Assessing Fertility and Nuptiality Differentials of Rural and Urban Iran

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Delayed marriage and non-marriage were the important factors of fertility decline in the classic case of Western Europe [8,1] and in some parts of Eastern Europe [16]. Changes in age structure of marriage, though not so much in the proportion of non-marriage, have also been observed along with trends of fertility decline in the recent history of some Eastern Asian Countries see, for example, [6,17]. In light of these historical cases it is natural to ask what is, and will be the relative impact of nuptiality and fertility change on the growth of populations in developing nations which remain high in fertility and traditionally are married young and nearly universally.

Lesthaeghe simulated the marriage and marital fertility patterns of some North African and Middle Eastern populations, and concluded that fertility as measured by the Gross Reproduction Rate (GRR) cannot be brought down to 1.5 or less without considerable change in nuptiality from the traditional pattern of very early marrige [11]. Moreover, nuptiality transition for these countries would have as much effect as marital-fertility transition on the reduction of overall fertility. However, on the basis of her comparative investigation of Eastern European countries, shlar reiterated the thesis of nuptiality and marital fertility alterations as variable responses to post-transition population growth [16,7]. The Balkans, for example, have responded to the pressure of population increase by adopting contraception and abortion. It is thus an empirical question whether marriage or childbirth behaviour is more readily subject to modification at the onset of rapid growth.

Iran is one of those countries currently experiencing a high rate of population growth (above 3 percent per annum). The fertility level of Iran was estimated to have a total fertility rate ranging from 6.7 to 7.0 per woman during the mid 1960's [18,15]. In light of a vigorous national programme launched since 1967 for lowering the fertility we are questioning in particular whether there is evidence that fertility of the Iranian women is susceptible to change and to what extent if its is [10].

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Our purpose in this paper is to delineate ranges of variation in age of nuptiality and marital fertility as represented by available data for rural and urban Iran. Following the section on methods of estimating the current marital fertilities and nuptialities of Iran, we will assess the relative impact of these rural-urban differentials in nuptiality and marital fertility on population growth of Iran.

METHODOLOGY

Like other high fertility countries, precise statistics on nuptiality and fertility are unavailable from the official Iranian sources. To assess the current state of affairs one must rely on sample survey data.

Table 1

Reported Number of Children Ever Born by Age of Mother: Iran 1975

Age	Mammasani[a]	Rural Iran[b]	Urban Iran[b]	Shiraz[c]
15—19	1.09	1.78	2.04	1.43
20—24	2.52	3.52	3.40	1.95
25—29	4.47	5.15	4.32	3.18
30—34	6.09	6.56	4.96	4.95
35—39	7.36	7.62	5.39	5.37
40—44	7.93	8.23	5.44	6.33
45—49	7.69	—	—	—

Sources: [12, 13, 14].

In this paper we employ the data on children ever born and proportions currently married by age of women, which are obtained from recent surveys of various sources: a national survey [13] dividing the sample into rural and urban; a local survey of a southern provincial city, Shiraz [14] and an intensive dual-record experiment project conducted in Mammasani, a rural country in the same southern province [12]. Unfortunately there are problems with the accuracy of age reporting in these various surveys. A quick glance at Table 1 and Table 2 should caution against the direct use of the reported number of children ever born and percent currently married by age of women. The average parity under age 20, for example, ranges from 1.09 (Mammasani) to 2.04 (the urban national sample). While the urban women reported higher average parity at age under 20, the rural population had higher average parity in the age category 20-24. An apparent transfer of age categories is involved, but no systematic guideline for correction seems to be suggested by the data. Although the sample size of the national survey (over 100,000) see [13] is much larger than the local samples of Shiraz (about 600) and of Mammasani (1,046 for 1974 and a subsample of 321 for 1975),[1] errors of age reporting are not necessarily mitigated by size of a sample. We resorted hence to Coale *et al.*, new method for estimate of marital fertility, which needs not rely on the age specification in reporting the number of children ever born [5].

[1]The coding of 1975 survey data was not completed at the time of our research for this study. Hence we selected a random subsample of 321 questionnaires (about one-third of the total sample) for a tabulation of average parity by duration of marriage.

Table 2

Reported Percent of Females Currently Married: Iran 1975

Age of Women	Mammasani	Rural Iran	Urban Iran	Shiraz
15—19	80.32	36.60	19.76	43.07
20—24	85.80	88.00	65.97	79.55
25—29	86.13	77.00	90.94	92.48
30—34	87.45	78.70	96.75	95.87
35—59	100.00	99.20	88.64	97.03
40—44	85.86	98.80	98.77	97.37
45—49	—	—	—	—

Source: See table 1.

Coale *et al.*, argued for a constant ratio that relates a given "natural fertility" schedule to a fixed standard fertility schedule [5], if these fertility schedules are specified in terms of the duration of marriage rather than age of mother.[2] In other words, variations between duration schedules of natural fertility can be sufficiently measured by differences in level without varying the schedule pattern by marital duration. Based on this assumption of one constant ratio for difference between schedules of natural fertility estimates and corrections of transfer by misreporting, the duration categories can be made.

The selection of a standard duration schedule of average parities depends, however, on appropriate assumption of the age pattern of marriage (see Table 3). Once a ratio of the observed duration schedule to the reference standard is ascertained through proper adjustments for misreporting of marital duration, the ratio is used to obtain the corresponding schedule of marital fertility rates by age of mothers.

A detailed reading of table 3 which presents the said procedure may be in order. Two consecutive surveys were conducted in connection with a dual-record experiment project in Mammasani in 1974 and 1975 [14], which asked the question of marital duration. No other surveys included in this study provide information of women's duration of marriage. The two sets of average parities by duration under 15 years for Mammasani, at first sight, appear to differ considerably (see p_1 row in table 3). The advantage of Coale *et al.*'s new method lies in using these variations relative to calculated standard schedules for an adjustment for possible misreporting of the marital duration. The ratios of observed parities (P_i) to the selected standard mean parities ($\hat{P}_i$) at the three 5-year duration categories vary from .88 to .73 (see R_i in table 3) for 1974 and 1975 data. Check for any delayed cohabitation is based on the difference between proportion of zero-parity in the first 5-year duration of marriage (P_{01}) to that of zero-parity in the second 5-year duration (P_{02}). If this difference is no more than .25, no adjustment for delayed cohabitation after marriage is necessary. Check for misreporting the duration of marrige is based on the ratio between ratios of observed mean parity to the standard

[2]Other estimation methods based on age of mother such as Brass' and Gompertz (Murphy and Nagnar 1972; Denton and Spencer 1974) curve for graduation have been tried, but failed to resolve the basic problem of age misreporting.

at first and second 5-year categories of duration (i.e., R_1 and R_2). If this ratio is greater than 1, a "downward" error in overreporting the shorter duration of marriage is suspected and it is thus adjusted accordingly. When the ratio between R_1 and R_2 is approximately 1.0, no such adjustment for misreporting the marital duration is needed, as a constant ratio is assumed to apply to all duration periods of marriage between natural fertility schedules. The result after adjustment of 1974 data for a downward transfer in reported duration turns out remarkably close to the estimated ratio for the 1975 data (.815 and .816). The ratio of Mammasani's marital fertility, taken to be a "natural fertility", is thus 0.816 to the standard schedule as postulated by Coale [5]. The obtained age-specific marital fertility rates for Mammasani is shown at the bottom of Table 3.

Table 3

Procedures of Fertility Estimates by Coale et al. Parity-duration Method: Mammasani 1974 and 1975

	1974 (N=1,045)			1975 (N=321)		
Duration of Marriage	0—4	5—9	10—14	0—4	5—9	10—14
Observed Mean Parity (P_i)	.98	2.82	4.69	.90	2.76	4.00
Calculated Mean Parity ($\hat{P}_i$)	1.11	3.38	5.50	1.11	3.38	5.50
	(mean age at marriage 19,			a_o = 13,		k = 5.26)
$R_i = (P_i/\hat{P}_i)$	.88	.83	.85	.81	.82	.73
	Check for Delayed Cohabitation					
	$P_{01} - P_{02} = .24$; no adjustment is needed			$P_{01} - P_{02} = .27$ slightly over .25; no adjustment is needed		
	Check for Shift in Duration Categroies					
	$E = R_1/R_2 = 1.052$; downward Adjusted $R^* = R_1/1.07 = R_2/1.02 = .816$			R_1 and R_2 are close enough, so take average $R^* = .815$		

Estimated Age Specific Marital Fertility Rates
(standard × 0.816)

Age	*MFR*
10—14	.1102
15—19	.3355
20—24	.3830
25—29	.3605
30—34	.3254
35—39	.2632
40—44	.1361
45—49	.0206

The estimated schedule of marital fertility may be used to derive the number of children ever born by simply accumulating the fertility rates up to the mid-point of each age category. Assuming an appropriate level of mortality (West model level 13 approximates the mortality of Mammasani in our separate study), children surviving by age of mothers can also be estimated.[3] These estimated numbers of children ever born and children surviving are compared with the reported children ever born by Mammasani's women in Table 4. The validity of our estimated marital fertility schedule based on the natural fertility assumption is enhanced by the fact that the reported numbers of children ever born for married women in Mammasani are consistently lying between the estimated children ever born and children surviving.

Table 4

Average Number of Children Ever Born (CEB) and Children Surviving Derived from Estimated Natural Fertility Schedule as Compared with Reported Children Ever Born: Mammasani 1975

Age	Estimated Natural MFR	Average Number of CEB	Average Number of Children Surviving (Mortality Level 13)	Reported Average Number of CEB
10—14	0.1102	0.27	0.23	—
15—19	0.3355	1.11	0.93	1.09
20—24	0.3830	2.91	2.38	2.52
25—29	0.3605	4.77	3.65	4.47
30—34	0.3254	6.48	5.18	6.09
35—39	0.2632	7.96	6.27	7.36
39—44	0.1361	8.95	6.94	7.93
45—49	0.0206	9.35	7.08	7.69

If we can assume the estimated marital fertility for Mammasani, a rather remote rural county in southern Iran, as the "natural fertility for the Iranian population,[4] and discount the erratic variations in the reported average parities

[3]The calculation of children surviving in Table 4 is simplified as:

$$\begin{array}{llll} (2.5\,f_1)\ (_{2.5}P_0) & & & \text{for } S_1 \\ (5\,f_1)\ (_5P_0) + & (2.5\,f_2)\ (_{2.5}P_0) & & \text{for } S_2 \\ (5\,f_1)\ (_{10}P_0) + & (5\,f_2)\ (_5P_0) + & (2.5\,f_3)\ (_{2.5}P_0) & \text{for } S_3 \end{array}$$

where f_i is the fertility rate for age category i, i=1, 8; KPo is the survival rates from age 0 up to age k; and S_i is the children surviving for mothers in age category i.

[4]In fact, given data we have at hand there is no choice other than assuming that the estimated Mammasani's marital fertility as the "natural fertility", and against this base-line age schedule of marital fertility other obtained sample data are compared. Neither the national survey nor the Shiraz sample contained information of average parity by duration of marriage. When comparing to the estimated natural fertility of Mammasani, the national survey data (see Table 1) appeared to be peculiarly high in average parities at ages under 25. It is difficult to understand why, while the average parities of rural Iran are comparable to the estimated Mammasani's schedule, the attained parities at younger ages be higher than the estimated natural fertility, except for the age misreport.

for women under the age 25 from the sample surveys, we may follow a technique also proposed by Coale for the description of a controlled fertility as deviating from the reference natural fertility [5]. The descriptive equation is as follows:

$$r(a) = n(a)\ M \exp [m.v(a)]$$

where r(a) is the marital fertility rate at age a; n(a) is the standard natural fertility rate at age a; M is the ratio of the natural fertility in question to the standard natural fertility.[5] In the case of Iran, M = 0.816 as represented by the estimated Mammasani's schedule v(a) is a set of empirically derived numerals reflecting the average deviations by age of a controlled fertility from the age gradation of natural fertility; and m is an index of extent of control which deviate from the age gradation of the natural fertility, which is used as a base-line reference for the population in question.

Assuming that various fertility schedules of Iran do not deviate from the natural fertility of Mammasani until after age 25, we may vary the index m to the extent that conforms (approximately) to the reported numbers of children ever born for the urban Iranian populations. Table 5 shows that an m = 1.00 would generate the age schedule of children ever born resembling the city data of Shiraz, and m = 1.75 the national sample of urban population. The national sample of rural population is taken to be the same as the Mammasani's natural fertility, with the justification that no firm empirical ground suggests otherwise.

Table 5

Variations in Marital Fertility Schedules as Estimated by Deviations (m) from the Natural Fertility and the Corresponding Schedules of Children Ever Born: Iran 1975*

	Rural Iran and Mammasani m = 0.0		Shiraz m = 1.0		Urban Iran m = 1.75	
Age	MFR	CEB	MFR	CEB	MFR	CEB
10—14	0.1102	0.27	0.1102	0.27	0.1102	0.27
15—19	0.3355	1.11	0.3355	1.11	0.3355	1.11
20—24	0.3630	2.91	0.3630	2.91	0.3630	2.91
25—29	0.3605	4.77	0.2628	4.524	0.2073	4.385
30—34	0.3254	6.48	0.1442	5.541	0.0783	5.099
35—39	0.2632	7.96	0.0923	6.132	0.0420	5.399
40—44	0.1361	8.95	0.0327	6.444	0.0113	5.532
45—49	0.0206	9.35	0.0059	6.535	0.0011	5.563

*See text for explanation of m

The age patterns of marriage are described in terms of Coale's [2,4] standard nuptiality schedule, which has the following expression:

$$g(a) = (0.19465/k) \exp \{(-0.174/k)(a - a_o - 6.06k) - \exp [(-0.2881/k)(a - a_o - 6.06k)]\}$$

[5] Usually this quantity M is estimated by fertility rates at age category 15-19 or 20-24, relative to that of a standard natural fertility schedule. In this case we have assumed that variations of all fertility schedules under consideration do not deviate from the Mammasani's natural fertility until age 25 and thereafter. Hence, M = 0.816 is used throughout all estimates.

where g(a) is the age specific rate of marriage; a_o is the beginning age the population enters marriage; and k is a scale factor indicating the tempo of entry into marriage relative to that of the standard nuptiality schedule.

The proportion ever married in an age category is simply the average of cumulative rates of marriage at the midpoint of a given age interval. Table 6 present three selected sets of standard nuptiality schedules that approximate the reported percents of women currently married in rural and urban Iran. The basic reference points in particular are on the percents reported as currently married under age 25. A shift of beginning age of first marriage from a_o = 13.5, the traditional early marriage of the rural pattern to a_o = 14.5 of the observed urban pattern seems to characterize the difference between the two sets of data on current marriage. The scale factor k is adjusted from 0.45 to 0.60 to reflect the relative scatterness in age distribution of urban entry into marriage (compare Table 6 with Table 2).

Table 6

Estimated Percent Ever Married by Coale's Standard Schedule: Iran 1975

Age of Women	Mammasani and Rural Iran a_o = 13.5 k = 0.45	Urban Iran a_o = 14.5 k = 0.60	Shiraz a_o = 13.5 k = 0.55
10—14	0.0036	0.0002	0.0024
15—19	0.4058	0.1602	0.2994
20—24	0.8880	0.6810	0.8016
25—29	0.9834	0.9206	0.9582
30—34	0.9978	0.9812	0.9912
35—39	0.9998	0.9958	0.9982
40—44	1.0000	0.9990	0.9998
45—49	1.0000	1.0000	1.0000

ASSESSING THE CHANGING NUPTIALITY AND FERTILITY

Although no precise fit for the available data can be claimed, the current differentials in marriage patterns between rural and urban Iran may be judged to be moderate at best. The beginning age of first marriage remains as low as 13 or 14, and the relative concentration of marriage in a short age span may be indexed by a k value or less than 0.60. The percent married by age 25 is close to 90 percent for the rural women and almost 70 percent for the urban counterpart.

Greater differences are found however between the current rural and urban marital fertilities. If the reported completed parities serve at all as some empirical references, the urban marital fertility schedule reflects a serious regulation of reproduction among women 25 and older. The completed parity of less than 6, as reported by the urban women would require the m-vlue, index of fertility limitation, at the magnitude of 1.7 or more (see Table 5).

Combining the lowered marital fertility rates and moderately delayed marriage, as seemingly occurring in urban Iran, the age schedule of fertility would result in a total fertility rate of 3.1 per woman, and a GRR as low as 1.5 (see Table 7). This is a striking contrast to the still high fertility of rural Iran which remains unchanged in the early entry into marriage and the uncontrolled "natural fertility", among the married. The total fertility rate for the rural Iran is estimated to be 7.8 per woman, and GRR as high as 3.8[6]. Shiraz, a southern provincial capital and eighth largest city of Iran, stands half-way in between the overall rural and urban fertility levels.

To facilitate an evaluation of relative impact on population growth of the differentials in nuptiality and fertility, we translate the fertility schedules into some stable-population measures. Assuming a level of mortality with $e_0^\circ = 62.5$ "West-model" level 18, [3], which approximates a recent estimate for Shiraz [9], the Net Reproduction Rate (NRR) may be computed as follows [11, 2]:

$$NRR = GRR.p(\overline{m})$$

where GRR is the Gross Reproduction Rate, and $p(\overline{m})$, the survival ratio up to mean age $\overline{m}$ of the fertility schedule.

The average length of generation is obtained by:

$$T = \overline{m} - \sigma^2 \frac{\log GRR}{2\overline{m}}$$

where σ^2 is the variance of fertility schedule.

And, the Intrinsic Growth Rate:

$$r = \frac{\log NRR}{T}$$

Table 7

Estimated Age Specific Fertility Rates: Iran 1975

Age of Women	Mammasani & Rural Iran	Urban Iran	Shiraz
10—14	.0004	.0001	.0003
15—19	.1362	.0538	.1005
20—24	.3224	.2472	.2910
25—29	.3546	.1909	.2519
30—34	.3247	.0769	.1430
35—39	.2632	.0419	.0922
40—44	.1361	.0113	.0327
45—49	.0206	.0011	.0059
TFR =	7.791	3.116	4.587
GRR =	3.800	1.520	2.237

[6]The estimated rural fertility is considerably higher than the national total as reported for 1965-70. (TFR 7.6-7.0 as cited in the Introduction Section). Sources previously reported the national total of Iran, but no differentiation between rural and urban, also expressed suspicion of underestimate (e.g., UN 1971; The Population Council 1974).

The three fertility schedules are compared in Table 8 in terms of these stable-population measures. Urban Iran, if the estimated fertility rates maintain themselves, will come close to the target rate of population growth set by the government at 1 percent for the year 2000 [18]. The relative contribution to the reduction of rural population growth, as high as 4 percent, by changes in the components of nuptiality and marital fertility can also be seen in Table 8. If moderate change in marriage occurs to the extent as observed for the urban Iranian women, but marital fertility remains the same, the rate of rural growth will be reduced to 3.5 percent, a 15 percent reduction from 4.1. On the other hand, if the observed urban marital fertility prevails with no change in nuptiality, rural growth will be reduced by 50 percent to a rate of 2.1, which is still twice the one percent target of the government. The short age-span of urban marital fertility combined with the early and concentrated pattern of rural marriage would result in a very short length of less than 25 years of generation replacement.

Table 8

Intrinsic Rates of Growth by Differential Fertilities and Nuptialities: Iran 1970's

	GRR	$\overline{m}$ in year	NRR ($^{o}e_{o}$=62.5 yrs West level 18)	T in years	r%
Rural Iran	3.80	29.89	3.261	28.66	4.12
Urban Iran	1.52	26.25	1.30	25.99	1.02
Shiraz	2.24	27.26	1.92	26.62	2.45
Rural Marriage Urban MFR	1.94	25.01	1.66	24.58	2.07
Urban Marriage Rural MFR	3.34	31.07	2.87	30.12	3.51

CONCLUSIONS

Given the dearth of reliable vital statistics the present paper attempts some estimates of the current state of nuptiality and fertility in Iran based on various sources of sample surveys. Allowing for margins of error, we have come to identify a range of variation in both.

A combination of moderate change in nuptiality and a vigorous limitation of family size at relatively low ages of married women, as seemingly reflected in urban Iran, can lead to a significant reduction of fertility to the extent of one-percent growth. If this trend toward a controlled marital fertility is

regarded as a harbinger of the short-term response to the Iranian demographic transition, like Eastern European countries of traditionally early marriage pattern [16], the demand for family planning service is expected to rise in the years to come.

Although changes in fertility among the married may be leading the early stage of fertility transition, the significance of nuptiality impact on population growth should not be overlooked. Without somewhat delaying the age of entry into marriage, however moderate, the rural population growth would remain at a level higher than 2 percent even if the rural married women adopt the current pattern of urban fertility. The policy implication for controlling a run-away rate of growth in Iran and in other developing countries of early marriage practice seems to be clear. Family planning on the one hand may be expanding its service for fertility control among the married as demanded. On the other hand, family planning must be extended to its fullest sense as to include planning of the entry into marriage as well as marital reproduction. In particular, institutional opportunities open to the rural women as alternatives prior to their marriage must eventually be considered in the blue print of family planning.

A caveat for readers may be in order at the conclusion of this paper. No references to our knowledge have provided statistics of differential fertility in Iran in terms of age-specific fertility rate, which is the basic measure required for any inference of population growth. In this paper we have exercised with a new method for fertility estimate that is conducive to production of age schedules of fertility under conditions of inadequate and less than reliable data. Reasonableness of our estimates awaits future verification (e.g. the 1976 census of Iran). Our results, however, represent among the rare sources of vital statistics that are logically adjusted and corrected for, for the population of Iran.

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