that, in the 1970s, not only actual family size but also ideal fertility among rural families was double that of their counterparts in urban areas and their ideal fertility was higher than their actual family size. Rural couples with median actual family size of 3.5 children desired 4.7 children, while in urban areas the actual family size was 2.2 as compared with ideal fertility of 2.3. Hekmat and her colleagues (1983) argued that early marriage or high actual and ideal family size was a characteristic of some ethnic groups before and after the revolution. For example, nomads with a mean family size of 4.3 desired an average 6.2 (4.3 sons and 1.9 daughters). These groups were considered as dwellers of rural areas (Mohseni and Motabar 1976).

After the revolution, the peak of fertility was observed during 1980–84, and the level of fertility reached averages of around 8.0 and 6.0 children per women in rural and urban areas, respectively. Then, in the subsequent fifteen years, the TFR in both rural and urban areas reached around replacement level (Iran Ministry of Health 2002; Abbasi-Shavazi and McDonald 2005). By the year 2000, there was not much difference between the level of fertility in rural and urban areas of Iran.

Figure 3: Provincial map of Total Fertility Rate in Iran, 2000



Source: Iran 2000 Demographic and Health Survey

Moreover, the level and trend of fertility decline in provinces of Iran has been identical to the national level, although, there have been fertility differentials by province over the periods. By 2000, women in most provinces on average were having between 2 and 3 children (Abbasi-Shavazi 2000a; Abbasi-Shavazi and McDonald 2005). While some provinces have reached below-replacement level fertility (Abbasi-Shavazi 2001a), fertility in the provinces of Sistan Baluchistan, Kohgilooyeh Booyer Ahmdad and Ilam is noticeably higher than in other provinces. Figure 3 maps the provincial fertility differences in Iran in 2000 and gives a quick impression of the tendency to the low fertility throughout the country. The four selected provinces targeted in this study appear in the map with their names.

Total fertility rate based on age specific fertility rates

Age-specific fertility rates in Iran have declined considerably for all age groups (Abbasi-Shavazi and McDonald (2005). The steep fertility decline in all age groups may suggest that simultaneously young couples were starting their childbearing later, married women were spacing their births further apart and older women were stopping their childbearing. The simultaneity of these behaviours explains the very sharp fall in total fertility that has occurred in Iran since the late 1980s.

Given that the trend of age-specific fertility over the last three decades has already been documented (Abbasi-Shavazi and McDonald (2005), this section uses the IDHS data to analyse the age-specific and total fertility rates for the year 2000. The direct method is applied to estimate age-based fertility for this section. The IDHS 2000 data set used in this section is representative of provincial and national data in Iran. In the IDHS 2000 survey, all ever married women aged 10–49 were interviewed, and asked whether they had had a birth during the two-year period prior to the survey. The number of births was sufficient to calculate the age-specific fertility rates and the level of total fertility rate at the provincial level and at the national level by different socio-economic and demographic characteristics. For calculating all fertility indicators in this section, the number of births for women in the year prior to the survey has been applied to the women aged 15–49 enumerated as household members in the interviews.

Tables 2 and 3 show total fertility rate and the age-specific rates for provinces. The rates for rural and urban areas were weighted to calculate the provincial level, and the provincial rates were also weighted to calculate the age-specific and total fertility rates at the national level for Iran. Twenty-eight provinces plus Tehran City were included in this analysis to estimate the weighted measures at the national level for Iran. The numbers are sorted from the lowest to the highest total fertility rates, and have been divided into three categories.

As shown in Table 2, the below-replacement category consists of Tehran City, Gilan and Isfahan, all of which were included in the 2005 Iran Low Fertility Survey, as well as thirteen other provinces shown in the table. The level of the total fertility rate was 1.3 for Tehran City and 1.4 for Gilan. The below-replacement category comprised about 65 per cent of the total population of Iran. The next category consists of four provinces (Yazd is one of the selected provinces in the 2005 ILFS) that have total fertility of about replacement level between 2.1 to 2.2. Around four per cent of the population of Iran are living in these locations. The third category comprises the nine remaining provinces in Iran. In these provinces fertility is above replacement level and comprises about 31 per cent of the total population. All of these provinces have a level of fertility between 2.3–

2.7 except Sistan and Baluchistan which has a level significantly different from the rest of the country with a total fertility rate of 4.1.

Table 2: Total fertility rate for provinces, Iran, 2000

Province	TFR[1]	% Weight of population in country[2]
Below replacement level		**64.8**
Tehran City	1.3	13.4
Gilan	1.4	4.2
Fars	1.7	6.0
Isfahan	1.7	7.2
Markazi	1.7	2.2
Mazadaran	1.7	4.6
Kermanshah	1.8	2.8
Qazvin	1.8	1.6
Hamedan	1.8	2.8
Ilam	1.8	0.7
Kordestan	1.9	2.1
Lorestan	1.9	2.3
Tehran, other parts	1.9	6.2
Ardebil	2.0	1.7
Zanjan	2.0	1.4
East Azarbaijan	2.0	5.6
Around replacement level		**4.5**
Semnan	2.1	0.9
Bushehr	2.2	1.1
Charmahal	2.2	1.2
Yazd	2.2	1.4
Above replacement level		**30.7**
Kohgiluyeh	2.3	0.8
Golestan	2.3	2.2
Khorasan	2.4	10.4
West Azarbaijan	2.5	3.8
Kerman	2.5	3.2
Khuzestan	2.6	5.2
Qom	2.6	1.4
Hormozgan	2.7	1.6
Sistan and Baluchistan	4.1	2.3
Total country of Iran	**2.02**	**100.0**

1. Direct method applied to the 2000 Iran DHS
2. Using estimated population in 2000 by Statistical Centre of Iran (Statistical Centre of Iran 2005).

Table 3 shows age-specific fertility rates for all provinces sorted for the TFR. The figures show that the age-specific fertility rates in some of the provinces for the age group 15–19 are very low, such as Ilam, Kermanshah, Lorestan and Fars (between 15 to 18 per 1000 women). Further, most of the low fertility provinces have a similarly low rate of fertility for this age group. The highest level of the age-specific fertility rate for this age group is observed in Sistan and Baluchistan province, and is almost twice as high as that observed in other provinces of Iran. In Tehran City, Gilan, Isfahan and Yazd, the rate is 21.1, 22, 25.5 and 26.2 per 1000 women respectively. Low or high fertility rates for women in the age group 15–19 are related to the proportion of never married women in this age group in the mentioned provinces. For example, the highest proportion of never

married women aged 15–19 is observed in Ilam (93 per cent), whilst, Sistan and Baluchistan has the lowest proportion of never married women of this age (76 per cent). This is also supported by rates of later or earlier marriage in these regions among women aged 20–29. Taken together they are further evidence of the quality of the 2000 IDHS data. The highest level of fertility belongs to the age group 25–29 years, followed by the age group 20–24, and then 30–34, with levels of 122, 98.2 and 88.3 per thousand, respectively, at the national level.

Table 3: ASFRs and TFR, direct method, Iran, 2000

Province	Age Specific Fertility Rates							TFR
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	
Tehran City	21.1	55.1	99.7	57.8	26.8	4.2	0.0	1.3
Gilan	22.0	68.3	101.1	52.9	37.2	4.2	0.0	1.4
Markazi	30.7	90.2	100.0	68.7	32.7	13.0	3.2	1.7
Mazadaran	21.9	114.5	108.0	71.3	25.4	3.7	0.0	1.7
Fars	18.1	88.0	102.4	97.0	14.6	11.1	2.0	1.7
Isfahan	25.5	88.8	129.7	63.1	26.4	3.0	0.0	1.7
Kermanshah	16.1	110.2	93.7	73.4	39.5	15.1	4.8	1.8
Hamedan	27.9	94.8	112.1	79.8	32.7	8.5	6.9	1.8
Ilam	14.6	64.8	118.1	94.2	56.7	18.3	2.0	1.8
Qazvin	33.0	112.5	99.8	60.7	23.5	21.9	2.5	1.8
Kordestan	30.2	106.7	111.4	77.5	28.7	11.9	3.9	1.9
Lorestan	17.7	91.0	123.7	92.9	53.6	5.7	0.0	1.9
Tehran, other parts	39.7	104.1	122.5	84.3	35.4	4.1	0.0	1.9
East Azarbaijan	23.2	101.1	123.3	98.2	46.3	15.4	1.8	2.0
Zanjan	27.5	84.3	135.8	88.7	47.6	12.0	2.8	2.0
Ardebil	38.3	91.9	115.3	75.3	49.8	21.3	2.5	2.0
Semnan	29.0	103.8	136.6	71.4	59.9	17.6	0.0	2.1
Charmahal	23.0	109.3	149.4	87.0	55.3	13.5	0.0	2.2
Bushehr	22.5	94.5	118.5	117.8	64.6	16.2	1.6	2.2
Kohgiluyeh	23.8	111.9	126.7	110.2	51.0	27.1	2.3	2.3
Yazd	26.2	121.7	142.5	96.2	51.0	13.1	0.0	2.3
Golestan	19.6	95.8	137.5	114.5	67.0	21.8	3.1	2.3
Khorasan	27.5	102.8	123.7	120.8	67.3	27.7	9.6	2.4
West Azarbaijan	38.8	132.6	128.0	101.3	59.7	26.1	3.8	2.5
Kerman	20.3	104.2	153.0	105.5	76.8	30.6	2.6	2.5
Khuzestan	30.5	135.5	149.8	109.3	53.1	23.5	9.5	2.6
Qom	26.9	123.1	182.2	119.4	62.0	4.6	5.0	2.6
Hormozgan	35.1	132.8	155.0	117.4	77.0	24.2	5.6	2.7
Sistan	62.8	183.7	202.9	163.4	121.4	75.4	12.9	4.1
Country, total	**26.7**	**98.2**	**122.1**	**88.3**	**44.5**	**14.8**	**3.1**	**2.02**

Source: Iran 2000 Demographic and Health Survey

Fertility for all age groups in rural areas is slightly higher than in urban areas, and the difference can be observed in the age group 20–24 which makes the highest contribution to the TFR in rural areas. It is noticeable that fertility for women aged 35 and older is very low as the fertility of the age group 35–39 is only 14.8 children per thousand women. Among women in their 40s, fertility decreases to less than five births

per thousand women. This demonstrates early stopping of child bearing in Iran. Fertility of women aged 35–39 is almost half of that for the age group 30–34: among urban women it is 36.5 and among rural women is 58.8 per thousand.

Tehran City has the lowest level of fertility – less than 100 per thousand in all age groups. Isfahan and Gilan have the next lowest levels of fertility. Only the age group 25–29 has a fertility rate of over 100 per thousand in these provinces. Yazd province has a higher level of fertility at age group 20–24, a sign of the traditional practice of childbearing and early marriage. This will be the subject of discussion in the contraceptive use dynamics. For those provinces that are presently experiencing below replacement fertility, fertility has fallen in both younger and older age groups. All provinces except Sistan and Baluchistan and Kerman have a level of fertility of less than 30 in the age group 40–44, and less than 10 for the age group 45–49 years.

Mean number of children ever born

Another cohort measure of fertility is 'children ever born'. The mean children ever born to women is the mean of the number of live births that women of a certain age have ever had. For all women this measure is very sensitive to women's ages: as women age, the mean number of children increases. For Iran as a country where women now stop childbearing comparatively early, the mean number of children ever born at age 45–49 shown in Table 4, will become smaller in future years. The mean children ever born to women aged 45–49 reflects the reproductive behaviour of these women during around the past 30 years.

Table 4 shows that women in the age group 40–44 at the time of the IDHS Survey in 2000 had a mean number of 5.3 children ever born, and in the age group 20–24 this figure was equal to one child. In the age groups 25–29 and 30–34, the mean number of children ever born only increases to about two and three children. The differentials between provinces described above are observable across all age groups in the table indicating that these differentials have a long history. For example, the provinces with low current fertility also have low children ever born for women ages 40–49.

Multiple regression analysis was applied to the 2000 IDHS to explore to what extent the socio-demographic characteristics of women explain the number of children ever born. The results reveal that controlling for the duration of marriage and the age of women, children ever born is significantly lower as the level of education increases. Also, urban-rural differentials are statistically meaningful. On average, the weighted mean number of children ever born to women aged 40–49 (the 1960s marriage cohort) is approximately 7.2. This decreases to 5.6 among women in the 1970s marriage cohort and 3.5 for women in the 1980s marriage cohort. The mean number of children ever born to women aged 30–39 for those women who married in the 1970s is about 5.2. For women of the same age group who married in the 1980s, this figure decreases to 3.5 and declines further to 1.6 for women of the same age group who married in the 1990s. This indicates smaller family size over time, as well as the impact of delayed marriage.

Within each educational group fertility has declined over time. For example, the weighted mean number of children ever born to illiterate women from the 1960s marriage cohort is about 8. This decreases to 6.6 among women from the 1970s marriage cohort, and 4.6 among women who married in the 1980s, and to only 1.8 among illiterate women who married during the 1990s. Perhaps the fertility decline during the 1970s and 1980s is partly due to considerable decline in infant mortality

(Abbasi-Shavazi *et al.* 2005), as it has been theorised that child survival may contribute significantly to the lower number of children ever born (Preston 1978; Doepke 2005). However, since 1985, infant mortality has not changed sufficiently to contribute to fertility decline, and falling numbers of children ever born is probably more due to convergence of attitudes of women throughout the country. This conclusion is also applicable to women with higher levels of education as women of tertiary education who married in the 1970s had 3.2 children born, declining to 2.4 among women of the same level of education in the marriage cohort 1980s and about 1.0 for women from the 1990s marriage cohort. The point to be made is that it is not level of education alone which has significantly affected levels of fertility, but women with the same level of education have also changed their viewpoint towards fertility behaviour and their practice over the previous three decades (1970–2000).

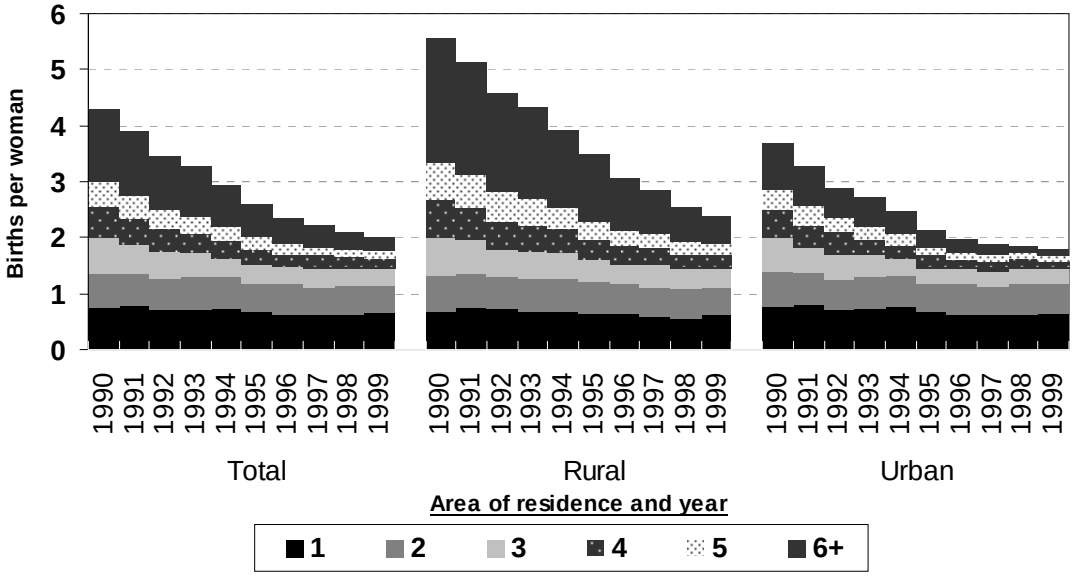
Table 4: Provincial and national mean number of children ever born, direct, 2000

	Children ever born by age							Total
Province	15–19	20–24	25–29	30–34	35–39	40–44	45–49	**CEB**
Markazi	0.3	0.9	1.9	2.8	4.0	5.0	6.7	3.1
Gilan	0.4	0.9	1.5	2.4	3.3	4.5	5.2	2.8
Mazadaran	0.3	0.8	1.6	2.4	3.3	4.4	5.3	2.7
East Azarbaijan	0.3	0.9	1.7	3.0	4.3	5.3	6.6	3.2
West Azarbaijan	0.5	1.1	2.0	3.3	4.6	5.8	6.6	3.6
Kermanshah	0.3	1.1	1.9	3.0	4.1	5.6	6.5	3.4
Khuzestan	0.5	1.2	2.3	3.4	4.5	5.9	6.6	3.5
Fars	0.3	1.0	2.0	3.3	4.4	5.5	6.3	3.4
Kerman	0.5	1.1	2.2	3.3	4.6	5.8	6.9	3.7
Khorasan	0.3	0.8	2.0	3.3	4.8	6.0	6.7	3.4
Isfahan	0.3	0.8	1.7	2.7	3.8	4.6	5.6	2.8
Sistan	0.8	1.9	3.1	4.6	6.1	7.5	8.0	4.2
Kordestan	0.4	1.0	2.0	3.2	4.8	6.2	7.4	3.6
Hamedan	0.3	1.0	2.0	3.2	4.4	5.7	7.0	3.5
Charmahal	0.4	1.1	2.2	3.7	4.9	6.3	7.2	3.7
Lorestan	0.3	1.1	2.3	3.6	5.0	6.4	7.5	3.8
Ilam	0.4	1.0	2.0	3.8	5.2	6.6	7.9	4.1
Kohgiluyeh	0.4	1.4	2.7	4.2	5.5	6.9	8.0	4.1
Bushehr	0.3	1.0	2.0	3.5	4.7	5.9	7.0	3.7
Zanjan	0.4	1.0	2.0	3.4	5.0	6.3	7.5	3.6
Semnan	0.4	0.9	1.8	2.6	3.6	4.3	5.3	2.9
Yazd	0.4	1.0	1.9	3.0	4.1	5.0	6.2	3.2
Hormozgan	0.6	1.4	2.5	3.8	5.4	6.2	7.4	3.8
Tehran, other parts	0.5	1.0	1.9	2.9	3.9	4.8	5.8	3.0
Ardebil	0.5	1.1	2.2	3.6	4.9	6.4	7.6	3.7
Qom	0.3	0.9	1.9	3.1	4.3	5.4	6.2	3.0
Qazvin	0.3	0.9	1.8	3.0	4.4	5.6	6.4	3.2
Golestan	0.3	1.1	2.0	3.1	4.6	5.8	6.7	3.5
Tehran City	0.4	0.7	1.4	2.2	2.9	3.6	4.3	2.4
Total	**0.4**	**1.0**	**1.9**	**3.0**	**4.2**	**5.3**	**6.2**	**3.2**

Source: Iran 2000 Demographic and Health Survey

Figure 4 shows the total fertility rates since 1990 calculated according to age specific parity orders derived from the fertility histories of women in the 2000 IDHS. As discussed earlier, the peak of fertility decline in Iran occurred in the 1990s and the gap between urban and rural areas became significantly narrower by the end of the 1990s. For example, in the early 1990s, parity orders 1 to 5 made similar contributions to the fertility level in rural areas, and parity orders five and above contributed around 50 per cent to the overall fertility level. By the end of the decade, parities 1 and 2 contributed well over 50 per cent of total fertility in urban areas and the contribution of parity orders five and more decreased to around 25 per cent in the rural areas.

Figure 4: Total fertility rate by parity contribution, Iran, 1990–1999



Source: The Iran 2000 Demographic and Health Survey.

Trends in the (cross-sectional) total fertility rate can be confounded by changes in the timing of births across women's lifetimes (tempo) as well as by changes in the numbers of children that they have by the time they end their childbearing (quantum) (Bongaarts and Feeny 1998). That fertility fell in all age groups during the decline suggests that simultaneously young couples were starting their childbearing later, married women were spacing their births longer, and older women were stopping their childbearing. The simultaneity of these patterns of change explains the very sharp fall in total fertility that has occurred in Iran since the late 1980s, but it also indicates that the timing of births was changing. As many authors (Feeney 1983; Feeney and Yu 1987; Ni-Bhrolchain 1996; Bongaarts and Feeny 1998; Fahey 2001; Ortega and Kohler 2002) have indicated, age-specific fertility rates can be misleading because they can rise and fall with changes in the time that women have their various births, *tempo*, independently of changes in the number of births that they eventually have, *quantum*. While the decline in fertility is so large that large falls in the quantum of fertility are inevitable, the level to which completed fertility is falling is still subject to question because of the potential impact of a delay of births – a tempo effect. The following section will analyse the fertility

dynamics to examine the impact of *tempo* and *quantum* on the fall of fertility in Iran and the low fertility provinces of Iran.

5. Fertility dynamics: Application of the parity progression ratio[4]

Age specific fertility rates (and their sum, the total fertility rate) use age as a controlling or standardising factor because the age structure of the population changes from year to year. If we did not take changes in the age distribution into account (if we simply used the trend in the total number of births), we could obtain a misleading impression of the rate at which women are having children. A concentration of women in the peak ages of childbearing would mean that births would tend to rise simply because of the change in age structure. However, age is not the only structural feature of a population that may influence the number of births in a given year. The other important structural feature is the distribution of women according to the number of children that they already have, that is, their parity and the time since the most recent birth. Feeney (1983: 88) argued that "In the analysis of population trends, age specific birth rates suffer from a serious defect - they may rise and fall with changes in the timing of births independently of changes in the level of fertility". To better assess the impact on fertility of changes in the timing of births, the synthetic parity progression model provides an alternative to conventional age-based approaches to the study of fertility. In this method, the control used is not age but the number of children that a women has already had in association with the time since the most recent birth (Feeney 1983; Feeney and Yu 1987; Ni-Bhrolchain 1987; Rallu and Toulemon 1994; Hinde 1998). The parity progression ratio can be used for trend analysis, determinant analysis and also for analysis of the impact of family planning on fertility. It has also been argued that analysis by parity facilitates interpretation of fertility trends because people make their decisions about having a child on the basis of the number of children that they already have rather than simply upon how old they are.

This section defines fertility behaviour among women according to the spacing time as they move from one child to the next child. The parity progression approach provides a model to investigate whether women move from marriage to the first child instantly after marriage without controlling fertility or whether they postpone their first birth in order to establish their marriage. The pattern of Feeney's analysis (1983) for China will be followed. The usefulness of Feeney's work in relation to the present study is that one can interpret exactly what has happened to fertility trends because when age-specific fertility rates or TFR are used, these measures are influenced by the timing of births. I will elaborate the parity progression method before turning to the results. Therefore, first, the methodology and applied data are described. Second, synthetic parity cohort measures are examined at the national level using the 2000 IDHS, and using the 2005 ILFS, at the provincial level for the four selected low fertility regions targeted in this research. These results provide the direct comparison with the synthetic cohort age based measure, the total fertility rate.

[4] The material presented in this section appeared as Hosseini-Chavoshi *et al.* (2006).

Methodology

In the literature, three main approaches to the analysis of fertility using parity have been utilised (Ni-Bhrolchain 1987; Hinde 1998):

Parity progression for birth or marriage cohort

Parity progression for birth cohorts describes the timing (age) of progression from one birth to the next across the lifetime of real birth cohorts. For example, for those born in 1960, we would examine the percentage that had first births in each subsequent year, the percentage who had second births, and so on. Parity progression by marriage cohort does likewise for year-of-marriage cohorts by time since marriage.

True parity cohort

Here the population is organized according to the year in which they had each birth and how long they take to have the next birth. Thus, for example, we consider all women who had a first birth in 1982 and measure the proportion that moves on to the second birth in each subsequent year.

Synthetic parity cohorts

In this case, we bring together all those who had a birth of a given parity in a particular year and measure the probability that they would do this given the time since their previous birth. These probabilities are then combined into a summary synthetic measure for all durations since the previous birth. Finally, the synthetic probabilities obtained for women of each parity can be combined into a single measure analogous to the total fertility rate.

The birth history information available from both the 2000 IDHS and the 2005 ILFS, enable the researcher to calculate the synthetic parity progression ratios. The synthetic parity progression ratios are calculated based on the following formula.

Let $B(i,j,t)$ = births in year t to women of parity i whose previous birth ($i-1$) occurred j years ago.

Let $P(i,j,t)$ = the mid-year population in year t of women of parity i whose previous birth ($i-1$) occurred j years ago.

Calculate the rate $B(i,j,t) / P(i,j,t)$ and convert it to a probability, $q(i,j)$ for year t.

$q(i,j)$ is the probability of a woman of parity $i-1$ moving to parity i in the j^{th} year after the $(i-1)^{th}$ birth (given she did not do so in any previous year) – all based on the fertility experience of women in year t.

Life table summary measures

Applying life table techniques to these one-year probabilities, we can calculate the (synthetic) lifetime probability that a woman will progress from the $(i-1)^{th}$ birth to the i^{th} birth. The literature suggests that a lifetime's experience is measured adequately by the 10 years experience after the $(i-1)^{th}$ birth.

That is, birth intervals longer than 10 years are very rare.

For the first interval, the date of marriage is taken as the starting point.

Let PP(i,t) = the lifetime probability of a woman progressing from the $(i-1)^{th}$ birth to the i^{th} birth based on the cross-sectional experience of women in year t.

PP(i) = 1- [(1-q(1)][(1-q(2)] ..... [(1-q(10)]

In like manner, we could calculate any other span of years, e.g. The chance of progressing to the first birth in the first five years of marriage, etc.

Calculation of the parity-based equivalent of the Total Fertility Rate

The PP(i) can be used to calculate the (synthetic) average number of births that a group of women would have across their lifetimes, the parity equivalent of the Total Fertility Rate:

1-PP(1) = CEB(0), the proportion who have 0 CEB

[1-PP(1)][1-PP(2)] = CEB(1), the proportion who have 1 CEB, etc

TFR = CEB(1) + 2CEB(2) + 3CEB(3) .....

The results of the synthetic parity progression ratios for the national level as well as for the four selected low fertility provinces are presented in the following section.

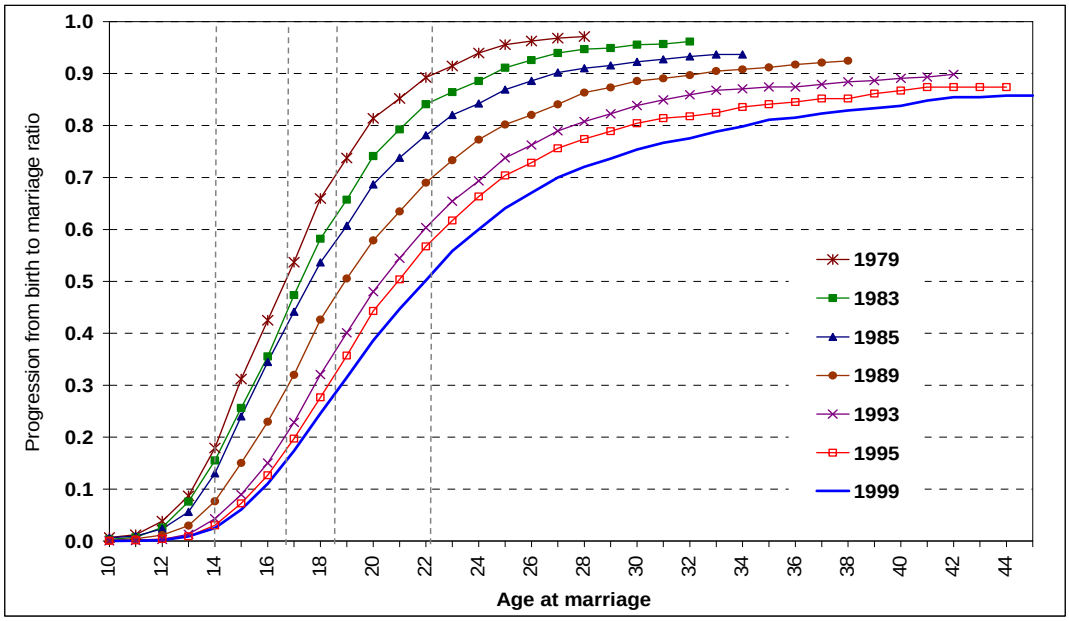
Parity progression

The progression to first marriage

The legal age at first marriage was lowered soon after the Islamic revolution. In apparent response, the proportion marrying at the youngest ages increased a little between 1975 and 1980 (Figure 5). As the 1980s progressed, the spread of universal high school education for girls countered this trend such that there was a sharp drop in the (synthetic cohort) proportion of girls marrying by age 18, especially between 1980 (66%) and 1986 (49%). However, at ages 20 and over, marriage rates rose between 1987 and 1990 as part of a mini marriage boom following the end of the Iran-Iraq War. As discussed below, the increased rates of marriage in the last years of the 1980s served to hold period fertility at a higher level than would otherwise have been the case during those years (a tempo effect).

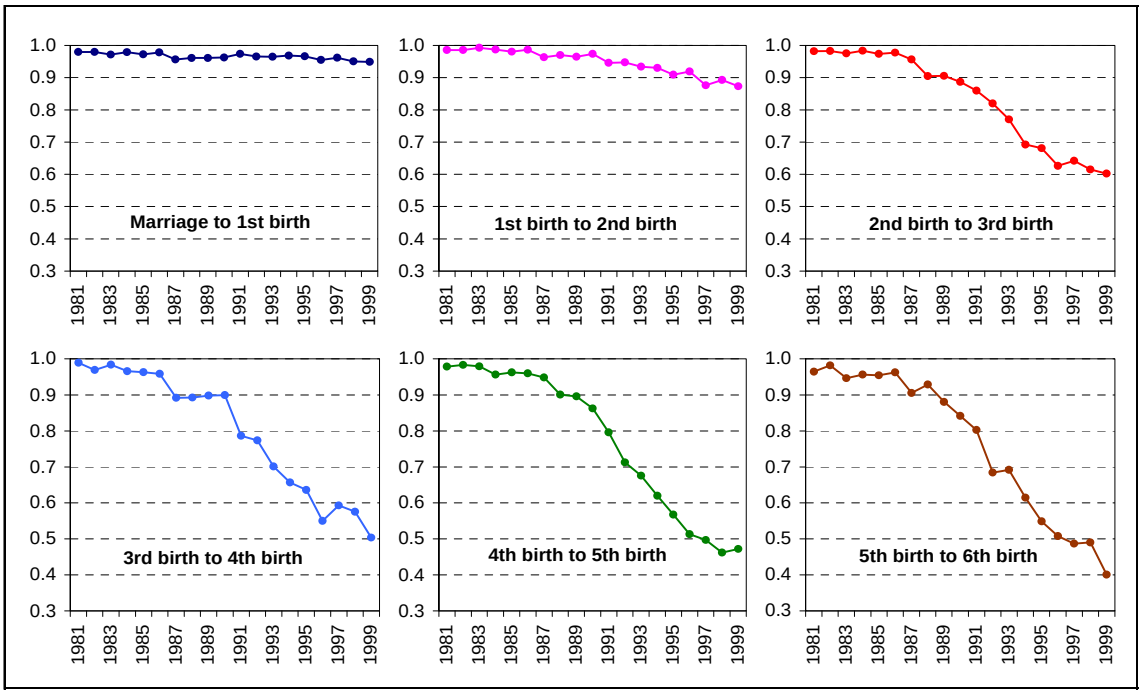
During the 1990s, age at first marriage has continued to increase gradually as more women have pursued post-school education. Over the period from 1981 to 1999, the synthetic lifetime proportion ever marrying fell from 99% to 86%. However, this downward trend flattened out in the last years of the 1990s and, based on preference data and observed proportions ever married for age cohorts, it can be argued that the lifetime percentage ever married will be at least 95 per cent for all Iranian women aged 20 and over in 1999. This means that, the effect of tempo distortion upon the synthetic proportion who ever married was significant at the end of the 1990s. Underlining the complexity of these trends, however, it is expected that the coming to marriageable age of the very large birth cohorts of the early 1980s will lead to a further delay of marriage after 2000. This cohort will face both considerable economic problems due to competition in the labour and housing markets and considerable adjustment in the marriage market given the imbalances that will arise from huge shifts in the numbers in successive birth cohorts.

Figure 5: Cumulative progression to first marriage for synthetic cohorts, Iran, 1981–1999, selected years



Source: Iran 2000 Demographic and Health Survey.

Figure 6: Lifetime parity progression ratios, synthetic cohorts, Iran, 1981–1999



Source: Iran 2000 Demographic and Health Survey

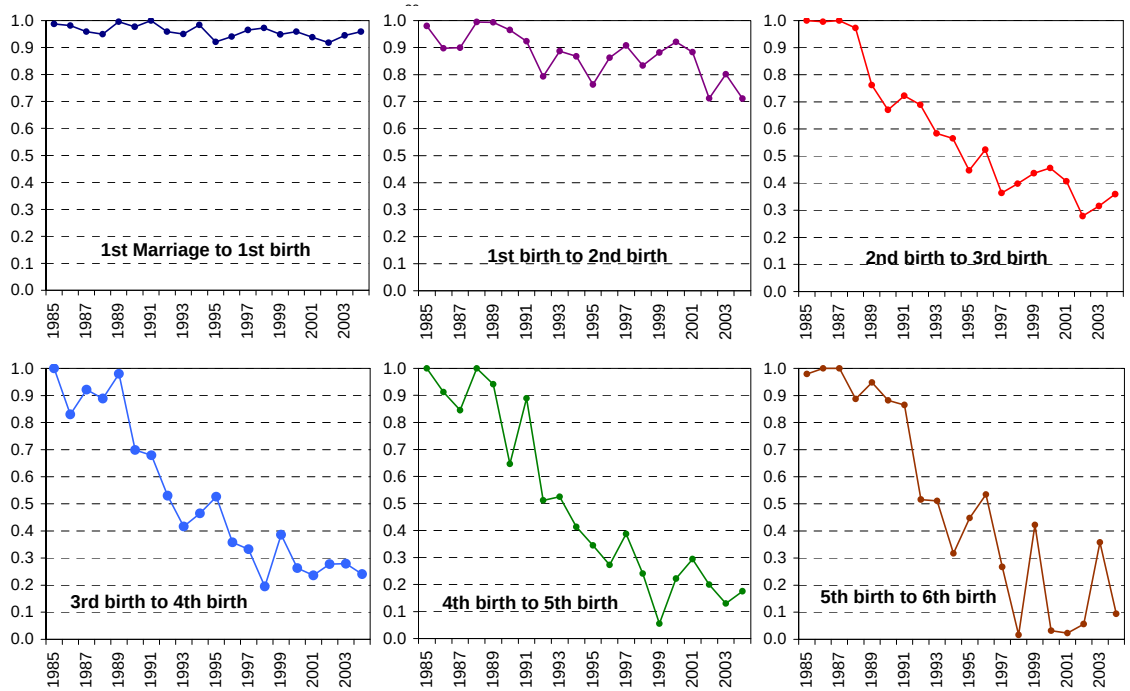
Progression to the first birth (from marriage)

The results of the IDHS 2000 in Figure 6 show that, on average, between 96–98 per cent of Iranian women had their first child after marriage, and the trend for progressing to the first child indicates that more than 90 per cent of women during the first five years after marriage had had their first child. It was revealed that there has been very little change across the whole period in the lifetime progression to the first birth for Iranian women from 1981 to 1999. The lifetime progression falls across time from 98 per cent in 1981 to 95 per cent in 1999, still at a high level at the end of the period.

Studies (Westoff and Akinrinola 2001) in developing countries show that around two per cent of women are infertile and do not progress to their first child during their reproductive life. In the demographic context, the interest is more about childlessness, referring to women who have no live birth and usually childlessness is measured at age 40 to 45. The results of the IDHS 2000 show that around three per cent of women aged 40–45 were childless, and progression to the first child during the last two decades has not changed. However in recent years, the interval between marriage and the first birth has begun to widen.

Figure 7 also indicates a similar result for the four low fertility provinces of Gilan, Yazd, Isfahan and Tehran City. It indicates very little change across the whole period in the lifetime progression to the first birth. Thus, it can be concluded that fertility decline in Iran and even in the low fertility provinces is not the consequence of married women opting to have no children.

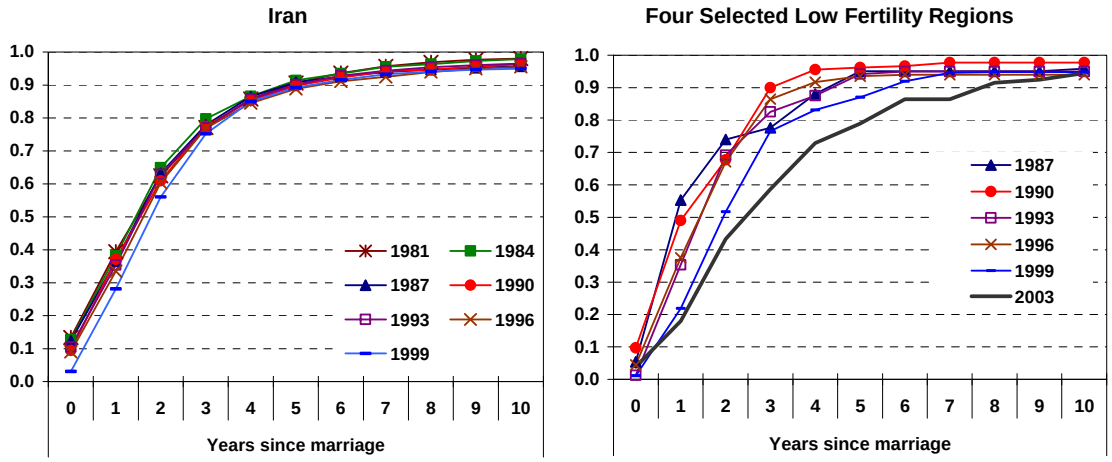
Figure 7: Lifetime parity progression ratios, synthetic cohorts, four selected low fertility regions, 1981–1999



Source: Iran 2000 Demographic and Health Survey.

The results in Figure 8 also show that there was very little change in the timing of the first birth after marriage across the last two decades. However, it is evident that a new trend towards a short delay of the first birth within the first few years of marriage was emerging at the end of the 1990s onwards. Delay of the first birth is much more evident among the four selected low fertility regions indicating that this may be an emerging trend across Iran in the future. Consistent with this trend, during the 1990s, use of contraception within the first birth interval increased from 3 to 20 per cent (Abbasi-Shavazi *et al.* 2006). Moreover, during the 1980–99 period, the results from the 2005 ILFS shows that ever use of contraception within the first birth interval in the four low fertility provinces increased from 14 to 41 per cent, and this increase has an association with age at marriage and education levels, as well as with urban or rural area of residence. This is a direction to be expected in a low fertility society where economic aspirations are high, economic opportunities for many young people are constrained, and age at marriage remains relatively early. This is due to the emerging delay of the first birth within marriage but is not an indication of a preference for zero children.

Figure 8: Cumulative parity progression, synthetic cohorts, marriage to first birth, Iran and Four Low Fertility Regions, 1981-2003, selected years



Source: Iran 2000 Demographic and Health Survey **Source:** Iran 2005 Low Fertility Survey

Rindfuss and Morgan (1983) found that in several Asian countries romantic marriage has increased and arranged marriage has decreased, and that couples married through romantic marriage were less likely to delay their first child as compared with those married through an arranged marriage. They argued that less delay in progression to first birth was associated with the increased sexual interest and activity among partners of a romantic marriage, and increased likelihood of conception, compared to partners in an arranged marriage. In Iran however, arranged marriage is associated with a shorter interval of progressing to the first child (Abbasi-Shavazi *et al.* 2006), indicating that the data from Iran did not support the hypopaper by Rindfuss and Morgan.

Further, the increase in contraceptive use prior to the first child in recent years is compatible with the program implemented by the Ministry of Health by which newly married couples are required to attend marriage counselling sessions prior to first

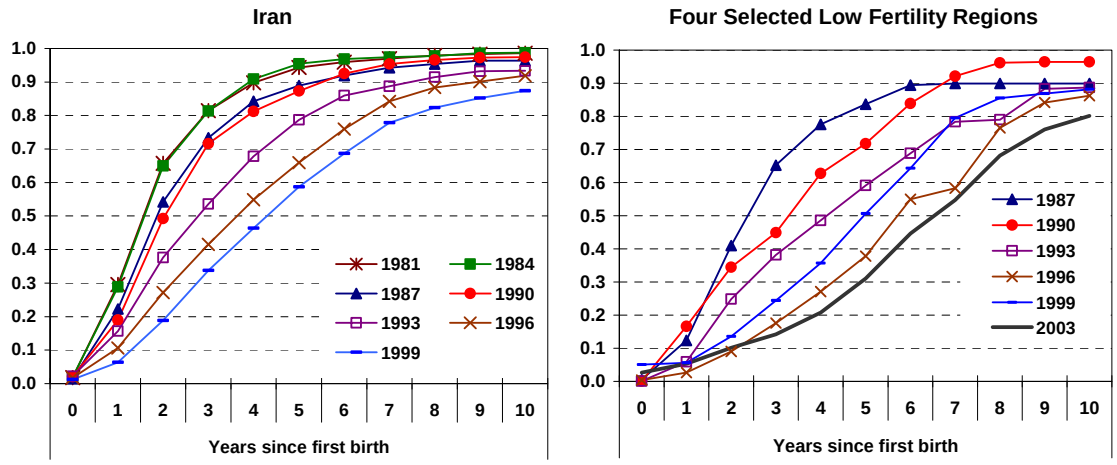
marriage. The program provides them with comprehensive knowledge and information about contraception and health and social aspects of motherhood and fatherhood. This program aims to educate couples about delaying their first child.

In general, despite this minor delay in the first birth, it can be concluded that delaying the first child has not contributed significantly to fertility decline in Iran.

Progression to the second birth

Lifetime progression to the second birth for Iranian women (Figure 6) was very high in the early years of the revolution (99 per cent), fell slowly to 1990 (97 per cent) and then more sharply in the 1990s to 87 per cent in 1999. The same result is observed for the low fertility provinces in Figure 7. Lifetime progression to the second birth for women in the four selected provinces was very high during the period 1985–1989 (around 99 per cent), fell slowly, though with some fluctuations, to around 92per cent in 1990, and then with some yearly fluctuation reduced slightly to around 88 per cent during 1990 and 1999 before it fell to around 70 per cent by the period 2002–2004. Note that the yearly fluctuations are due to the data used not to actual trends. These trends correspond closely to the observed trends in the total fertility rate.

Figure 9: Cumulative parity progression, synthetic cohorts, first birth to the second birth, Iran and Four Low Fertility Regions, 1981–2003, selected years



Source: Iran 2000 Demographic and Health Survey.

Source: Iran 2005 Low Fertility Survey.

In what is probably one of the most significant findings of this analysis, Figure 9 shows the onset of a very substantial delay of the second birth within the early years of marriage. For example, the proportion of Iranian women having their second birth within 3.5 years of their first birth fell from 81 per cent in 1981to 72 per cent in 1990 and then to 34 per cent in 1999. The difference between the 1981 and 1999 figures in the third year after the first birth (47 percentage points) is much wider than the corresponding difference in the 10th year after the first birth (12 percentage points). This is highly suggestive that what is being observed here is wider spacing of the interval between the first and second births (tempo), rather than a 'stopping at one' pattern (quantum). Thus, the percentage of women who stop at one may not be as high as 13

per cent for any real cohort. On the other hand, the results of the 2002 Iran Fertility Transition Survey on preferences of women confirm an emerging trend in some parts of the country, especially the province of Gilan, for one child only (Abbasi-Shavazi *et al.* 2003; Abbasi-Shavazi *et al.* 2004b). Progression to the second birth is even slower in the low fertility provinces. The interval between the first and second birth is now becoming very long indeed in these provinces with only 30 per cent progressing within five years.

The timing of the widening of the second birth interval corresponds closely with the reintroduction of the nationwide family planning program in Iran. Prior to 1990, there is little evidence of a change in the interval between the first and the second birth suggesting that this was not an explanation of the movements in fertility from the mid 1970s to the late 1980s.

Progression to the third birth

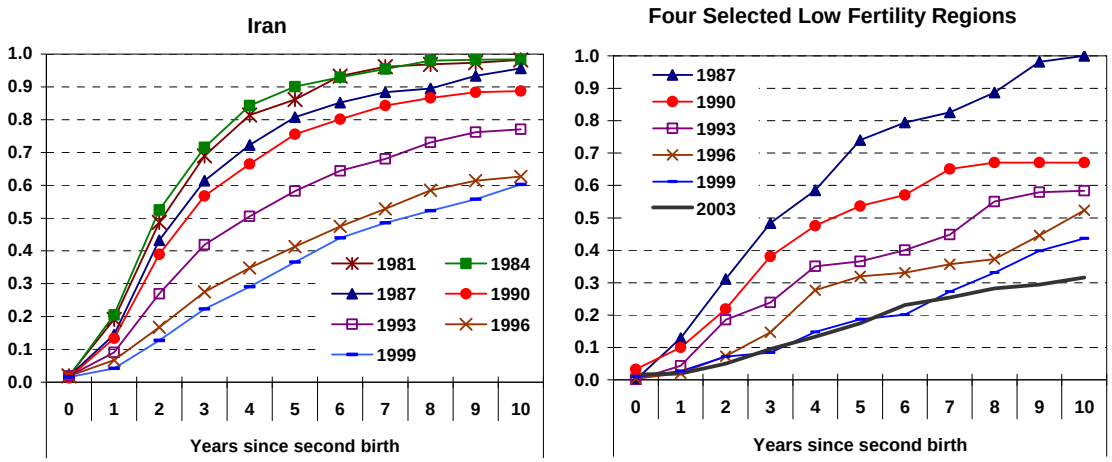
It is with progression to the third birth that we begin to observe the substantial changes in the quantum of fertility. In the early 1980s, the synthetic lifetime measure shows that 96–97 per cent of women in Iran who had had a second child continued to the third. By 1999, this had fallen to 60 per cent (Figure 6). The result of the ILFS in Figure 6 also shows that during 1985–1987 almost all of women in the four provinces who had had a second child continued to have the third child. The figure declined to around 56 per cent in 1984, before it fell to around 30 per cent during 2002–2004.

The trend over the period closely mirrored the trend in the total fertility rate – high in the early 1980s, a slow decline to 1990 and more rapid decline thereafter. It is very evident that 'stopping at two' is the central story of fertility decline in Iran. It is also evident that this new pattern had commenced prior to the reestablishment of the family planning program. Thus, the family planning program can be considered to have facilitated and accelerated a pattern of behaviour that had become established in parts of the society in the mid 1980s. Abbasi-Shavazi and his colleagues (2003) based on analysis of the 2002 Iran Fertility Transition Survey proposed that the economic aspirations of the population were raised by the revolution but the failure of household economic outcomes to meet expectations had become clearly evident by the mid 1980s.

In addition, it was evident to parents by the mid 1980s that their children would have better opportunities for education and social advancement in the new society if the parents were able to support their children through education. Stopping at two must have been seen by parents as a strategy to improve their own economic outcomes and the educational opportunities of their children (Abbasi-Shavazi *et al.* 2004b). The interesting question becomes what means of fertility control did women use to stop at two before the reestablishment of the family planning program?

The annual cumulative progressions (Figure 10) indicate another very interesting trend not evident from age-based analyses. The emergence of 'stopping at two' seems to have been preceded by a long-term trend towards wider spacing of the second and third births, a trend that continued through the early 1980s when fertility rates were at their highest. For example, based on the 1975–79 cross-sections, 54 per cent of women had moved from their second to their third birth by the end of the second year; for the 1980–84 cross-sections, at the height of the high fertility, 49 per cent had done so. This percentage then declines further in subsequent years. This may mean either that couples were already attempting unsuccessfully to stop at two or that they were indeed attempting to widen the interval between the second and third birth.

Figure 10: Cumulative parity progression, synthetic cohorts, second birth to the third birth, Iran and Four Low Fertility Regions, 1981–2003, selected years



Source: Iran 2000 Demographic and Health Survey **Source:** Iran 2005 Low Fertility Survey

Movement to the third birth is slower among women in low fertility regions for all birth cohorts as shown in right panel of Figure 10. For the 1987–90 cross-sections, before the revival of the family planning program, 30 per cent had moved from their second to their third birth by the end of the second year, but less than 8 per cent had done so since 2000, and the life time progression to the third birth has been around 30 to 40 per cent since 1999. This means that in these low fertility regions either couples are successfully practising contraception or attempting to terminate childbearing at two children.

Table 5: Life time parity progression ratios, Synthetic parity cohorts, ever married women, Iran and four selected low fertility provinces, 1981–2003

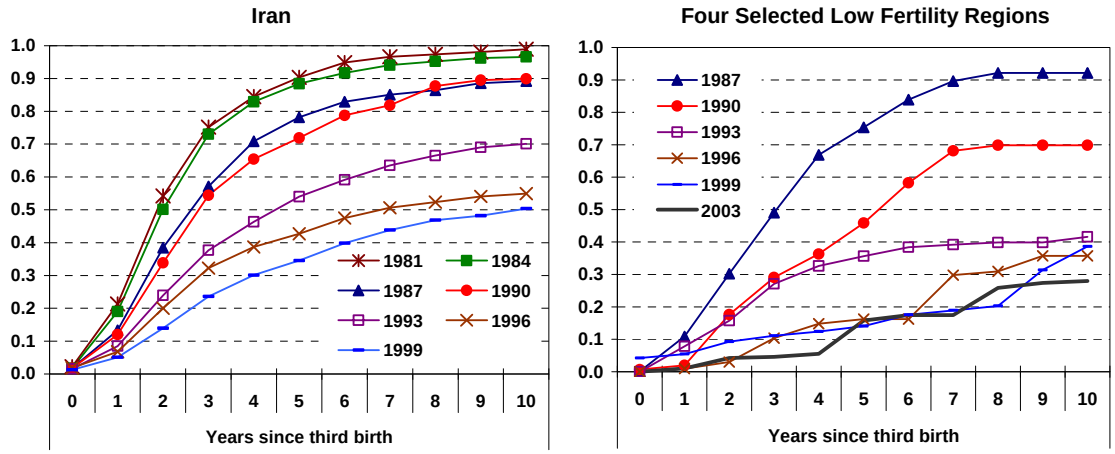
Parity progression	Lifetime percentage progressing										
	1981	1983	1986	1988	1990	1992	1995	1997	1999	2001	2003
Iran (National level) [1]											
Marriage to 1st	98.0	97.2	97.8	96.1	96.3	96.6	96.6	96.2	94.9		
1st to 2nd	98.6	99.3	98.7	97.0	97.4	94.8	90.9	87.6	87.4		
2nd to 3rd	98.2	97.5	97.8	90.5	88.7	82.0	68.1	64.2	60.3		
3rd to 4th	98.9	98.4	95.8	89.3	89.9	77.4	63.6	59.3	50.3		
4th to 5th	97.9	97.9	96.0	90.1	86.2	71.2	56.7	49.7	47.2		
5th to 6th	96.4	94.6	96.2	92.8	84.1	68.4	54.9	48.7	40.1		
Combined four selected low fertility provinces [2]											
Marriage to 1st			98.1	94.9	97.7	95.9	92.1	96.5	94.8	93.8	94.5
1st to 2nd			89.7	99.5	96.5	79.3	76.4	90.7	88.1	88.3	80.1
2nd to 3rd			99.5	97.3	67.1	68.9	44.7	36.3	43.6	40.7	31.6
3rd to 4th			83.0	88.8	69.8	53.0	52.6	33.2	38.6	23.6	27.9

Source: 1. Iran 2000 Demographic and Health Survey. 2. Iran 2005 Low Fertility Survey.

Progression to the fourth and higher order births

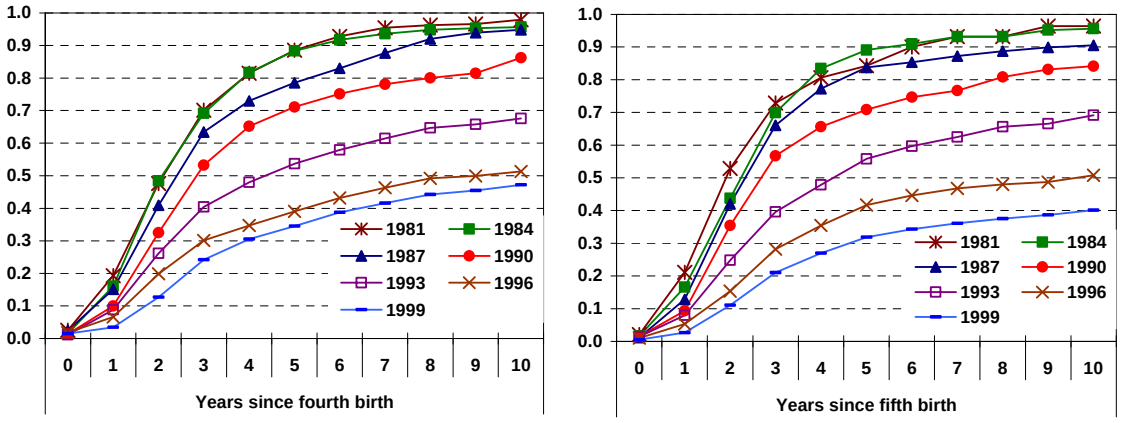
The phenomenon of 'stopping at two' from 1986 onwards extends to higher parities in the sense that, if a woman already had more than two children, there was an increased tendency across time to stop at whatever her parity was (Figure 6 and Table 5). Between 1986 and 1990, largely before the impact of the family planning program, the tendency to stop increased as parity increased for Iranian women. This pattern was accentuated between 1990 and 1999 with the family planning program in operation.

Figure 11: Cumulative parity progression, synthetic cohorts, third birth to the fourth birth, Iran and Four Low Fertility Regions, 1981-2003, selected years



Source: Iran 2000 Demographic and Health Survey. **Source:** Iran 2005 Low Fertility Survey.

Figure 12: Cumulative parity progression, synthetic cohorts, fourth to the fifth birth and fifth to the sixth birth, Iran, 1981–1999, selected years



Source: Iran 2000 Demographic and Health Survey.

Figure 11 and Figure 12 confirm the strong cross-sectional pattern of stopping at whatever parity a woman had at the time. The largest shift occurs in the early years of the family planning program (between 1990 and 1993) suggesting that there was a considerable unmet need for contraception that was satisfied with enthusiasm as soon as this option was provided. The proportion of women who had had fourth birth during 1985–1988 was between 90 to 99 per cent but this figure fell to less than 50 per cent for the whole country and fell sharply to around 20 per cent by 2004 in the low fertility regions.

Lifetime progression to the fourth birth in the late 1980s in the low fertility regions is almost the same as observed at the national level, and around 90 per cent of women progressed to their fourth birth. After 1990, lifetime progression to the fourth birth is much lower among women in the low fertility provinces than at the national level being, for example, 70 per cent at the national level compared with 40 per cent in low fertility regions for the 1993 birth cohort. That what was happening was stopping behaviour rather than spacing behaviour is again indicated by the fact that the fall in lifetime parity progression ratios is very similar to the fall by the third year after the previous birth. Thus, it is considered that the lifetime parity progression ratios for all births beyond the second birth are unlikely to be affected much by tempo distortions.

From a theoretical perspective, it is evident that stopping behaviour was very strongly cross-sectional. Stopping was not a phenomenon that emerged gradually with successive cohorts, for example, through increasing levels of education. The demand for contraception was simultaneous across women of all ages. Consistent with this, it has been found that ideal family size does not vary much according to the age of the woman. Older women and younger women both state low fertility ideals (Abbasi-Shavazi *et al.* 2004b). This supports the explanation that the decline in fertility was motivated through families wishing to change their own economic circumstances and the educational opportunities for their children. It also shows the important impact of the widespread provision of family planning services through the public health system.

Synthetic lifetime parity distributions and average parities

As summary measures, the implied completed parity distributions and the lifetime average number of children ever born to the synthetic parity cohorts were calculated as described earlier in the methodology (Table 6 and Figure 13). In these calculations, the cumulated proportion ever married to age 49 is projected using the closest available actual probabilities for the ages for which actual data were not available. For example, for the year 1981, the actual probabilities of first marriage to age 30 are used, but for age 31 the actual probability from 1982, and for age 32 the probability from 1983 are used, and so on. The shift in the implied (synthetic) completed parity distribution is truly remarkable – from 86 to just 4 per cent having six or more children in a period of less than two decades and from 9 per cent having three or fewer children to 78.5 per cent.

Finally, as shown in Figure 13, the average lifetime parity for synthetic cohorts provides a very similar trend to the total fertility rate derived from age-based measurement. As far as the survey results are concerned, this is the expected result as both measures are driven very largely by the annual number of births.

Table 6: Implied completed parity distribution and life time average parity, Synthetic parity cohorts, Iran and four selected low fertility provinces, 1981 – 2003

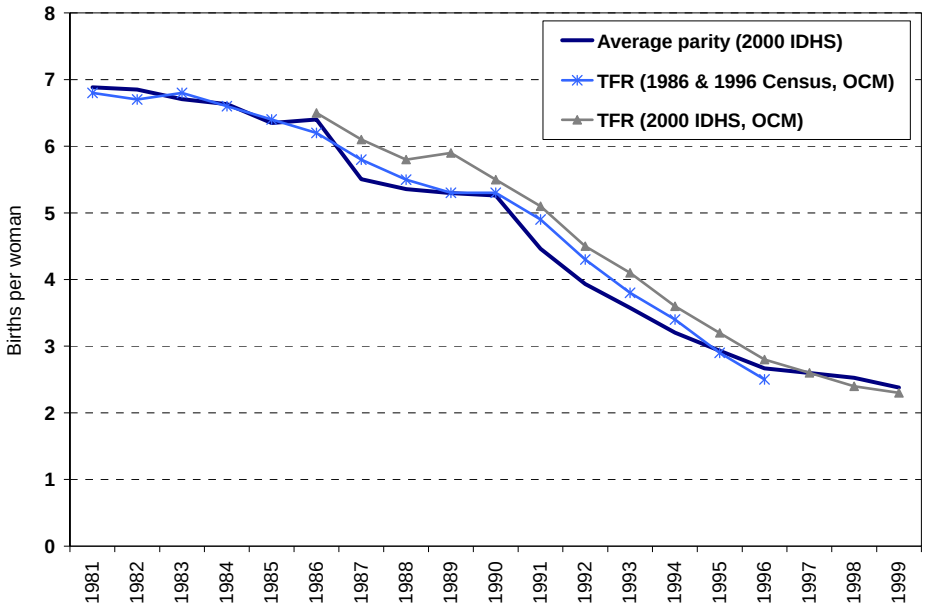
Parity progression	Lifetime percentage progressing										
	1981	1983	1986	1988	1990	1992	1995	1997	1999	2001	2003
Iran (National level)[1]											
0 (non-marriage)	2.9	3.8	6.8	8.1	5.4	10.1	12.6	14.3	14.2		
0 (within marriage)	2.0	2.7	2.0	3.6	3.5	3.1	3.0	3.3	4.4		
1	1.4	0.7	1.2	2.6	2.4	4.5	7.7	10.2	10.3		
2	1.7	2.3	2.0	8.1	10.0	14.8	24.5	25.8	28.3		
3	1.0	1.5	3.7	8.3	7.9	15.3	19.1	18.9	21.3		
4	1.9	1.9	3.4	6.9	9.7	15.0	14.4	13.8	11.4		
5	3.2	4.7	3.0	4.5	9.7	11.7	8.5	7.0	6.1		
6+	86.0	82.4	77.9	57.8	51.3	25.4	10.3	6.7	4.1		
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		
Average parity	6.9	6.7	6.4	5.4	5.3	3.9	2.9	2.6	2.4		
Four selected low fertility provinces[2]											
0 (non-marriage)			13.2	12.8	2.0	11.7	6.2	10.1	8.4	3.7	18.1
0 (within marriage)			1.6	4.4	2.2	3.6	7.4	3.1	4.7	5.9	4.5
1			8.7	0.4	3.4	17.5	20.4	8.0	10.3	10.6	15.4
2			0.4	2.3	30.4	20.9	36.5	50.1	43.2	47.3	42.4
3			12.9	8.9	18.7	21.8	14.0	19.1	20.5	24.8	14.1
4			5.5	0.0	15.3	12.0	10.2	5.8	12.2	5.4	4.8
5			0.0	8.0	3.3	6.1	3.0	2.7	0.4	2.2	0.5
6+			57.7	63.1	24.7	6.5	2.4	1.0	0.3	0.1	0.3
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average parity			4.9	5.3	3.8	2.5	2.1	2.1	2.1	2.1	1.7

Source: 1. The 2000 Iran Demographic and Health Survey; 2.The 2005 Iran Low Fertility Survey

Decomposition of fertility

The question remains to what extent changes in total fertility are due to changes in nuptiality and marital fertility. Abbasi-Shavazi (2000a) decomposed the changes in fertility during the two periods of 1976–1986 and 1986–1996 into two main components of nuptiality and marital fertility. He showed that around 85 per cent of change was due to marital fertility, which suggests that most of the fertility of Iranian women has been controlled within marriage. Around 15 per cent of the change is attributable to changes in nuptiality, specifically an increase in age at marriage and thus a reduction in the proportion of women married at early ages.

Figure 13: Average lifetime parity for synthetic cohorts[1] compared with the total fertility rate[2], Iran, 1981–1999



Source: 1. Abbasi and McDonald 2005 (Own Children Method applied to the Iran 1986 and 1996 Censuses and the IDHS); 2. The 2000 Iran Demographic and Health Survey.

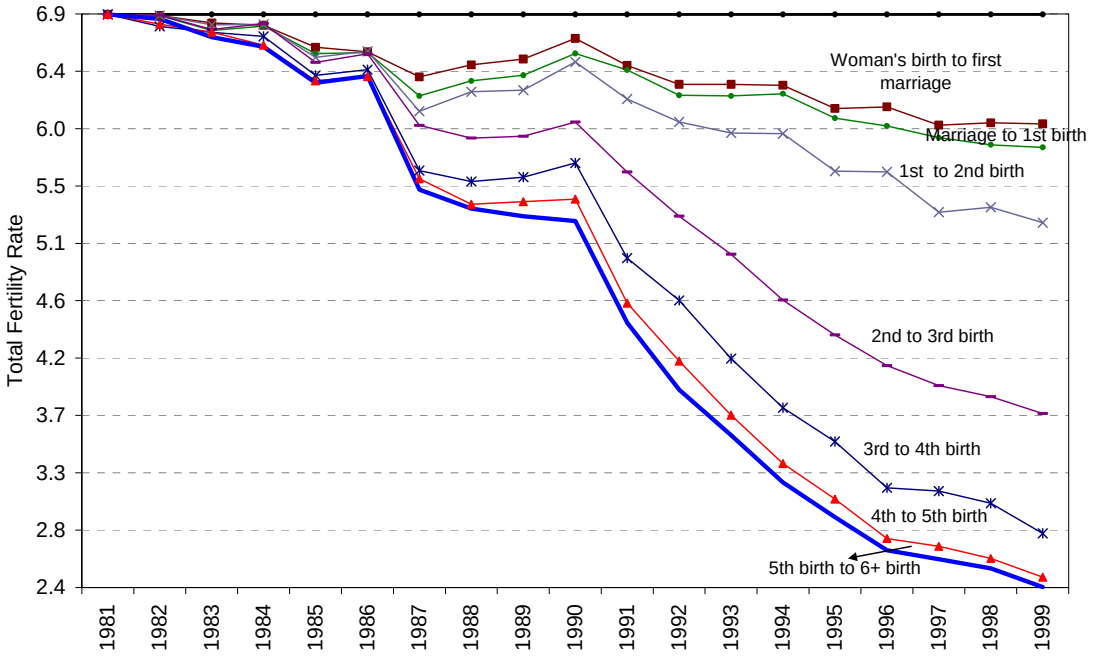
Figure 14 shows the trends of a decomposition of the change in the period lifetime fertility between 1981 and 1999 into changes in the progression to marriage and the progression to each successive birth. The top line, labelled 'Woman's birth to marriage' shows the change in period lifetime fertility that would have occurred if only the probabilities of progression to marriage had changed with no change from 1981 in any of the other progressions. The second line labelled 'Marriage to first birth' then adds the additional effect of changes in the progression from marriage to first birth. Successively, other progressions are added with the final line, when progression from the fifth to the sixth birth is added, showing the actual trend in period lifetime fertility.

The figure shows that the change in the timing of marriage on its own would have reduced the period lifetime fertility from around 7 births to 6 births over the whole period. Changes in progression from marriage to the first birth reduce the total fertility only slightly to 5.8, and changes in progression to the second birth reduce fertility a further 0.5 births per woman to 5.3. The progressions from birth to marriage, to first birth and to second birth are the changes where tempo effects will be playing a part as described earlier. Nevertheless, these trends are unlikely to turn upwards in the foreseeable future, that is, the tempo effects are not likely to be short-term. Further back in time, however, the trends for these progressions display a very interesting short-term tempo effect. In the final years of the 1980s, the years immediately following the end of the Iran-Iraq War, the period progression to marriage had the effect of increasing fertility (by about 0.2 births per woman) and there was also a small upward impact from the progression from the first to the second child. These tempo effects produced a kink (a flattening) in the decline of synthetic lifetime fertility between 1987 and 1990. This accentuated the apparent fall in fertility from 1990 onwards. This

observation could not have been made using conventional age-based measures of fertility and shows the explanatory power of the parity progression model.

As would be expected, by far the largest impact on period lifetime fertility is caused by the fall in progression from the second to the third birth. This commences effectively from 1988 and becomes increasingly larger with time. It accounts for a fall of around 1.6 births per woman in total. The fall in progression from the 3rd to the 4th birth is evident as early as 1984 as the first real sign of the impending fertility decline. Its effect gradually increases to 1987, levels off between 1987 and 1990 but then becomes increasingly more significant from 1990 onwards. Similar conclusions apply, at a lower level of significance, for the progression from the 4th to the 5th birth. The falls in these three progressions, from the second to the fifth birth, are most unlikely to be temporary and therefore reflect an irreversible fall in the quantum of fertility. They indicate the stopping behaviour that is central to the fall in Iran's fertility rate.

Figure 14: Decomposition of the 1981–2004 declines in fertility in Iran across the progression to marriage and each successive birth



Source: The 2000 Iran Demographic and Health Survey.

While, stopping childbearing behaviour clearly has played the major role in the decline of Iranian fertility from 1986 to 2000, the emergence of very low fertility in the low fertility provinces seems to have been driven in large measure by substantial increases in the intervals between marriage and first birth and between the first birth and the second birth.

6. Contraceptive use: levels and trends

The impact of contraceptive use on fertility regulation is related to its prevalence and method mix, as well as its effectiveness and continuation. Since the start of family planning programs in the 1960s, most developing countries have experienced fertility declines from around 7 to 2.5 by the mid 1990s (Bongaarts 2005). Pakistan, Tunisia, Egypt, Turkey and Iran were the first Muslim countries in the Middle East that officially adopted a population policy in the 1960s to reduce their population growth rate by implementing family planning (Nortman and Hofstatter 1978). The family planning program in Iran was officially introduced by the Ministry of Health in 1967 (Population Council 1968) and consequently the first general family planning clinic was established in 1968 in Tehran to provide contraception free of charge to couples voluntarily seeking family planning services (Iran Ministry of Health 2004). The family planning program was gradually developed, and the 1976 Iran Fertility Survey revealed that about 26 per cent of married women aged 15–49 were using a modern contraceptive method (Aghajanian 1994).

National level

The trend in contraceptive use in Iran (Table 7) shows that the percentage using any form of contraception among currently married women at ages 15–49 almost doubled from the 1970s to the end of the 1990s. The 1976 IFS revealed that 36 per cent of currently married women aged 15–49 were using any type of contraception. This can be considered as the result of the population policy adopted in 1967 and the first family planning campaign (Agha 1985; Aghajanian 1994). Among the 26 per cent using modern contraceptive methods, about 17 per cent were pill users, 4 per cent condom, while less than 5 per cent of women were using the IUD or any other form of modern contraceptive method available in the private sector. Users of traditional methods with 10 per cent coverage comprised about 28 per cent of contraceptive users. It should be mentioned that traditional method users in Iran mainly use withdrawal and a very low percentage (less than one per cent of women) use periodic abstinence.

The first situation analysis for implementation of the revived family planning program undertaken by the Ministry of Health and conducted in autumn 1989 showed that around 49 per cent of currently married Iranian women of reproductive ages were using a contraceptive method (Iran Ministry of Health 1990). This means that fertility control was being practised during the 1980s although it was considered as an inactive period for the family planning program. Following the revival of the official family planning program in 1989, the 1992 KAP survey covered 2000 households in each province of Iran and collected information about contraceptive use among currently married women aged 15–44.

The weighted result for the country (Table 7) revealed that after less than three years of reactivation of the family planning program, pill users comprised 23 per cent of eligible women and 9 per cent used sterilization methods. The prevalence of IUD use doubled, reaching 7 per cent of eligible women, and other modern and traditional methods remained almost at the same rates. Between 1993 and 1997, cross sectional surveys with similar sample size were conducted at the beginning of each year to evaluate the family planning program in terms of its impact on fertility decline, and to estimate the contraceptive prevalence rate. In the 1993 survey, all contraceptive users comprised 68

per cent of eligible women. Around a quarter of women were using the pill and about 19 per cent were using traditional methods. The surveys conducted from 1994 to 1997 show an increase in the proportion of women using contraception due mainly to the cumulated percentage of women and their husbands undergoing sterilization as well as a rising proportion of IUD users.

Table 7: Contraceptive prevalence rates (%) among currently married women aged 15–49, Iran, 1976–2000

Method	IFS 1976	IKAP 1989	IKAP 1992	IKAP 1993	IKAP 1994	IKAP 1995	IKAP 1996	IKAP 1997	IDHS 2000
Pill	17.3	18.1	22.6	24.5	22.0	22.8	21.9	20.9	18.4
Condom	4.0	5.7	6.4	6.7	6.6	5.7	5.6	5.4	5.9
IUD	1.4	3.7	7.1	7.2	7.8	7.1	8.3	8.3	8.5
Female sterilization			7.6	9.2	11.1	13.7	15.0	15.5	17.1
Male sterilization			0.9	1.0	1.2	1.3	1.6	1.9	2.7
Injectable (DMPA)					0.5	1.3	2.5	2.9	2.8
Norplant					0.0	0.0	0.0	0.5	0.5
Other	3.2	3.0		0.6	1.9	1.7	1.2	0.6	0.1
Traditional	10.1	18.4	20.0	18.6	18.9	19.2	18.0	16.9	17.8
All method	**36.0**	**48.9**	**64.6**	**67.8**	**70.0**	**72.8**	**73.7**	**72.9**	**73.8**
No. of women	4715	8975	36000	40963	40995	41082	41347	42645	87400

Source: Iran Fertility Survey (Aghajanian 1994) for 1976; the figures for 1989–2000 comes from the 1989–1997 KAP surveys and the 2000 IDHS conducted by the Iran Ministry of Health.

Low fertility provinces

The city of Tehran as the most populous location of Iran has had the lowest level of fertility. Metropolitan fertility fell from 3.0 in 1990 to 1.5 in 2005. Gilan underwent an even steeper fertility decline, from 3.5 in 1990 to 1.5 in 2005. Among the four provinces, Gilan has experienced the lowest contraceptive use since 1993, even lower than Tehran City. For example, the level of usage of modern methods in Gilan was around 46 per cent of currently married women of reproductive age in 1993 (1993 KAP survey) increasing to 53 per cent in 2005. In contrast, in Isfahan, the fertility rate was measured at 1.7 in 2005, and modern contraceptive use increased from 52 per cent in 1990 to 58 per cent in 2005. Yazd had a higher level of fertility at around 2.0 in 2005, and the modern contraceptive prevalence rate increased from 51 per cent in 1990 to 54 per cent in 2005.

The trends of fertility rates in these four regions show that fertility has fallen by more than 50 per cent, while modern contraceptive use has increased only slightly: between 2–6 percentage points (Table 8). Based on the data, it would appear that, in Iran modern contraceptive use does not increase once the prevalence rate reaches around 55 per cent. This limitation is due to the fact that among the remaining 45 per cent of women, around one-third have encountered sub-infecundity, and around one-third comprise those who seek to have another child, and the rest of the non-user group are those who do not want to fall pregnant but have other reasons for not using contraception. Fertility has continuously declined over the period 1990–2005. Women's use of

contraception has contributed to fertility decline through longer periods of spacing, or use of contraception for limiting childbearing.

Table 8: Trend of modern contraceptive prevalence (per cent) among currently married women aged 15–49, Selected low fertility provinces, selected years

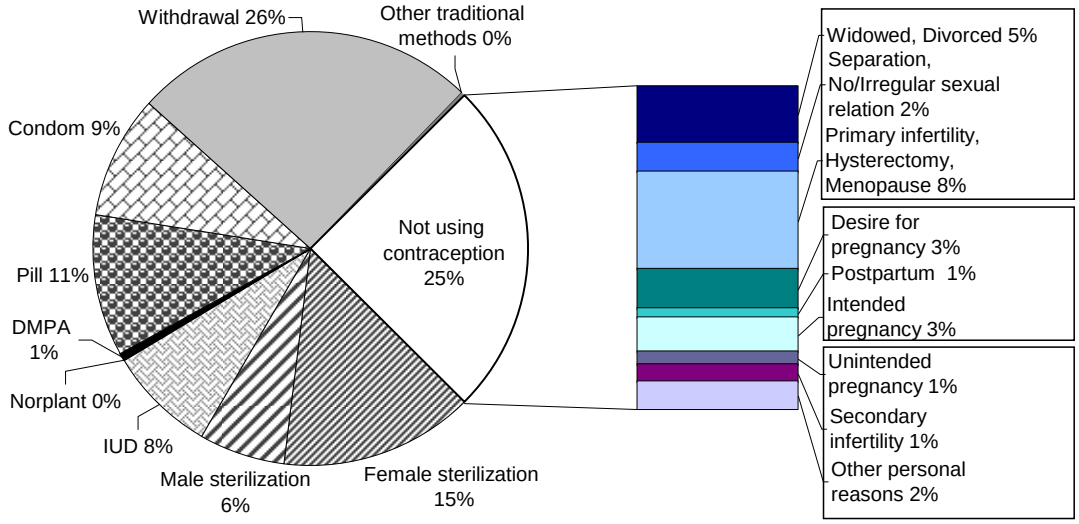
Area	1993	1995	1997	2000	2005
Urban					
Gilan province	43.0	47.7	57.7	45.0	50.5
Isfahan province	52.8	54.5	53.8	54.5	57.6
Yazd province	47.7	45.4	54.1	53.1	53.5
Tehran City				52.5	50.6
Tehran province	51.9	46.6	50.8	53.4	
Rural					
Gilan province	47.4	51.5	59.2	54.1	55.3
Isfahan province	51.4	59.3	59.8	60.8	61.4
Yazd province	50.2	59.9	59.8	59.1	53.4
Tehran province	58.3	56.7	45.7	58.7	57.3
Total					
Gilan province	45.6	50.0	58.5	49.5	52.8
Isfahan province	52.3	54.0	55.4	55.9	58.4
Yazd province	48.5	52.0	55.5	54.4	53.5
Tehran City				52.5	50.6
Tehran province	52.7	50.0	52.0	53.4	

Source: KAP (Knowledge, Attitude and Practice) Surveys conducted by the Ministry of Health during 1989–1997, the 2000 Iran Demographic and Health Survey and the 2005 Iran Low Fertility survey

Given that the low fertility provinces studied in the 2005 ILFS have below replacement-level fertility except for Yazd province which has around replacement fertility, the weighted rate of modern contraceptive use in these provinces can be representative of contraceptive practice in the low fertility regions of Iran. The results from the combined provinces of Isfahan, Yazd, Gilan, and Tehran City shown in Figure 15 indicates that 75 per cent of currently married women aged 15–49 were using some form of contraception. Further, 23 per cent of women were using a traditional method, that is, one-third of contraceptive users in these provinces were relying on traditional methods to avoid pregnancy. Around 17 per cent of women had undergone sterilization while 4 per cent of their husbands had undergone vasectomy. Male sterilization is twice as prevalent in these provinces compared to the rest of Iran, but female sterilization is lower than the national average. Condom use in these provinces at 10 per cent is almost twice the national level. In the provinces mentioned, 50 per cent of contraceptive users rely on male-related methods and this indicates one reason underlying low fertility. It can be said that in these provinces, couples' views on controlled fertility and smaller family size are more aligned than in other provinces. The other noticeable feature about the type of contraception used by women in low fertility provinces is the high prevalence of IUD, and the lower prevalence of hormonal methods (pill and DMPA) compared to the national level and other provinces. Of the 25 per cent of women who were non-users of contraception, 11 per cent were no longer at risk of pregnancy, 9 per

cent were pregnant or desired to fall pregnant, and only 6 per cent were at risk of pregnancy but were not using contraception.

Figure 15: Percentage distribution of ever married women aged 15–49 by using and not using contraceptive, combined four selected low fertility provinces, 2005



Source: The 2005 Iran Low Fertility Survey

Contraceptive use: determinants and correlates

Table 9 shows the likelihood of using any type of contraception compared to non-use of contraception, and also the likelihood of using a modern contraceptive versus traditional methods. Using logistic regression, controlling for the number of children, level of education and place of residence, currently married women aged 15–49, women of middle reproductive age (25–34) 24 per cent more likely than other women to use contraception. Older women (35–49) were 25 per cent less likely to use a contraceptive method to avoid pregnancy. When modern contraceptive users are examined versus traditional users, both women in middle and older age groups were less likely to use modern contraception than women in the age group 15–24.

A relation between contraceptive practice and number of children remains after controlling for other variables. About 90 per cent of Iranian couples perceive ideal fertility to be represented by two children, and consider four children to be a large family (Abbasi-Shavazi *et al.* 2004b). Women with three children are almost 17 per cent more likely to use a contraceptive than women who have two children. The difference relates to the type of contraception. Women with three children are 40 per cent more likely to use modern than traditional methods than women with two children. Usage for women with no children or only one child is 35 per cent less than for women with two children. The likelihood of using any form of modern contraception versus traditional

methods among women with more than three children is considerably higher than for women in other categories. Women who have four or more children are 2.7 times more likely to use a modern contraceptive than a traditional method compared to the reference category of women who have one child or less.

Controlling for place of residence, age, and number of children, women with a primary level of education are more than twice as likely as illiterate women to use contraception. The likelihood of women with secondary education using contraception is higher again, while women with a higher level of education (diploma or tertiary level) are the most likely to practise a form of contraception. Interestingly, there is a negative relationship between the likelihood of using modern methods and increasing levels of education. Among contraceptive users, women with primary education are 40 per cent less likely than illiterate women to practise a modern contraceptive method (as opposed to a traditional form), and the likelihood of using a modern method decreases to about 52–60 per cent for women with tertiary education (Table 9).

At the national level the number of women included in the multivariate analysis is very large and this affects the statistical significance of the relationships between contraceptive practice and the demographic characteristics of women. However, the results at the provincial level using a smaller sample size also show significant relationships with most of the demographic characteristics of women and their reproductive behaviour. At the national level, place or the province of residence has a significant affect on the pattern of contraceptive use. It is noticeable that the likelihood of using modern rather than traditional methods is higher in rural areas than in urban areas, but women living in urban areas are 38 per cent more likely to use any form of contraception to avoid pregnancy.

Despite different levels of provincial fertility, contraceptive prevalence is almost the same in each province. In the logistic regression model, provinces were divided into five categories to examine contraceptive use differentials according to the provincial level of fertility. Gilan and Tehran City are considered as the reference category having the lowest fertility in the country. After controlling for age, education, rural/urban residence, and the number of children, there is no difference between provinces that have below-replacement or replacement fertility (TFR =1.7–2.1) and Gilan and Tehran City in terms of using any form of contraception. However, users in the replacement fertility provinces are 74 per cent more likely to use a modern than a traditional method than women in Gilan and Tehran City. Further, the likelihood of practising contraception falls with increasing levels of fertility in the other provinces with fertility above replacement level. Women are less likely to use a contraceptive method in general compared with women in Gilan and Tehran, while contraceptive users are 59 and 34 per cent more likely to use modern contraception rather than traditional contraception in the provinces with fertility of 2.2–2.4 and 2.5–2.7 respectively (Table 9).

The exceptional result relates to Sistan and Baluchistan, which has the lowest level of contraceptive use and the highest level of fertility (4.1) in Iran. Women in this province are 80 per cent less likely to use a contraceptive method than women in Gilan and Tehran City, although users are 2.3 times more likely to use a modern method than a traditional contraceptive. The results indicate that use of traditional methods is more prevalent in the provinces with lower levels of fertility, and Iran's family planning program should pay more attention to withdrawal users in applied fertility control policy.

Table 9: Odds ratios from LR analysis indicating the likelihood of current use of any form of contraception among currently married women 15–49, and using a modern method among contraceptive users by selected factors

Variables in the equation		Any method users vs non-users		Modern method users vs traditional users	
Age group	15–24 (ref.)				
	25–34	**	1.24	**	0.81
	35–49	**	0.75	**	0.47
Number of Children	0–1	**	0.16	**	0.65
	2 (ref.)				
	3	**	1.17	**	1.40
	4+	**	1.61	**	2.70
Level of Education	Illiterate (ref.)				
	Primary	**	2.14	**	0.58
	Secondary	**	2.95	**	0.48
	Diploma or university	**	3.49	**	0.40
Area of Residence	Rural (ref.)				
	Urban	**	1.38	**	0.65
Region	Gilan and Tehran City, TFR<1.5 (ref.)				
	Provinces with TFR=1.7–2.1		0.99	**	1.74
	Provinces with TFR=2.2–2.4	**	0.66	**	1.59
	Provinces with TFR=2.5–2.7	**	0.62	**	1.34
	Sistan and Balouchistan TFR=4.1	**	0.20	**	2.30
	Constant	**	3.01	**	6.32
Cases included in Analysis			82,317		62,275

Note: ** Significant at level P<=0.01 * Significant at level 0.01<P<=0.05
Source: The 2000 Iran Demographic and Health Survey

7. Contraceptive Use and Parity Progression

Contraceptive use dynamics in the conceptual framework of this paper refers to the adoption of contraceptive use within pregnancy intervals. It investigates the first use of contraception at each parity, the duration of contraceptive use and the differentials in parity progressions patterns between contraceptive users and non-users. In this research, a model for the fertility regulation process is developed to examine the effects of changes in contraceptive prevalence, failure rates, method mix, and discontinuation rates because a high level of discontinuation of contraceptive methods affects induced abortion rates (Henshaw and Kost 1996). This study also examines the incidence of abortion although the available data are limited. While in Iran, contraceptive use has increased significantly, it is necessary to explore to what extent abortion substitutes for contraception.

The 2005 ILFS data allow analysis of contraceptive use dynamics including ever and first adoption of contraception at each parity level, continuation and discontinuation rates,

and lifetime contraceptive use. In addition, the data provide the possibility of a multilevel and multivariate analysis to explore determinants of reproductive and contraceptive use behaviour across marriage cohorts and places of residence. The analysis of contraceptive use dynamics is rather detailed and long, and this paper deals with fertility regulation among users and non users of contraception. This section will first describe the contraceptive and fertility history information collected in the 2005 ILFS and also its quality. Second, the first use of contraception and its determinants is examined. The first use of contraception at each parity is then examined to explore factors underlying contraceptive intention and contraceptive use across the reproductive life course. Third, parity progression is compared between contraceptive users and non-users. Finally, limiting childbearing is investigated through exploration of the age and parity at sterilization.

Methodology: event history analysis

In an analysis of contraceptive histories, three units exist in the analysis and models. The first unit is episodes or intervals of contraceptive use, the second is the woman, and the third unit comprises women clustered for place of residence or any other grouped demographic characteristics such as marriage cohort, age, education level, or pregnancy order.

Event history analysis is the appropriate method for the analysis of such demographic events as transition between different stages of life, for example, from birth to marriage, from marriage to first birth, from second to third birth, and so on (Courgeau 1992; Murphy 1992; Trussell *et al.* 1992). However, this method may involve some statistical biases. For example, one of the problems in a cohort analysis is that a woman might perhaps enter in the analysis more than once. Therefore, individual characteristics in the analysis are repeated so that they are likely to be correlated and may affect the results by appearing to be significant, when they are not actually statistically significant (Liaw 1976; Little 1992).

Event history analysis is also the appropriate method to measure discontinuation rates and efficacy of contraceptive methods (Kost 1993; Curtis and Hammerslough 1995; Blanc and Curtis 2001; Khatun 2005). It has been suggested (Ali and Cleland 1995, 1999) that the data relating to the last three months prior to the time of survey should be excluded to ensure unbiased data related to women who are not aware of their pregnancy in the first trimester.

The data available from the 2005 ILFS allow us to use event history analysis to examine the dynamics of contraceptive use in the four selected provinces of Iran. To meet the purposes of following sections, the data on fertility and contraceptive use history of all interviewed ever-married women 15–54 was integrated into a data file which included 5526 records. In this data file, each record horizontally holds the background social and demographic information of women plus their fertility and contraceptive use history information for each method from first marriage to the time of survey. Thus, this arrangement of the data allows the estimation of the probability of progression to any event of interest. Bivariate analysis is first utilised to describe the basic measures, and survival analysis is applied to the data to estimate the survival function of the event of interest.

First use of contraception

Table 10 presents demographic characteristics of ever users of contraception at their first use of contraception. Around 41 per cent of ever users were under 20 years old at first use, around 40 per cent were between 20–24, 14 per cent between 25–29, and six per cent were over 30 years. This young age at first use is related to an early age at marriage. Considering parity, around 33 per cent of women adopted contraception before they had any children, and 48 per cent at parity one.

Desire for a child is the main reason for not using contraception before having the first child. This cultural pressure for a woman to show her fecundity immediately after marriage is also evident in other societies (Basu 1993; Wang and Yang 1996; Kalipeni 1997). This is one of the reasons for the short period between marriage and the birth of the first child. Having no children or having just one can be considered, in some societies or cultures, as a sign of weakness or of male impotence. The woman and the man try to affirm their fecundity and capacity for reproduction by having children. The effect of this cultural pressure is least evident in Tehran city and most evident in Gilan.

Table 10: Demographic characteristics of women at first use of contraception

Demographic characteristic of users	Region				Combined regions	
	Gilan	Isfahan	Yazd	Tehran city	%	N
Age						
<20	31.9	45.9	45.3	40.6	40.8	2024
20–24	41.7	38.0	38.1	39.8	39.6	1969
25–29	16.5	11.7	10.5	14.3	13.8	667
30+	9.9	4.3	6.1	5.2	5.9	374
Children ever born						
0	15.9	28.9	23.8	42.4	32.9	1263
1	59.4	49.7	52.8	43.0	48.3	2578
2	12.4	9.6	10.4	8.8	9.8	544
3+	12.4	11.7	12.9	5.9	9.0	649
Total	100.0	100.0	100.0	100.0	100.0	5034

Source: The 2005 Iran Low Fertility Survey

Recent studies show that two children is the most common stated ideal family size for women of reproductive age (Abbasi-Shavazi *et al.* 2003; Abbasi-Shavazi *et al.* 2004b). Considering this preference, comparing the result of reasons for discontinuation and parity at first use of contraception, the results of this study also support women's attitudes towards the small family size norm. In other words, when the highest percentage of first contraceptive adoption is at parity zero or one, the desire to become pregnant is the main reason for discontinuation.

First use of contraception at each parity

First use of contraception before at parity zero

As couples are not aware of their fecundity at the time of marriage, analysing the first use of contraception before first pregnancy among all women is valid even though some women will become aware of their infecundity later in their married life. Overall, around one-quarter of all women used contraception before their first pregnancy within the first year of marriage, and mostly within the first three months of marriage. For example, around 19 per cent of women adopted contraception within the first three months of marriage, and this figure increased only to 24 per cent within the first year of marriage (Table 11). This pattern holds for women by all socio-demographic characteristics.

Table 11: Cumulative percentage adopting contraception within first year of marriage before the first pregnancy

Demographic characteristics		Months since first marriage				Number
		3	6	9	12	of women
Region	Gilan	11.5	12.8	13.4	15.7	1603
	Isfahan	19.8	21.7	23.4	25.3	1495
	Yazd	14.5	16.5	17.5	19.3	1506
	Tehran city	35.7	38.1	39.8	42.4	922
Area of growing up by age 14	Urban	26.6	28.8	30.4	33.3	2560
	Rural	11.7	13.2	14.2	15.7	2966
Marriage Cohort	<1980	6.2	6.3	6.5	7.1	1344
	1980–84	8.2	9	9.4	9.4	781
	1985–89	9.6	10.2	10.2	10.7	667
	1990–94	19.7	20.8	21.9	23.5	824
	1995–99	25.6	29.3	31.8	34.6	859
	2000–05	39.5	43.1	45.4	50.2	1051
Level of Education	Illiterate	1.4	1.9	1.9	2.3	650
	Primary	9.1	10.1	10.9	11.6	2069
	Secondary	20.7	22.7	24.1	27.4	1267
	Diploma or university	36.5	39.8	41.9	45.5	1540
Total		18.7	20.5	21.7	23.8	5526

Source: The 2005 Iran Low Fertility Survey.

Using contraception in the first year of marriage was most common for women in Tehran city followed by women in Isfahan. Women in Gilan were less likely to adopt contraception before their first pregnancy and only 15.7 per cent of them used contraception within the first year after marriage before the first pregnancy. The level of education was also strongly associated with first contraception. Women with a higher level of education were more likely to use contraception to avoid first pregnancy within the first year of marriage. Where women lived before age 14 was also related to the first

use of contraception. Women growing up in an urban area were twice as likely as women raised in a rural area to use contraception to avoid the first pregnancy within the first year of marriage. The probability of using contraception before the first conception has increased significantly over time. Almost half of the women married since 2000 used contraception within the first year of marriage to avoid their first pregnancy while this proportion for women married before 1990 was only around 10 per cent.

First use of contraception at parities one, two and three

As discussed earlier, having the first child is very important for couples in Iran. Once the first child is born, then families are satisfied because the couple has fulfilled their familial and societal role of having a child. In addition, they are certain about their fecundity. Thus, the couple can make a more informed decision about the use of contraception to delay the second child. The probabilities of first use of contraception at parities one, two, and three shown in Table 12 are based on women who have had the birth of the given order at the time of starting the method.

The decision to use contraception is generally made within the first three months after delivery. For instance, between 60 to 65 per cent of women who have had a first, second, or third child, had started to use contraception during the first three months after delivery to delay the subsequent birth. By twelve months these figures had increased only to around 67, 72 and 68 per cent, respectively.

Table 12: Cumulative percentage adopting contraception within 3 and 12 months of the stated birth

Characteristics	Parity one		Parity two		Parity three	
of women	3 months	12 months	3 months	12 months	3 months	12 months
Region						
Gilan	62.0	71.6	67.3	75.9	60.0	69.0
Isfahan	64.3	70.1	67.0	72.9	62.5	68.0
Yazd	63.8	67.6	64.8	70.5	61.2	67.0
Tehran city	71.8	79.7	75.3	82.2	68.9	76.1
Marriage cohort						
<1980	37.8	41.8	47.5	53.0	51.2	57.1
1980–84	53.3	59.3	65.6	73.2	67.3	75.0
1985–89	69.6	76.3	77.1	86.0	77.7	86.3
1990–94	80.9	88.5	89.5	94.9	85.1	90.7
1995–99	85.7	93.5	88.5	95.3	94.5	94.5
2000–05	88.4	96.7	87.2	95.7		
Education level						
Illiterate	25.8	29.6	34.7	40.9	37.6	43.1
Primary	58.5	64.6	65.5	71.6	63.2	70.4
Secondary	78.2	85.6	83.1	90.0	81.5	87.8
Diploma or university	82.9	91.2	84.8	92.7	82.9	90.2
Total	60.0	66.6	65.3	72.0	61.2	67.9

Source: The 2005 Iran Low Fertility Survey.

Place of residence, the time of marriage and the level of education each contribute significantly to the probabilities of adopting contraception. Women in Tehran city were significantly more likely to adopt a contraceptive to delay their second or third child than women in the other three provinces in the study. Nonetheless, the adoption of contraception to delay these births has increased significantly across marriage cohorts, particularly the delaying of the second and third child. For example, around half (53.3 per cent) of the women of marriage cohort 1980–1984 had adopted contraception to delay their second child within three months after their first child, but the figure has risen considerably, to around 90 per cent (88.4 per cent) for the most recent marriage cohort. Women's level of education is also associated with contraceptive adoption. As the level of education increases women are more likely to adopt a contraception. For instance, around 41 per cent (40.9 per cent) of illiterate women with two children adopted contraception within twelve months compared with more than 90 per cent (92.7 per cent) of women with tertiary education.

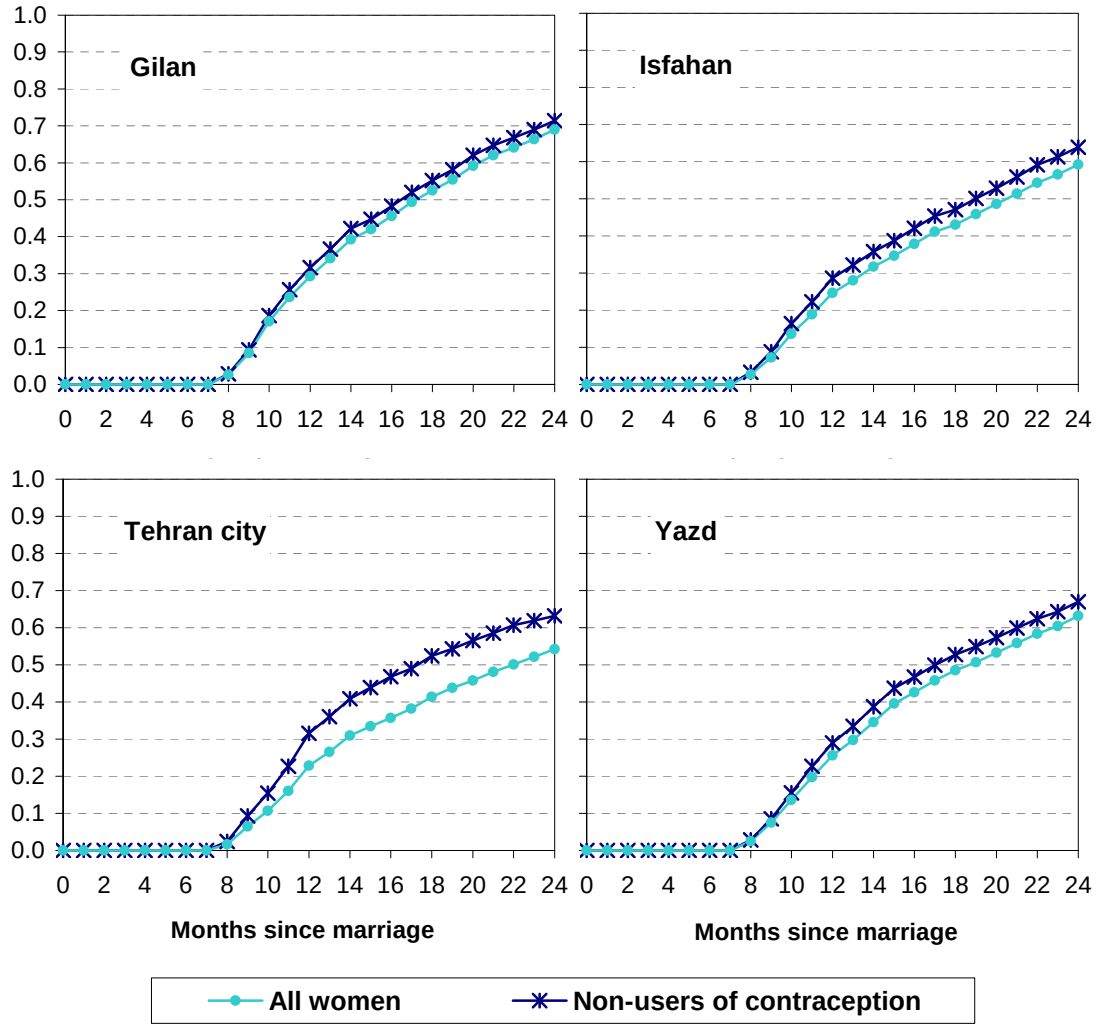
Contraceptive users versus non-users: parity progression

This section examines how and to what extent contraceptive use affects the postponement of births through the contribution of contraception to the rate of parity progression. Survival analysis is used to compose the probability of progression to each parity among all women (including contraceptive users and non-users) with the progression among non-users. The difference shows the overall effect of contraceptive use on parity progression. It should be noted that if a woman becomes sub-fecund, she will be right censored. The Wilcoxon (Gehan) statistic is used to test the significance of the differences observed between levels by region, education, and marriage cohorts. The difference shows the overall effect of contraceptive use on parity progression.

Progression from marriage to the first birth:

Figure 16 compare the probability of progression to the first birth among non users of contraception with all women (both users and non-users) according to the place of residence. Contraceptive use before the first pregnancy has little effect on the timing of the first birth except in Tehran city. Those women who used contraception were slower to progress to their first pregnancy than those who did not use any method. In general, about 55–70 per cent of all women have their first child within two years after marriage, and this figure is around 2–10 per cent higher for non-users of contraception. While there is little difference between the four provinces, the general pattern of contraceptive use before first pregnancy indicates that women living in Tehran city are more motivated to use contraception to prevent a first pregnancy. With no contraceptive use, the reported interval between marriage (a proxy for first intercourse) and first birth is around 15 months, and the non-users of contraception in this study are compatible with this pattern. This is another indication of the quality of the life history data collected in the ILFS.

Figure 16: Cumulative life table probabilities of progressing from marriage to the first birth by place of residence, all women versus non-users of contraception



Source: The 2005 Iran Low Fertility Survey

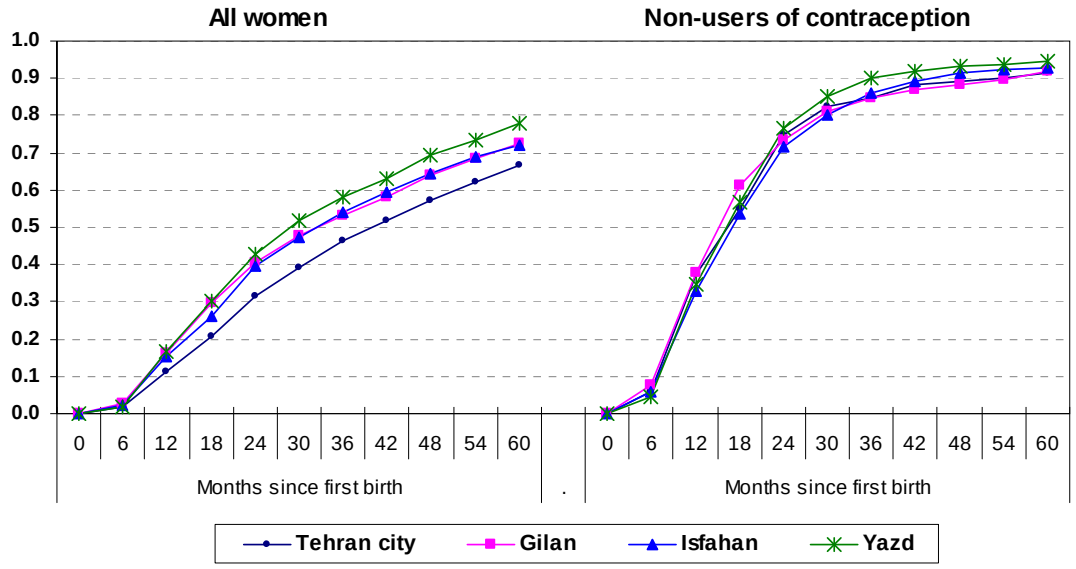
Progression from first to second birth

The general pattern of progression at parity one onwards is different from that obtained for parity zero. Not only is the progression from marriage to first birth naturally quicker than progression to other parities because there is no period of post-partum non-susceptibility to conception, but also, contraceptive use patterns before the first birth are considerably different compared with women's practices before the second or higher birth. Figure 17 shows the parity progression from the first birth to the second birth for all women in the four selected regions for those who use contraception and for those not using a method to delay their second birth. Only 20 per cent of all women had their second birth within 18 months following the first birth. The progression increases to around 30 and 40 per cent within 24 and 30 months of the first birth.

For all women, the three regions of Gilan, Isfahan and Yazd follow much the same pattern in progression, and almost 70 per cent of women had their second birth within less than three years after their first birth, while in Tehran city a slower progression can be observed between the twelve and 30 month. Progression is much faster for women

who had not used any contraception since their first birth. Non-users of contraception had the same pattern of progression from the first to the second birth in each province. Around five per cent of women in all regions had their second birth within the first year, and between 50 and 60 per cent of them progressed to their second birth in less than two years. The difference of a 30 per cent progression for all women within two years, compared to 60 per cent progression for non-users of contraception within the same period indicates the major impact that contraception has had upon the length of the interval between the first and second birth.

Figure 17: Cumulative life table probabilities of progressing from the first to the second birth by place of residence, all women versus non-users of contraception



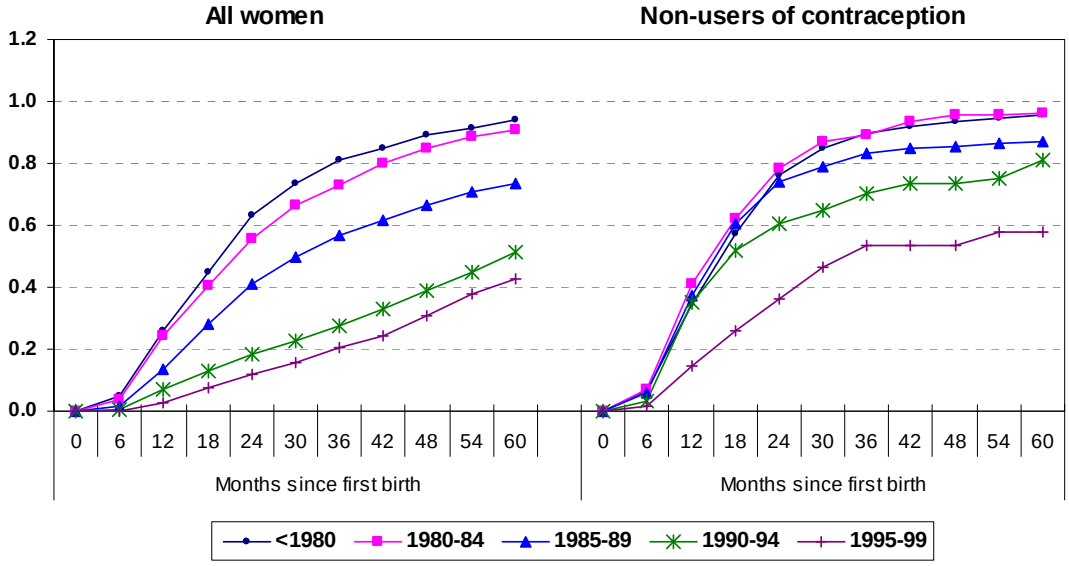
Source: The 2005 Iran Low Fertility Survey

While there is a consistent progression among regions, progression from the first to the second birth according to marriage cohort shows different patterns among both users and non-users of contraception. The widening of birth interval between first and second birth since 1985 was discussed earlier. The results show that more than 50 per cent of women who had married before 1985 had their second birth within two years after their first birth. For the marriage cohort of 1985–99, this increases slightly to two and half years, while the median interval for women who had married in the 1990s increases sharply to five years and more.

In general, progressions to the second birth have been lowered over time, particularly among women who married since 1990. Progression ratios to the second birth among non-users of contraception shown in Figure 18 not only are higher than their counterparts in the category of all women, but different progressions are also observed within this category. The progressions to the second birth are the same for all marriage cohorts by 18 months except for the marriage cohort 1995–99. Having the second birth occurred progressively earlier within 2–5 years for cohorts prior to 1990 but progressively later for cohorts from 1990 onwards. The contribution of contraceptive

users among all women produce slower and lower progression to the second birth among all women compared to non-users of contraception. However, non-users in the marriage cohorts before 1985 were as likely as their counterparts in the category of all women to have almost the same progression to the second birth. The gap between the proportion of non-users of contraception from the marriage cohort 1995 who progressed to second birth, compared to the marriage cohort prior to 1990, suggests termination of some second births since 1990.

Figure 18: Cumulative life table probabilities of progressing from first to the second birth by marriage cohort, all women versus non-users of contraception



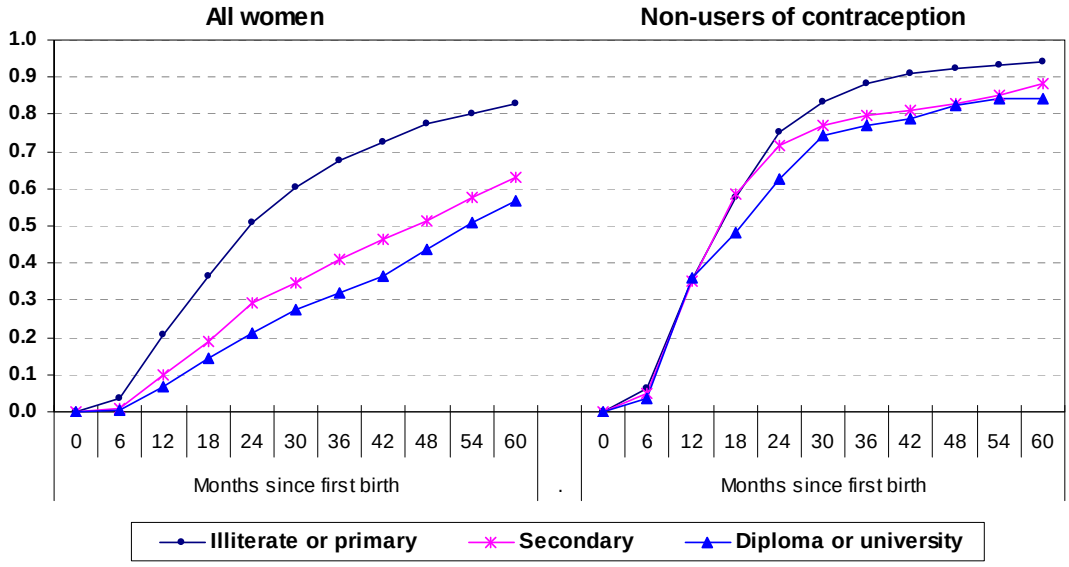
Source: The 2005 Iran Low Fertility Survey

Women's education is a powerful determinant for most of the fertility and reproductive health behaviours observed in developing countries (Caldwell 1980; Martin 1995; Ainsworth *et al.* 1996). The general result suggests that as women have higher levels of education, they have lower fertility, marry later, and limit their family size to a greater extent in developing countries. The results of the 2005 ILFS also show that education has a considerable impact on progression from the first birth to the second birth when contraceptive use is involved.

Figure 19 illustrates movement from first to second birth for women with these different education levels: illiterate and primary, secondary, diploma and university. The pattern of progression from the first birth to the second birth within 18 months is exactly the same for women with any level of education when they did not use contraception. In other words, in the absence of contraception, level of education does not contribute to fertility behaviour in terms of first and second birth spacing. A slightly lower progression rate (5–10 per cent less) is observed for progression within two and three years for non-users of contraception with diploma or university-level education, compared to non-users with other levels of education.

The diagram on the left hand side of Figure 19 shows a considerable differential for progression from the first to the second birth when contraceptive use is involved. Among the three categories, the slowest progression is observed for women with the highest level of education, and the highest or quickest progression is observed for women with the lowest level of education (illiterate and primary education). About 50 per cent of women who are either illiterate or have elementary education, progressed to the second birth within less than 30 months after their first birth, whereas only 20 to 30 per cent of women with secondary or higher level of education progressed to the second birth within the same period.

Figure 19: Cumulative life table probabilities of progressing from first to the second birth by level of education, all women versus non-users of contraception



Source: The 2005 Iran Low Fertility Survey

Progression from second to the third birth: Contraceptive users versus non-users

As described earlier, decline in the progression from the second to the third birth has made the largest contribution to fertility decline since 1990. Women's attitudes to ideal family size have also changed considerably since 1990. Marriage cohorts since 1990 have desired a small family size at the time of marrying and had sustained this desire by the time of the research in 2002(Abbasi-Shavazi *et al.* 2003; Abbasi-Shavazi and Askari-Nadoushan 2005). The generation that married earlier than 1990, and the younger generation that married since 1990, verified the same small ideal family size at the time of the research. However, the older generation had desired a larger family size at the time of their marriage (Abbasi-Shavazi *et al.* 2004a). Taking into account the above attitudes, it would be expected that after 1990, wider spacing occurred between second and third births compared to the spacing between first and second births and, more importantly, that the level of progression would be lower.

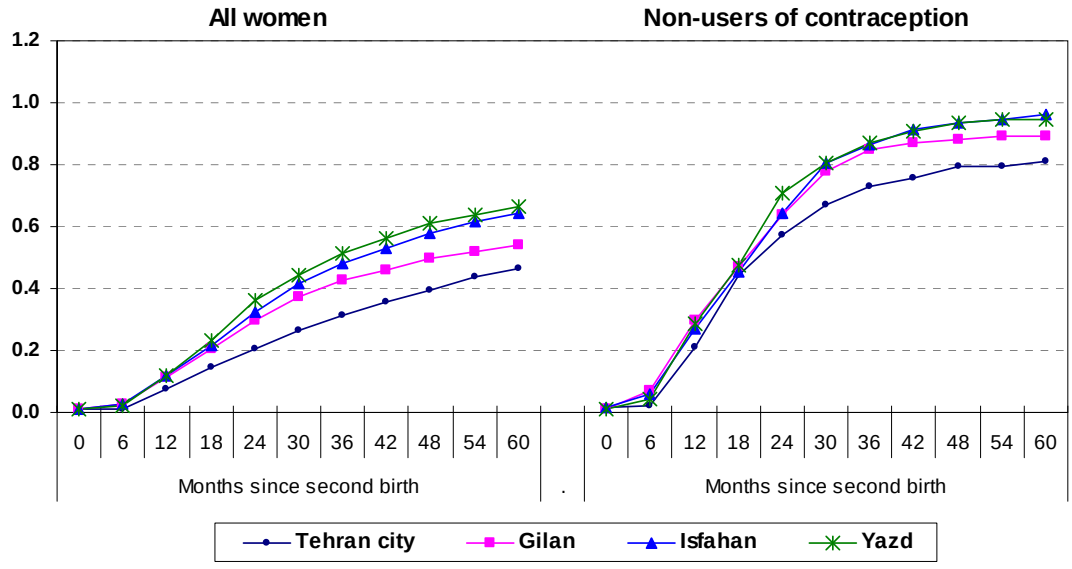
The result of this study indicates that the pattern of progression from second to third birth is different according to place of residence, either when contraceptive use is

involved, or not. The lowest progression is observed among all women residents of Tehran city for a given period after the second birth, followed by all women in Gilan province, and then almost the same pattern for Isfahan and Yazd provinces. The progression rate for all women i.e., both contraceptive users and non-users for the three provinces of Isfahan, Gilan and Yazd, is about 40 per cent within three years, while this figure is 12 per cent lower for Tehran city within the same period (Figure 20).

Around fifty five per cent of women in the two provinces of Isfahan and Yazd had had their third birth within the fourth year after their second birth, while less than 50 per cent of all women in Gilan and less than 40 per cent of all women in Tehran city moved to their third birth within the same period. This means that lower levels of progression occur between second and third births compared to the progression to the second birth when contraceptive use is involved. In contrast with the result observed for progression to the second birth among non-users of contraception, Tehran city varies somewhat considerably from the other three provinces for progression to the third birth with a lower level of progression being observed.

The lower progressions in portion in Tehran city, either among non-users or all women call for controlling other determinants at the provincial level to define the extent of the effect of the place of residence. The lower progression from the second to the third birth in Tehran city among non-users of contraception as compared with their counterparts in other provinces suggests that some of the pregnancies between second and third birth may have been terminated.

Figure 20: Cumulative life table probabilities of progressing from second to the third birth by place of residence, all women versus non-users of contraception



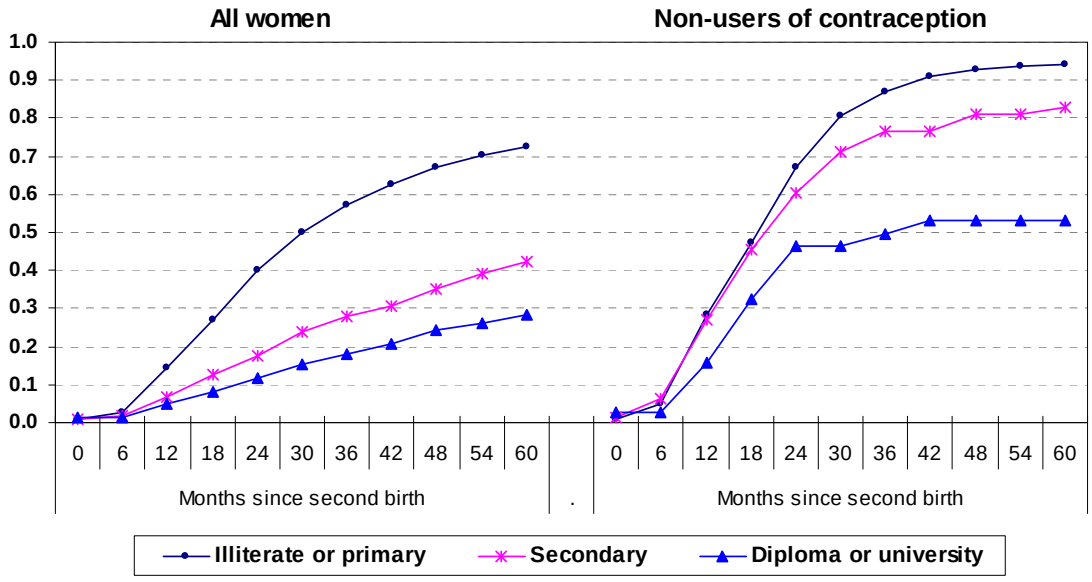
Source: The 2005 Iran Low Fertility Survey

The differential impact of education level on progression to the third birth is more pronounced compared to the progression to the second birth. This differential can be observed among all women (Figure 21). Fewer than 18 per cent of women who had

finished a high level of education (diploma or university) progressed to their third birth within three years. This progression is slightly higher among women with secondary education – 24 per cent. It increases to over 50 per cent within three years among those women who had a primary education or were illiterate. Within five years only one out of four women with a high level of education had undergone a third birth. In contrast, it appears that women who are either illiterate or with a primary education did not desire to limit their family size to two children, and seven out of ten of these women had a third birth within five years. The mentioned ratios apply to all women, of whom some practiced contraception to delay their third birth (left panel of Figure 21).

The graph located on the right hand side of Figure 21 mirrors progression ratios from the second to the third birth among women who have not used contraception to delay their third birth according to their level of education. In contrast to the pattern observed among non-users of contraception for progression to the first and second birth, there are much more significant differences for movement to the third birth according to the level of education of women. Again the slowest progression from the second to third birth is observed among women with the highest level of education as only 33 per cent of these women progressed to their third birth within two years after their second birth. This ratio increases to 45 per cent within three years, and stabilizes at around 50 per cent after three years. Despite not using any contraception, 50 per cent of these women have not had a third birth within five years.

Figure 21: Cumulative life table probabilities of progressing from second to the third birth by level of education, all women versus non-users of contraception



Source: The 2005 Iran Low Fertility Survey

Women with lower education in the categories of both secondary education and illiterate or elementary level of education experienced the same level of progression to the third birth within two years. Around 45 per cent of these two groups of women had their third child within two years, whereas a higher proportion of women of elementary

education or illiterate women had their third birth within three to five years. This proportion increased to 80 per cent for secondary, and 95 per cent for illiterate or elementary educated women. It is notable that more than 80 per cent of women with an education lower than tertiary level had their third birth within five years. This pattern of progression among women with lower education is about what would be expected with a normal exposure to the risk of pregnancy. Thus the low progression for those with a high education suggests the possibility of termination or intentional miscarriage as a back up for avoiding a third birth.

8. Conclusion

Fertility trends and dynamics in Iran by province and rural and urban areas over the last three decades have been reviewed in this paper. The total fertility rate declined moderately during the early 1970s, before it rose in the years surrounding the revolution. The high fertility took a downward trend by the mid-1980s that accelerated during the late 1980s and throughout the 1990s. The TFR was near replacement level by 2000.

Despite the huge fall in fertility, there has been very little change in the percentage of ever married Iranian women having no children. Recently, from 1995 onwards, there is evidence that some couples have begun to delay the first birth within marriage. This may have arisen because social pressure for early marriage has remained strong but employment and income opportunities for young people have become problematic. Delay of the first birth within marriage is a rational response to this situation. The period percentage of women having only one child remained at around 2 to 3 per cent prior to the reestablishment of the family planning program. Since then, the percentage stopping at one has increased sharply to reach 13 per cent. The increasing delay of the first birth is likely to have caused a small tempo distortion in the synthetic lifetime progression to the first birth, that is, the 13 per cent figure in 1999 may be artificially high. On the other hand, in other research, we have observed the emergence of a one-child preference among a segment of the population. This is confirmed here by the progression to the first birth in the low fertility provinces. There is evidence of a very considerable widening of the interval between the first and second birth post 1990. This trend is particularly strong in the low fertility provinces.

A pattern of stopping at two commenced in the mid 1980s and became very powerful in the 1990s in line with the trend in the total fertility rate. Widespread adoption and implementation of a two-child family norm is the essential story of fertility decline in Iran. There is also some evidence that some Iranian women were attempting to 'stop at two' even earlier than the mid 1980s, but their attempts were largely unsuccessful. This evidence comes from the widening of the interval between the second and the third birth even during the high fertility years of the early 1980s. This may have been due to attempts to control fertility when contraception was not readily available.

Where parity was already higher than two, the 'stop at two' phenomenon was matched by a stop at whatever parity a woman had reached. In other words, there is strong evidence of a cross-sectional cessation of childbearing for all women with parity two or more. As expected, the tendency to stop was greater as parity increased. These trends also tended to match the timing of movements in the total fertility rate. There is evidence also of a new phenomenon observed clearly in the low fertility provinces of a

shift to much wider intervals before the first and second births. The extension of this behaviour across the country would see the national fertility rate also falling to a very low level. The question that arises here is how and under what conditions, Iranian women have regulated their fertility to achieve these outcomes.

Most scholars consider social developments as underlying factors that facilitate the fertility transition in Iran, and view family planning as a cornerstone of fertility decline in Iran. This is evidenced by the fact that fertility increased over the decade of the 1980s during the suspension of family planning, and declined remarkably during the contemporary revival of family planning. Thus, reviewing fertility changes during the last decades needs to be examined along the trends of contraceptive use during the mentioned period focusing on contraceptive use dynamics. This approach allows exploration of the way that Iranian women have controlled and regulated their fertility, and establishes a link between fertility decline and contraceptive use to illustrate the impact of family planning in general on rapid fertility decline in Iran.

Looking at the trend of contraceptive use supports the trend of fertility decline and there is a cross-sectional association between the rise of contraceptive use and fertility decline at the end of the 1980s and during the early 1990s. Fertility had declined since the mid-1980s before the revival of the family planning program in the late 1980s. Over a period of five years only the contraceptive prevalence rate increased from a rate of 27 per cent to around 50 per cent by the mid-1990s. The results from this research and other studies show that the level of modern contraceptive use has only slightly increased since the mid-1990s. Further, the share of permanent contraceptive users has increased every year. Given that the mean age at using permanent methods is about 30 years, on average sterilisation method users contribute to contraceptive users by approximately 15 years. The main point to be made is at what parity these women adopted sterilisation method and how much they could contribute the level of fertility if they had not undergone sterilisation. The other point relates to the efficacy and continuity of other contraceptive users in terms of the annual level of fertility.

A high proportion of using female sterilisation methods among women in rural areas match with their number of children. However, some of the results such as extremely high prevalence of using condom in Yazd province or vasectomy in Isfahan province need further investigation for cultural factors to explore the decision-making processes of couples. Sistan and Baluchistan which has the highest level of fertility also has the lowest level of sterilisation method use. Here, both ethnicity and religion explain these differentials. In Sistan and Baluchistan the general results show that Sunni women have higher levels of fertility and less contraceptive use to avoid pregnancy. But when controlled for religious sect, it is (Baluch) ethnicity that makes the difference, not (Sunni) religious sect. This research however does not have enough variables to examine cultural variables associated with contraceptive use or fertility behaviour.

The review of non-users of contraception since 1990 shows a lower proportion of women who have not had their family planning needs met. In 2000 for the whole country, around 26 per cent of married women of reproductive age were not using any contraception. Of these women, only 12 per cent were not using a method because of personal reasons or complaints and were at risk of pregnancy while not using contraception. Seven per cent of them had unwanted pregnancy and these figures can be added to unmet need. One third were intentionally pregnant or desired to fall pregnant. The remaining women were not at risk of pregnancy either permanently or

temporarily. With such a low proportion of unmet need for family planning, and such a high level of contraceptive use, this research has investigated the dynamics of contraceptive use over the reproductive life of women, and under which circumstances they have used contraceptives to control their fertility. The 2005 ILFS conducted in four low fertility regions is the only data set that allows investigation of this objective. While this data can not be representative of the whole country, the results can be considered as a pattern that other provinces of Iran will follow in the future. Event history analysis applied to the lifetime contraceptive use and pregnancy for ever-married women aged 15–54 allows exploration of the differentials over the last three decades 1980–2005.

The first ever use of contraception by all women in four low fertility regions indicates that the majority of women had used contraception for the first time after having their first child. The interesting point to be made is that even in a province like Gilan with below replacement level fertility, conservative viewpoints in relation to not preventing first pregnancy remain dominant. This is even stronger in Yazd province which is famous as a conservative and religious region. The result for Tehran city is completely different than other regions, for example, around 42 per cent of women in the city of Tehran had prevented their first pregnancy. The highest level of first ever use of contraception is practised after women have given birth to their first child. While 42 per cent of women in Tehran city had used a form of contraception before their first pregnancy, more than 50 per cent of them had used the traditional method of withdrawal to avoid their first pregnancy. In Tehran city, high usage of withdrawal before first pregnancy could also be related to the conservative viewpoint against use of modern contraception to prevent a first pregnancy. However in general, across all regions, the probability of using contraception at parity zero has increased over time from less than 10 per cent among women of the marriage cohort 1980s and earlier, to more than 50 per cent among women who were married in 2000 or after.

Being liberal or conservative is also explored through respondents' answers to the question about the outcome of their pregnancies. Around 10 per cent of women from Gilan and Tehran city claimed to have experienced an induced abortion during their lifecourse, while less than 2 per cent of women from the other two provinces of Yazd and Isfahan claimed that they had undergone induced abortion. In contrast, it was more women from Yazd and Isfahan (and not Gilan and Tehran) who claimed that they had experienced miscarriage during their reproductive lifecourse. From this it can be implied that women of conservative religious dispositions may intentionally report their induced abortion as a miscarriage due to their perception of induced abortion as immoral.

The results of most studies show that there is a strong relationship between education and reproductive behaviour. However, in terms of first use of contraceptive before first pregnancy, there is little difference between women of different levels of education, and in general if women used any method, they preferred traditional methods, namely withdrawal. Urbanity – either currently living in an urban area or raised in an urban area – shows that women are more likely to adopt a contraceptive method within 12 months after their first marriage. The probability of adopting contraception within 12 months after marriage has increased over time, and also increases with the level of education of women. The proportion and probability of adopting contraception increases considerably at parity one and higher, and socio-demographic factors can assist explain this increase. After giving birth to either first child, second child, or third child, there is no difference in the timing of adopting contraception, and more than 75 per cent of women start to use a contraceptive within three months after their delivery. However,

variations exist between women of different levels of education in terms of the timing of their adoption e.g., while less than 40 per cent of illiterate women are likely to start using a contraceptive after their first, second or third child to avoid their next pregnancy, this probability increases to more than 80 per cent among women with secondary or tertiary education. Further, illiterate women are more likely to take longer to adopt a contraceptive after giving birth, suggesting that they rely on breast feeding practice to prevent pregnancy, while educated women do not rely on breast feeding and tend to use a contraceptive soon after giving birth. The overall result for the probability of adopting contraception after giving birth to the first and later children increases over time. The highest probability can be observed since 1990, supporting the impact of the revival of the family planning program, and active provision of services to women. This probability during the 1980s is lower than the result in 1990 but is still much higher than the probabilities before 1980. This indicates that the intention and motivation of avoiding pregnancy did not decrease during the 1980s, but accelerated from 1990.

The results for progression from marriage to first birth among both non-users of contraception and all women, are the same. This indicates that in general women do not intend to delay their first pregnancy. Further, the proportion of contraceptive users among all women does not contribute to any different progression compared to non users of contraception. Even those women who do use contraception, use it for a short time only to avoid their first pregnancy, and so the time of progression to the first birth is short. Almost 70 per cent of women had their first birth within two years after marriage. A slightly lower percentage of progression to the first birth within two years since marriage can be observed among women living in Tehran city who were both users and non-users of contraception.

In general, there is little differential between non-users and all women in terms of progression to first birth, but this small differential increases over time. For example, progression to the first birth (12 months) among women in the marriage cohort 1980-84 is very close for non-users and all women. Further, the percentage of progression to first birth is only 3 per cent higher for all women compared to non-users of contraception. For women in the marriage cohort 1995–99, the differential increases to around 5 per cent. The major differential between non-users of contraception and the category of all women can be found after parity one. Here, the proportion of progression from the first to the second birth among non-users of contraception within two years, is two times higher among non-users of contraception compared to all women (including users of contraception). Stopping at one child among all women within five years after first birth includes on average 20–30 per cent of women, while more than 90 per cent of non-users of contraception have had their second child within four years after their first child, increasing to 95 per cent within five years after the first birth.

While there is no differential between each category of women in four regions, the result for different marriage cohorts shows a slower progression to first to the second child over time among both users and non-users of contraception. The point to be made is that even non-users of contraception since 1990 have a lower progression to the second birth. All women (including contraceptive users) who married after 1990 have considerably lower progression to the second birth compared to women who married before. The same result was found for non-users of contraception. When both groups of women were controlled for their level of education, the interesting result was that women with secondary or tertiary education either using contraception or not using

contraceptive, have a slower progression to the second birth. The same result in terms of education can also be observed for non-users in progression from second to the third birth. While the same pattern can be observed for progression from second to third birth among both non-users and users of contraception, in general the proportion is much lower for second to third birth than progression to second birth. The remarkable low progression to the third birth among both users and non-users of contraception reflects the intention for small family size, and concerted efforts to avoid third birth. However, the pattern for progression from second to third birth is substantially different from previous parity progressions. A particularly remarkable low progression to the third birth can be observed among non-users of contraception with tertiary education, compared to their counterparts with lower education. This gives rise to the question of how women who have not used any contraception are controlling their fertility to avoid a third birth, and the practice of induced abortion or any other type of emergency contraception as a back up for contraception use.

Attempting to limit childbearing is another phenomenon that has occurred since 1999. It should be mentioned that the first planning program under the Shah's regime was not providing active services for sterilisation, and access to the sterilisation method was only available through private hospitals. The new family planning program in 1989 established a free-of-charge, nationwide tubal ligation service in public hospitals and mobile teams, as well as vasectomy services in public hospitals and some specialist clinics. This easy access to sterilisation services was widely advertised through the health network system, and couples with large families were encouraged to undergo sterilisation methods. The impact of sterilisation on the level of fertility in the first years following revival of the family planning program, may not contribute to the rate of lower completed fertility as most couples adopted this method when they already had more than five children. The results indicate that when women are controlled for their major demographic characteristics, couples in Isfahan province are more likely to undergo a sterilisation procedure to limit their childbearing significantly at younger ages as well as at the lower parity level compared to the other three regions. Also, women in Yazd are more likely than women in the other three regions to adopt a sterilisation method at a higher level of parity.

References

Abbasi-Shavazi, M. J. (2000a). Effects of marital fertility and nuptiality on fertility transition in the Islamic Republic of Iran. *Working Paper in Demography no. 84*, Canberra, The Australian National University.

Abbasi-Shavazi, M. J. (2000b). National trends and social inclusion: Fertility trends and differentials in the Islamic Republic of Iran. *IUSSP Conference on Fertility and Family Planning in the 21st century*. Dhaka.

Abbasi-Shavazi, M. J. (2001a). Below replacement fertility in Iran: Progress and prospects. *Workshop on: Low Fertility in Advanced Countries: Trends, Theories and Policies*. Tokyo.

Abbasi-Shavazi, M. J. (2001b). Fertility revolution in Iran. *Population & Société, INED* (375): 1-4.

Abbasi-Shavazi, M. J. (2002a). Convergence of fertility behaviours in Iran: Provincial fertility levels, trends and patterns in Iran. *Social Science Journal* 18: 201-231.

Abbasi-Shavazi, M. J. (2002b). Recent changes and the future of fertility in Iran. In *Continuing the fertility transition*. United Nations (Ed.) New York, Population Division of the United Nations: 425-439.

Abbasi-Shavazi, M. J. (2005). The rise and fall of fertility in post-revolutionary Iran. In *Islam, the State and Population*. G. Jones and M. Karim (Eds). London, Hurst & Co.: 199-217.

Abbasi-Shavazi, M. J. and A. Askari-Nadoushan (2005). Family Changes and Fertility decline in Iran: Case study in Yazd province. *Journal of Social Sciences* 25: 45-75.

Abbasi-Shavazi, M. J., M. Hosseini-Chavoshi, M. Koosheshi and M. Naghavi (2005). Trends and emerging issues of health and mortality in the Islamic Republic of Iran. In *Emerging Issues of Health in Mortality in the Asian and Pacific Region*. ESCAP (Ed.) New York, United Nation: 147-160.

Abbasi-Shavazi, M. J., M. Hosseini-Chavoshi and P. F. McDonald (2004a). Convergence of fertility ideals in Iran: A comparative study of the youth and the older generation. *12th Biennial Conference of the Australian Population Association: Population and Society: Issues, Research, Policy*. The Australian National University, Canberra.

Abbasi-Shavazi, M. J., M. Hosseini-Chavoshi, P. F. McDonald and B. Delavar (2004b). *Fertility Transition in Iran: Evidence from four selected provinces* Tehran, Iran Ministry of Health and Medical Education.

Abbasi-Shavazi, M. J. and P. McDonald (2006). The fertility decline in the Islamic Republic of Iran: 1972-2000. *Asian Population Studies* 2 (3): 217 - 237.

Abbasi-Shavazi, M. J. and P. F. McDonald (2005). National and provincial fertility trends in Iran, 1972-2000. *Working Paper in Demography No. 94*, Canberra, The Australian National University.

Abbasi-Shavazi, M. J., P. F. McDonald and M. Hosseini-Chavoshi (2003). Changes in family, fertility behavior and attitudes in Iran. *Working paper in Demography no. 88*, Canberra, The Australian National University.

Abbasi-Shavazi, M. J., A. Mehryar, G. Jones and P. F. McDonald (2002). Revolution, War and Modernization: Population Policy and Fertility Change in Iran. *Journal of Population Research* 19(1): 25-46.

Abbasi-Shavazi, M. J., P. Morgan, M. Hosseini-Chavoshi and P. McDonald (2006). The first birth interval in Iran. *Annual Meeting of the Population Association of America*. Los Angeles.

Aghajanian, A. (1994). Family planning and contraceptive use in Iran, 1967-1992. *International Family Planning Perspectives* 20(2): 66-69.

Aghajanian, A. and A. Mehryar (1999a). Fertility transition in the Islamic Republic of Iran: 1967-1996. *Asia-Pacific Population Journal* 14(1): 21-42.

Aghajanian, A. and A. Mehryar (1999b). Fertility, contraceptive use and family planning program activity in the Islamic Republic of Iran: 1976-1996. *International Family Planning Perspectives* 25(2): 98-102.

Ainsworth, M., K. Beegle and A. Nyamete (1996). The Impact of Women's Schooling on Fertility and Contraceptive Use: A Study of Fourteen Sub-Saharan African Countries. *World Bank Economic Review* 10(1): 85-122.

Ali, M. and J. Cleland (1995). Contraceptive discontinuation in six developing countries: A cause-specific analysis. *International Family Planning Perspectives* 21(3): 92-97.

Ali, M. and J. Cleland (1999). Determinants of contraceptive discontinuation in six developing countries. *Journal of Biosocial Science* 31(3): 343-360.

Amani, M. (1970). *Births and fertility in Iran*. Tehran, Division of Population Research, University of Tehran.

Azimi, H. (1981). *Population growth and its needs*. Tehran, Budget and Planning Organization, Department of Human Resources and Social Planning

Basu, A. M. (1993). Cultural Influences on the Timing of First Births in India: Large Differences that add up to Little Difference. *Population Studies* 47(1): 85-95.

Blanc, A. K. and S. Curtis (2001). Does contraceptive discontinuation matter? *MEASURE Evaluation Technical Report*, Chapel Hill, University of North Carolina. 1: 21-23.

Bongaarts, J. and G. Feeny (1998). On the Quantum and Tempo of Fertility. *Population and Development Review* 24(2): 271-291.

Bongaarts, J. and R. G. Potter (1983). *Fertility, Biology, and Behavior. An Analysis of the ProximateDeterminants*. New York, Academic Press.

Caldwell, J. C. (1980). Mass education as a determinant of the timing of fertility decline6(2): 225-255. *Population and Development Review* 6(2): 225-255.

Coale, A. J., W. Feng, N. E. Riley and F. d. Lin (1991). Recent Trends in Fertility and Nuptiality in China. *Science* 251(4992): 389-393.

Courgeau, D. (1992). *Title Event history analysis in demography*. Oxford [England], New York:, Clarendon Press, Oxford University Press.

Curtis, S. L. and C. R. Hammerslough (1995). Model further analysis plan: Contraceptive use dynamics. *DHS Analytical Reports No. 6*, Calverton, Maryland, Macro International Inc. .

Dixon, R. (1978). Late marriage and non-marriage as demographic responses. *Population Studies* 32: 449–466.

Doepke, M. (2005). Child mortality and fertility decline: Does the Barro-Becker model fit the facts? *Population Economics* 18(Journal of Population Economics): 337-366.

Fahey, T. (2001). Trends in Irish fertility rates in comparative perspective. *The Economic and Social Review* 32(2): 153-180.

Feeney, G. (1983). Population dynamics based on birth intervals and parity progression. *Population Studies* 37(1): 75-89.

Feeney, G. and J. Yu (1987). Period parity measures of fertility in China. *Population Studies* 41(1): 77-102.

Hajnal, J. (1953). Age at marriage and proportions marrying. In *Population in History*. D. V. Glass and D. E. C. Eversley (Eds) London, Arnold: 101-143.

Hekmat, F., R. I. Kabacoff and H. E. Klein (1983). Motivations for childbearing and fertility behavior among urban and rural families of Iran. *Birth Psychological Bulletin* 4(1): 26-39.

Henshaw, S. K. and K. Kost (1996). Abortion patients in 1994-1995: characteristics and contraceptive use. *Family Planning Perspectives* 28(4): 140-147 and 158.

Hinde, A. (1998). *Demographic methods*. New York, Oxford University Press Inc.

Hoodfar, H. and S. Assadpour (2000). The Politics of Population Policy in the Islamic Republic of Iran. *Studies in Family Planning* 31(1): 19-34.

Hosseini-Chavoshi, M., P. F. McDonald and M. J. Abbasi-Shavazi (2006). The Iranian Fertility Decline, 1981-1999: An Application of the Synthetic Parity Progression Ratio Method. *Population-E* 61(5-6): 701-718.

Iran Ministry of Health (2002). Population and Health in the Islamic Republic of IRAN (Iran DHS report): October 2000. Tehran, Iran Ministry of Health.

Iran Ministry of Health (2003). Country report of the population and family planning program in the Islamic Republic of Iran. Tehran, Iran Ministry of Health.

Kalipeni, E. (1997). Population Pressure, Social Change, Culture and Malawi's Pattern of Fertility Transition. *African Studies Review* 40(2): 173-208.

Khatun, M. (2005). *Contraceptive use Dynamics*. Amsterdam, Dutch University Press.

Klitsch, M. (1994). Decline in fertility among Japanese women attributed not to contraceptive use but to late age at marriage. *Family Planning Perspectives* 26(3): 137-138.

Kost, K. (1993). The dynamics of contraceptive use in Peru. *Studies in Family Planning*(24): 109+.

Ladier-Fouladi, M. (1997). The fertility transition in Iran. *Population: An English Selection* 9: 191-214.

Liaw, K. L. (1976). Sensitivity analysis of discrete-time interregional population systems. *Demography* 13(4): 521–539.

Little, R. J. (1992). Incomplete data in event history analysis. In *Demographic Application of Event History Analysis*. J. Trussell, R. Hankinson and J. Tilton (Eds) Oxford [England], Clarendon Press: 141-156.

Management and Planning Organization (1999). Human development of the Islamic Republic of Iran, 1999. Tehran, Management and Planning Organization and United Nations.

Martin, T. C. (1995). Women's education and fertility: results from 26 Demographic and Health Surveys. *Studies in Family Planning* 26(4): 187–202.

Mehryar, A., N. Roudi, A. Aghajanian and F. Tajdini (1998). Evaluation and attainments of the family planning program in the Islamic Republic of Iran. *Working paper*, Tehran, Management and Plan Organisation, Institute for Research on Planning and Development.

Mehryar, A., M. Tabibian and R. Gholipour (1999). Correlates and determinants of fertility decline in Iran, 1986-1996: a district level analysis. *Working paper*, Tehran, Management and Plan Organisation, Institute for Research on Planning and Development.

Mehryar, A. and F. Tajdini (1998). Population and development in the Islamic Republic of Iran: a review of the main findings of the 1996 census and other sources of data. *Working paper No. 2*, Tehran, Management and Plan Organisation, Institute for Research on Planning and Development.

Mirzaie, M. (1998). Swings in fertility limitations in Iran. *Working Paper in Demography* No. 72. Canberra, Australian National University.

Mirzaie, M. (2005). Swings in fertility limitations in Iran. *Critique: Critical Middle Easterm Studies* 14(1): 25-33.

Mohseni, M. and M. Motabar (1976). Fertility and family planning among nomads. *Sociol Ruralis* 16(3): 197-207.

Murphy, M. (1992). The progression to the third birth in Sweden. In *Demographic Application of Event History Analysis*. J. Trussell, R. Hankinson and J. Tilton (Eds) Oxford, Clarendon Press: 141-156.

Ni-Bhrolchain, M. (1987). Period parity progression ratios and birth intervals in England and Wales, 1941-19771: A synthetic life table analysis. *Population Studies* 41(1): 103-125.

Ni-Bhrolchain, M. (1996). Time period versus generation: How should trends in fertility be measured. *Journal of the Statistical and Social Inquiry Society of Ireland* 27(3): 235-284.

Ortega, J. A. and H. P. Kohler (2002). Measuring low fertility: Rethinking demographic methods. *MPIDR working paper WP 2002-001*, Rostock, Germany, Max Plank Institute for Demographic Research.

Padidar-Nia, H. 1977. Population dynamics in Iran: New estimates on mortality and fertility. PhD, Public Health University of Texas.

Pileroudi, C. (2001). *The district primary health care networks in Iran*. Tehran, Ministry of Health and Medical Education.

Preston, S. H., Ed. (1978). The Effect of Infant and Child Mortality on Fertility. New York, Academic Press.

Rallu, J. and L. Toulemon (1994). Period fertility measures: The construction of different indices and their application to France, 1946-89. *Population*(6): 59-93.

Rindfuss, R. R. and S. P. Morgan (1983). Marriage, sex, and the first birth interval: The quiet revolution in Asia. *Population and Development Review* 9: 259-278.

Statistical Centre of Iran (2002). *Iran Statistical Yearbook -1381*. Tehran, Statistical Centre of Iran (ISC).

Statistical Centre of Iran. (2005). "Table of Population Estimation for Total Country and Ostans: 1997-2001." Retrieved 10 Dec. 2005; 6:22 AM, from http://www.sci.org.ir/english/default.htm.

Statistical Centre of Iran (2006a). Iran Statistical Year book 1383 [2004- 2005]. Tehran, Statistical Centre of Iran (ISC).

Statistical Centre of Iran. (2006b). "Labor Force Indicators (21 March to 21 June 2006)." from http://www.sci.org.ir/portal/faces/public/sci_en/sci_en.selecteddata/sci_en.Summary.

Trussell, J., R. Hankinson and J. Tilton (1992). Demographic Application of Event History Analysis. Oxford [England], Clarendon Press.

United Nations. (2004). "World Population Prospects: The 2004 Revision and World Urbanization Prospects." Retrieved 30 Nov. 2005; 1:32 AM, from http://esa.un.org/unpp.

Wang, F. and Q. Yang (1996). Age at Marriage and the First Birth Interval: The Emerging Change in Sexual Behavior Among Young Couples in China. *Population and Development Review* 22(2): 299-320.

Westoff, C. F. and B. Akinrinola (2001). *The contraception - fertility link in Sub-Saharan Africa and in other developing countries*. Calverton, Maryland, ORC Macro.