

BIMAL CHAKRABORTI

DEMOGRAPHIC EFFECT CONSEQUENT UPON CHANGE IN AGE PATTERN
OF MARRIAGE: AN INDIAN EXAMPLE

The mortality which has been observed to be a steadily declining rate for a long period has stopped doing so recently. After a long history of high fertility, it has rather shown a tendency to decline, possibly due to adoption of large scale programme on family planning. This makes a scope for reduction in growth rate. Further, the objects of our demographic targets is to reduce the birth rate to a level of 25 per 1000 of population by 1985 and to bring the N.R.R. to a level of one by about 2000. The new legislation of abortion and increasing the minimum age at marriage no doubt, will help in attaining the above objective. Our intent in this paper is to study how far a change in the marital status distribution will contribute to, in achieving our targets.

The paper has been designed through a simplified model, to isolate the influence of mortality and marriage pattern on marital status distribution over a period of years and then to analyse its likely effect on fertility. The marital status distribution is the resultant effect of birth, death, marriage and divorce patterns of the years preceding it and is modified by trend in these effects.

Marriage pattern of West Bengal 1971, reflects that overwhelming majority of population is found to be in married state which indicates, it is potentially favourable towards higher birth rate. For the last 50 years, the proportion married have not changed appreciably in West Bengal, though the level and pattern in Kerala is much lower but age at marriage and birth rate are also higher at the same time. It has been aimed in this model that if the marriage pattern in West Bengal converges to that of the existing pattern in Kerala by the end of 1996 in a linear fashion, what will be the effect on state fertility level. On the basis of this assumed model, the probability of marrying for the intervening years have been interpolated. Based on two alternative hypotheses as one, by changing the e_0^m and keeping the marriage pattern constant, the other by changing the marriage pattern along with changing e_0^m till the end of 1996, the marital status composition of West Bengal for the next 25 years has been projected and its impact on fertility has been estimated by holding the pattern and magnitude of ASMPFR observed in 1971 to remain unchanged.

TABLE 1

Age Specific Marital Fertility Rate West Bengal 1971

Age group	ASMFR
15-19	298.9
20-24	313.8
25-29	266.2
30-34	195.6
35-39	125.5
40-44	44.3
45-49	11.5

The ASMFR obtained from different sources for West Bengal 1971, have been adjusted to give most plausible figures. Table 1 shows the adjusted ASMFR of West Bengal in 1971 which has been used in estimating the projected general fertility rates.

ANALYSIS

The observed marital status distribution by age for males and females for West Bengal, 1971, has first been smoothed by using the 3-point iterated moving average formula $l^f_{[1, 2, 1]}$ to eliminate the effects of age misreporting to a large extent.

On the assumption that the proportions of female single in quinquennial age groups have remained stable over time, the combined probability of survival and marriage from age group $(5x - 5x+4)$ to $(5x+5 - 5x+9)$ has been obtained from

$$P(M) \frac{l^f_{5x+5} - l^f_{5x+9}}{l^f_{5x} - l^f_{5x+4}} = \frac{l^f_{5x} - l^f_{5x+4} - l^f_{5x+5} - l^f_{5x+9}}{l^f_{5x} - l^f_{5x+4}}$$

where $l^f_{5x} - l^f_{5x+4}$ represents the proportion of females single in the age group $5x - 5x+4$. Five-year probability of marriages from one age group to the other have been derived from this combined probability on the assumption that the probability of marriage from one age group to another is independent of the probability of survival, by dividing it with the probability of survival at an average expectation of life corresponding to those five year period.

METHODS OF PROJECTION OF NEVER MARRIED AND MARRIED POPULATION UNDER:

1) Changing mortality and constant marriage pattern

The course of mortality over a period of next 25 years has been assumed that the e_0^a will first increase at the rate of 0.9 unit per year from 1971 to 1986 and then at the rate of .75 points per year till 1996. The assumed e_0^a for different periods for West Bengal is given in table 2.

The survivorship rates for males and females have been estimated by interpolating linearly from UM model life tables, between p_x values of the corresponding age-groups at the two adjacent e_0^a .

Female population in 0-4 age-group for the years 1976 and 1981 have been derived from estimated number of female births during the period 1971-76 and 1976-81 under the assumption of constant birth rate at the 1971 level and using the p_5 values for the years 1971-76 and 1976-81 separately.

TABLE 2

Assumed e_0^a for Different Periods, 1971-1996

Year	Male	Female
1971	48.9	49.0
1976	52.6	52.7
1981	56.4	56.5
1986	60.1	60.2
1991	62.6	62.7
1996	65.2	65.3

Projection of Single Female Population

The single female population at time $t+5$ has been obtained by surviving the single female population at time t in one age-group to the next higher age-group at time $t+5$ and subtracting from it the current marriages to the single females during the interval t to $t+5$. The estimating formula is given below:

$$S^{t+5}_{5x+3-5x+9} = S^t_{5x-5x+4} \frac{l^f_{5x+3-5x+9}}{l^f_{5x-5x+4}} \cdot \left[1 - P(M) \frac{5x+3-5x+9}{5x-5x+4} \right]$$

where, $S_{5x+5}^{f+5} - S_{5x+9}^f$ represents females single at time $t+5$ in the age group $5x+5 - 5x+9$.

Similarly, $S_{5x-5x+4}^f$ represents females single at time t in the age group $5x - 5x+4$.

$$\frac{L_{5x+5-5x+9}^f}{L_{5x-5x+4}^f} = \text{Female survivorship ratio from age group } (5x - 5x+4) \text{ to } (5x+5 - 5x+9).$$

$$P(M)_{5x+5-5x+9}^{5x+5-5x+9} \text{ Probability of marriage from age group } (5x - 5x+4) \text{ to } (5x+5 - 5x+9)$$

Projection of Married Female Population

For this, we have only combined those females who got married during the interval t to $t+5$ and remained married at the end of the period and those who survived as married by the time $t+5$ out of already married at time t , considering females married once only.

Thus the total married female population in the age group $5x+5 - 5x+9$ at the time $t+5$ has been worked out as follows,

$$M_{5x+5-5x+9}^{t+5} = S_{5x-5x+4}^t \cdot \frac{L_{5x+5-5x+9}^f}{L_{5x-5x+4}^f} \left\{ P(M)_{5x+5-5x+9}^{5x+5-5x+9} \right\}$$

$$+ \frac{L_{5x+10-5x+14}^M}{L_{5x+5-5x+9}^M} + M_{5x-5x+4}^t \cdot \frac{L_{5x+5-5x+9}^f}{L_{5x-5x+4}^f} \cdot \frac{L_{5x+10-5x+14}^M}{L_{5x+5-5x+9}^M}$$

$$\text{where } \frac{L_{5x+10-5x+14}^M}{L_{5x+5-5x+9}^M} \text{ refers to male survivorship ratio from age group } 5x+5 - 5x+9 \text{ to } 5x+10 - 5x+14$$

The difference between the ages of husband and wife at the time of marriage has been assumed to be five years.

Our limitations of the projection estimates is that no differential mortality indicated by the survival probabilities has been assumed for the categories of married and never married groups.

2) Changing mortality and changing marriage pattern

In this part marital status distribution has been projected under the same assumption on e_0^o but change in marriage pattern with advancement of time. The current marriage pattern observed in the state will approach to the Kerala pattern observed in 1971 by the end of the year 1996. The assumed probabilities of marriage for the periods 1971-76, 1976-81, 1981-86, 1986-91 and 1991-1996 have been obtained by reducing linearly the probabilities of the state in 1971 to that of Kerala currently, till the end of the projection period. Justification of considering Kerala in the model is based on the fact that Kerala is the state where proportion marrying in earlier ages as well as in higher ages are minimum, and it is expected to be followed in future by other states of India. Table 3 gives the estimated probabilities of marriage for different projected periods, calculated on the basis explained above.

TABLE 3
Probability of Female Marriages: 1971-1996, by Five Year Periods t to $t+5$

Age group	1971-76	1976-81	1981-86	1986-91	1991-96
0-4	.0000	.0000	.0000	.0000	.0000
5-9	.1172	.1012	.0853	.0692	.0531
10-14	.3504	.3172	.2840	.2508	.2076
15-19	.6160	.5767	.5398	.5049	.4608
20-24	.6792	.6677	.6564	.6452	.6323
25-29	.5740	.5867	.5996	.6128	.6245
30-34	.4787	.4448	.4132	.3839	.3449
35-39	.3411	.3012	.2660	.2349	.1849
40-44	.2648	.2291	.1982	.1714	.1256
45-49	.0295	.0257	.0224	.0195	.0145

Based on these assumed probability of marriage schedules and assumed expectations of life for the same period, the two marital status distributions for the periods under study have been obtained.

CALCULATION OF GENERAL FERTILITY RATE

Having arrived at the married female populations in quinquennial age-groups in the reproductive span, the number of births have been computed for the projected years, multiplying the married female populations at different years and ages by respective ASMPFR for 1971. These births were divided by the total average female population in the reproduction span of the corresponding years to get the GFR.

RESULTS

The estimated number of never married and currently married female population in the reproductive age groups for the different years under same and changing marriage patterns for West Bengal State are given in the tables 4, 5 (a), 5 (b).

TABLE 4

*Projected Never Married Female Population in Each Age-Group
West Bengal, 1971-1996*

Age group	Never married female population in					
	1971	1976	1981	1986	1991	1996
0-4	3585703	3380439	3185145	—	—	—
5-9	3375940	3402115	3242855	3085131	—	—
10-14	2339619	2931403	3018069	2936280	2848953	—
15-19	1123298	1493371	1973740	2137383	2169723	2230420
20-24	336660	420821	619690	894236	1044990	1157865
25-29	97258	104836	136553	208965	312516	379517
30-34	37377	40138	42241	53588	79608	115766
35-39	15856	18839	21687	24254	32431	51369
40-44	8244	10067	12773	15530	18176	25964
45-49	4771	5801	7483	9934	12533	17300

For understanding the marriage trend in the projected years, proportion of never married and proportion married under two alternative hypotheses in each age-group have been presented in tables 6(a), 6(b) and 6(c) till 1991. The same for 1996 could not be prepared because of non availability of base population.

Critical examination of the table presented under constant marriage pattern reveals two major indications. With the e_0^f increasing, ups and downs are observed in the course of projected females for the first four age-groups except for the group 15-19, whereas in all other higher ages a tendency for an apparent increase

TABLE 5(a)

*Projected Number of Married Female Population in Each Age-Group,
West Bengal, 1971-1996*

Age group	Under constant marriage pattern					1996
	1971	1976	1981	1986	1991	
10-14	142905	408836	414646	397402	379565	—
15-19	862316	959611	1038909	1076822	1047545	1020312
20-24	1281512	1492384	1039341	1211391	1320257	1346637
25-29	1358469	1421582	1050230	533430	592563	696196
30-34	1225846	1322607	1197689	817115	235667	172074
35-39	1001127	1154354	1213805	1105202	737502	154947
40-44	748573	920252	1061380	1129805	1036476	689836
45-49	527495	669395	832344	973514	1045953	965737
Total (15-49)	7005338	7940185	7433698	6847279	6015963	5045739

TABLE 5(b)

*Projected Number of Married Female Population in Each Age-Group,
West Bengal, 1971-1996*

Age group	Under changing marriage pattern					1996
	1971	1976	1981	1986	1991	
10-14	142905	382711	335162	270754	209792	—
15-19	862316	922400	897936	833291	715870	577156
20-24	1281512	1470701	954121	1027513	1047418	975063
25-29	1358469	1419746	1043306	516408	558133	642635
30-34	1225846	1323172	1199565	821273	244736	189258
35-39	1001127	1153746	1211862	1101865	731730	143330
40-44	748573	919946	1060312	1127844	1033549	684355
45-49	527495	669253	831843	972507	1044331	963047
Total (15-49)	7005338	7878964	7198945	6400701	5375767	4174844

TABLE 6(a)
*Projected Proportions of Never Married Females in Each Age-Group,
 West Bengal, 1971-1991*

Age group	1971	1976	1981	1986	1991
10-14	.8587	.9215	.8445	.7606	.7102
15-19	.5984	.5428	.6281	.6034	.6030
20-24	.2080	.1934	.2290	.2883	.3236
25-29	.0617	.0575	.0638	.0784	.1177
30-34	.0275	.0266	.0236	.0255	.0382
35-39	.0137	.0150	.0147	.0138	.0187
40-44	.0089	.0092	.0104	.0108	.0126
45-49	.0064	.0062	.0070	.0083	.0098

TABLE 6(b)
*Projected Proportions of Married Females in Each Age-Group
 West Bengal, 1971-1991, According to Table 5(a)*

Age group	1971	1976	1981	1986	1991
10-14	.0524	.1285	.1160	.1029	.0947
15-19	.4593	.3488	.3306	.3040	.2911
20-24	.7919	.6859	.3841	.3906	.4089
25-29	.8625	.7795	.4912	.2002	.2232
30-34	.9014	.8780	.6708	.3887	.1131
35-39	.8686	.9180	.8239	.6305	.4272
40-44	.8051	.8419	.8655	.7834	.6859
45-49	.7071	.7111	.7854	.8157	.8237

TABLE 6(c)
*Projected Proportions of Married Females in Each Age Group,
 West Bengal, 1971-91, According to Table 5(b)*

Age group	1971	1976	1981	1986	1991
10-14	.0524	.1203	.0938	.0701	.0523
15-19	.4594	.3353	.2858	.2353	.1989
20-24	.7919	.6759	.3526	.3313	.3244
25-29	.8625	.7788	.4880	.1939	.2102
30-34	.9014	.8784	.6718	.3907	.1174
35-39	.8686	.9176	.8226	.6286	.4239
40-44	.8051	.8417	.8646	.7821	.6840
45-49	.7071	.7109	.7850	.8148	.8224

TABLE 7

*Expected General Fertility Rates in West Bengal Under Two
Alternative Assumptions of Marriage Pattern*

Year	Under constant pattern	Under changing pattern	Difference p.c. reduction
1971	203.5	203.5	—
1976	199.6	198.9	0.0
1981	182.8	179.0	2.0
1986	175.8	167.0	5.0
1991	179.8	165.3	8.0
1996	199.7	178.6	10.5

is noticed in the number of married females till the middle of the period with a steady decline subsequently. With changing marriage pattern, though similar pattern of observations are illuminated, but weights of the relative changes are no doubt different. All these ups and downs in the frequency of number married can be explained as due to the likely decrease in the incidence of widowhood, resulting from an increase in the e_0^o .

Decrease in the number married at a faster rate in earlier age-groups and an increase in the latter age groups under changing marriage pattern may be ascribed to a decline in the probability of marriage in earlier age-groups, coupled with an increase in the e_x^o , causing a decline in the incidence of widowhood.

From table 5, one conclusion that can easily be drawn is that a change in the e_0^o will itself bring in a change in the frequency married and hence in the marital status distribution. The changes are rapid when the probability of marriage in the earlier age-groups decreases.

In order to study the effect of changing marriage pattern on fertility, the same age specific marital fertility rates given in table 2, have been applied to both the sets of the projected married female population obtained for the projection period.

Observations from table 7 show that in the initial stages level of GFR shows a declining trend because of changes in number married in earlier age-groups but the counterforce of reduction in widowhood, due to increase in e_x^o helps to prolong the married life ultimately helping the increase. The changing marriage pattern with changing e_x^o shows a declining trend in GFR at a relatively higher rate with time and the ultimate total decline during the period of 25 years is observed to be 10.5 percent.

CONCLUSION

It is realised, the assumption of a constant fertility schedule in the model need not be valid under all circumstances. However, when the ASMFR of Kerala, 1971 is applied to projected married female population of 1996, under changing marriage pattern, the GFR of West Bengal approximates a value of 178.5. Kerala is a state where age at marriage is high and fertility is also higher. So if we have valid reason to believe that a shift in the marriage pattern of West Bengal to current Kerala pattern by 1996, will not bring a change in ASMFR, still then the GFR will decline as a result of change in the marital status distribution only. On the other hand, if the increase in ASMFR is assumed to be the result of the decreasing probability of marriage and increase in e_x^0 , the marital distribution will change but there will not be a significant change in the GFR of West Bengal.

REFERENCES

- SRS Bulletins, R.G. Office, Ministry of Home Affairs, New Delhi
 Social & Cultural Tables, vol. 1, Census of India, 1971.
 Population Studies, vol. 12, n. 2, 1958, p. 131.
 Projection by marital status: in "Methods of Population Projection" Widen L (1967) Gothenburg University, Demographic Institute, Rept. n. 9.
 Report of the expert committee on population projection, paper n. 1 of 1979, Serie 1, Census of India, R.G. Office, New Delhi.

SUMMARY

Marital status composition of a population is influenced by multiple factors like socio-economic, political, religious and other traditional and regional factors, but the demographic factors like mortality, marriage habit none the less play an important role in modifying the composition and consequent effect on fertility.

This paper has been designed to isolate the influence of mortality and marriage pattern on marital status distribution under two alternative models one of constant marriage pattern with changing mortality and the other where both mortality and marriage pattern change and then to analyse its impact on general fertility rate.

Projections of the never married and currently married female population have been made based on the common assumption that e_x^0 in West Bengal State will

increase first 0.9 unit per year till 1986 after that 0.75 unit till 1996, and alternative assumption on probability of marriage which in the first case, remains constant till the end of projection period at West Bengal 1971 level, while on the other case, it would come down linearly by 1996 to current Kerala level in 1971. The effect on fertility due to these alternative projections have been studied.

Result shows in the initial stages fertility has a decline because of changes in number married in earlier age groups for both the projections but ultimately it increases again due to increase in e_0^c of married females. Changing marriage pattern with change in e_0^c shows a relatively higher rate of decline in fertility in comparison with the constant marriage pattern. The per cent reduction in fertility within a period of 25 years, under two patterns comes out as 1.8 and 12.2 respectively and the relative difference is therefore 10.5 per cent ultimately.

RIASSUNTO

La composizione di una popolazione secondo lo stato civile è condizionata da fattori socio-economici, politici e religiosi e da altri ancora legati alla tradizione. I fattori demografici quali la mortalità e il costume matrimoniale giocano, tuttavia, un ruolo importante sulle variazioni di tale composizione e, quindi, sulla fecondità.

Il presente lavoro si propone di isolare l'influenza della mortalità e dei modelli matrimoniali sulla distribuzione per stato civile in base a due alternative: a) modelli matrimoniali costanti e mortalità variabile; b) modelli matrimoniali e mortalità entrambi variabili; e di analizzarne conseguentemente l'effetto sul quoziente di fecondità generale.

Le proiezioni della popolazione femminile hanno riguardato, da un lato, le donne senza alcuna esperienza matrimoniale e, dall'altro, quelle coniugate, ipotizzando che e_0^c nello Stato del Bengala occidentale aumenti di 0.9 unità per anno dal 1971 fino al 1986 e poi di 0,75 unità fino al 1996. Le ipotesi alternative riguardo alle probabilità di matrimonio sono che nel primo caso esse rimangano costanti fino al termine del periodo di proiezione, al livello osservato nel Bengala occidentale nel 1971; mentre, nel secondo caso, esse diminuiscono linearmente a partire dal 1996 fino al livello osservato nel Kerala nel 1971.

I risultati raggiunti per quanto attiene agli effetti sulla fecondità, mostrano che questa diminuisce nelle fasi iniziali in quanto diminuisce il numero di matrimoni nelle classi di età più giovani, in entrambe le proiezioni. Tuttavia, la fecondità ha mostrato di recente ancora un aumento a causa dell'incremento di e_0^c tra le donne coniugate. La variazione dei modelli matrimoniali e del valore e_0^c induce ad una più intensa diminuzione della fecondità rispetto all'ipotesi alternativa. La riduzione proporzionale della fecondità in un intervallo di 25 anni è, a seconda delle alternative considerate, dell'1,8 o del 12,2 % con una differenza relativa, quindi, del 10,5%.

RESUME

La composition d'état marital d'une population est influencée par des facteurs socio-économiques, politiques, religieux et traditionnels. Pourtant, les facteurs démographiques tels que la mortalité et les habitudes de mariage jouent un rôle important sur la modification de cette composition.

Cette étude est consacrée à isoler l'influence de la mortalité et du modèle de mariage sur la distribution d'état marital. Deux modèles alternatifs sont envisagés: i) modèle constant de mariage avec la mortalité variée et ii) mortalité et modèle de mariage variés. Ensuite, nous avons analysé le point d'impact sur le taux général de fécondité.

La projection de deux populations de femmes, l'une de jamais mariées et l'autre de mariées récemment a été faite, basée sur l'hypothèse que: i) e_0^f dans l'état du Bengale Occidental sera augmenté à 1 unité par an jusqu'en 1986 et ensuite ii) à 0.75 unité jusqu'en 1996 et les hypothèses alternatives de mariage sont: i) la probabilité sera constante jusqu'à la fin de la période de projection dans le Bengale Occidental en 1971 et ii) elle va descendre linéairement en 1996 au niveau de Kerala en 1971. L'effet de la fécondité à cause de ces projections alternatives a été étudié.

Dans les étapes initiales la fécondité décline à cause du changement dans le nombre de mariages dans les groupes jeunes des deux projections. Mais, elle augmente encore à cause de l'augmentation de e_0^f parmi les femmes mariées. La variation des modèles de mariage et de la valeur de e_0^f produit une réduction de la fécondité par rapport à l'hypothèse alternative. La réduction proportionnelle de la fécondité dans un intervalle de 25 ans est de 1,8 ou de 12,2% selon les alternatives considérées, avec une différence relative, donc, de 10,5%.